

# Business Processes Modelling

## MPB (6 cfu, 295AA)

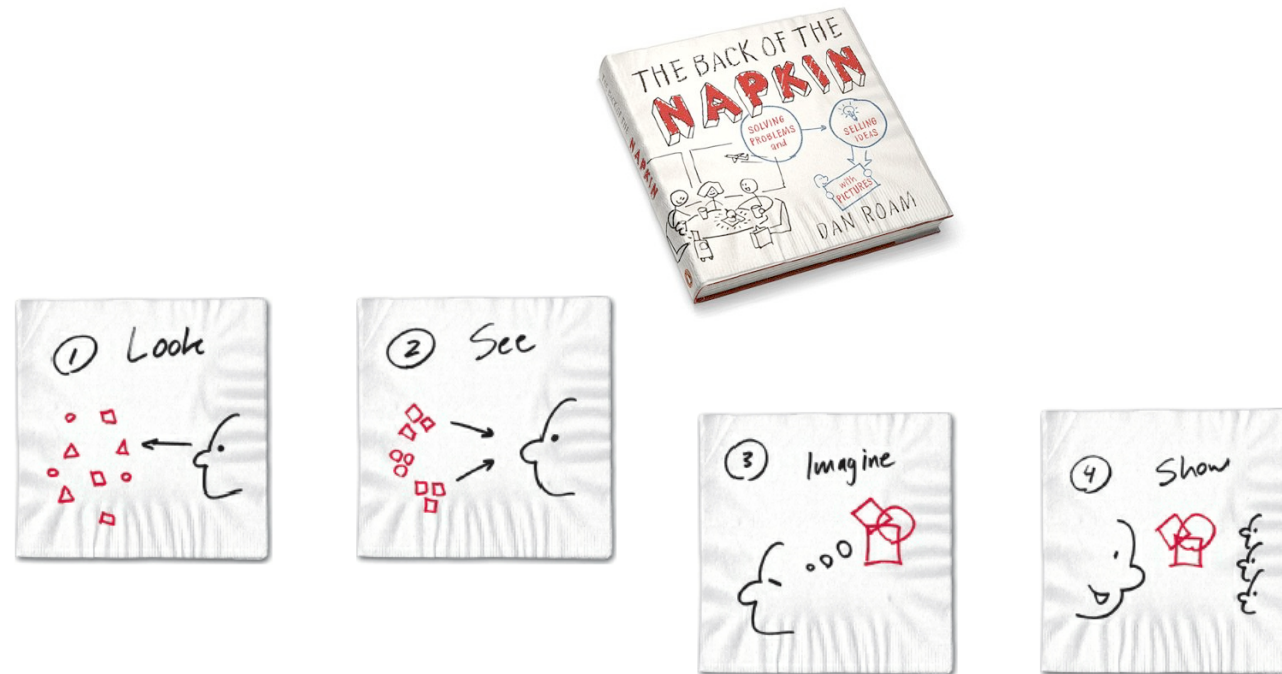
Roberto Bruni

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

03 - Visual notation



# Objective



To lay the foundation of business process modelling through graphical approaches

Ch. 3 of Business Process Management: Concepts, Languages, Architectures

# Business process

**Definition:** a **business process** consists of a set of activities that are performed in coordination in an organizational and technical environment. These activities jointly realize a business goal.

Orchestration

Each business process is enacted by a single organization, but it may interact with business processes performed by other organizations.

Collaboration / Choreography

- Weske

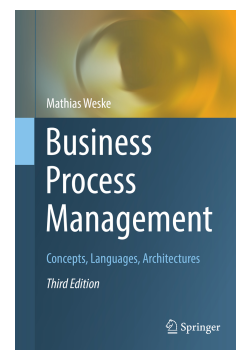
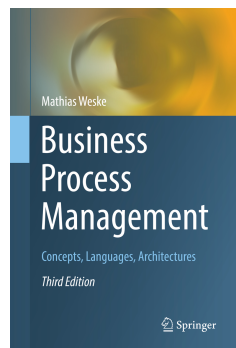
# Business process models and instances

**Definition:** **business process model** consists of a set of activity models and execution constraints between them.

- Weske

**Definition:** **business process instance** represents a concrete case in the operational business of a company, consisting of activity instances.

- Weske



# Models and instances

Each activity model acts as a blueprint  
for a set of activity instances

Each business process model  
acts as a blueprint for a set of  
business process instances  
(related to cases)



Enter  
credit  
request

Enter c.r.  
(r017, Miller,  
10000)

Enter c.r.  
(r018, Brown,  
15500)

Enter c.r.  
(r019, McGraf,  
12000)



If no confusion is possible, the term **activity** is  
used to refer to activity models (tasks)  
as well as activity instances

Analogously, the term **process** is used to refer  
to process models as well as process instances

# Modelling:

## Who is the customer?

*Each business process starts and ends with a customer who requests a product and who receives the product as a result of the business process*

a customer can be internal to the company,  
e.g. a department



# Modelling:

## Who is the owner?

*Each business process is assigned a process owner, who is responsible for the process*

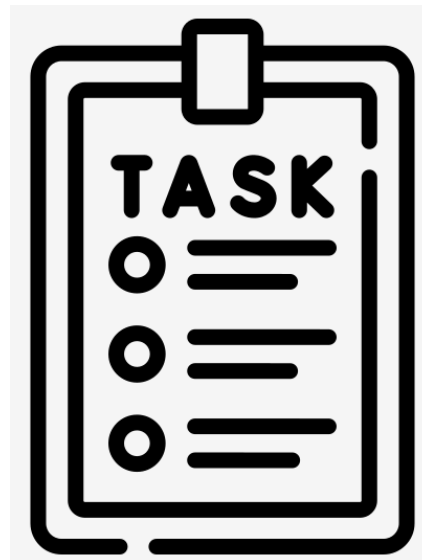
the owner is in charge of making sure  
that process instances are conducted correctly,  
that business goals are met, and  
that process performances are measured and improved



# Modelling: Which tasks?

*Each business process comprises  
a set of activities needed to realize the business goals*

tasks can be expressed at different levels of granularity  
(each unit of work is seen as an atomic action, possibly  
with a duration and a cost)

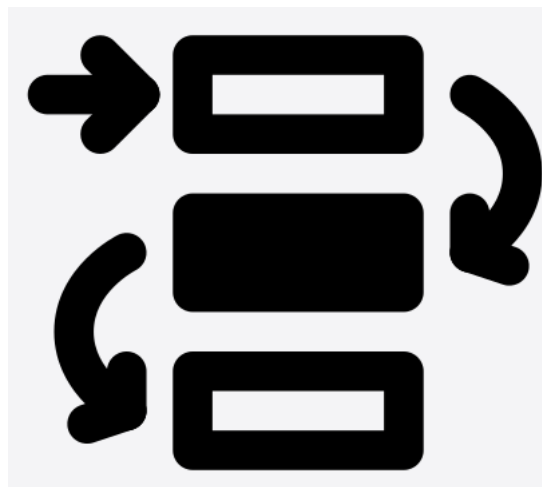




# Modelling: Which dependencies?

*Execution constraints are used to order activities in a way that enterprise resources are used efficiently and at the same time the business goals are met*

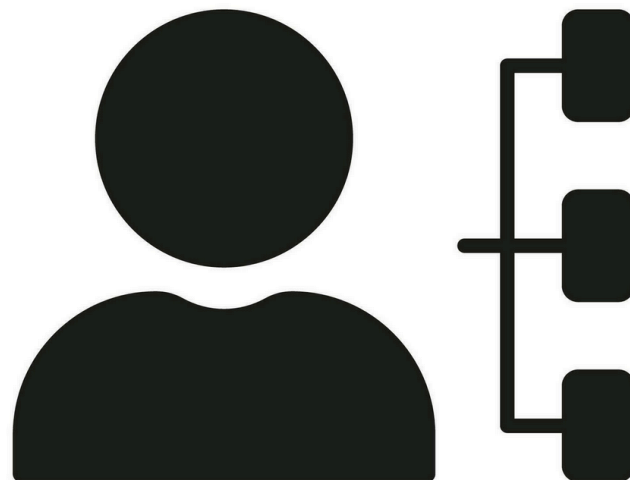
process orchestration languages are used to express execution constraints about distribution over *time*



# Modelling: Which roles?

*Each task may need some specific abilities (roles)  
to be carried out*

process orchestration languages are used to express  
execution constraints about distribution over *space*



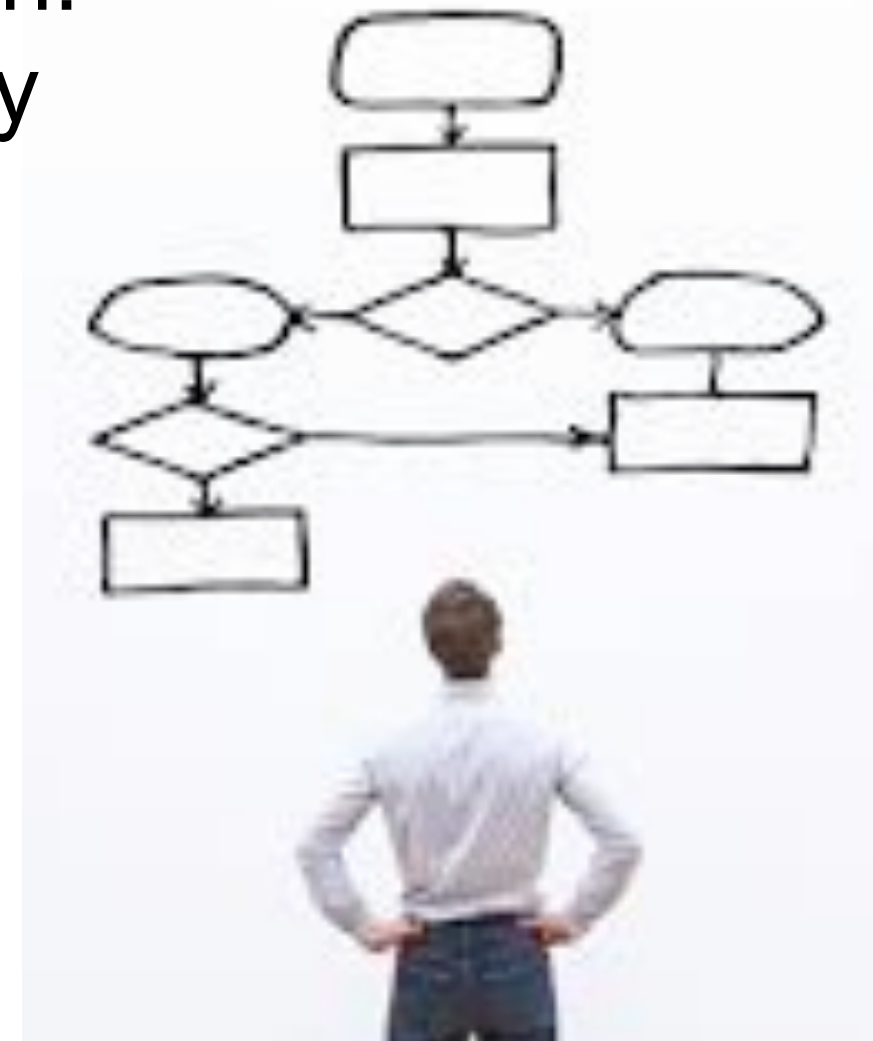
# Modelling

From informal textual descriptions (requirements)  
to a particular business process modelling notation

Explicit business process models expressed in a  
graphical notation facilitate communication, so that  
different stakeholders can:

**communicate** efficiently  
**refine** processes  
**improve** processes

No	Requirement	Use Case
1	To locate user's current location	Current Location
2	To display user's current location information	Display Current Location
3	To display error when couldn't locate location	Error Displaying Locations
4	To provide a search function for user to search for direction to another location	Search Direction
5	To display user's desired location direction	Display Direction
6	To provide user the floor plans of the building	Floor Layout
7	To provide the list of floor layout for user to select	Select Floor
8	To display the selected floor layout by the user	Display Floor Layout
9	To provide user all the stores information in the building	Store List
10	To provide the list of store categories for user to select	Select Category
11	To display the list of stores under the selected	Select Store
12	To display the selected store information	Display Store Information
13	To display the first interface of	Home



# Business process management

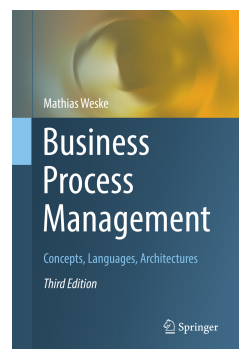
**Definition:** **business process management**

includes concepts, methods, and techniques to support the design, administration, configuration, enactment, and analysis of business processes.

- *Weske*

We need **explicit representation** of business processes, their **tasks** and the **execution constraints** between them

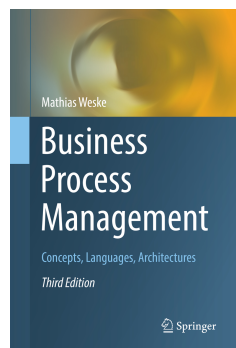
Business processes can then be subject to **analysis, improvement, and enactment**



# Business process management system

Business process models are the main artefact for implementing business processes

This implementation can be done by organizational rules and policies, but it can also be done by business process management (software) system



**Definition: business process management system** is a generic software system that is driven by explicit process representations to coordinate the enactment of business processes.

