BPMN: modeling industry processes

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11 February 2026

Aspects of Software Engineering

Technical aspects:

- Architecture
- Designing
- Deploying
- Maintaining
- Testing

Human aspects:

- Requirements
- Modeling
- Process

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- **Modeling**
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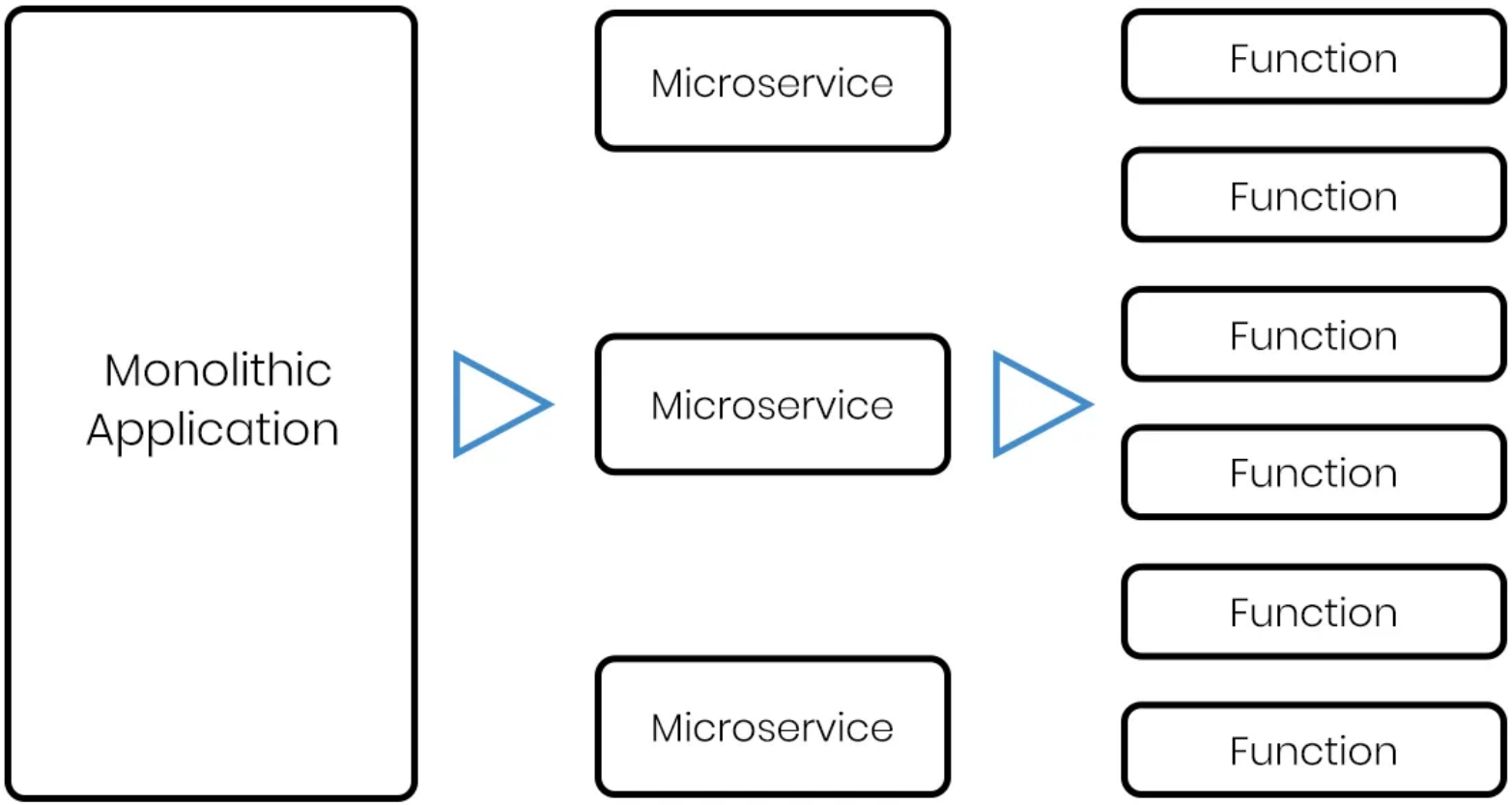
Software Architectures



Monolithic Architecture

All components combined into a single application.

Pros

- Simple to develop initially
- Easier to test as a single unit
- Less complex deployment
- Performance can be higher due to fewer inter-process calls

Cons

- Hard to scale horizontally
- Changes require redeploying the entire system
- Difficult to maintain as codebase grows
- Low flexibility for adopting new technologies

Microservices Architecture

A collection of small, independently deployable services.

Pros

- Independent deployment of services
- Easier to scale individual components
- Technology diversity allowed per service
- Fault isolation improves system resilience

Cons

- Increased operational complexity
- Inter-service communication overhead
- Harder to test end-to-end
- Requires robust monitoring and logging

Serverless Architecture

Functions runs on demands in cloud-based services.

