BRIOL Patrice

BPMN 2.0 – The Business Process Modeling Notation

Modeling Introduction

Ingenieriedesprocessus.net

Objectives

- Learn a standardized business process modeling notation
- Scope
  - BPMN elements
  - Business Process diagram
- Out of scope
  - Correlation, composition and choreography diagrams
  - BPM Methodology
  - BPMN tool how to
- Practices, Practices and Practices …

Organization

- BPMN Elements
  - Basic Elements
    - Start drawing business process diagrams
    - At least up to 70% of business process drawing
  - Advanced concepts
    - Elements set to complete the full business process diagrams

Basic Elements

- BPM & Modeling
- Process instances
- BPMN
- Participants (pool & lanes)
- Message
- Business process diagrams
- Activity
- Sequence flow
- Events
- Activities
- Gateways
- Artifacts
- Data objects
- Loops
- Sub-Process

The Business Process Management initiative

- Business Process
  - A collection of related, structured activities or tasks that produce a specific service or product for a particular customer or customers.
- Business Process Management
  - Focus on aligning all aspects of an organization with the wants and needs of clients.
  - Analysis/Modeling/Design
    - Define targets and objectives
    - Representing visually the business processes tasks or activities
  - Execution
    - Executing the modelized activities
  - Monitoring
    - Measuring the results
  - Optimization
    - Comparing the results with the targeted objectives
    - Defines new steps to improve the situation

Modeling

- Model
  - Anything used to represent anything else
- Conceptual model
  - Refer to models which are represented by concepts or related concepts which are formed after a conceptualization process in the mind
  - A model is not the "Reality", but only an overview

Process Instance

- The Model describe the situation
- Each time the described situation occurs, it creates a new **process instance**
- It may have many process instances during the day
- A process instance may last for many hours/days/months/years before ending

BPMN

- The Business Process Modeling Notation (BPMN) is a standard for business process modeling that provides a graphical notation for specifying business processes in a Business Process Diagram (BPD).
- The notation is based on a flowcharting technique.
- The objective of BPMN is to support business process management, for both technical users and business users, by providing a notation that is intuitive to business users, yet able to represent complex process semantics.
- The BPMN specification also provides a mapping between the graphics of the notation and the underlying constructs of execution languages.

What BPMN is not for ?

- Modeling data
- Modeling organisation hierarchy
- Modeling objects in a object-oriented programming
- Modeling functionalities
- Modeling user interfaces

The Origins

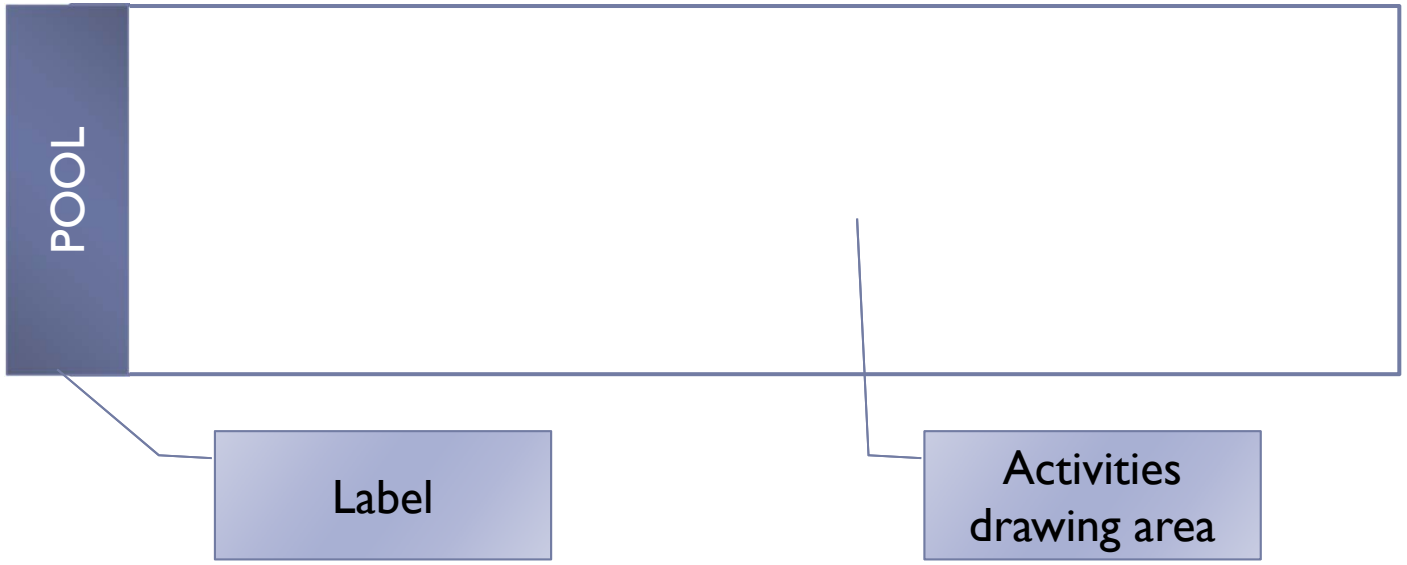
- 2004 BPMN 1.0 (BPMI.org) – 48 Elements
  - Initial release
- 2008 BPMN 1.1 (OMG) – 55 Elements
  - Extends the gateways elements
  - Introduces new event triggers, signal events, rename rules to conditional events
- 2009 BPMN 1.2 (OMG) – 55 Elements
  - Minors changes (mostly addressed to the modeling tools vendors)
- 2010 BPMN 2.0 (OMG) – 116 Elements
  - Extends the scope and capabilities of the BPMN 1.2 :
    - Formalizes the execution semantics for all BPMN elements
    - Composition and correlation
    - Extends the definition of human interactions
    - Defines a ***Choreography*** model

Practice

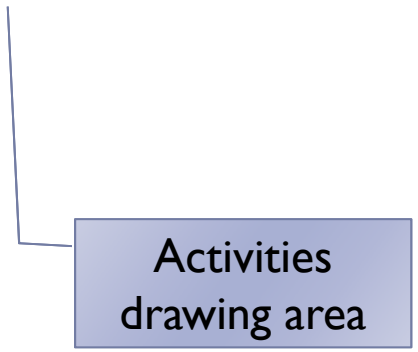
- What is a business process ?
- What is a model ?
- What is BPM ?
- What is BPMN stands for ?
- What is in the scope of BPMN ?
- What is not in the scope of BPMN ?
- What is a process instance ?

The Participants

- Participant
  - A business entity, which executes or has responsibilities in the execution of activities
  - Represented by a **POOL**