- Weske

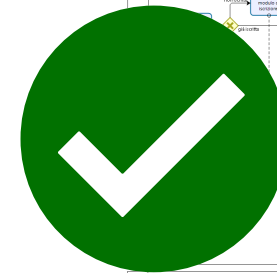
# Representing processes

## Visual representations:

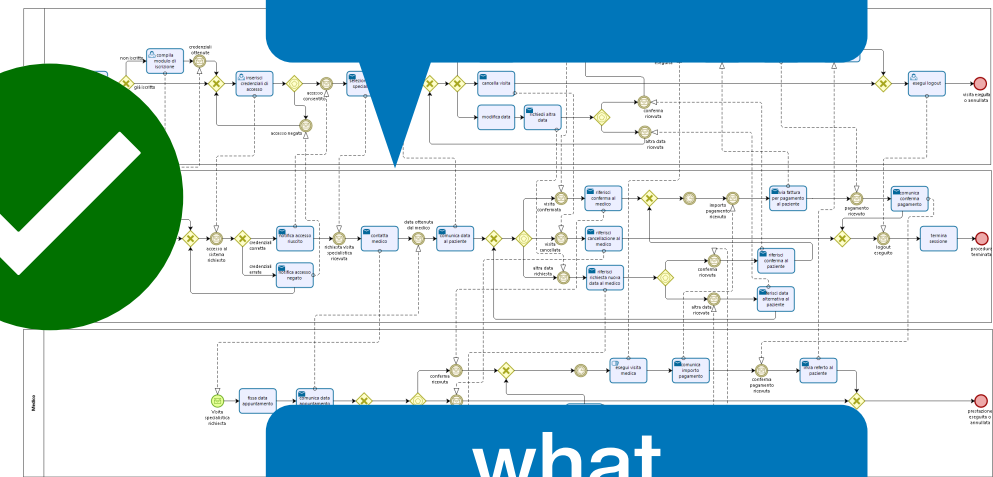
diagrams and charts

understandable by humans

(informal, intuitive, BPMN, EPC, BPEL)



what we see

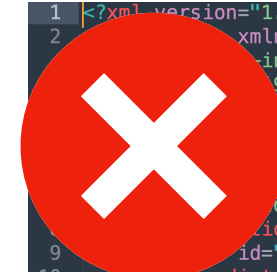


what machines see

## Languages:

unambiguous machine syntax

(process dialects, XML schemes)

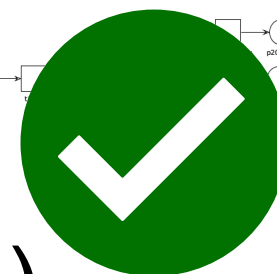


```
1 <?xml version="1.0"?>
2   xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:xsi="http://www.w3.org/2001/XMLSchema"
3   instance="id="_2019_1207470" targetNamespace="http://www.bizagi.com/
4   9011207470" xmlns="http://www.omg.org/spec/BPMN/20100524/MODEL">
5     <process id="Id_4184d428-51f4-4a5f-a66c-4b24ae1da1b3" name="Processo principale">
6       <startEvent id="Id_b106ba3a-1bbb-4efd-bece-dc9cda12eeeb" type="start" />
7       <task id="Id_15079acc-09ed-4adf-b44f-1578d60b82a8" type="task" />
8       <endEvent id="Id_ebce1c69-4d72-45f6-8b3e-2367442967ab" type="end" />
9       <intermediateCatchEvent id="Id_254c9cde-6b8c-42be-a151-55ed4e87b322" name="conferma
10      ricevuta">
```

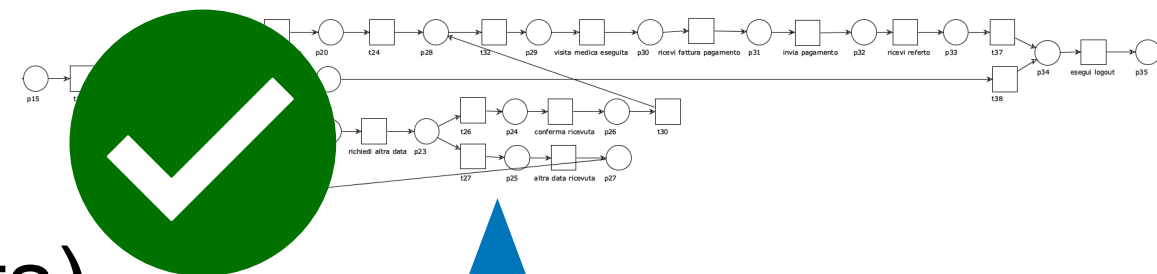
## Models:

rigorous semantics for scientists

(automata, Petri nets, workflow nets)



what we analyse



# Do you know XML?

**eXtensible Markup Language:**  
file format for storing and transmitting data

XML tags represent the data structure and contain metadata

```
<?xml version="1.0" encoding="UTF-8"?>
```

```
<note>
```

```
  <from>Alice</from>
```

```
  <to>Bob</to>
```

```
  <heading>Reminder</heading>
```

```
  <body>Don't forget to buy oranges!</body>
```

```
</note>
```

# BPMN vs .bpmn



```
<?xml version="1.0" encoding="UTF-8"?>
<bpmn:process id="Process_0pjif87">
  <bpmn:startEvent id="StartEvent_1">
    <bpmn:outgoing>Flow_0u05dpy</bpmn:outgoing>
  </bpmn:startEvent>
  <bpmn:task id="Activity_11zhm01" name="Run">
    <bpmn:incoming>Flow_0u05dpy</bpmn:incoming>
    <bpmn:outgoing>Flow_17t5zjm</bpmn:outgoing>
  </bpmn:task>
  <bpmn:sequenceFlow id="Flow_0u05dpy" sourceRef="StartEvent_1" targetRef="Activity_11zhm01" />
  <bpmn:endEvent id="Event_1t0u7im">
    <bpmn:incoming>Flow_17t5zjm</bpmn:incoming>
  </bpmn:endEvent>
  <bpmn:sequenceFlow id="Flow_17t5zjm" sourceRef="Activity_11zhm01" targetRef="Event_1t0u7im" />
</bpmn:process>
</note>
```



# Insurance claim example (simplified)

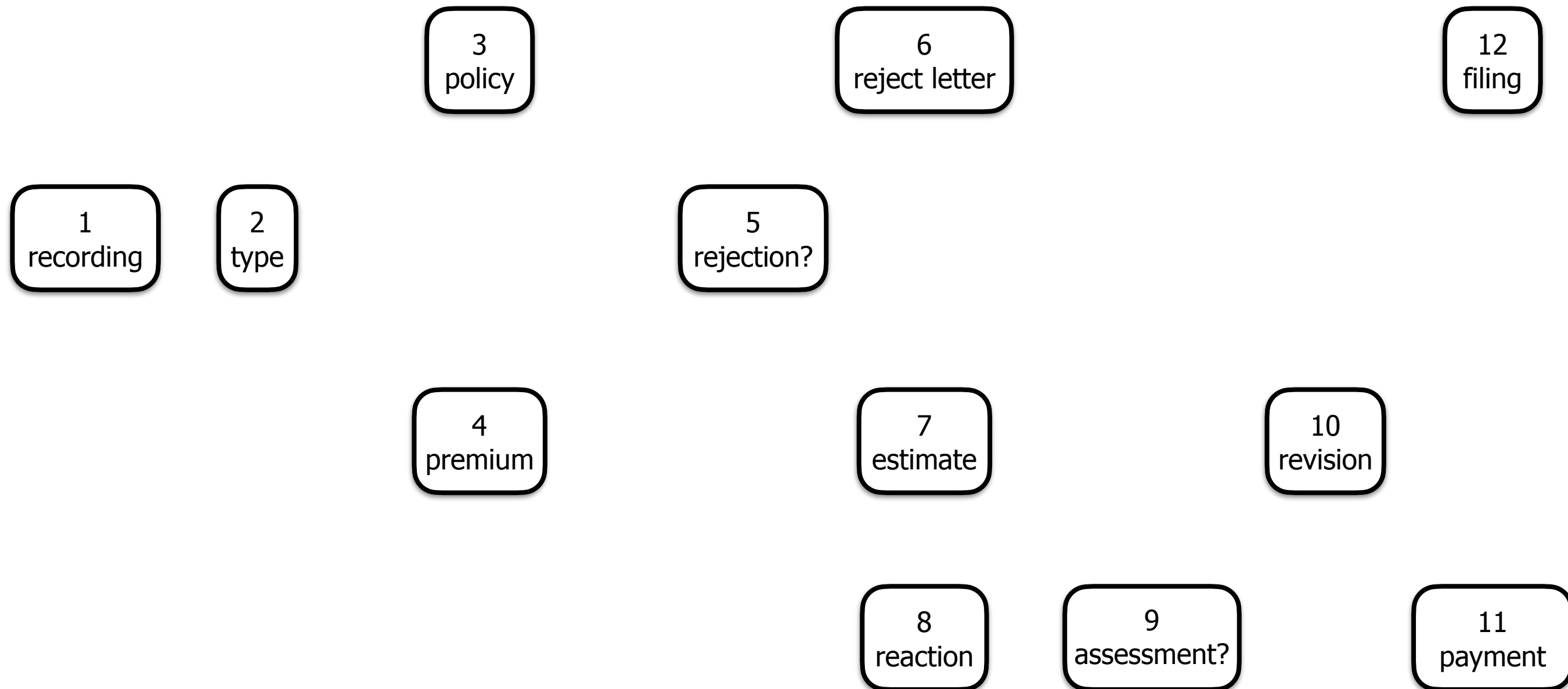
Sect.1.3 of Workflow Management: Models, Methods, and Systems

# An example: insurance claim

1. **recording** the receipt of the claim
2. establishing the **type** of the claim
3. checking covering of client's **policy**
4. checking the **premium** (payments up to date?)
5. decision for **rejection/admission**:
6. if 3 or 4 has negative result: producing a **rejection letter**, then 12
7. if 3 & 4 have positive results: sending **estimate** amount to be paid,
8. recording client's **reaction**
9. **assessment** of objection:
10. if 9 has negative result: decision to **revise** 7
11. if 9 has positive result: **payment** of claim
12. **filing** and closure of claim

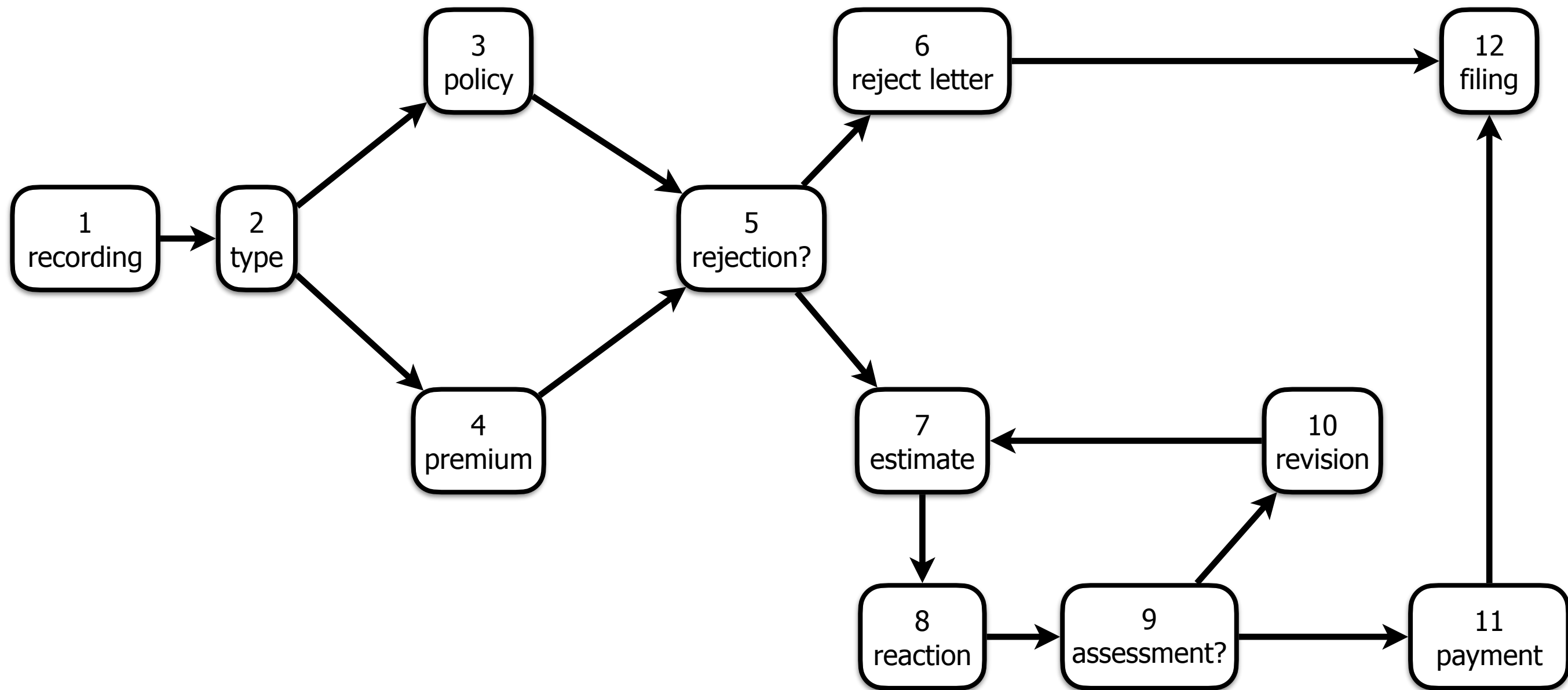
# Tasks

1. [recording](#) the receipt of the claim
2. establishing the [type](#) of the claim
3. checking covering of client's [policy](#)
4. checking the [premium](#) (payments up to date?)
5. decision for [rejection/admission](#):
6. if 3 or 4 has negative result: producing a [rejection letter](#), then 12
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12. [filing](#) and closure of claim