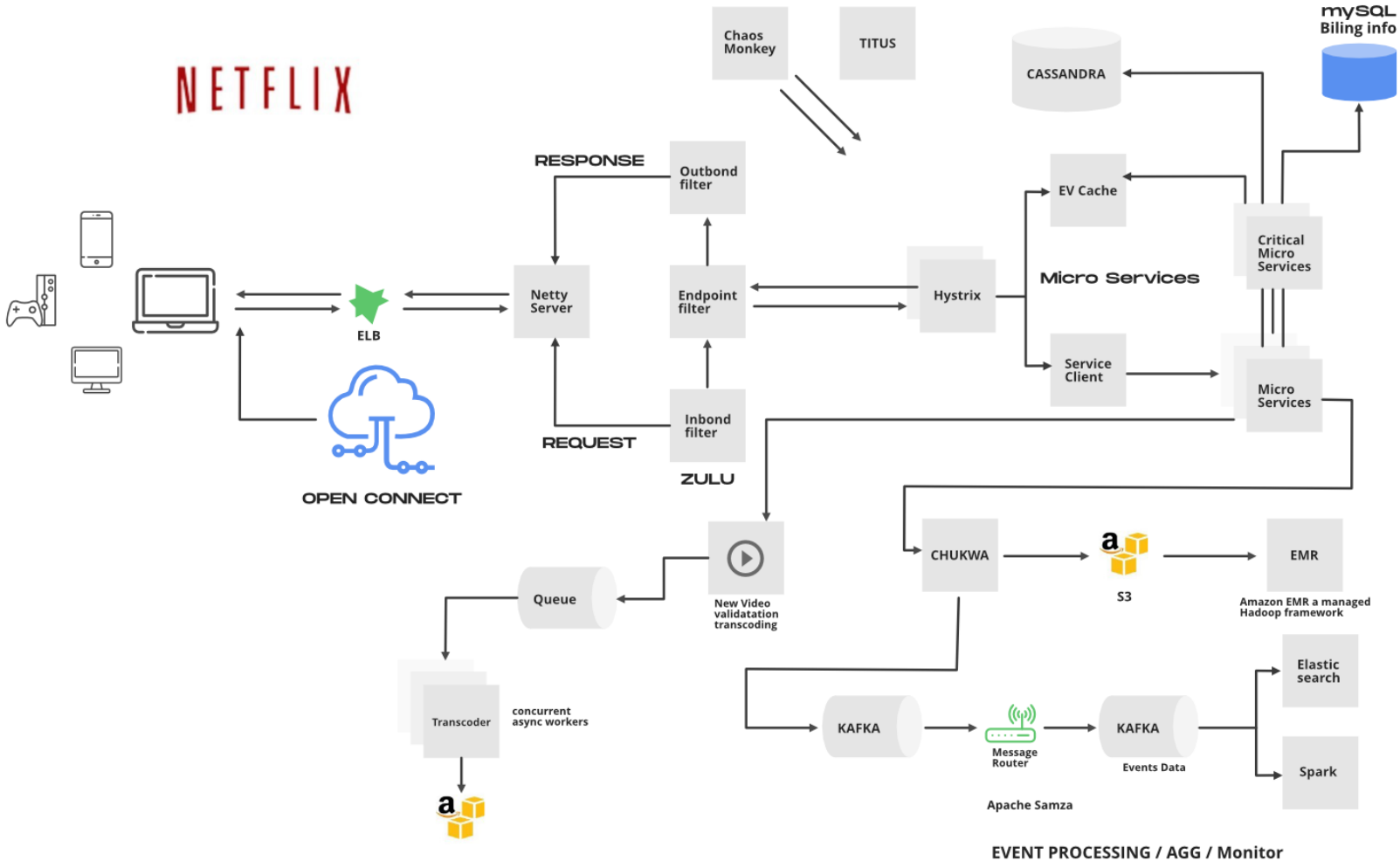
Pros

- No server management
- Automatic scaling based on demand
- Cost-efficient: pay only for execution time
- Quick deployment of small functions

Cons

- Cold start latency can affect performance
- Limited execution duration and resources
- Vendor lock-in risks
- Harder to debug and test locally

Microservices Example



Managing the Complexity of Software Design

Why model business processes?

- Software design is hard
- Models are the lingua franca between domain experts and developers
- Models allow us to focus on the **logic** and **flow**