Pool – Default pool

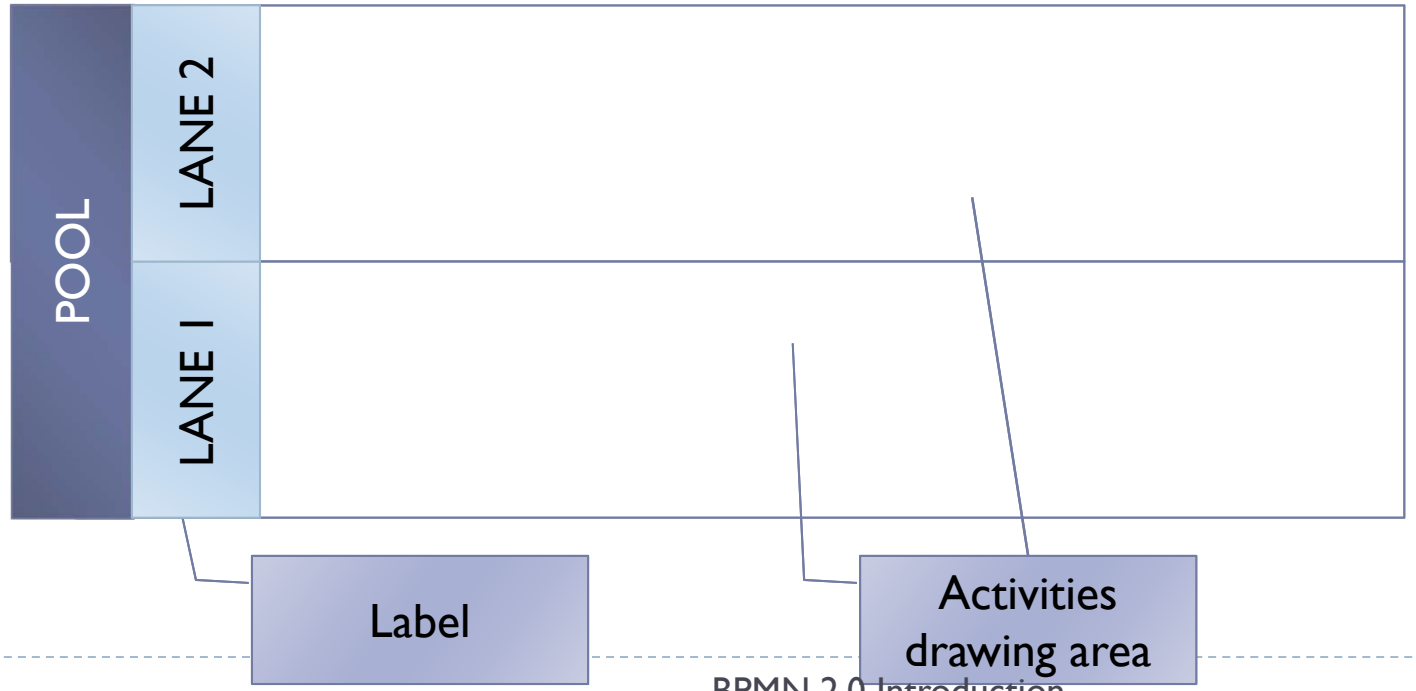


Many Participants, many pools

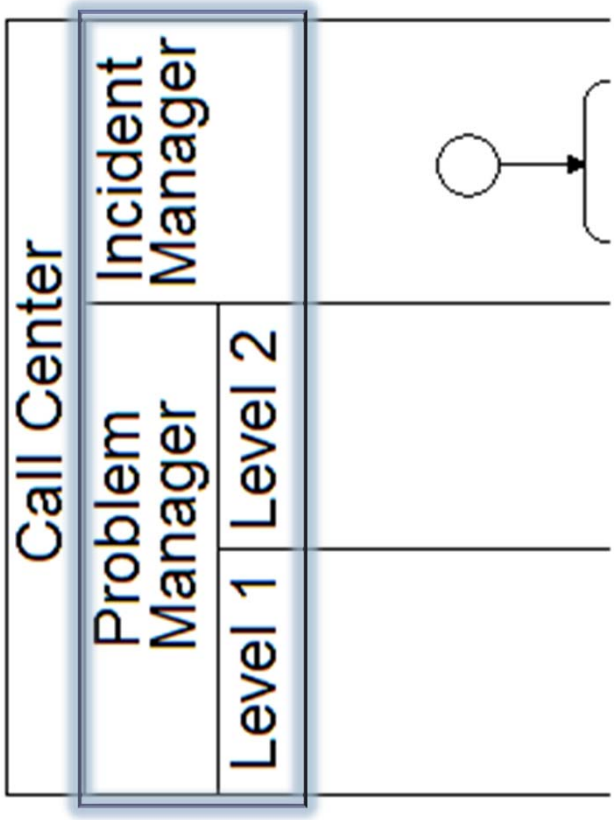
Pool - Samples

The Participant's roles

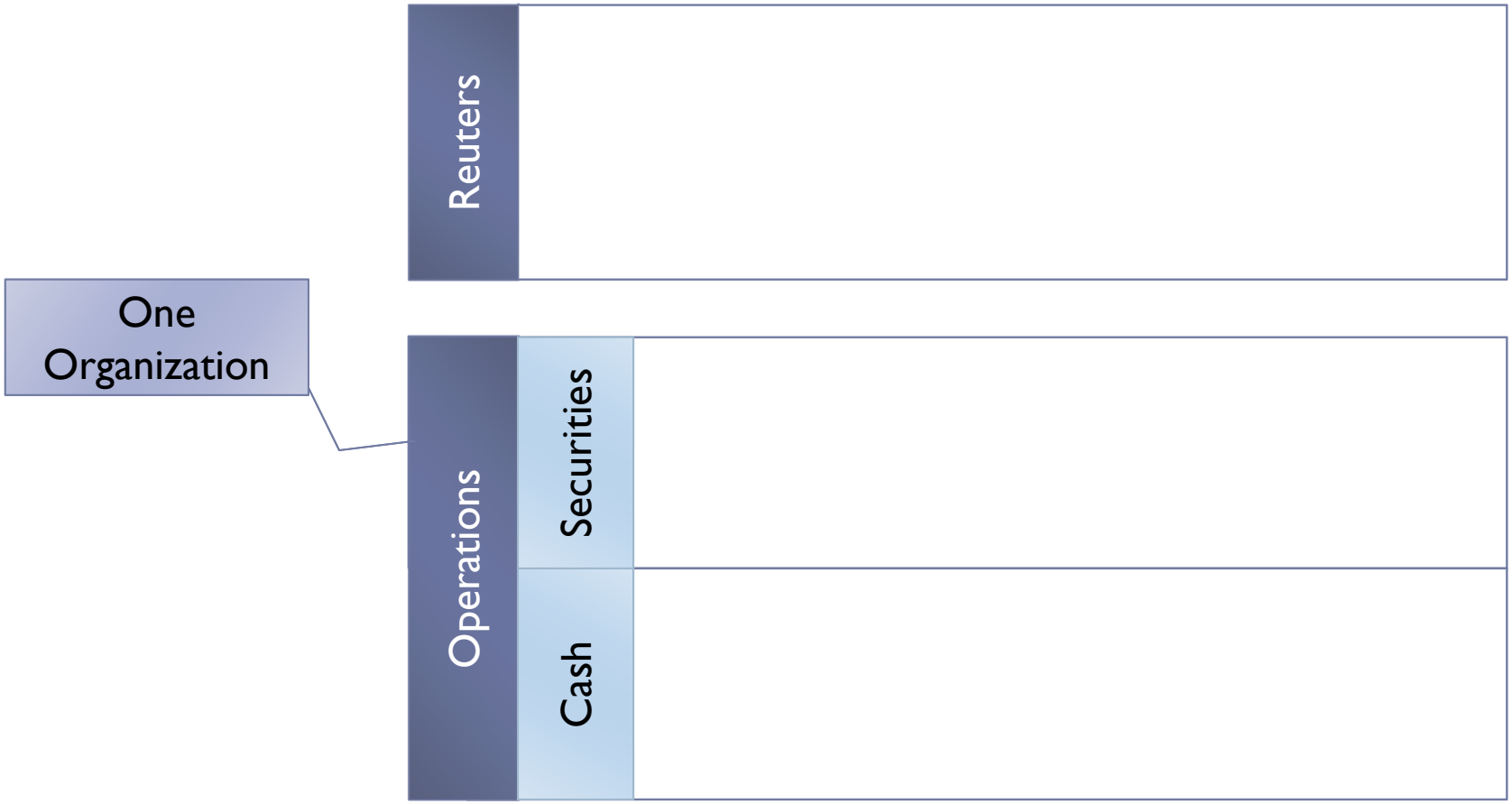
- Lane
  - Represents a role within a pool
  - A POOL may have 0 or more **LANEs**



Nested Lanes



Pool & Lanes Sample



POOL – comments

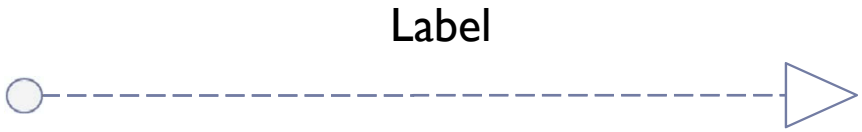
- The POOL may represent not only an entity but also the name of the business process.
  Eg. Process 'Buy a Security'

Pool & Lane - Practice

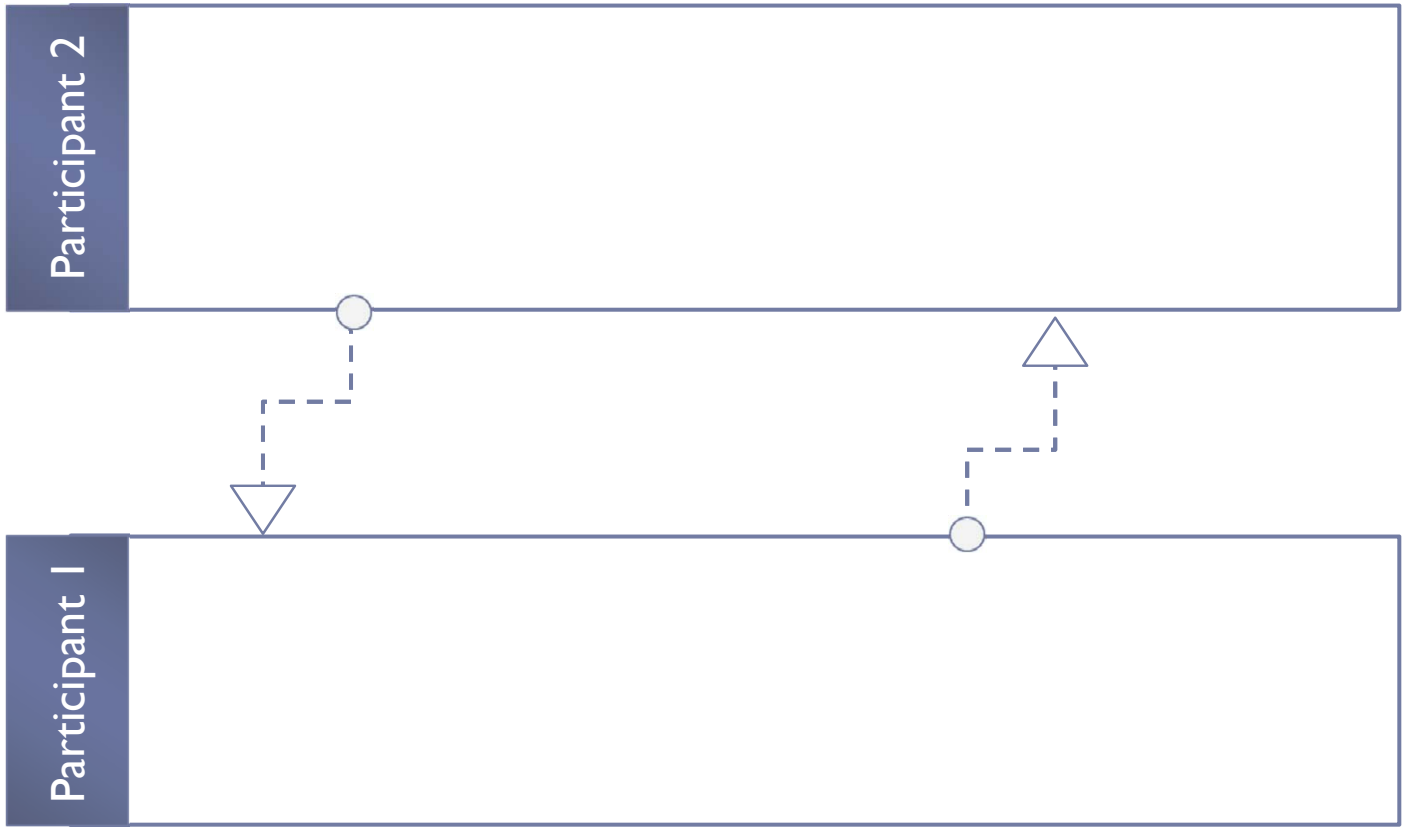
- Draw your department and its neighbors (inside and outside the organization) with
  Pool(s) and Lanes
- Find a process in your department that requests many differents roles and draw the latters with Pool and lanes
- Draw the following organisation:
  - The BMN Inc has 4 main depts. : Production, Sales, R&D, Finance. The Sales contains the Accounting and Control depts. The Production has Car, Motocycle and Scooter production lines

Message

- Message
  - The way to represent the information exchange between the participants POOL
  - One or more messages between POOLS