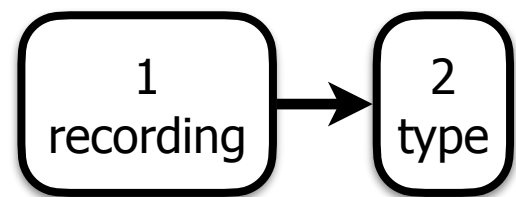
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# Links

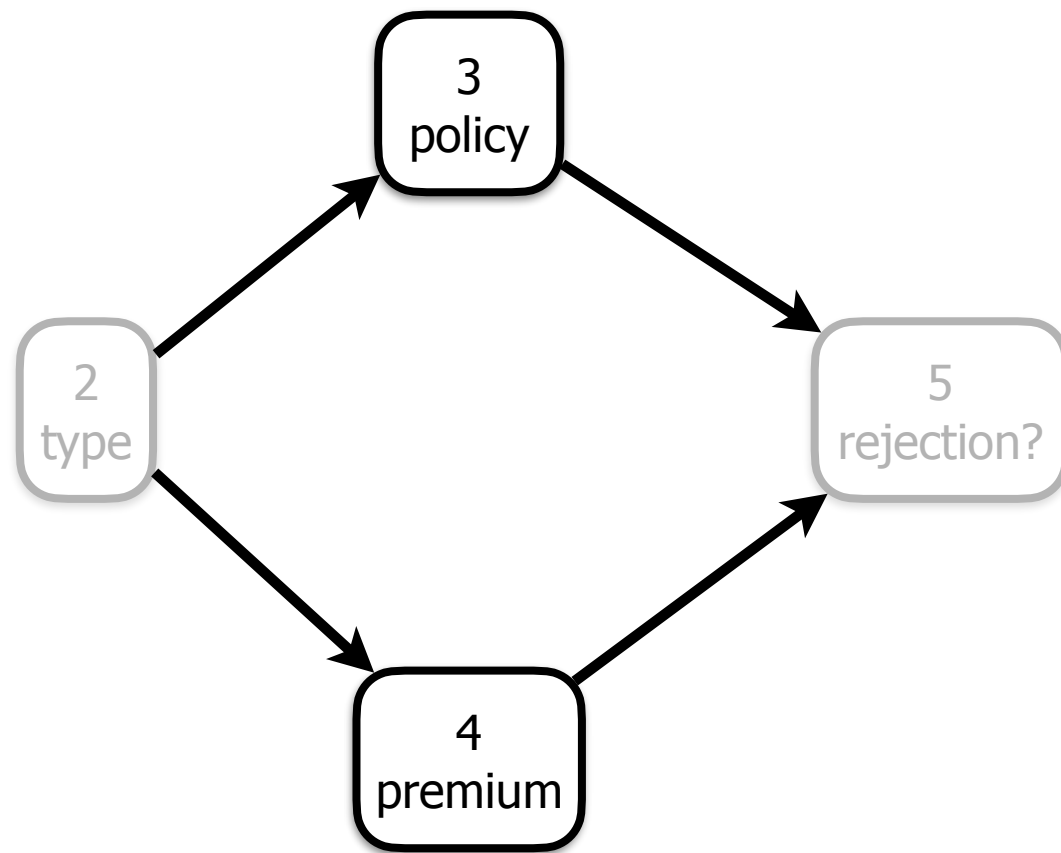


Some patterns

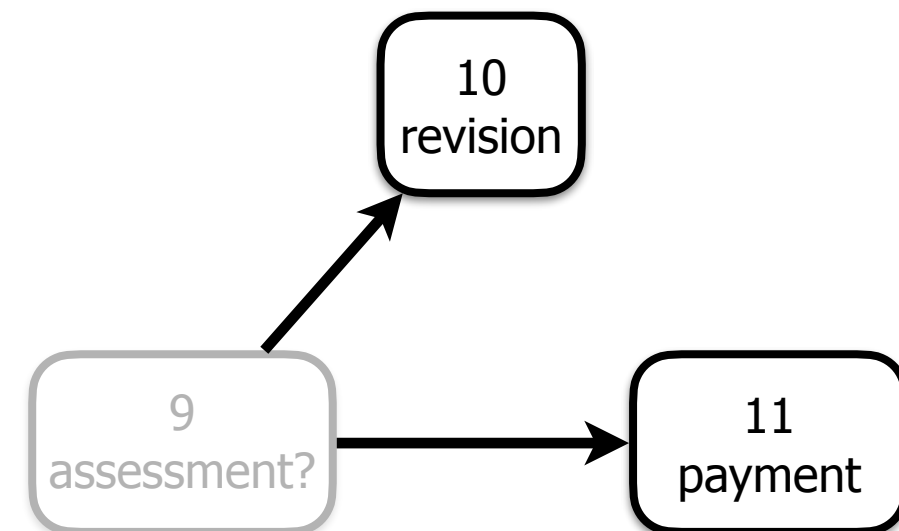
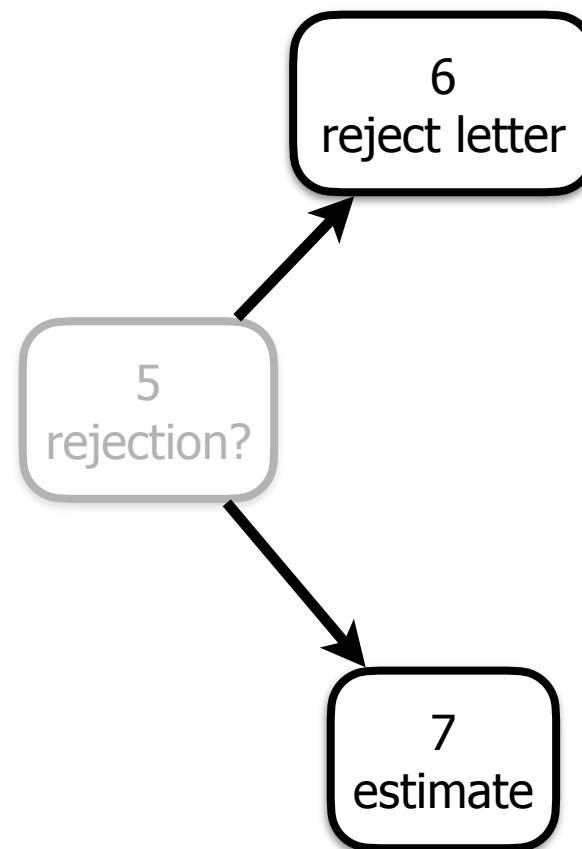
# Sequence