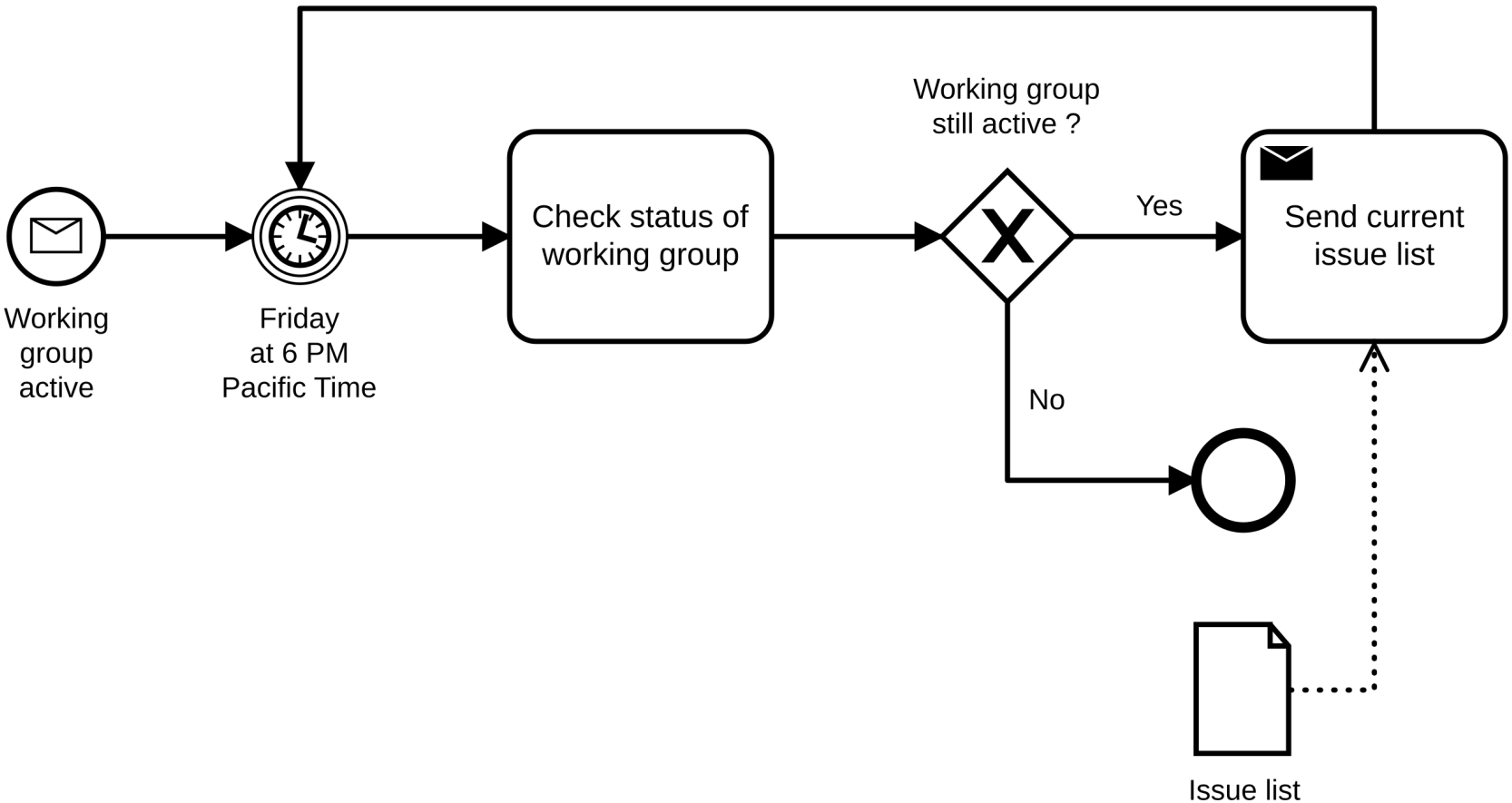
BPMN: Business Process Model and Notation

BPMN: Business Process Model and Notation

Graphical rapresentation method to specify industrial processes

- Made by OMG
- Version 1 in 2006, version 2 in 2011
- Adapted by ISO as an intenational standard
- Thousands of companies use it

BPMN Example



BPMN token simulation:
https://bpmn-io.github.io/bpmn-js-token-simulation/modeler.html