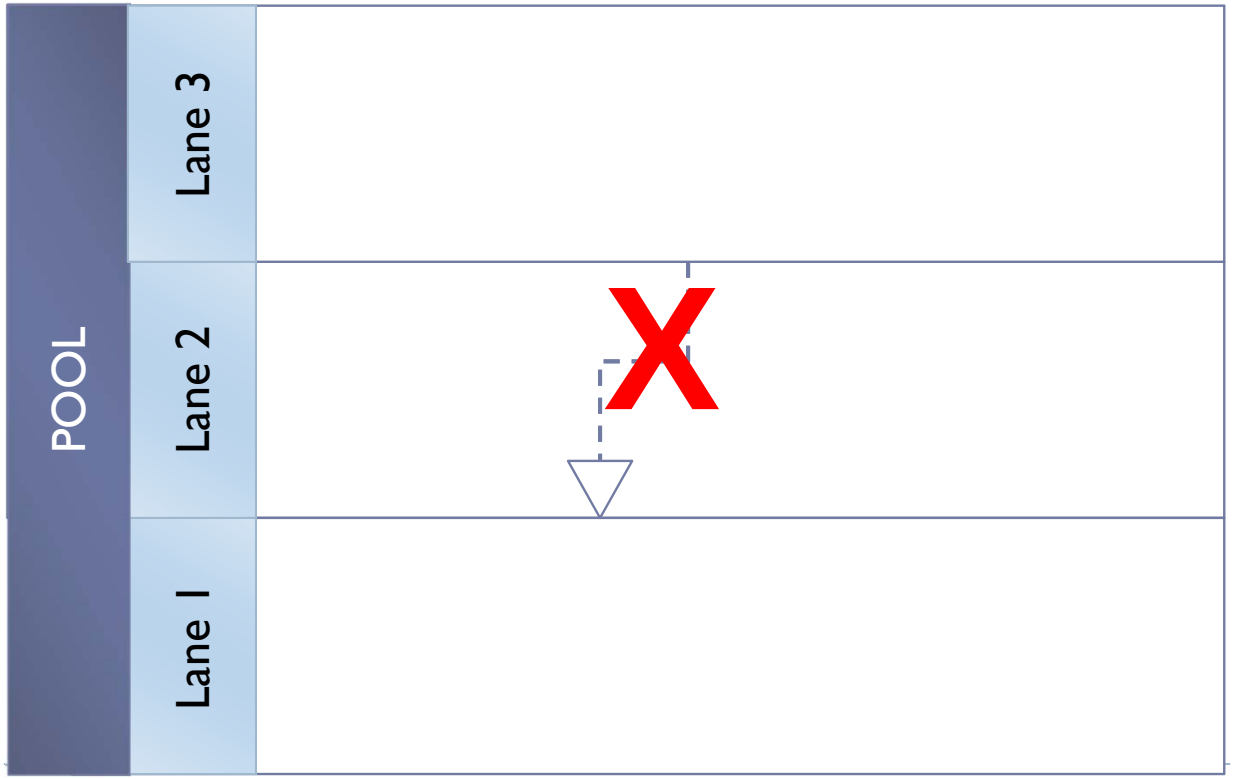


Messages and Pools



Message - Care

- Only between POOLs, never between LANEs of the same pool !

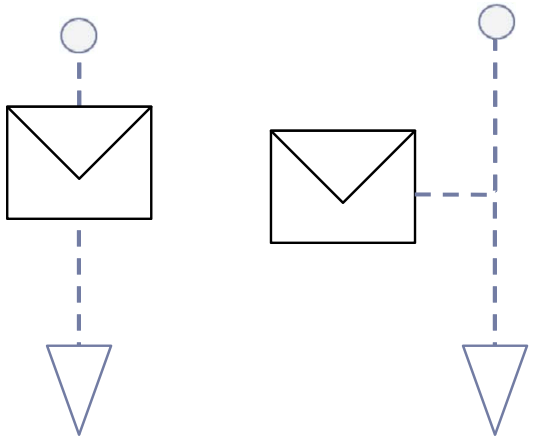


Message Object

- Represents the information itself exchanged between the pools
- Helps to represents
  - **Initiating** Participant, or the one who initiate the execution of the business Process
  - **Non-Initiating** Participant, or the one who is awakened by the initiator or then it sends back an answer

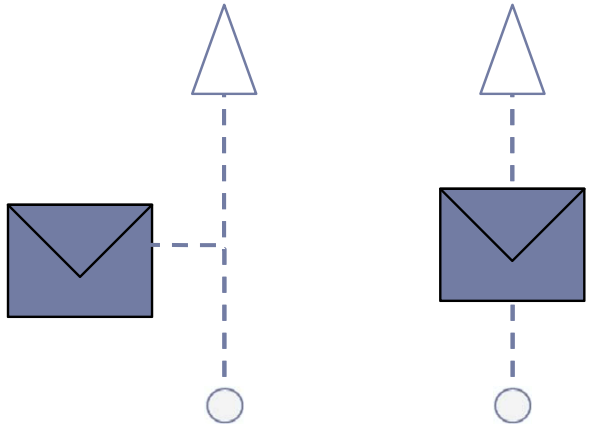
Message Object Representation

Initiating message object



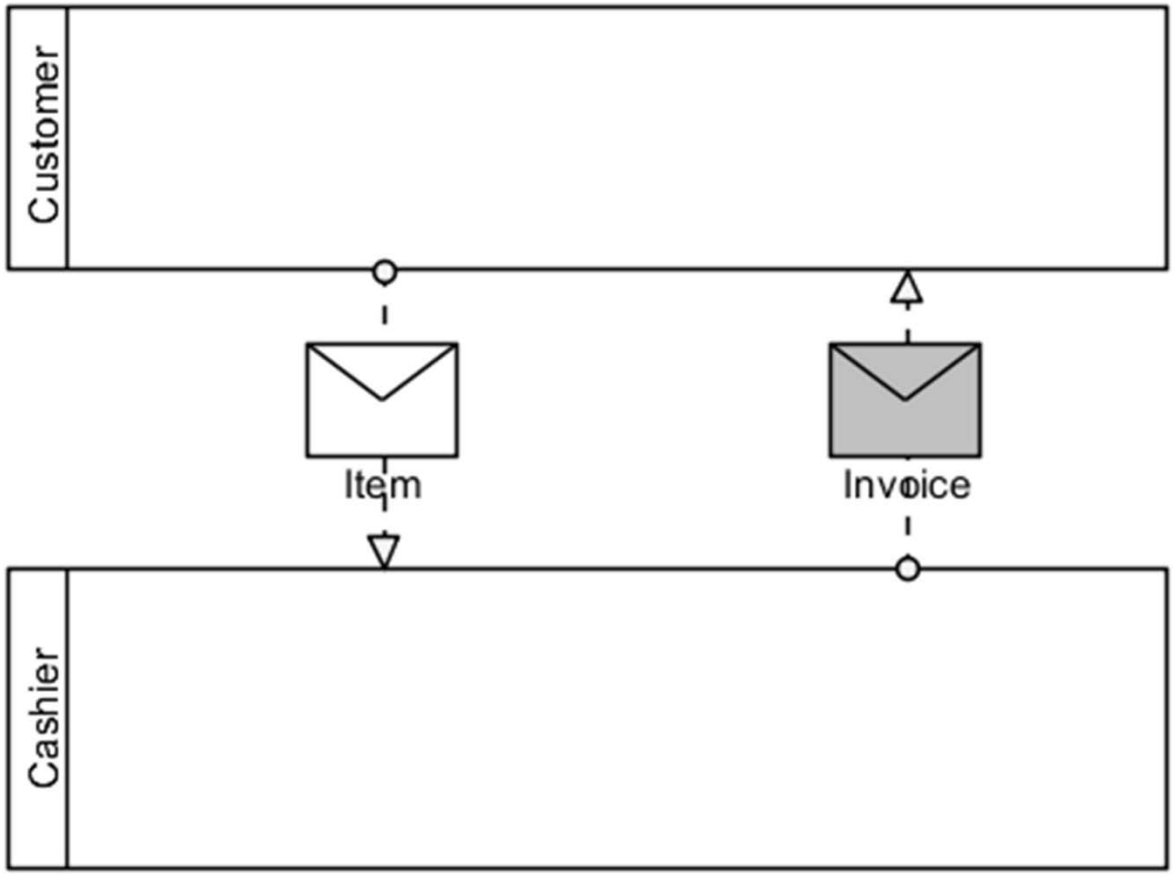
Unfilled

Non-Initiating message object



Filled

Message & Pools sample



Messages & Objects - Practice

- Draw the pools, messages and messages objects between
  - A Tourist and a Cashier
  - The tourist buy one ticket with its coins
- Discussions: When to use the Pools and/or Lanes ? or both ?

Business Process Diagram principles

- Representing workflows with
  - ***Activities*** representing the role's task to execute
  - ***Sequence Flows*** that link logically the activities
  - ***Events*** which represents happening condition
  - ***Gateway*** representing a decision
  - ***Message Flow*** representing the information exchange between the participants

Activity

- Describe the work to be executed within a business process
- Has one label, 0..n inputs, 0..n outputs

Activity sample

A simple business process with one activity

Activity Practice

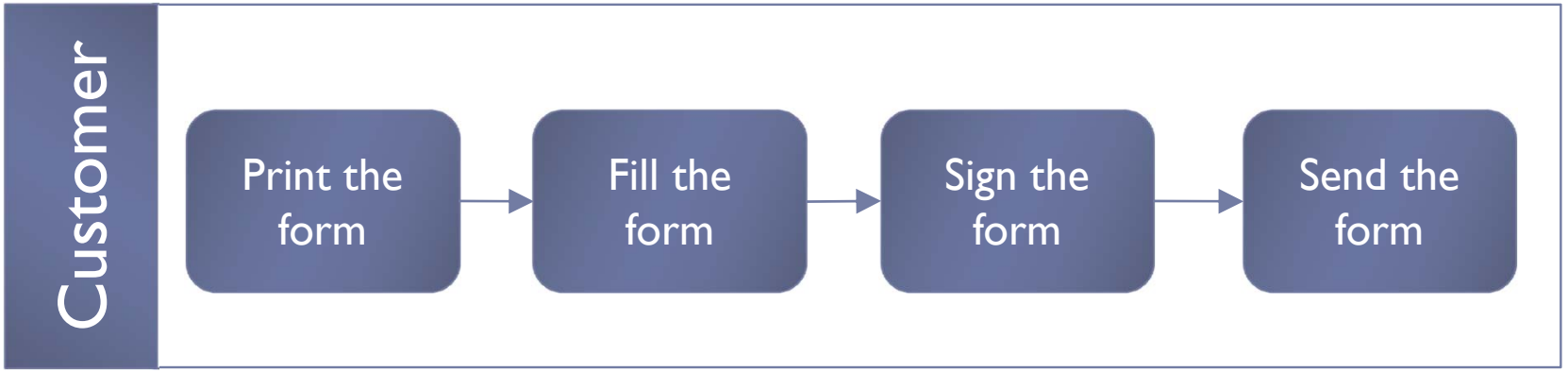
- Find activities among the followings:
  - Call
  - Intranet Application
  - Receive orders
  - Error raised
  - Fullfill the form
  - Upcoming message
  - MS Word
  - Close the door

Sequence Flows

- Represents the logical flow between two activities
- Can cross many LANES of the same POOL