# Parallel

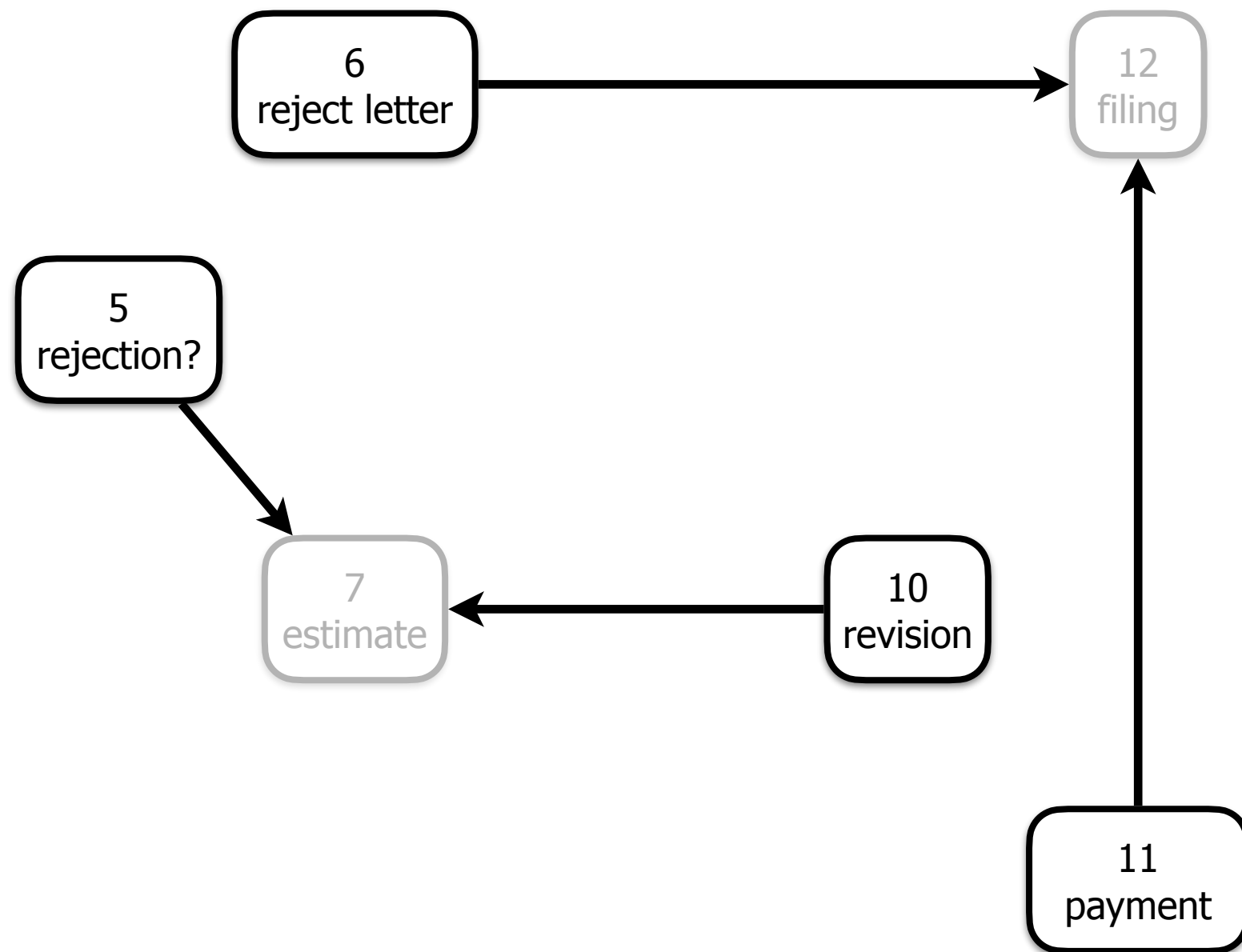


# Choice / Split

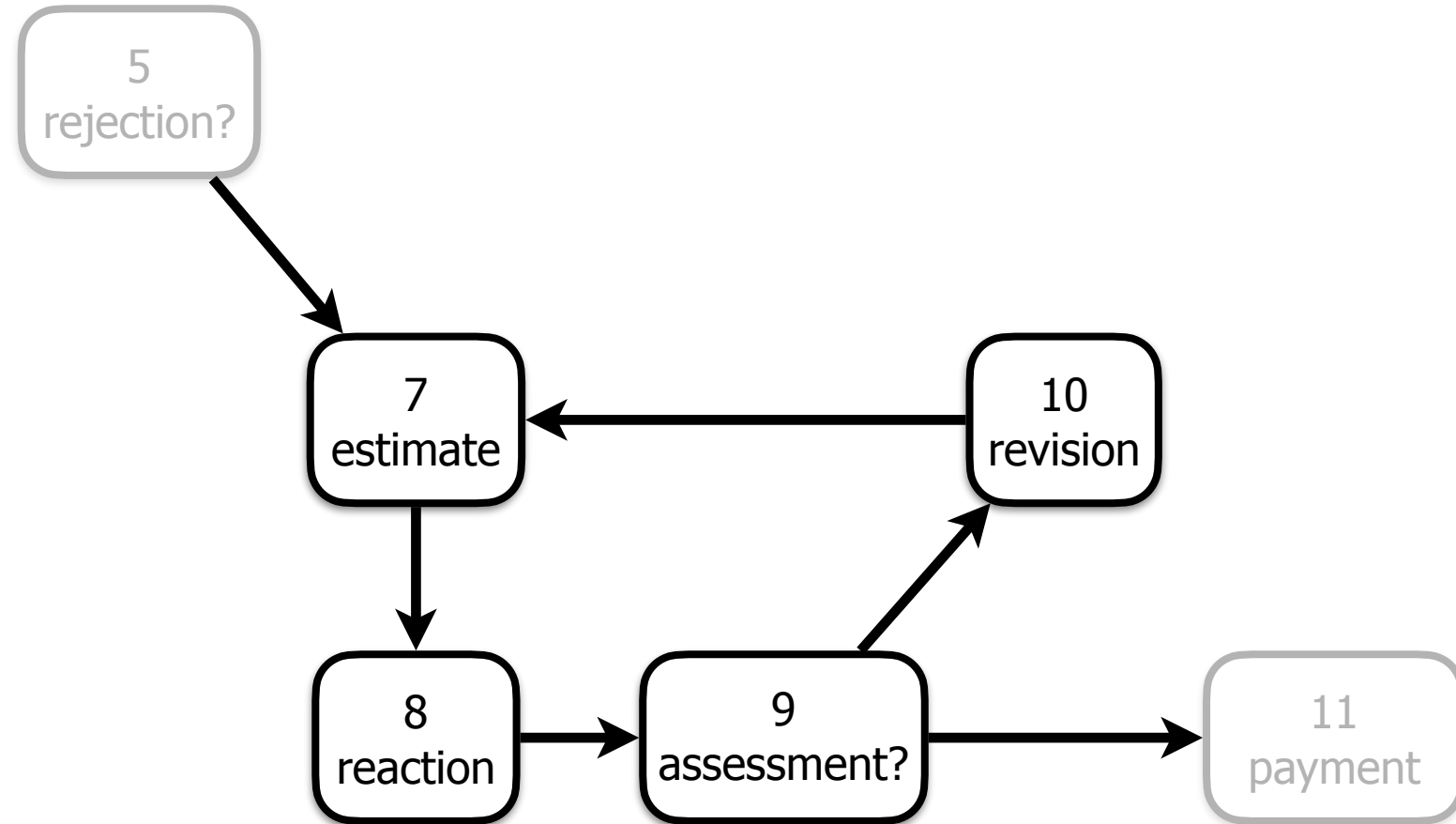




# Merge

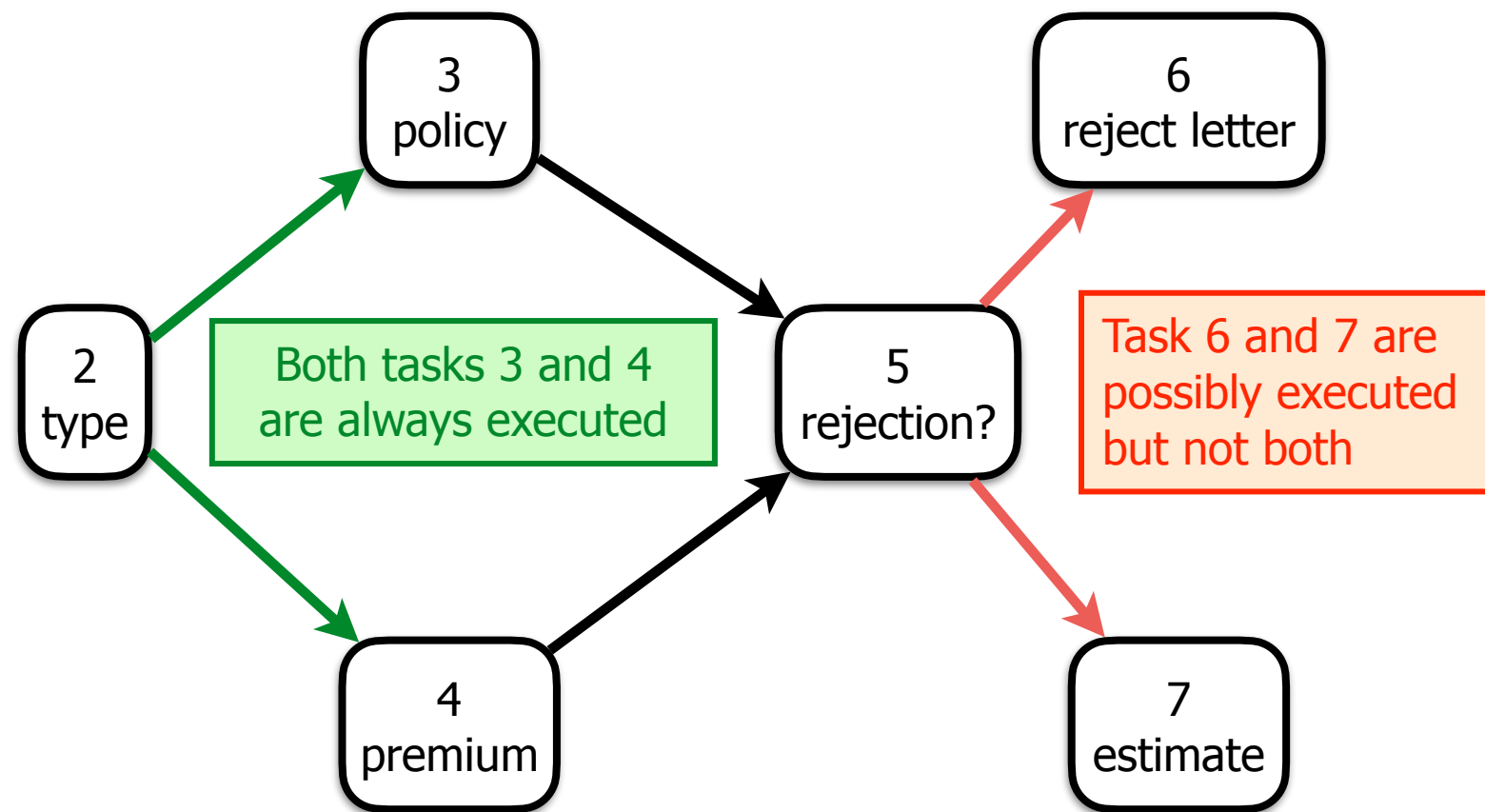


# Iteration

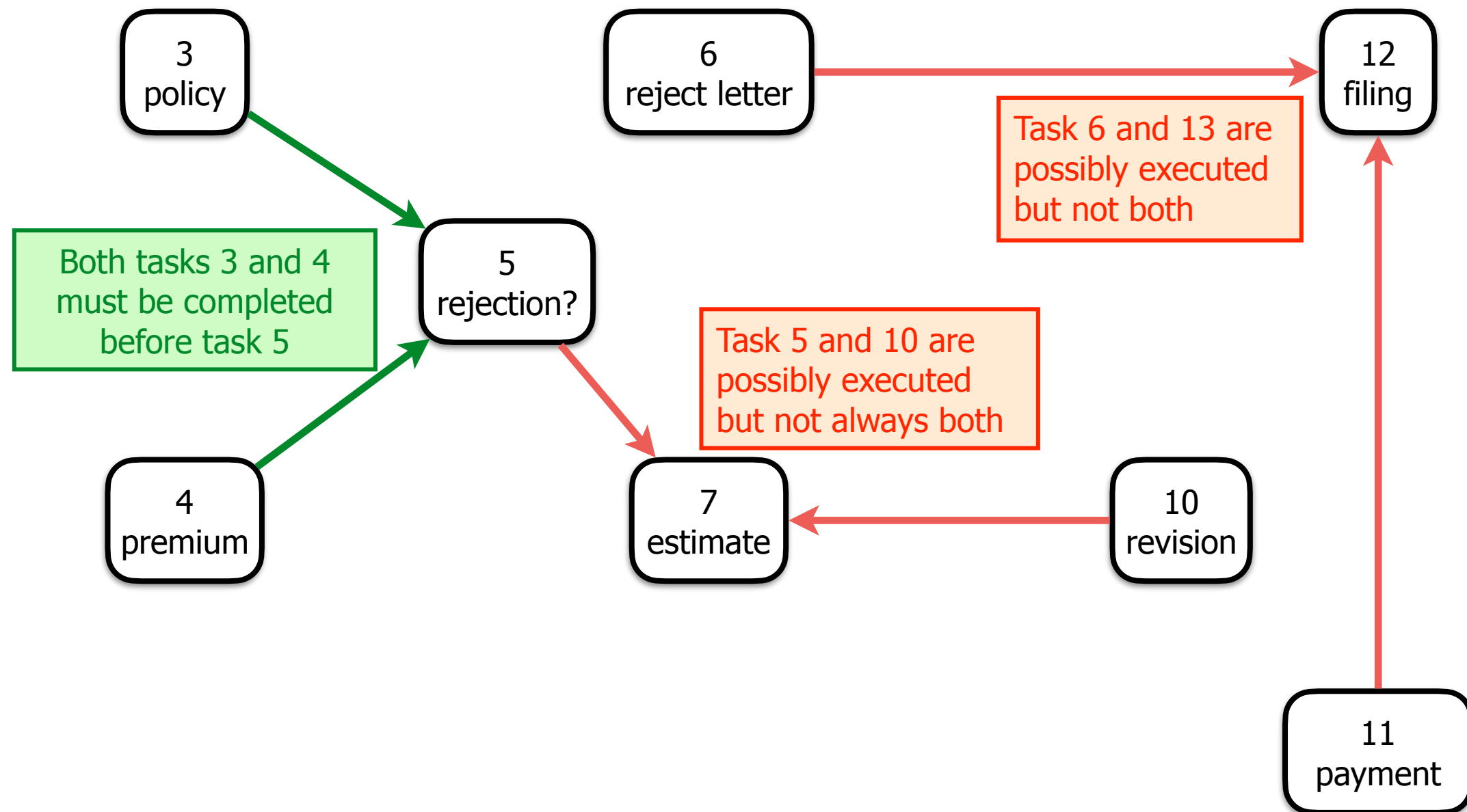


# Ambiguity

# Ambiguity!

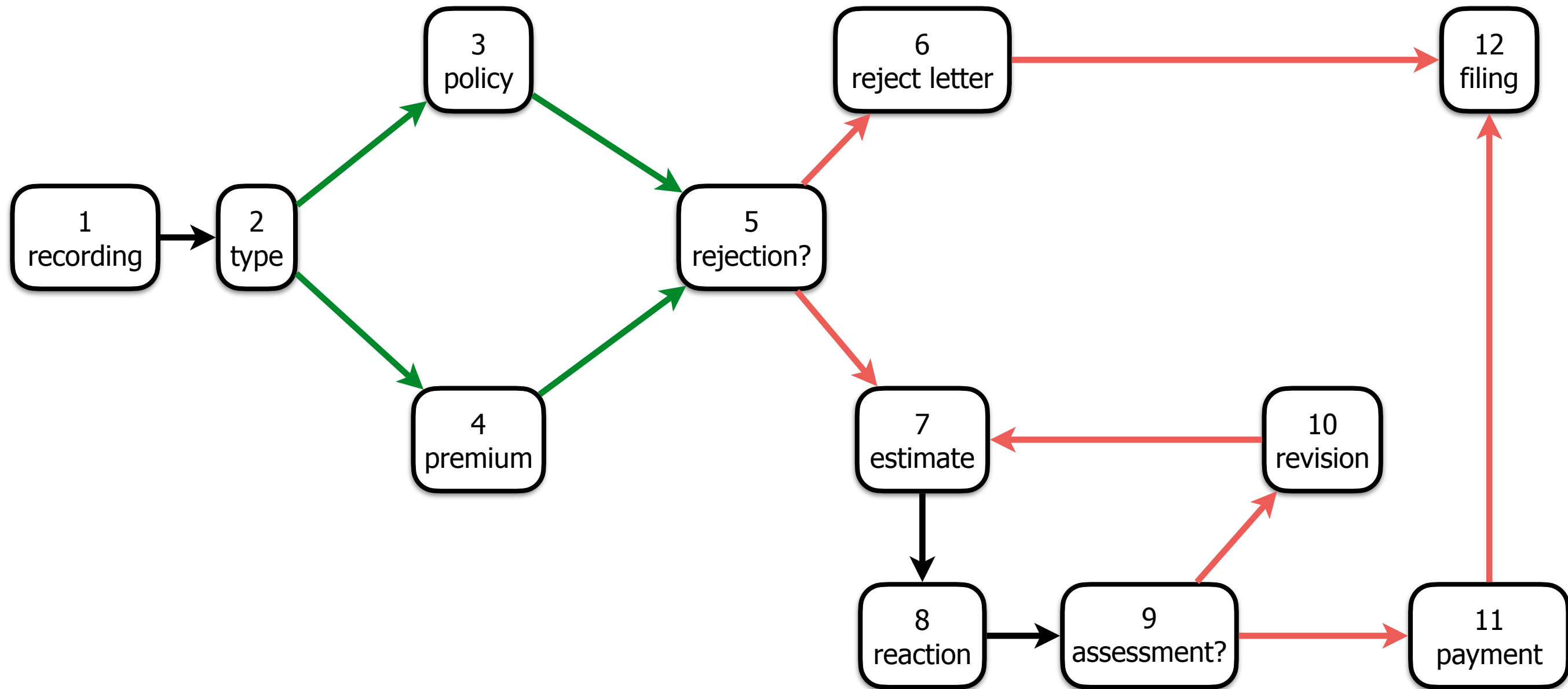