BPMN: Start and End event

BPMN: Task

BPMN: Many types of tasks

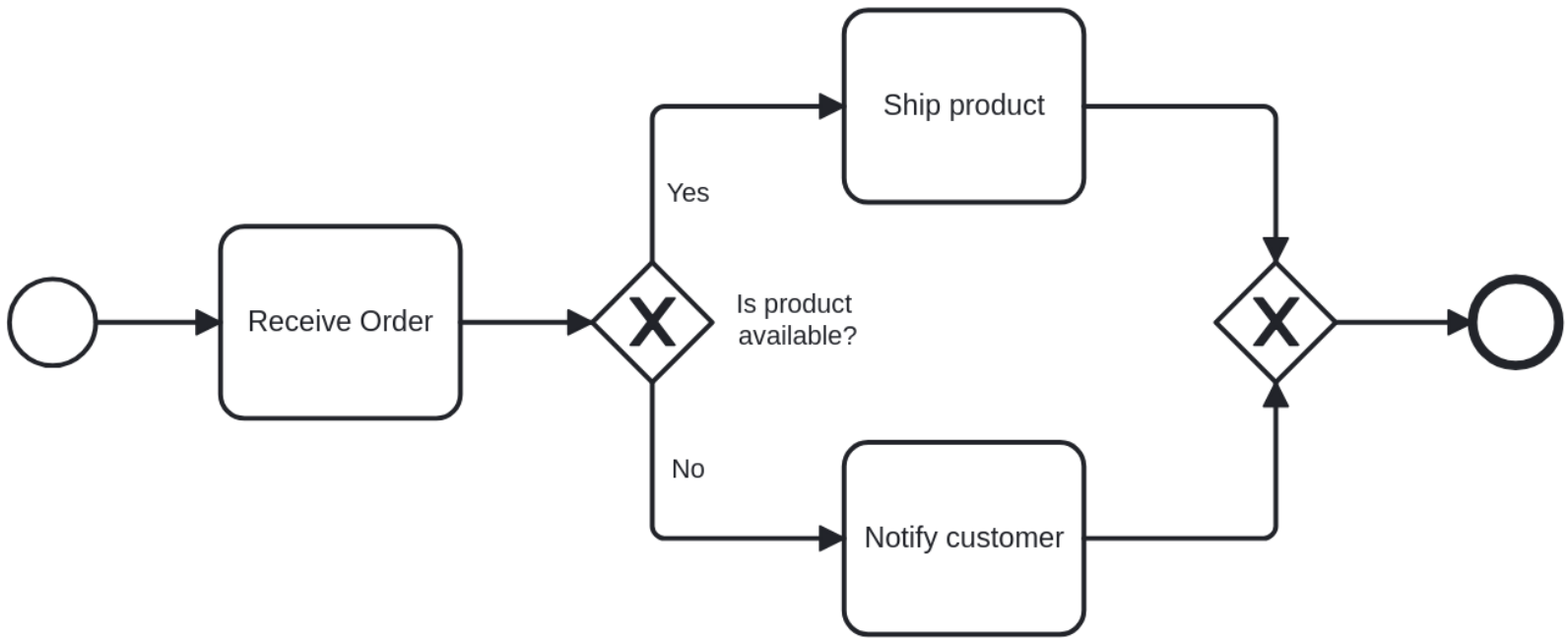
BPMN: Gateways

Exclusive
Gataway

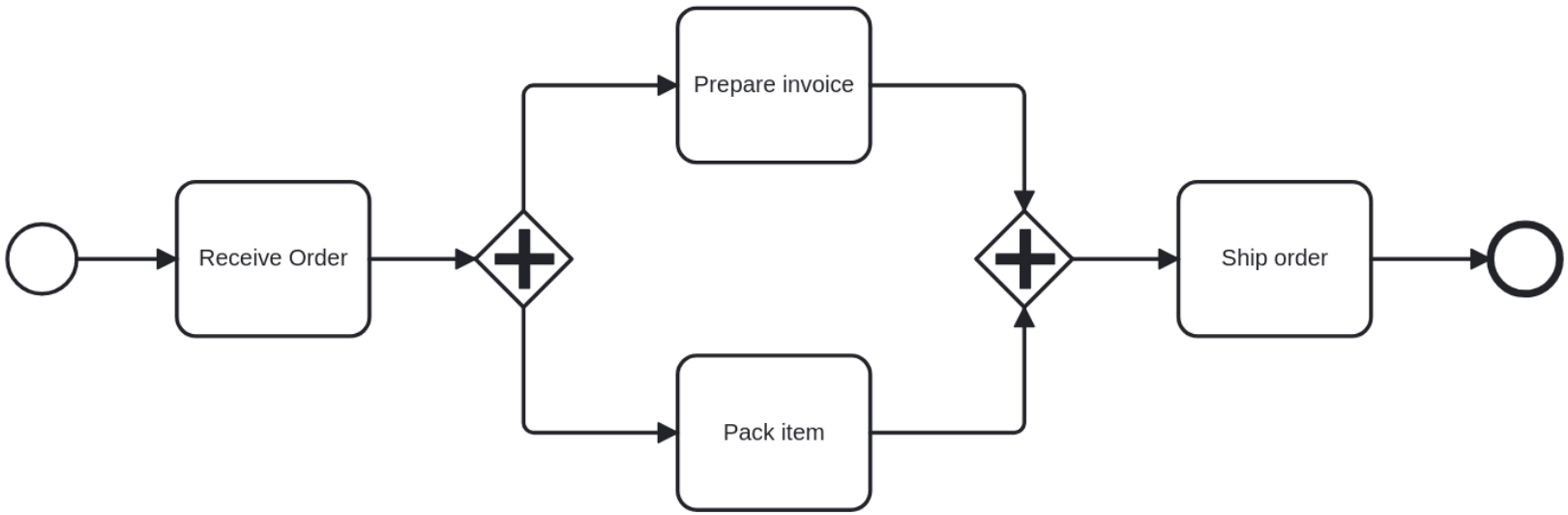
Parallel
Gateway

BPMN: Example 1

A shop receives an order for a product. A worker checks the product availability. If the product is available, the worker ships the product; otherwise, the worker notifies the customer about the unavailability.