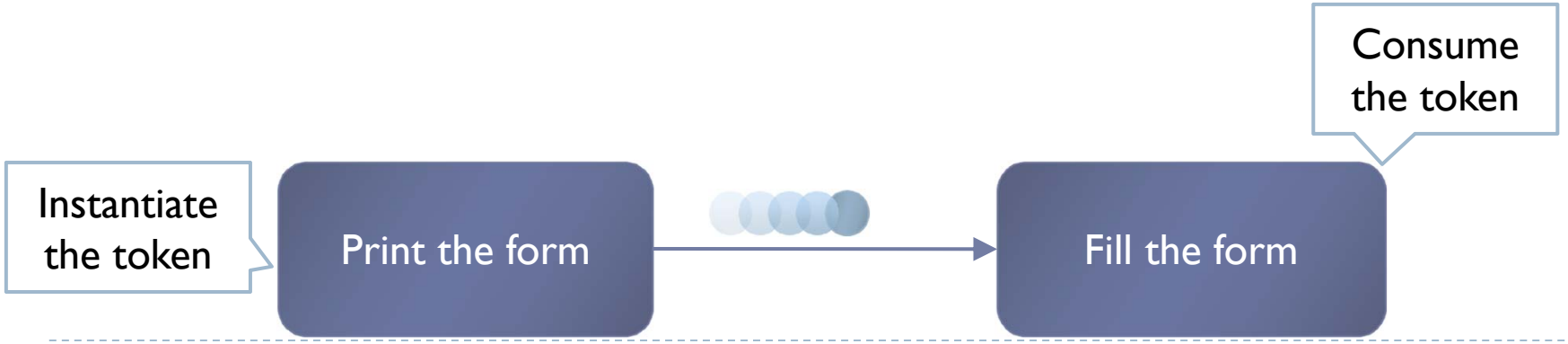
Simple sequence flow

- The customer prints the form
- The customer fills the form
- The customer signs the form
- The customer sends the form

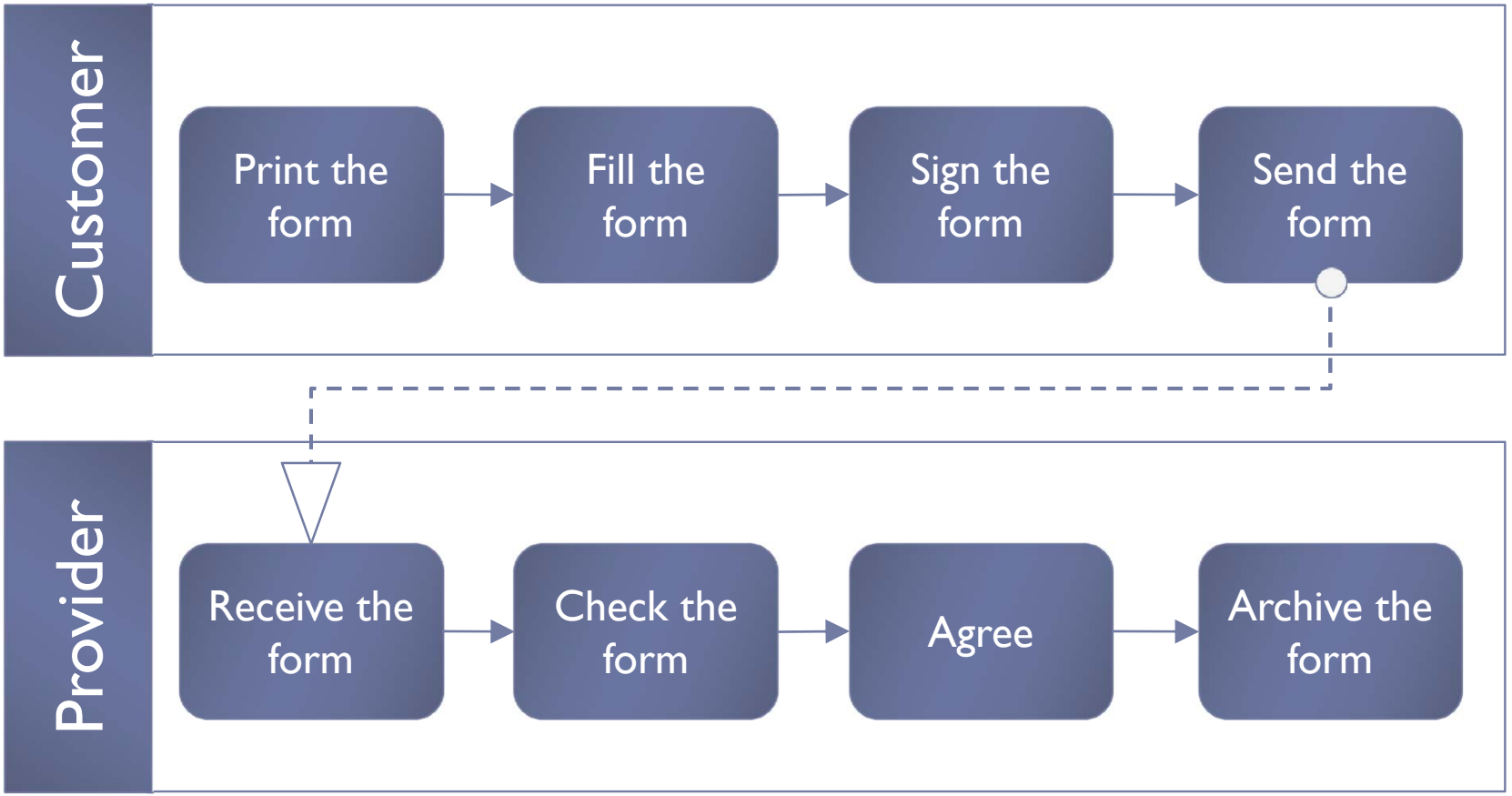


Token

- A conceptual principle used to analyse and define the sequence flow
- The token represents the flow, the activity is started when it receives a the token, it releases the token when its execution is finished
- Only a concept, not an element of the BPMN notation
- No visual representation

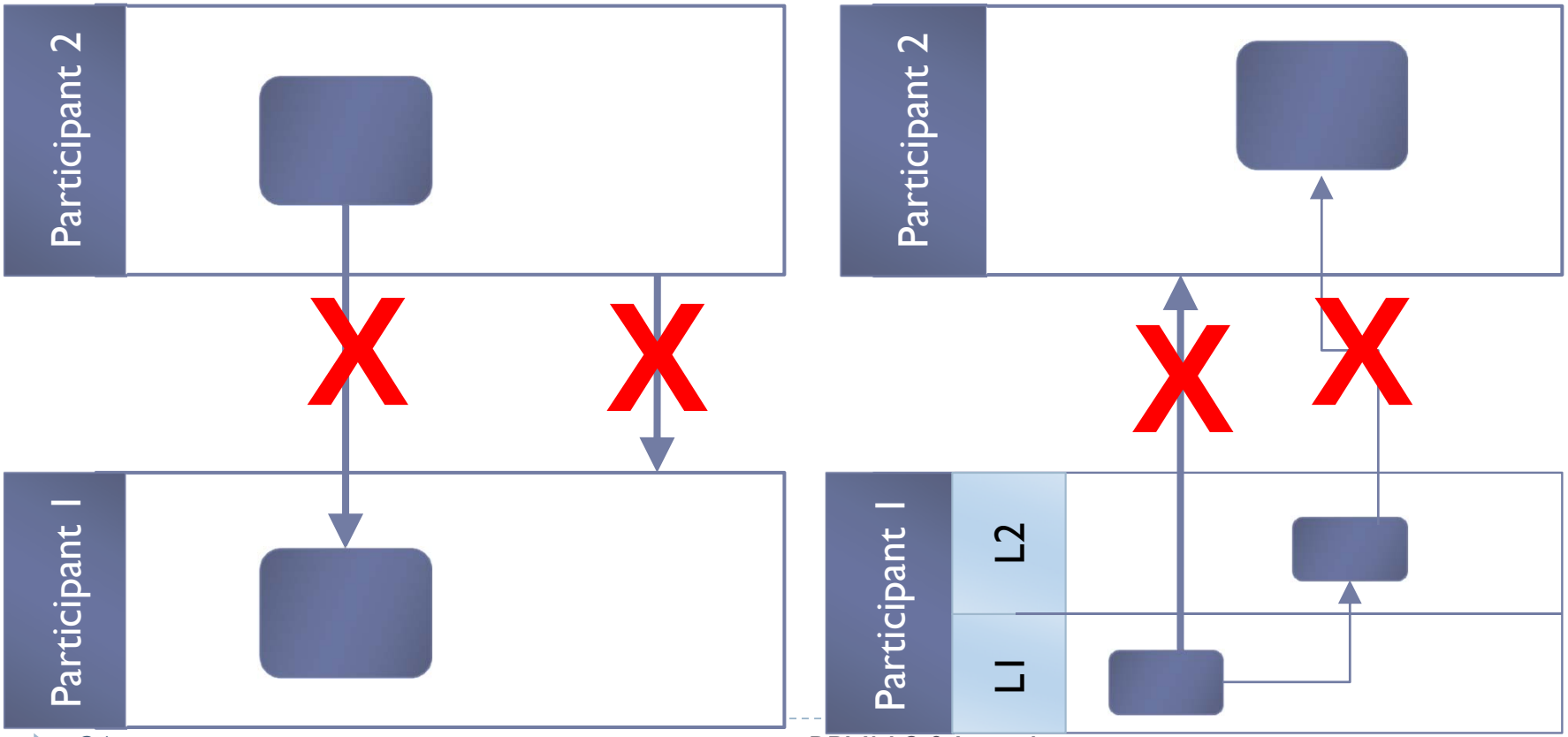


Token practice – draw the token



Sequence Flow – Additional rules

- Cannot cross many POOLS



Sequence Flow, Practice

- Draw the corresponding activities, sequence and pool of the following comment
  - "The BMN's marketing analyse the market (Customers needs)and setup the action plan for its new Car production line. The setup of the action plan is done with the help of the R&D departement. The R&D dept advises the marketing with a solution with a pre-validated price from the financial dept. Finally, once the Car production line has started the production of the new car, the Sales department sales those new products to the Customers."