# Ambiguity!

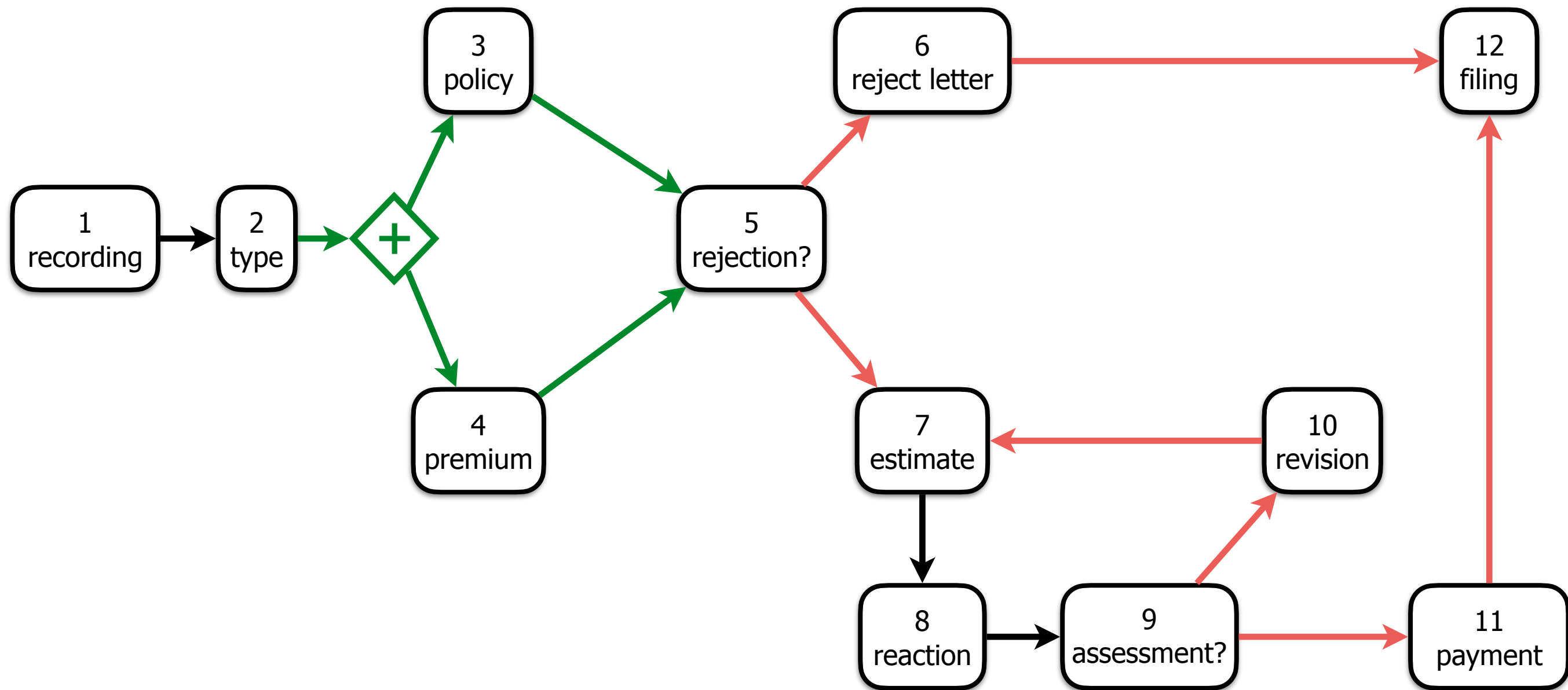


# Disambiguation

# Disambiguation

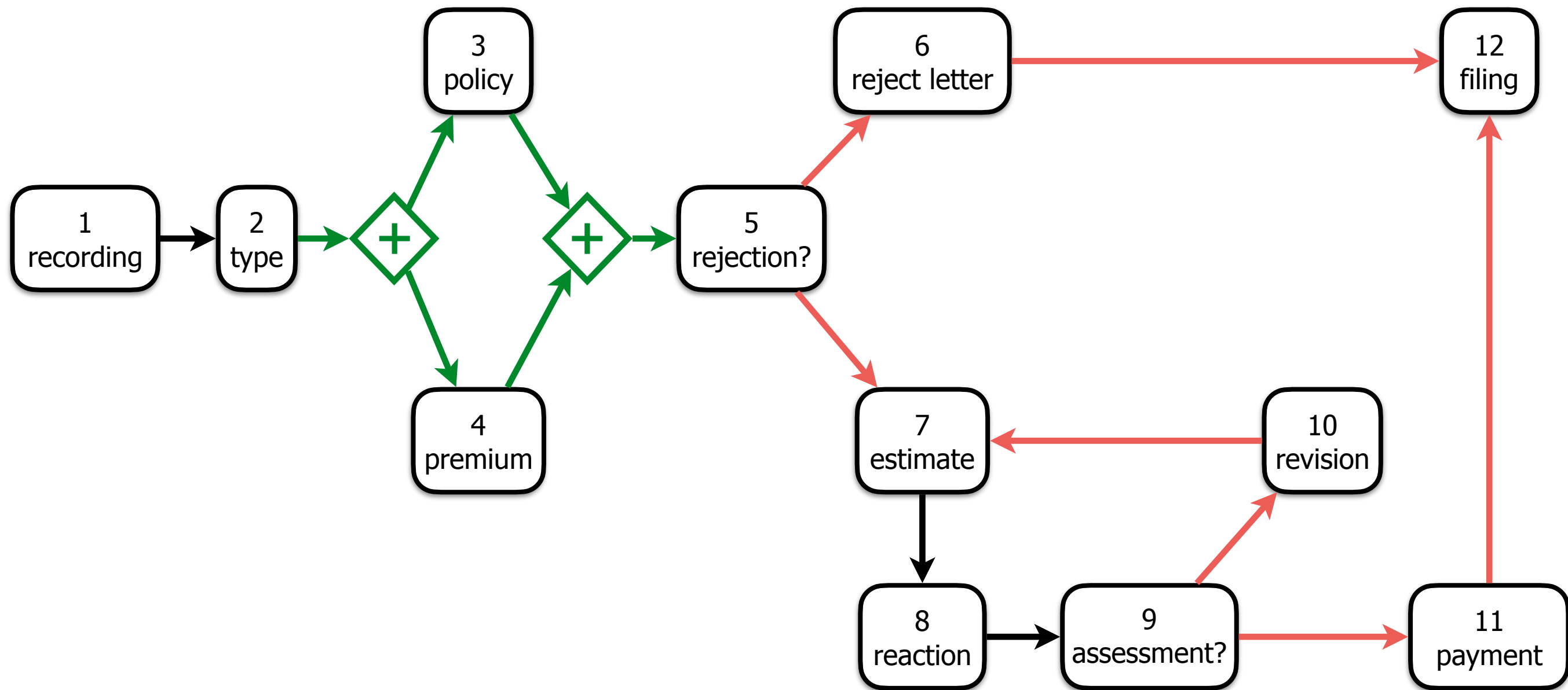
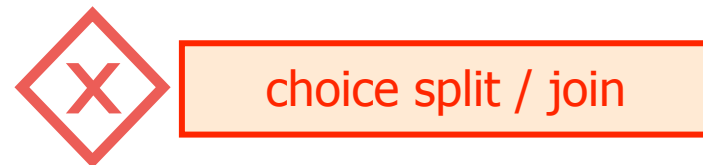


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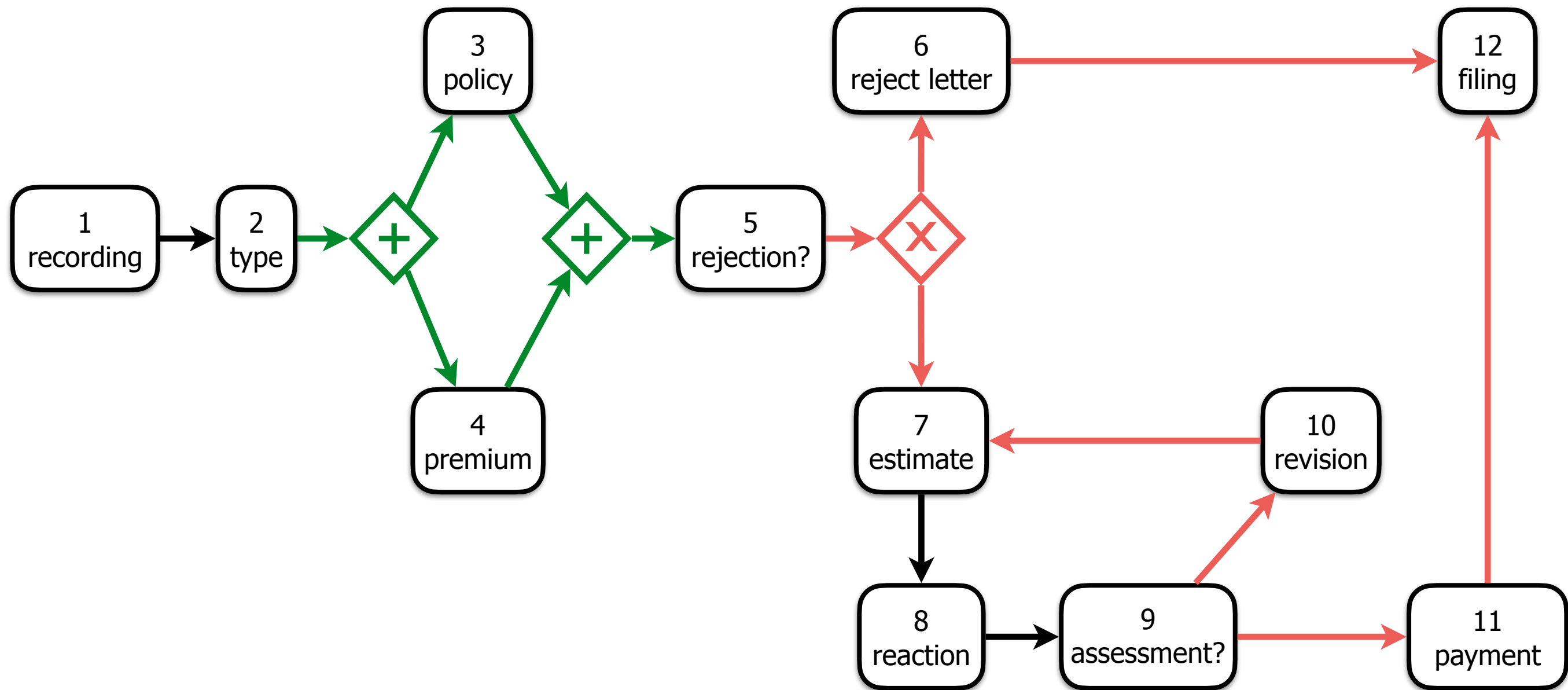
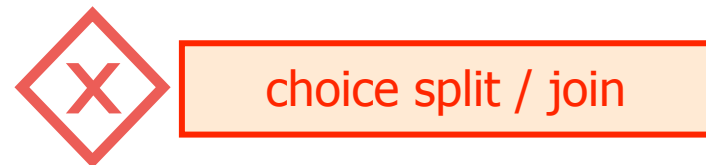