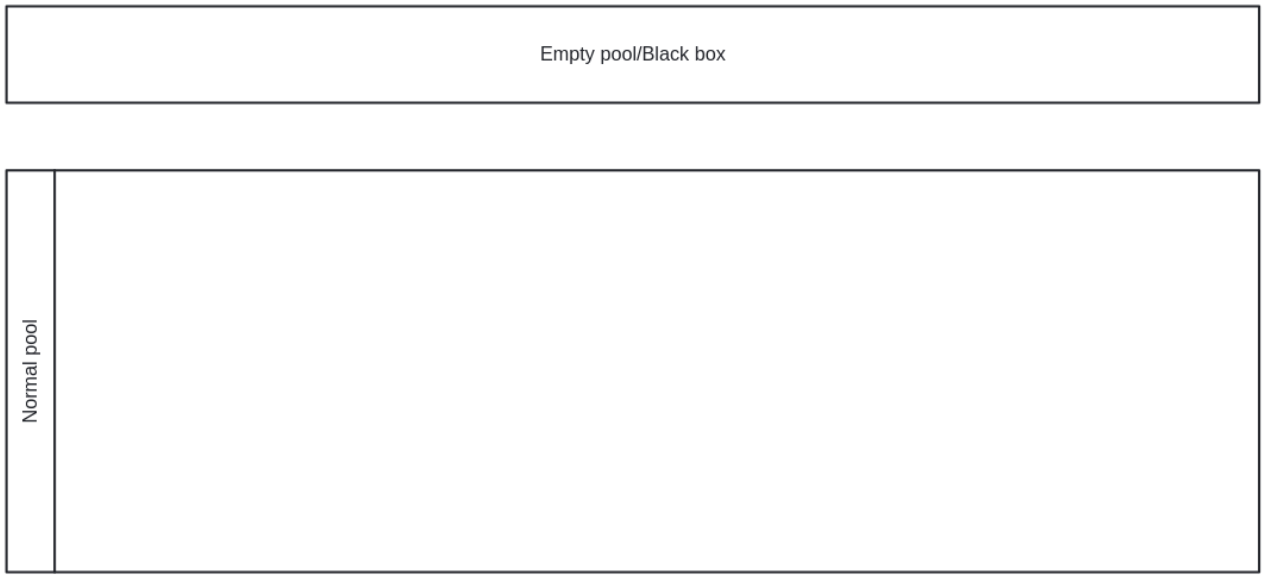
BPMN: Example 2



BPMN Collaborations

BPMN: Pools and Lanes

BPMN: Empty pool

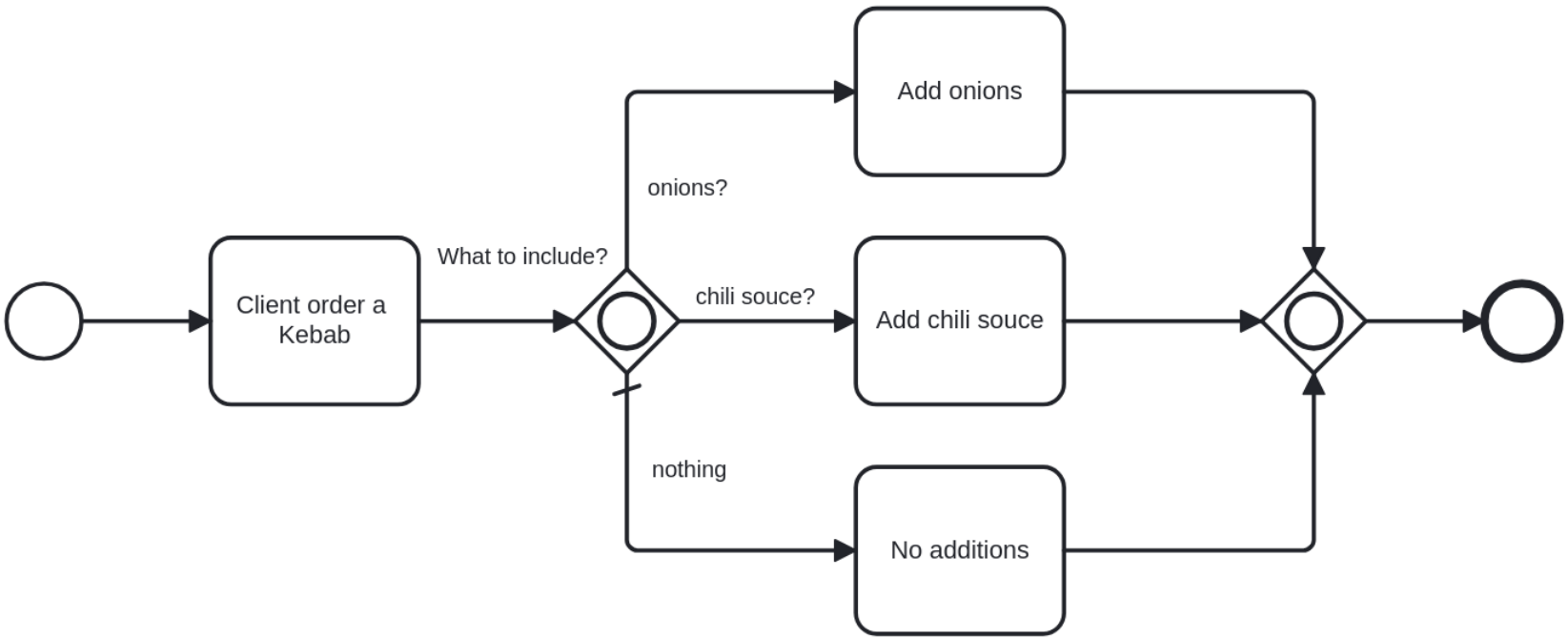


BPMN: More gateways

Inclusive Gateway

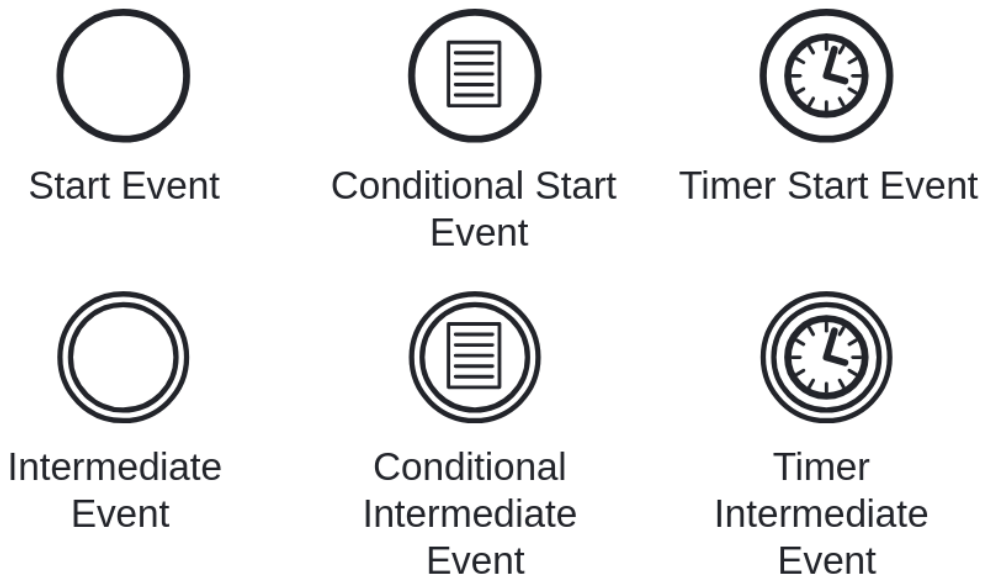
Event-Based Gateway