Business Process Diagram (BPD)

- A combination of visual objects
- Depict a Business Process execution
- Each visual object has a distinctive signification
  - Visual Elements influences the process execution curse except the 'Articfacts'

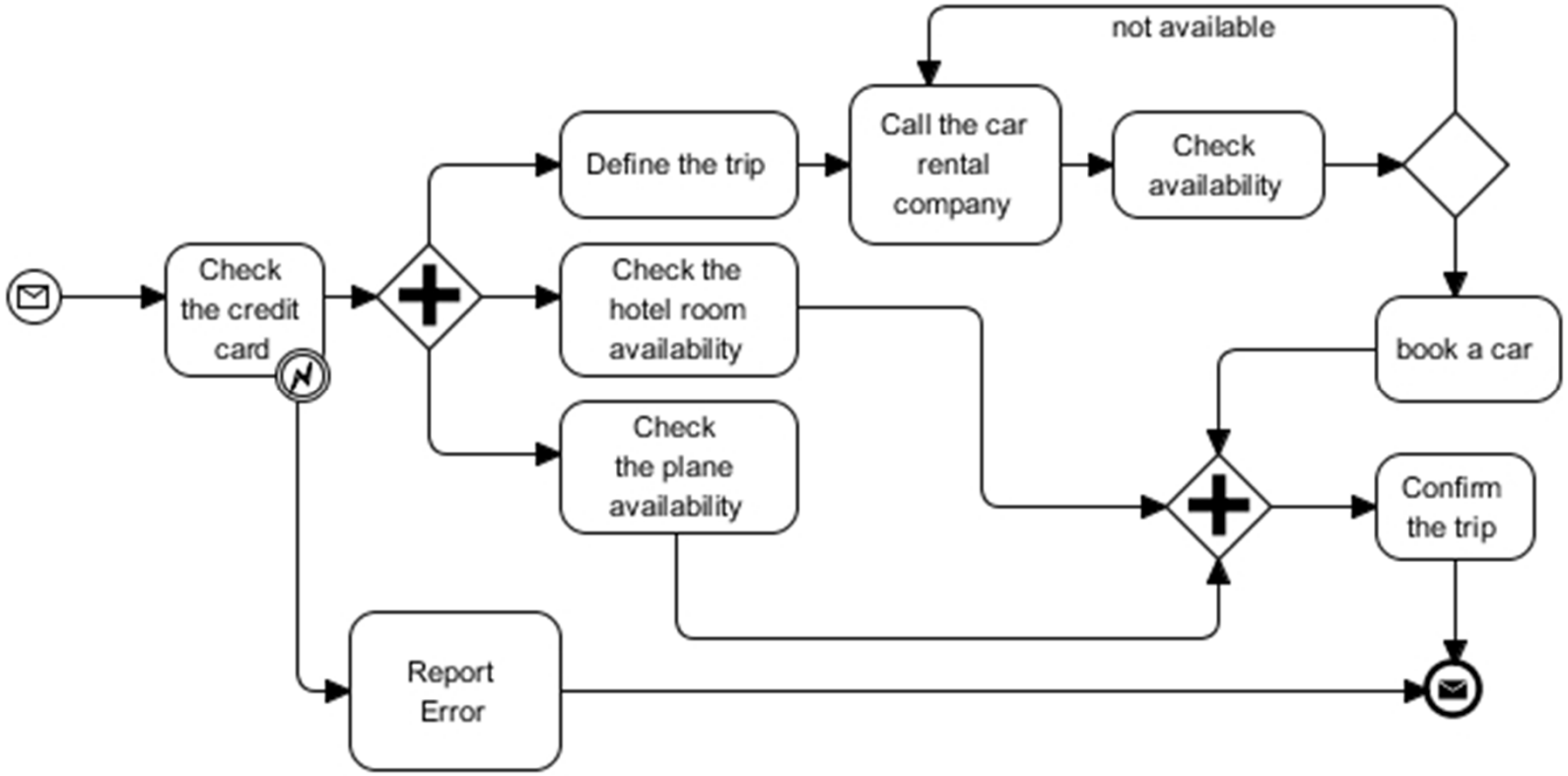
Core elements set

Category	Elements
Flow objects	Events, Activities, Gateways
Data objects	Data Objects, Data Input, Data Output, Data stores
Connecting objects	Sequence Flow, Message Flow, Association
Swimlines	Pool, Lane
Artifacts	Group, Annotation

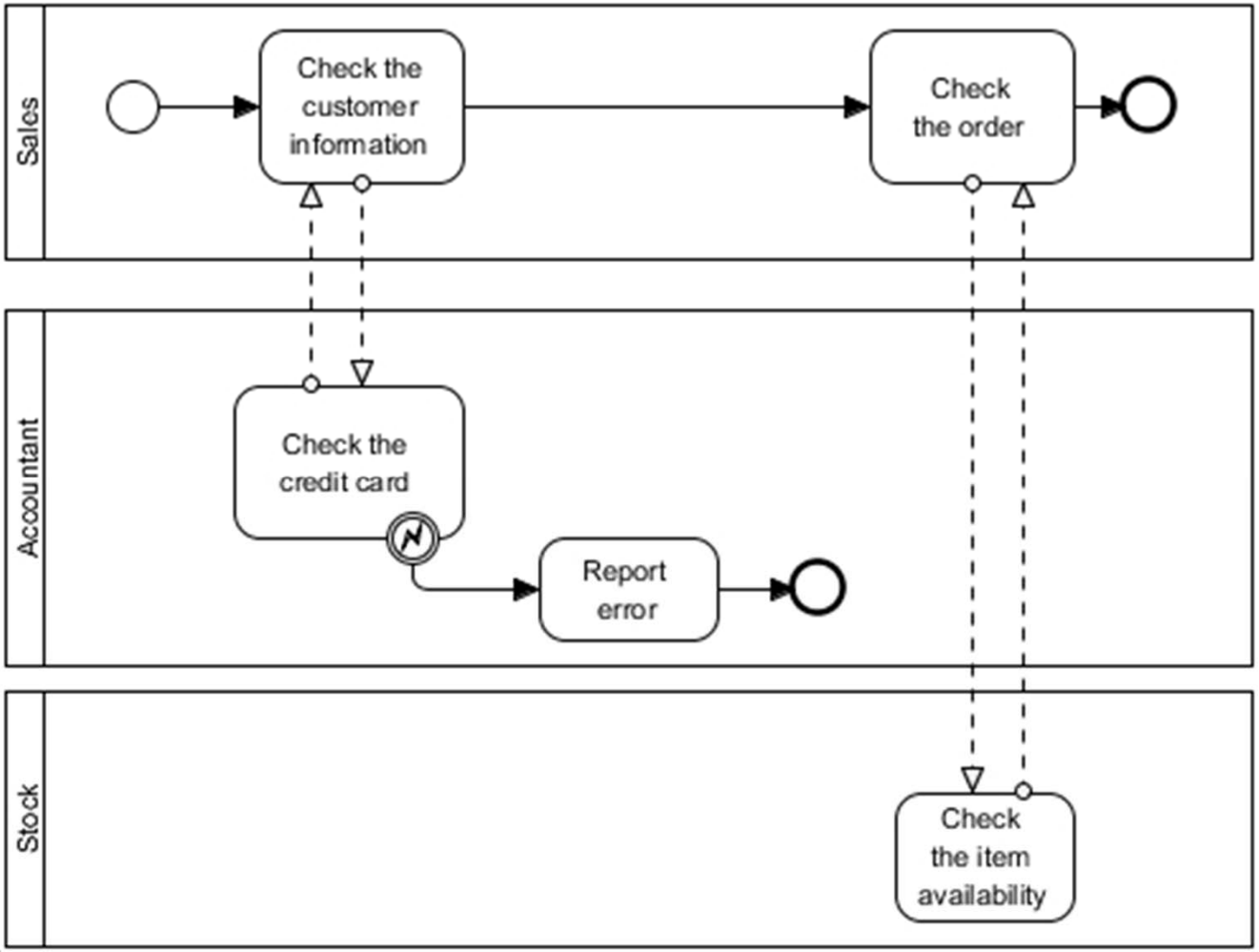
Process Diagrams specification

- The BPMN specifications describes 3 categories of BPD
  - Private Processes
    - Internal processes, target to be executed (BPMS)
  - Public Processes
    - Interactions between Participants without specification of respective internal activities implementation
  - Collaboration Processes
    - Communication between several Public Processes