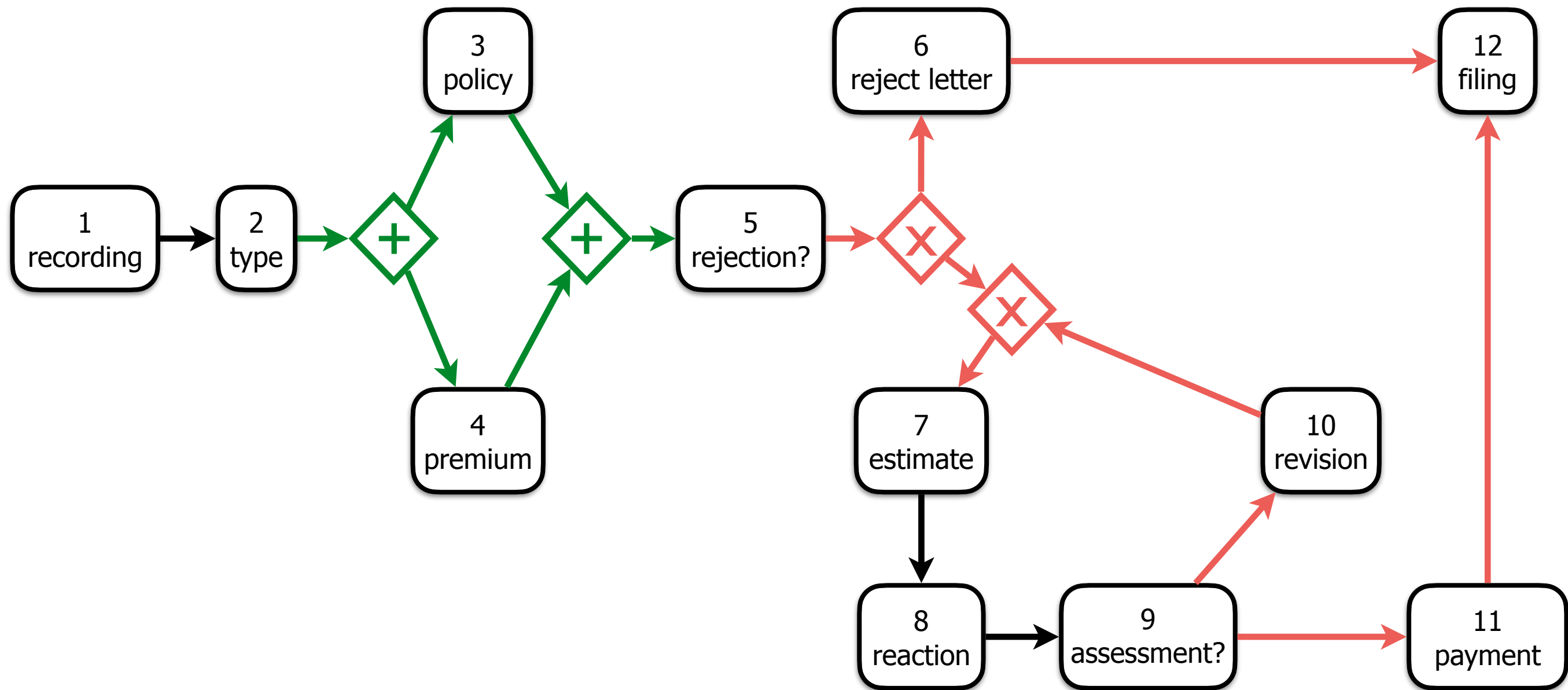
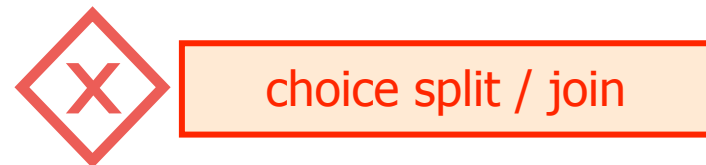
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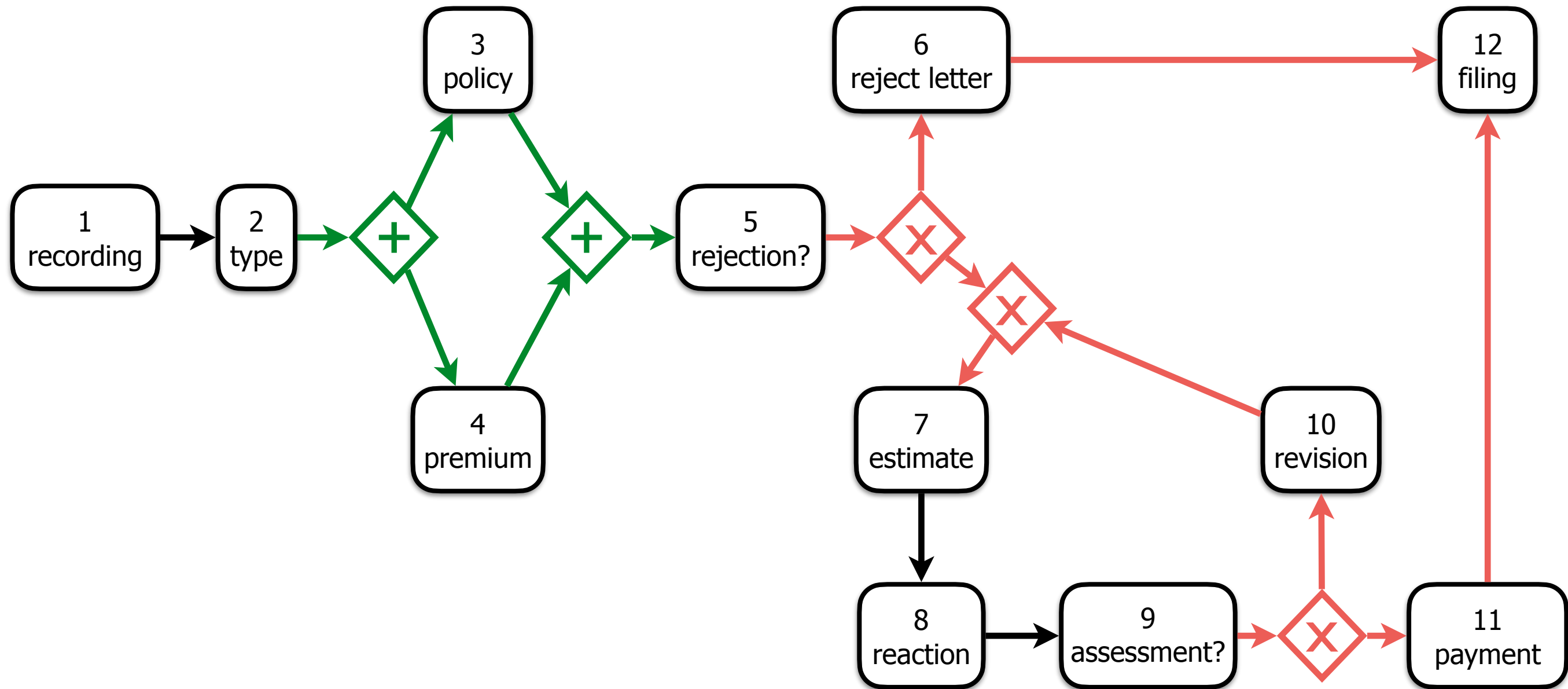
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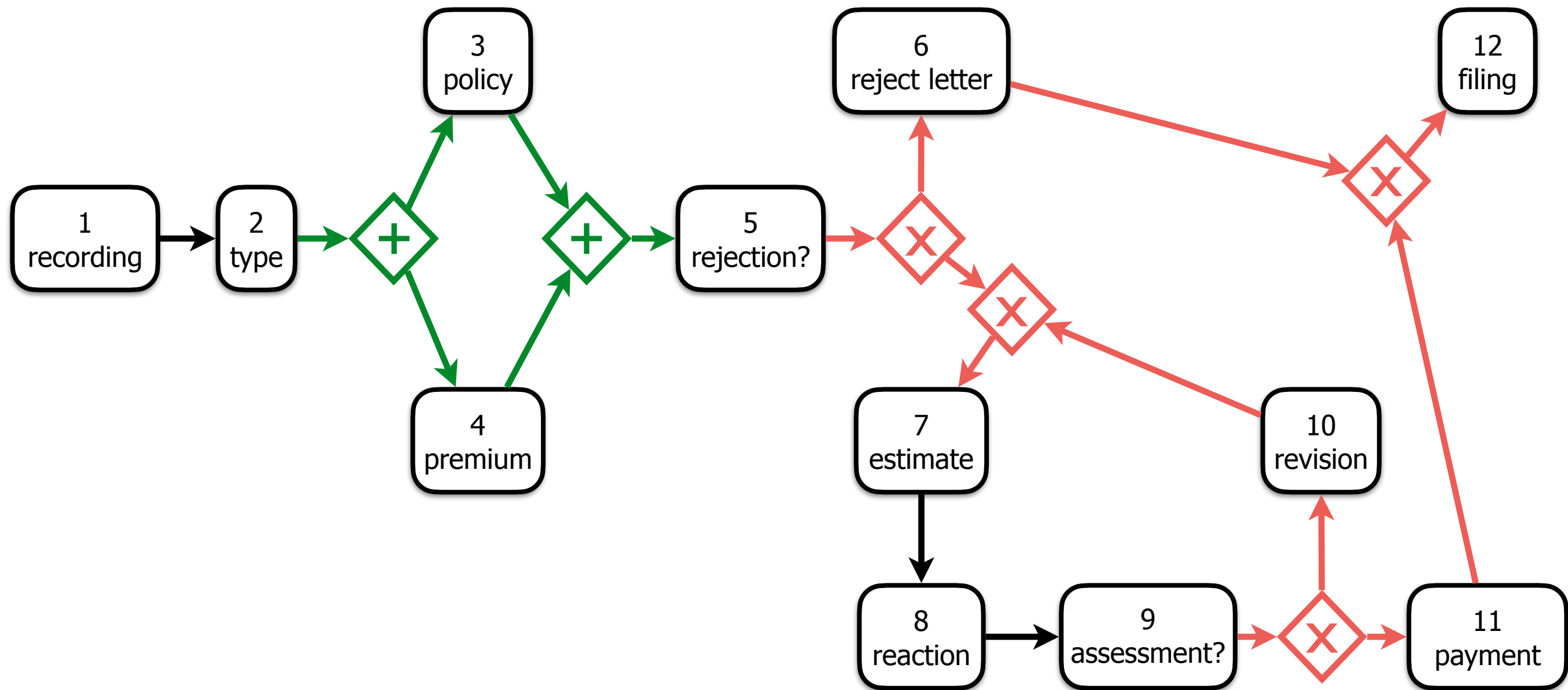
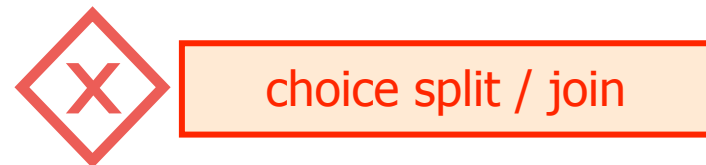
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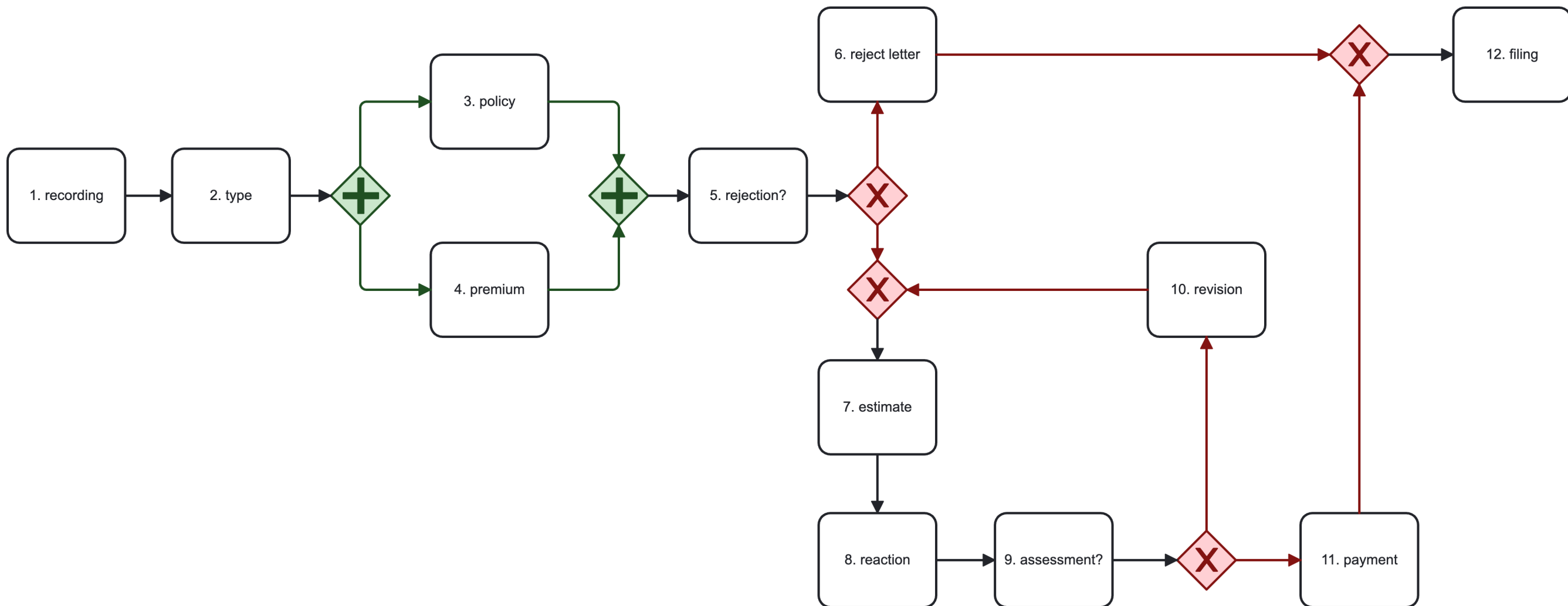
# Disambiguation



# Disambiguation

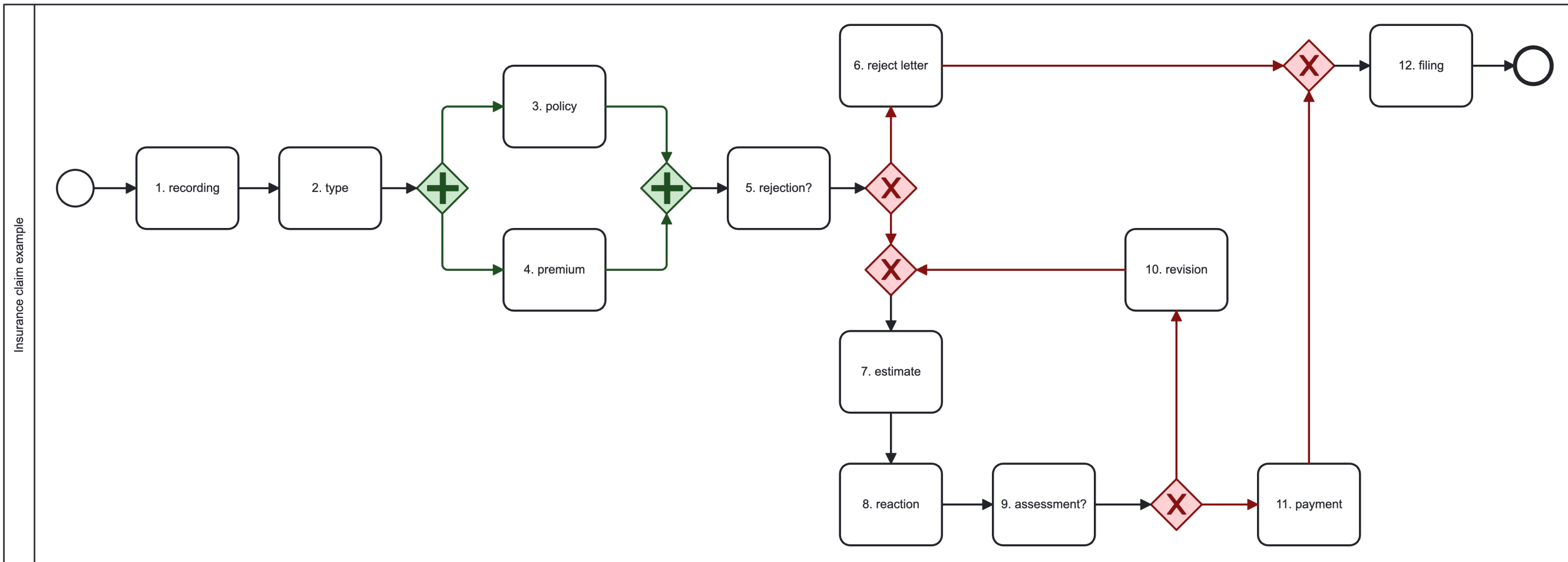


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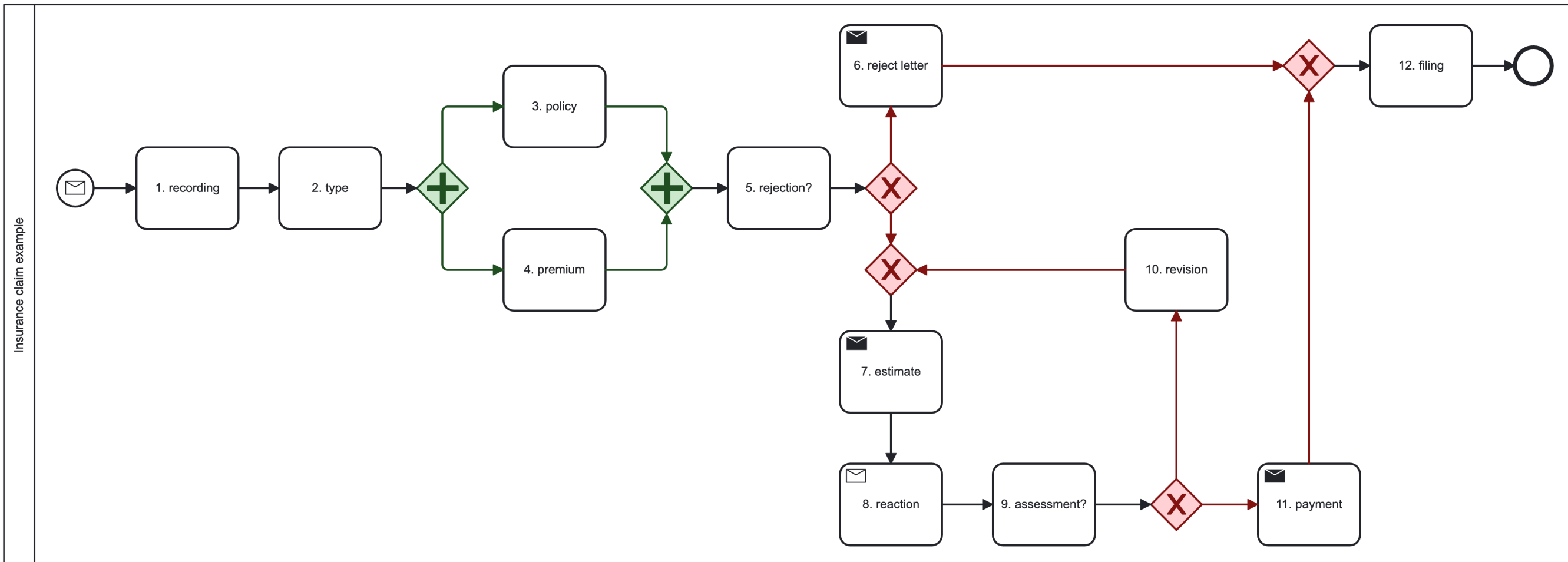
<https://camunda.com/download/modeler/>  
<https://bpmn.io/>