BPMN: Inclusive gateway example



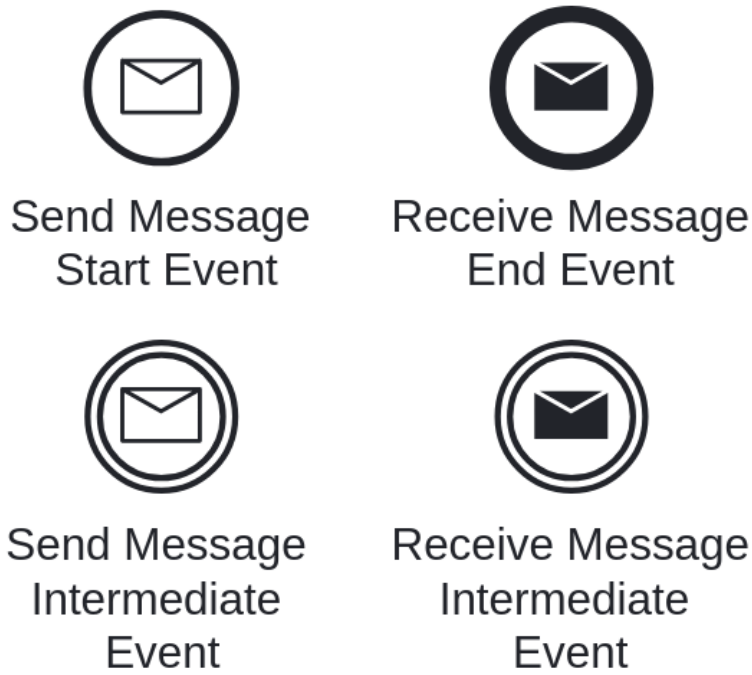
BPMN: More events

A blank intermediate event is also said a "**None event**".



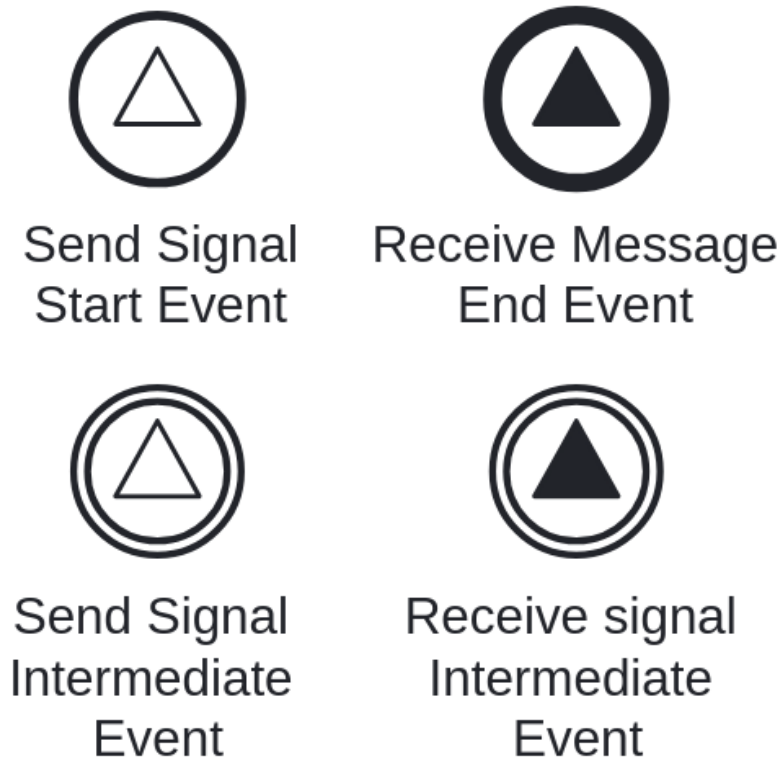
BPMN: Messages events

Single sender, single recipient.