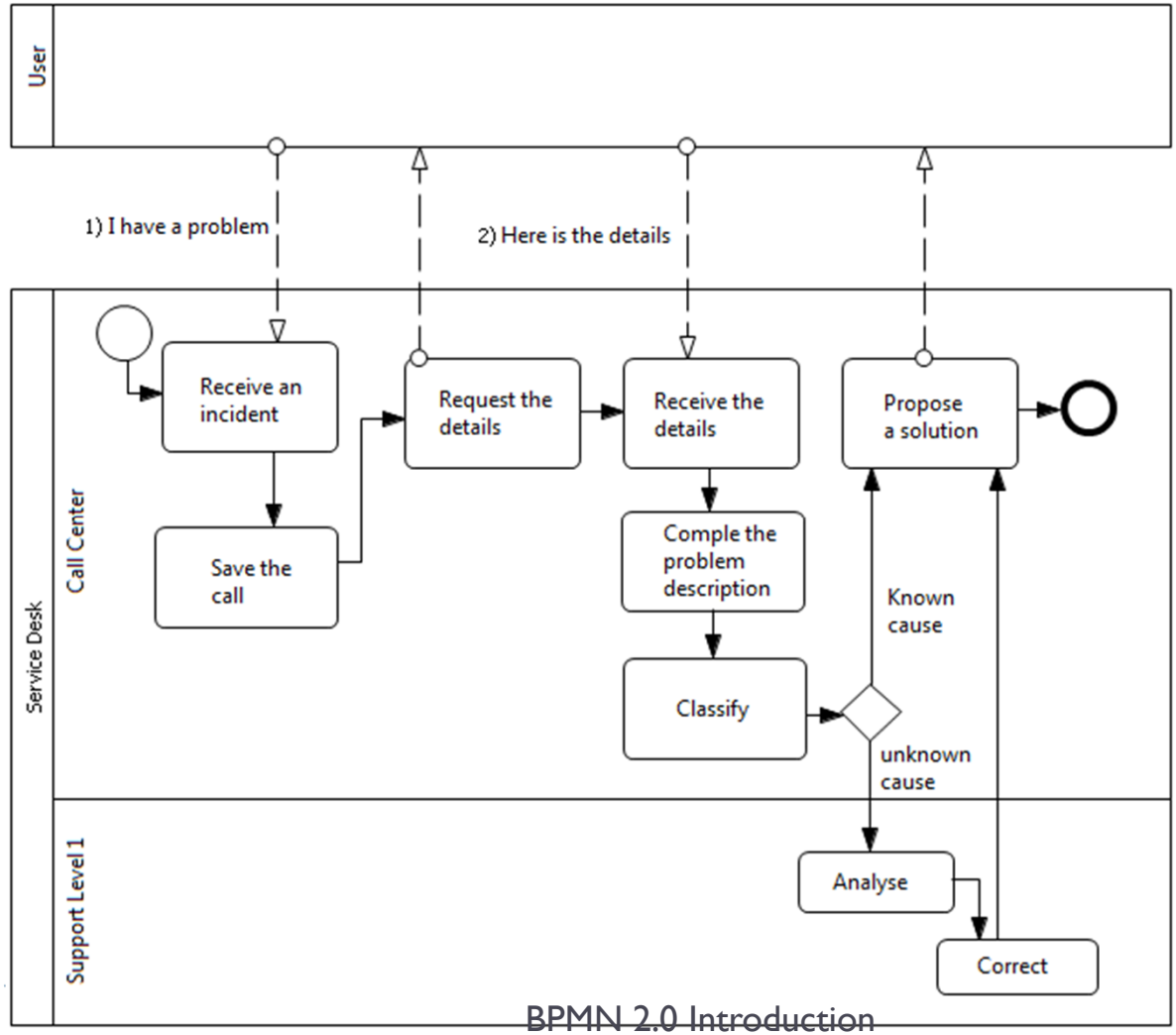
Private Process



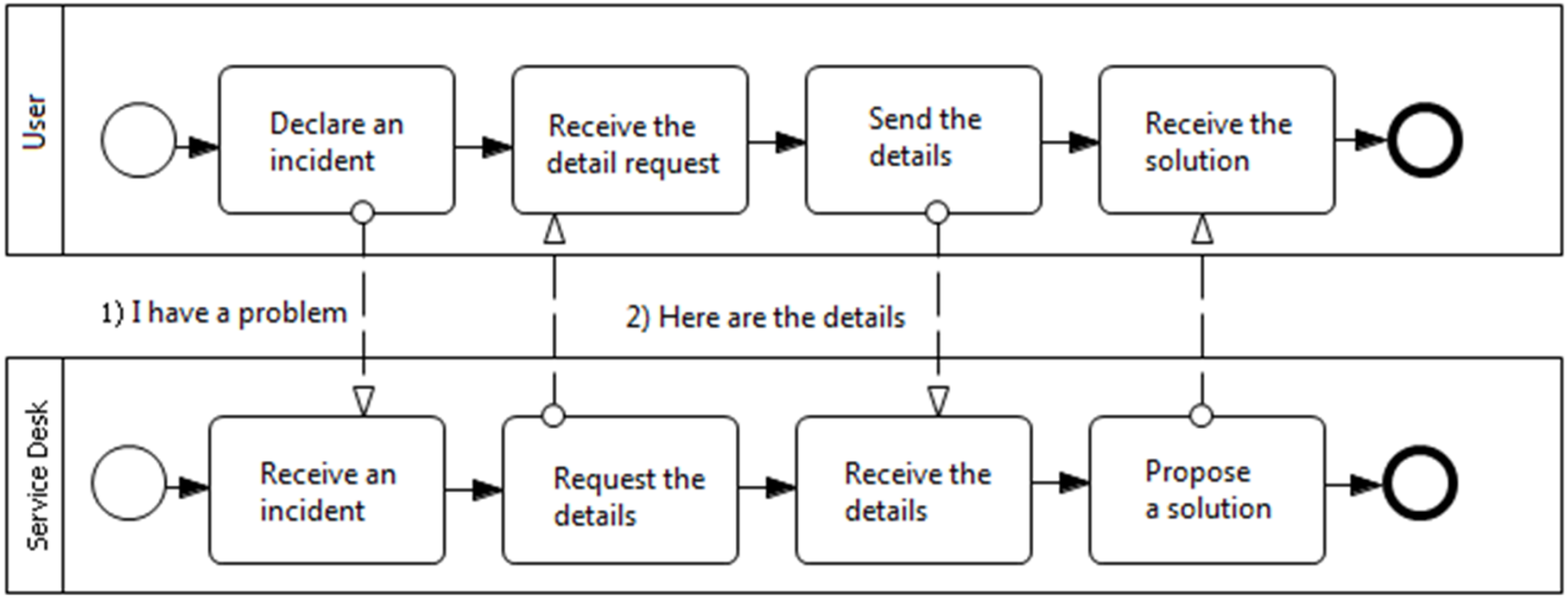
Public Process



Public and Private Processes

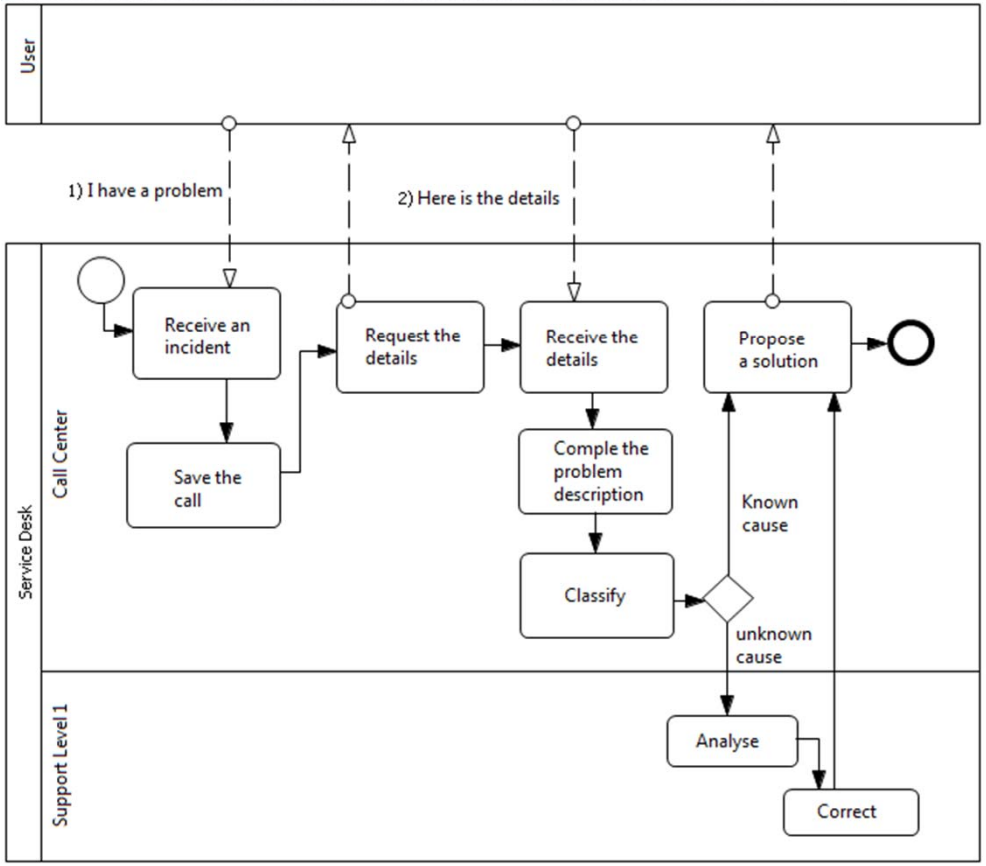


Collaboration Process



Business Process Diagram, Practice

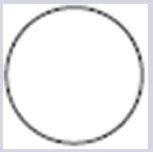
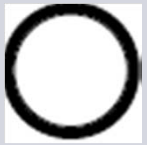
- What is a BPD ?
- What are the 5 core elements set ?
- What are the 3 main categories of the BPD ?
- Explain the following diagram and describe the BPD category



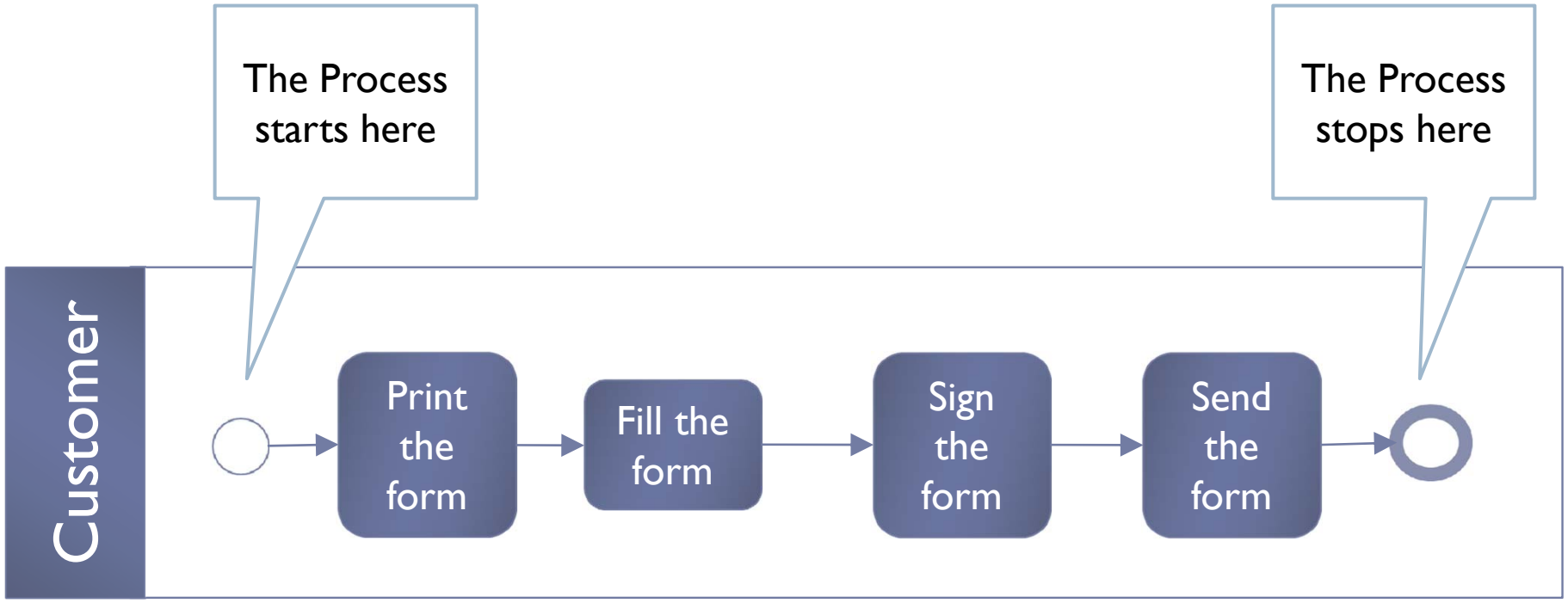
Flow Objects - Events

- Event: something that happened during the process execution
- 3 event categories
  - Start A listening Event which starts the execution flow
  - Intermediate Some events which may happen during the course of the execution flow
  - End At the end of the flow, an event can be thrown.