# Disambiguation



<https://camunda.com/download/modeler/>  
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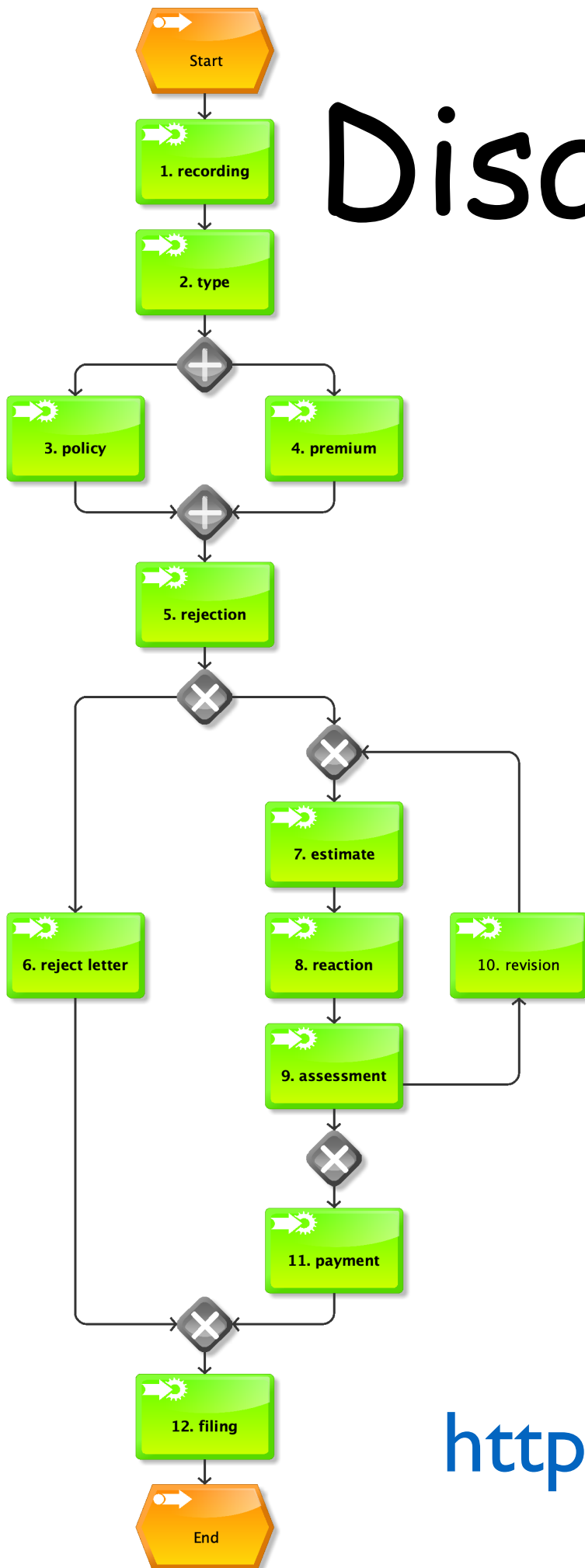
# Disambiguation (BPMN)



<https://camunda.com/download/modeler/>  
<https://bpmn.io/>



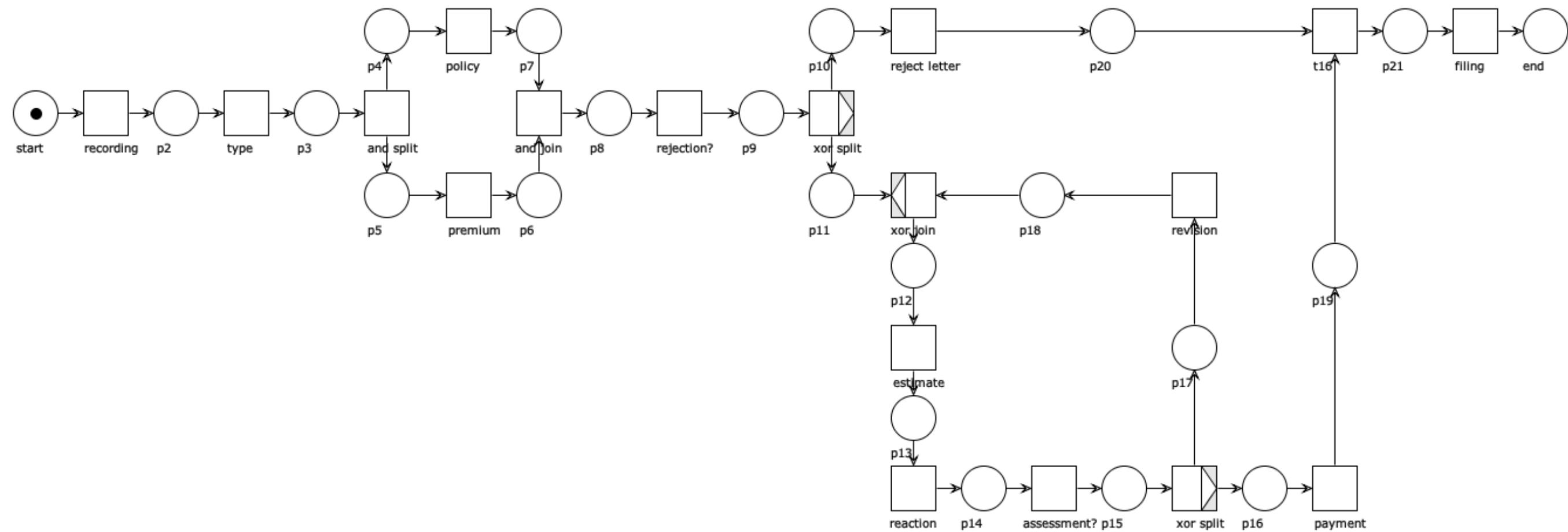
# Disambiguation (EPC)



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



# Disambiguation (WfN)

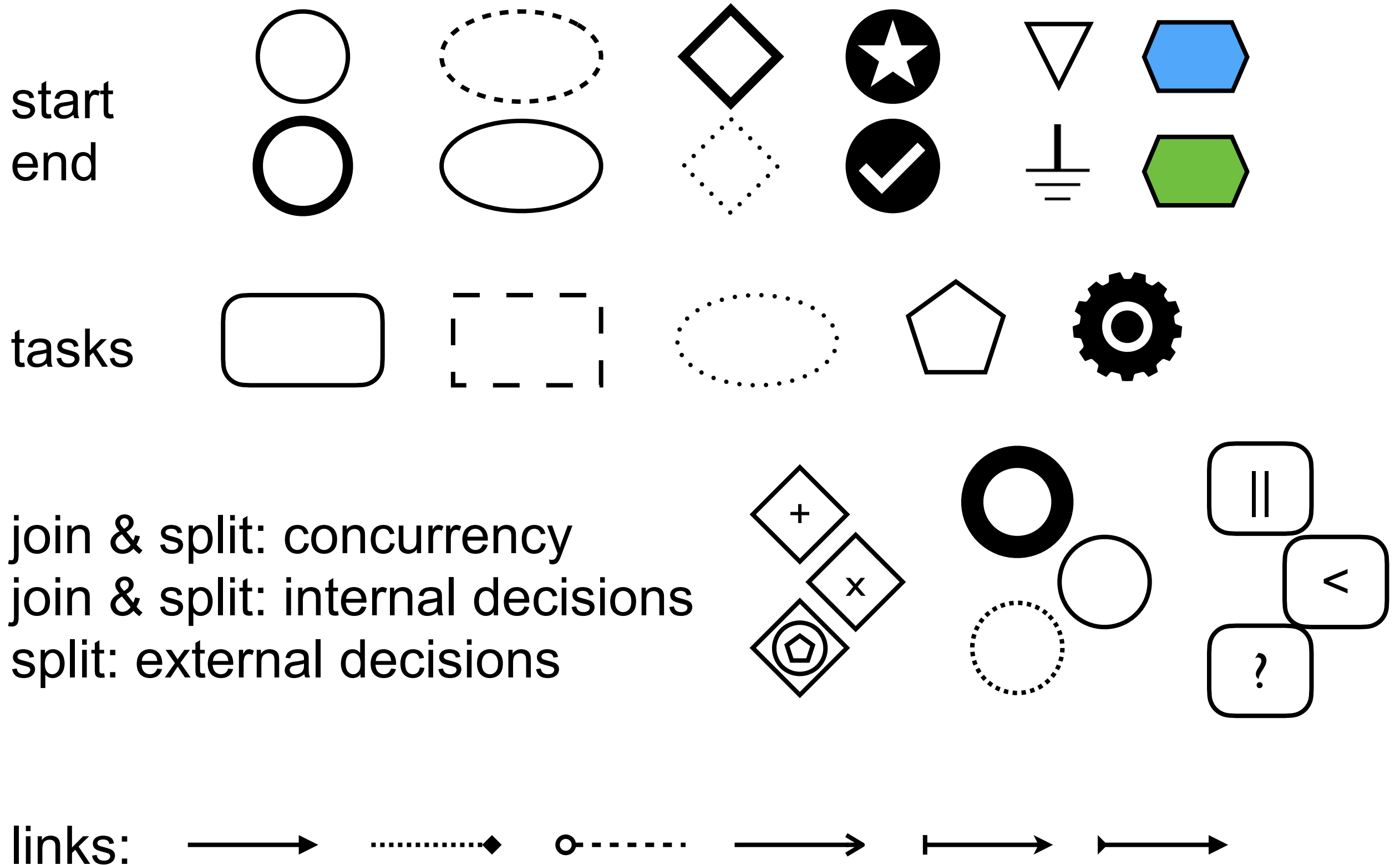


<http://woped.dhbw-karlsruhe.de/>

# Ingredients

start / end	nodes
tasks	nodes
join & split: concurrency	nodes
join & split: internal decisions	nodes
split: external decisions	nodes
links: causal and temporal dependencies	edges
responsibility: whole process / single tasks	?
information: data, parameters, ...	?
platform: bindings, services, ports, ...	?

# Let's invent our own notation



It is your turn

# Exercise

Invent your own diagrammatic notation to describe the following interaction protocol (choose symbols, shapes, colours carefully)

Alice wants to sell her car, Bob is interested in buying it.

Alice asks some quote.

Bob can accept the bargain, refuse it or make a counteroffer.