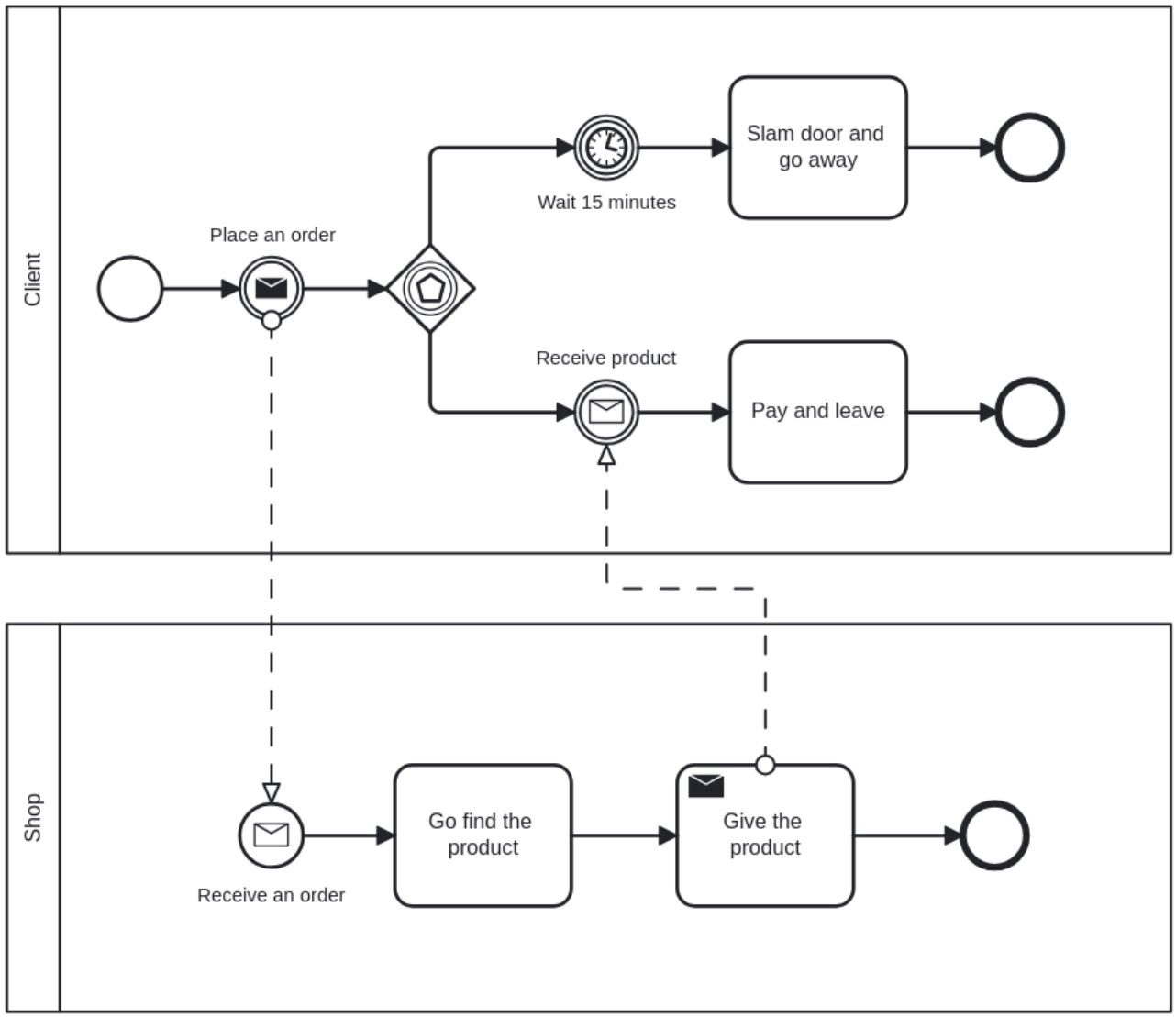


BPMN: Signaling events

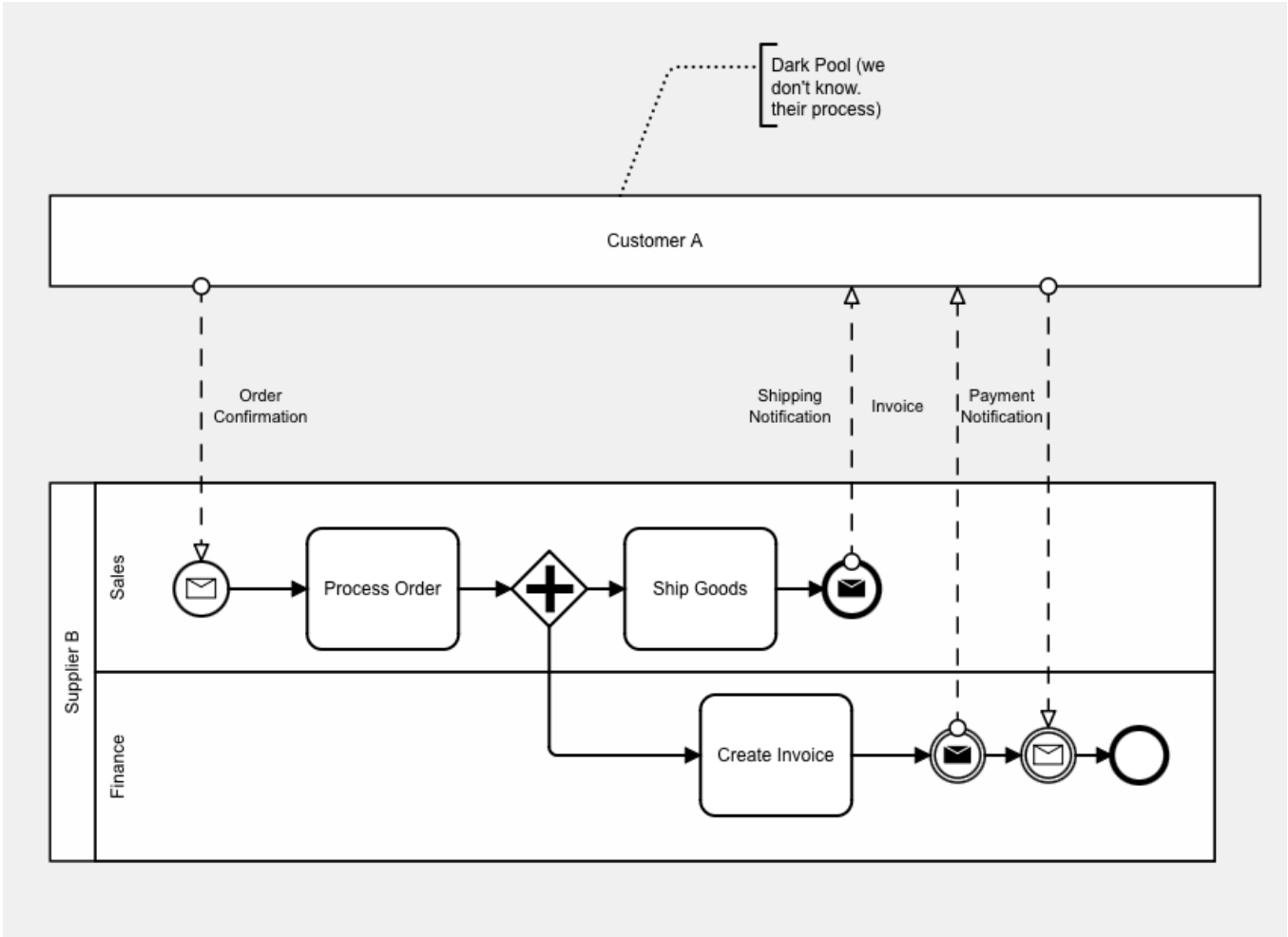
Single sender, many recipients.



BPMN: Pools and event-based gateway example



BPMN: Empty pool example



Exercise: The Pizza Restaurant

A customer is hungry and, therefore, orders a pizza from a pizza restaurant. The waiter receives the order and pass it to the cook, and the cook prepares the pizza. If the pizza is not delivered within 15 minutes, the customer asks the waiter to hurry. Once the pizza is ready, the cook send a signal to the waiter, and the waiter delivers it to the customer. The customer eats the pizza and pays for it to the waiter, and the process ends.

Identify first the partecipants (or sub-roles)

A **customer** is hungry and, therefore, orders a pizza from a **pizza restaurant**. The **waiter** receives the order and pass it to the **cook**, and the cook prepares the pizza. If the pizza is not delivered within 15 minutes, the customer asks the waiter to hurry. Once the pizza is ready, the cook send a signal to the waiter, and the waiter delivers it to the customer. The customer eats the pizza and pays for it to the waiter, and the process ends.

What starts the process?

A customer **is hungry** and, therefore, orders a pizza from a pizza restaurant. The waiter receives the order and pass it to the cook, and the cook prepares the pizza. If the pizza is not delivered within 15 minutes, the customer asks the waiter to hurry. Once the pizza is ready, the cook send a signal to the waiter, and the waiter delivers it to the customer. The customer eats the pizza and pays for it to the waiter, and the process ends.