Flow Objects - Events

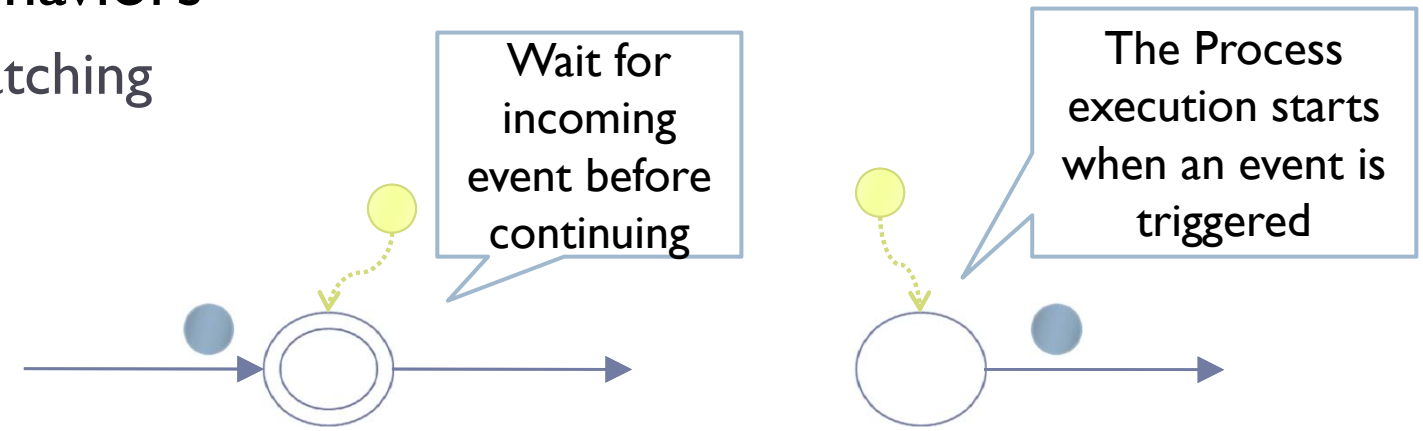
Event	Symbol
Start	
Intermediate	
End	

Event - simple sample

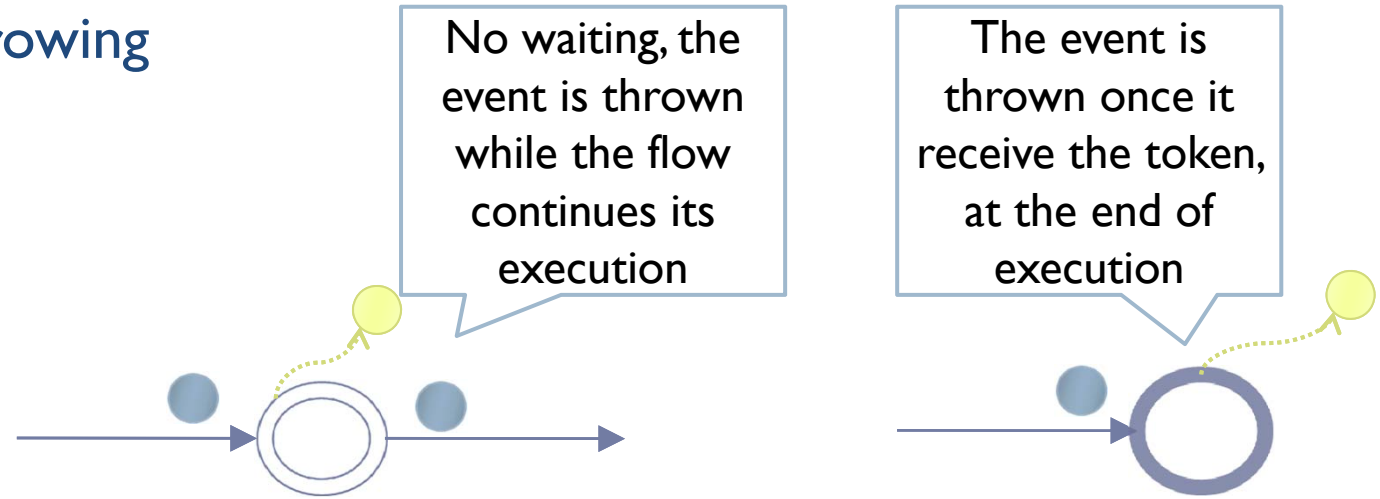


Event Behaviors – general presentation

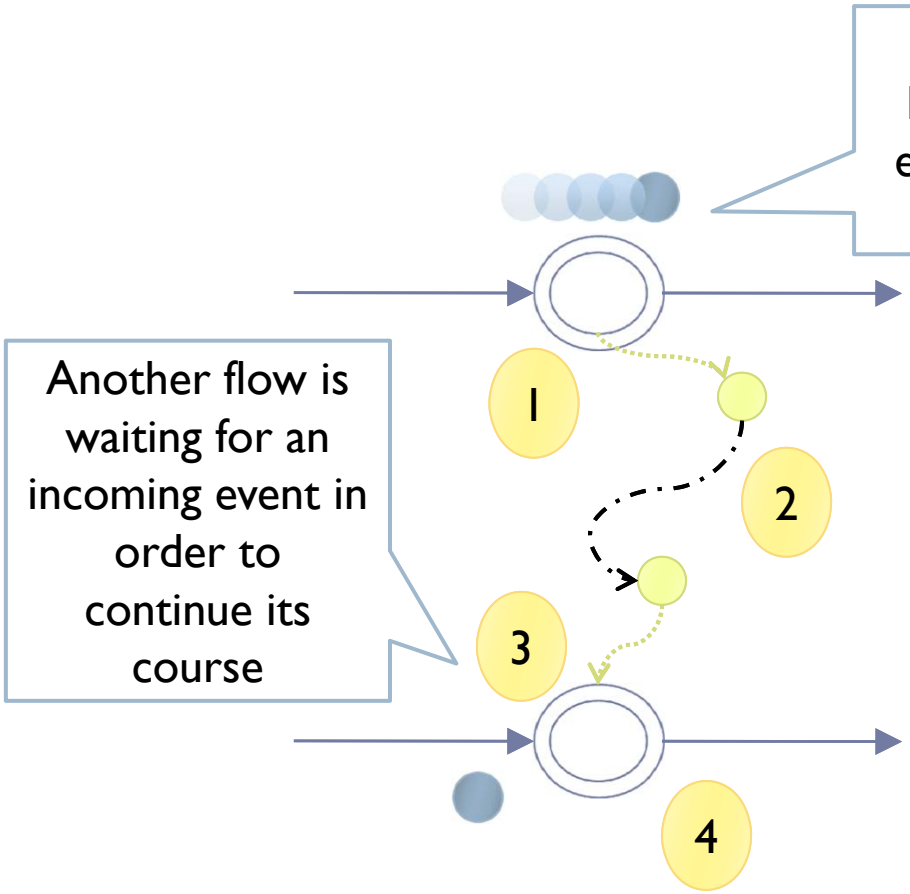
- 2 Behaviors
  - Catching



  - Throwing



Events – How it works



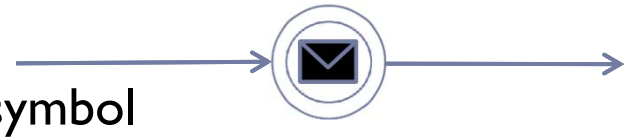
1. Event is thrown
2. Event information is broadcasted
3. The Event information is caught by the listener
4. The waiting token continues its course

Event, Practice I

- What is an Event ?
- What are the 3 Event's categories ?
- Describe the Event mechanism ?
- Draw the following process
  - "the process starts when the production dept receives the new plan, then the dept's operator programs the robot. Once finished, he packs the result and finish the process by sending it to the sales dept."

Events categories

- The BPMN specification defines 13 event situations
  - Each situation has a dedicated symbol placed in the center of the event symbol.
  - Each situation has a dedicated specificities



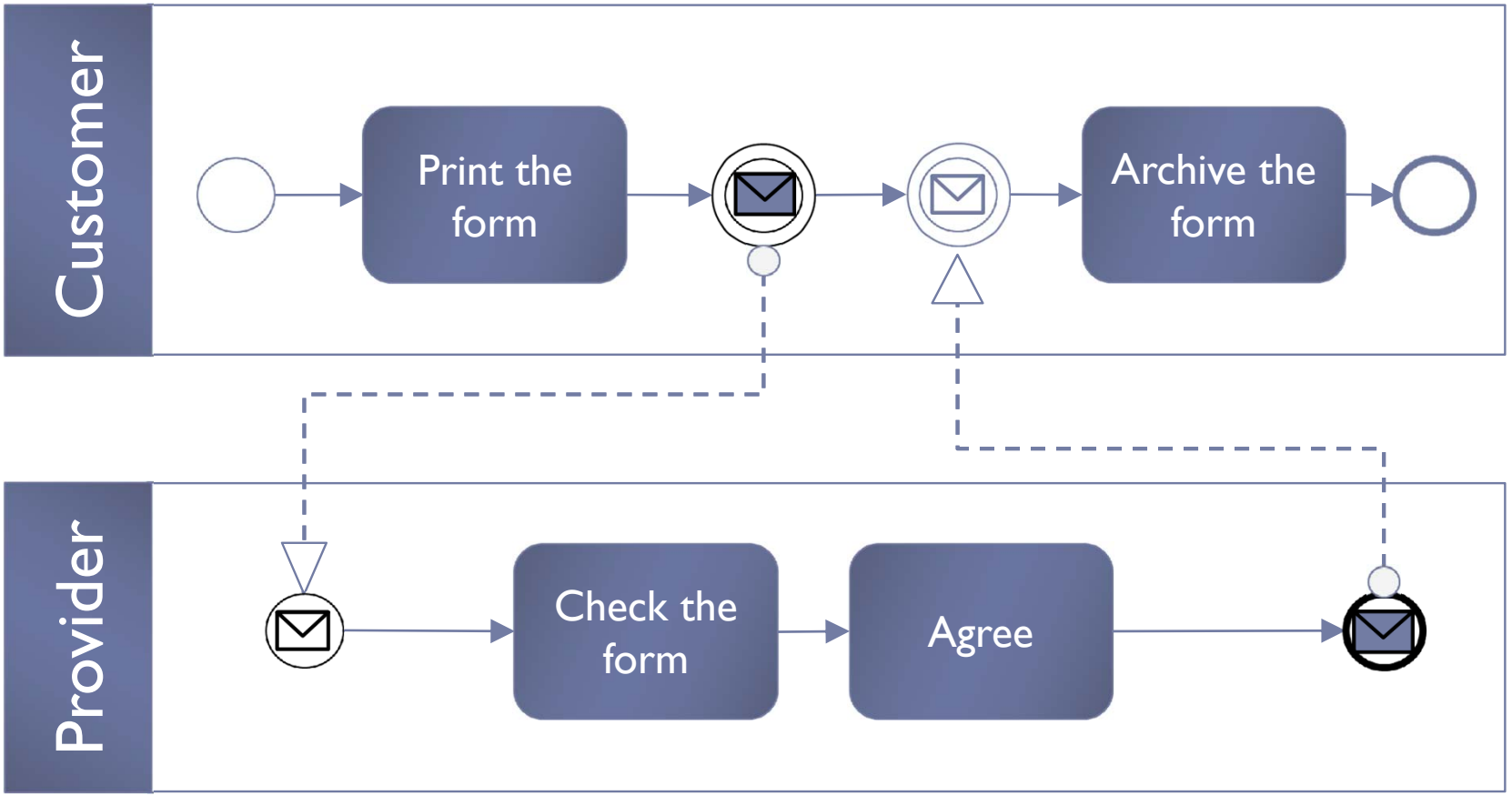
- Throwing : black inner symbol
- Catching : white inner symbol