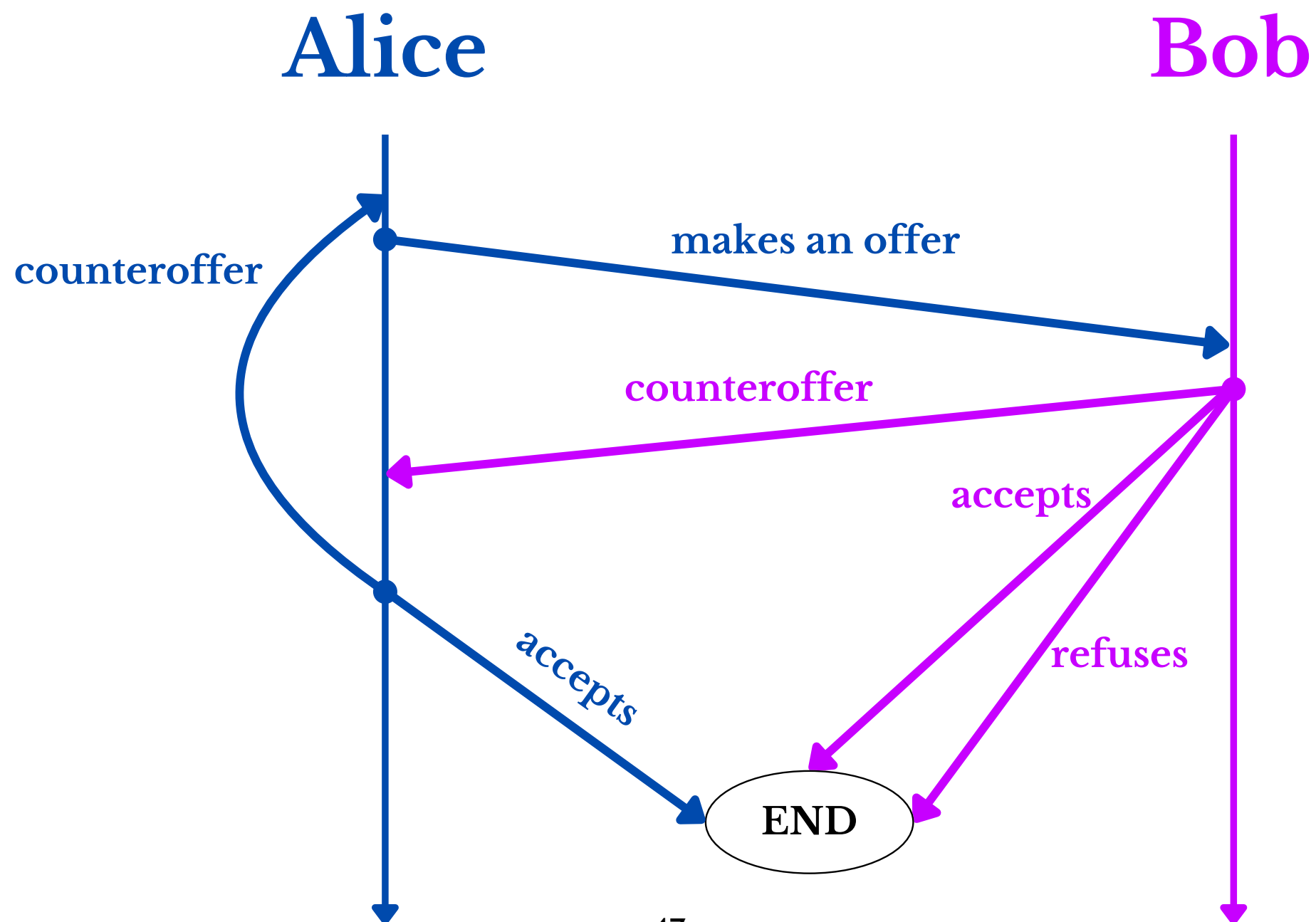
Alice can accept or make a counteroffer and so on,

Until either the bargain is accepted or refused.

**Send your solutions to: [bruni@di.unipi.it](mailto:bruni@di.unipi.it)**

# Alice-Bob contest 2024/25

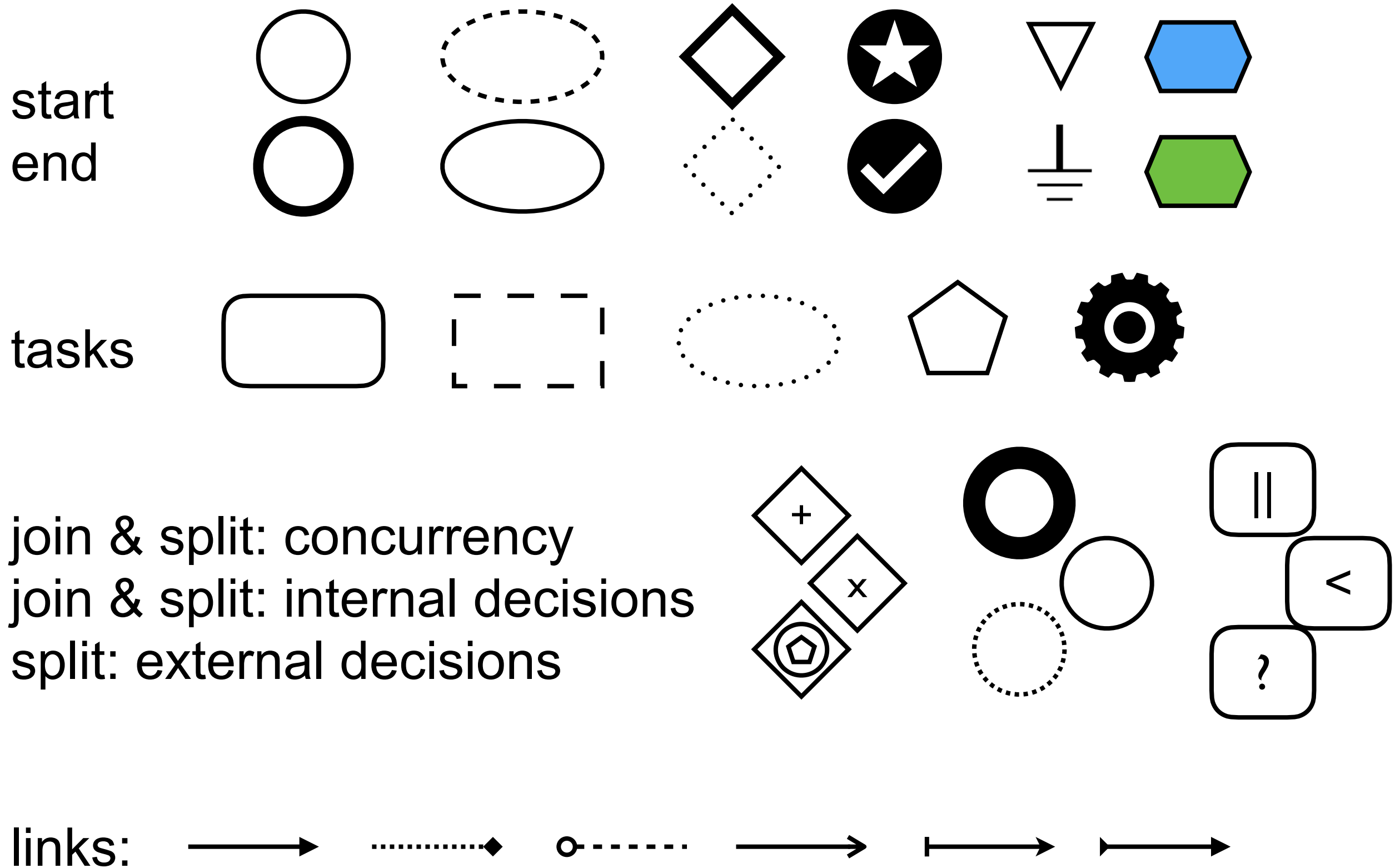
The winner was...



Which lesson?

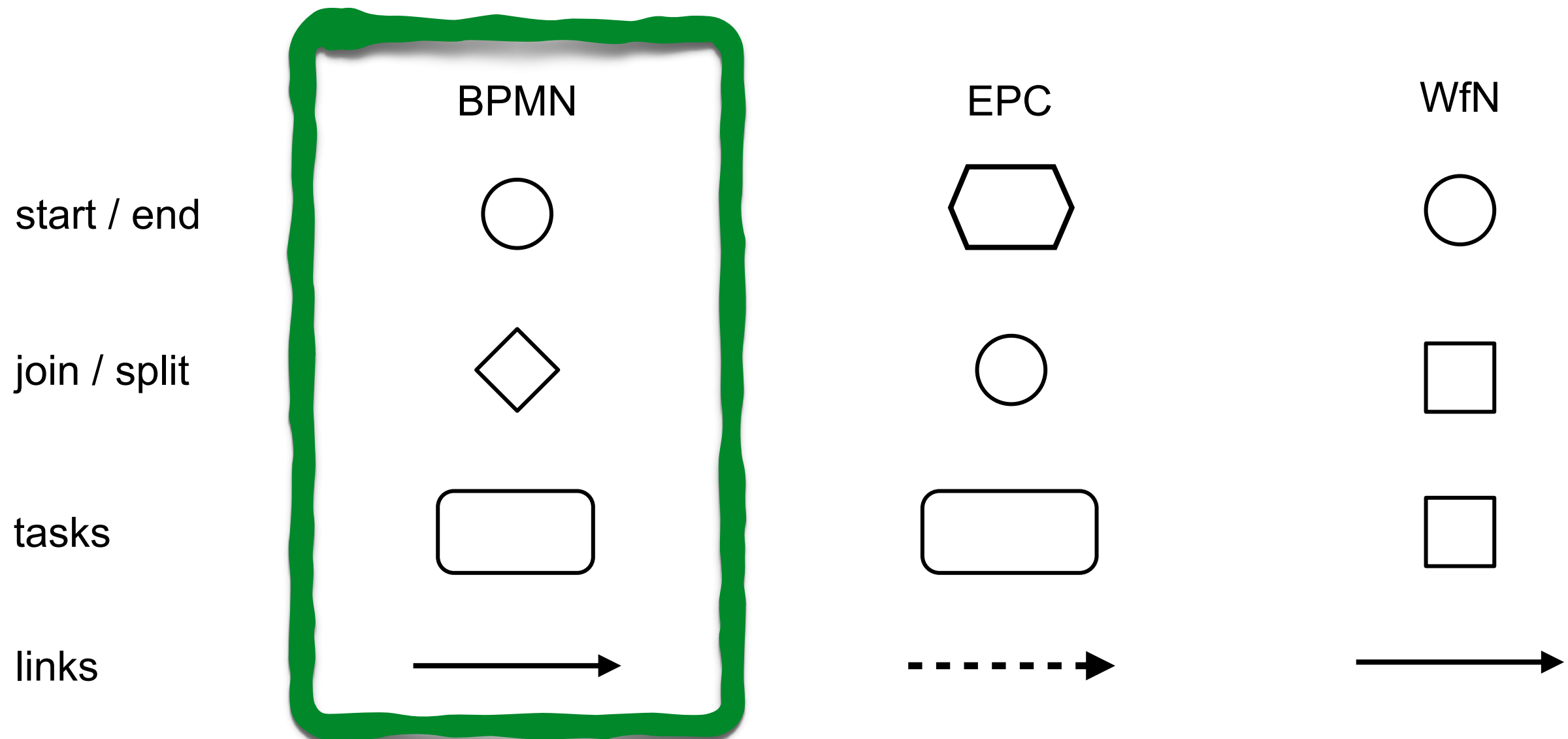


# Let's invent our own notation

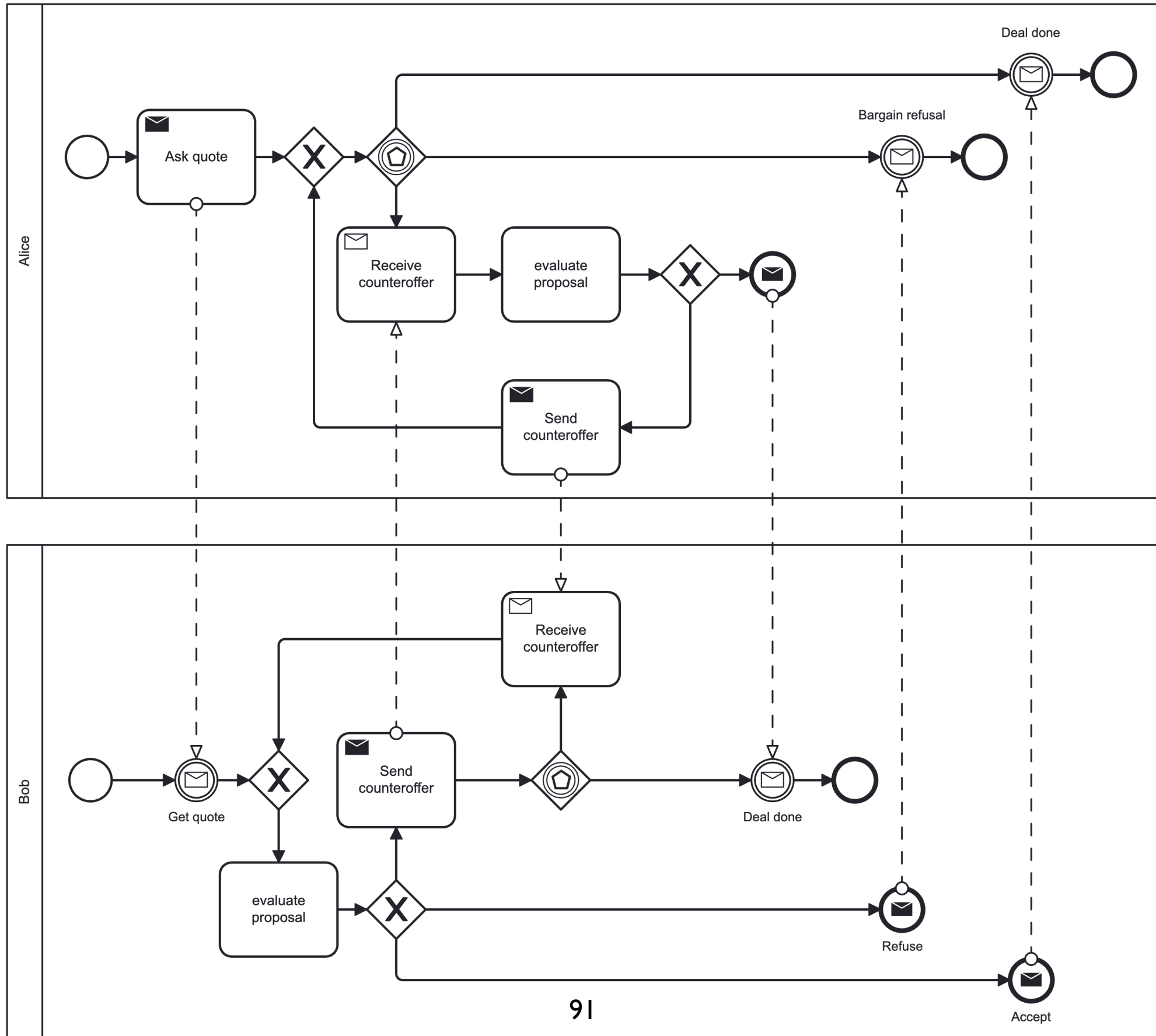


# A sneak peek at standards

## BPMN, EPC, Workflow nets



# Alice-Bob car selling in BPMN



# Alice-Bob car selling in BPMN