What are the other actions?

A customer is hungry and, therefore, **orders a pizza** from a pizza shop. The waiter **receives the order** and pass it to the cook, and the **prepares the pizza**. If the pizza is not delivered within 15 minutes, the customer **asks the waiter to hurry**. Once the pizza is ready, the cook **send a signal** to the waiter, and the waiter **delivers it** to the customer. The customer **eats the pizza** and **pays** for it to the waiter, and the process ends.

Which is the flow? What are the conditions?

A customer is hungry and, therefore, orders a pizza from a pizza restaurant. The waiter receives the order and pass it to the cook, and the cook prepares the pizza. **If the pizza is not delivered within 15 minutes**, the customer asks the waiter to hurry. **Once the pizza is ready**, the cook send a signal to the waiter, and the waiter delivers it to the customer. The customer eats the pizza and pays for it to the waiter, and the process ends.

Solution

Harder Exercise: Pizza Delivery

A customer is hungry and orders a pizza for home delivery from a pizza restaurant. The assistant receives the order and forwards it to the cook. The cook prepares the pizza.

If the pizza is not delivered within 15 minutes, the customer contacts the assistant to ask for the delivery to be hurried. The assistant handles the request and informs the delivery boy.

Once the pizza is ready, the cook notifies the assistant. The assistant assigns the delivery to the delivery boy, who delivers the pizza to the customer's home.

After receiving the pizza, the customer pays the delivery boy, and eats it. The process then ends.

The end! Questions?