This Intermediate Event waits for an incoming message

Events categories inner symbols

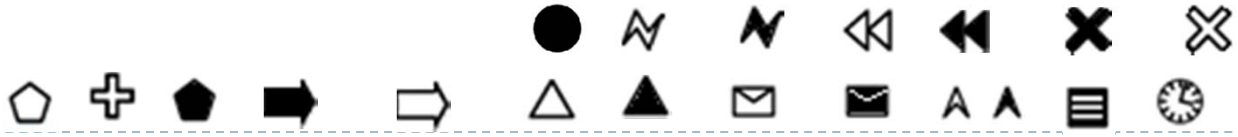
Event	Catch	Thrown	Description
None			Indicates the start or the end of the flow
Terminate			Immediately stops the process execution
Error			Indicates that an error is thrown/caught
Compensation			Compensate previously executed activities
Cancel			Cancel transactionnal activities
Signal			Broadcast/receive a signal
Message			Send/receive a message
Escalation			Escalation issued to an upper level
Conditional			React following a business rules
Timer			React after a specified delay
Multiple			Catch/throw many specified events
Parallel Multiple			Receive many simultaneous events
Link			Within a sequence flow (simplify)

Flow Objects – Events Sample



Flow Objects, Event, Practice II

- What are the 2 Events mechanisms ?
- How is filled the icon for those ones ?
- Draw the following:
  - "The R&D dept receives the new customers' needs described in an email from the marketing dept. Then the researcher starts by analysing the needs. Once analysed, he sends its proposal to the financial department wich sends back the cost price. Then the process finished when the researcher sends back the complete proposal"
- Discussion: When to use the Start and End Event regarding the pool or lane usage ?
- Describe the following icons:



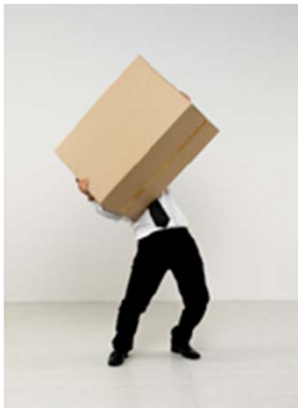
Flow Objects - Activities

- Activity = The generic term that defines the executed work = Task

- Each activity is connected within the Sequence flows (on the same pool/lane) or with Message Flows (between pools)

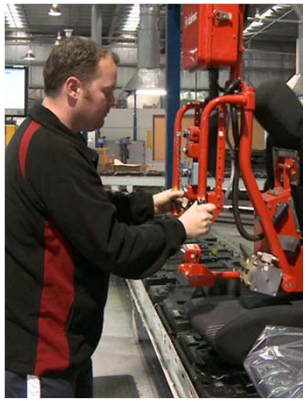
Define dedicated behaviors

- Manual handling



Manual task

- User's task



User's task

- Automated tasks

Service task

Activity behavior Categories 1

Task	Symbol	Description
Abstract		No influence on the Process Execution (Engine). It is only used to clarify the understanding of the Process.
Service		Refers to en external services execution
Receive		The process execution is stopped and waits for the incoming message from another participant.
Send		The task sends a message to another participant. The process execution is not stopped.

Activity behavior Categories 2

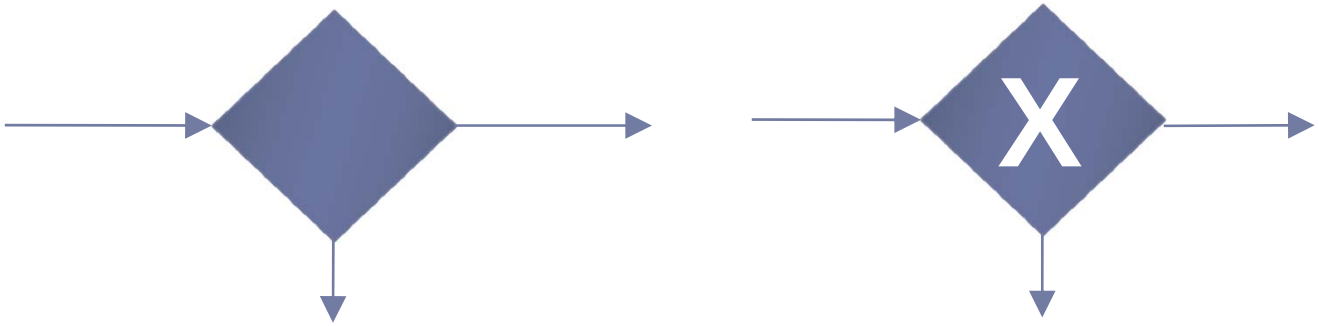
Task	Symbol	Description
User		The User participate to the business process execution
Script		The script is executed when this activity is started
Manual		A non-automated task performed by a human
Business Rule		A mechanism is called to ask a business rules engine and give back the answer.

Activities, Practice

- What are the 3 main Activity's categories ?
- How many categories of Activities are defined within the specification?
- This activity is related to which category ?

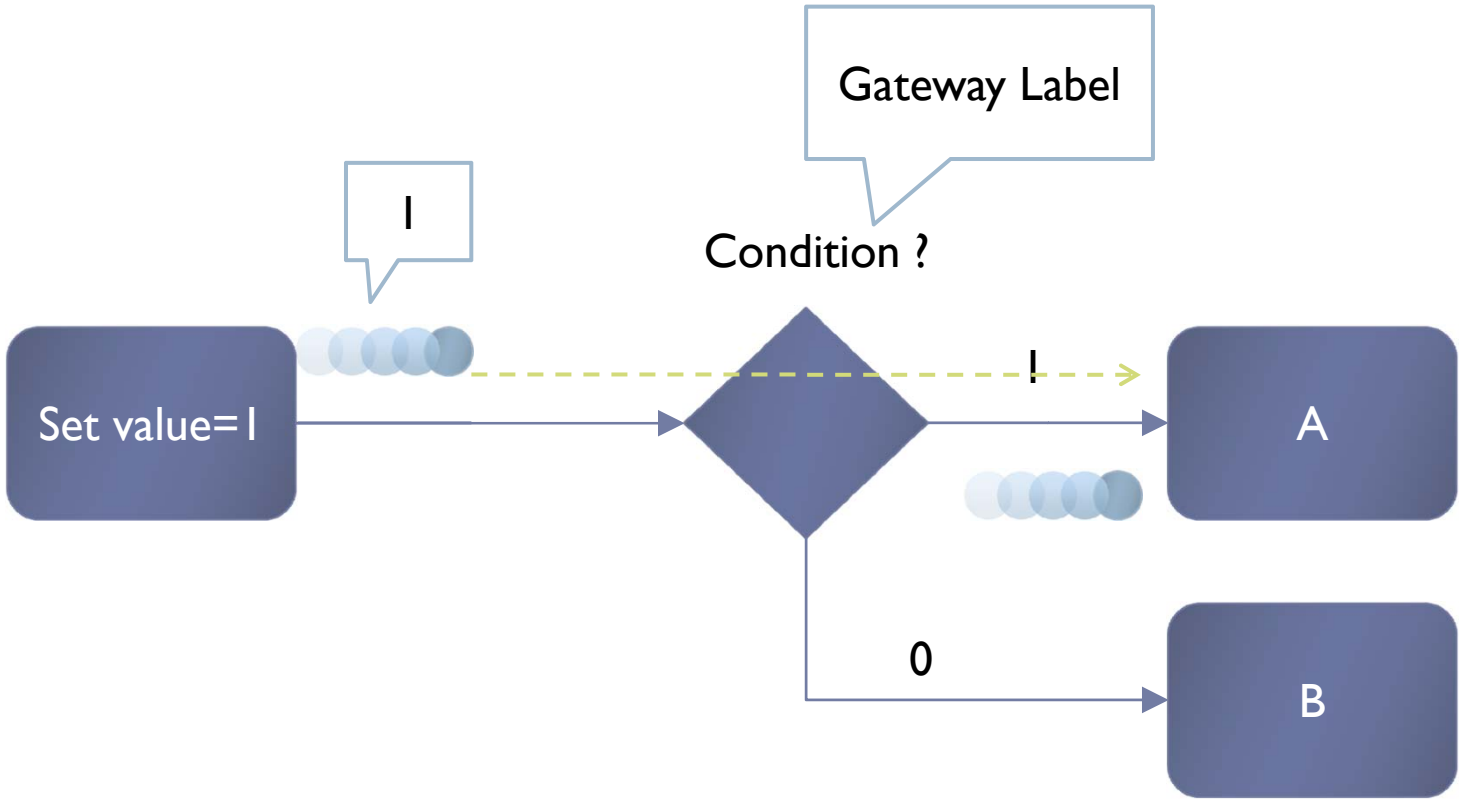
Flow Objects - Gateway

- A process may contain several alternatives or concurrent conditional flows
- Conditions to execute something
- IF CONDITION THEN DO situation

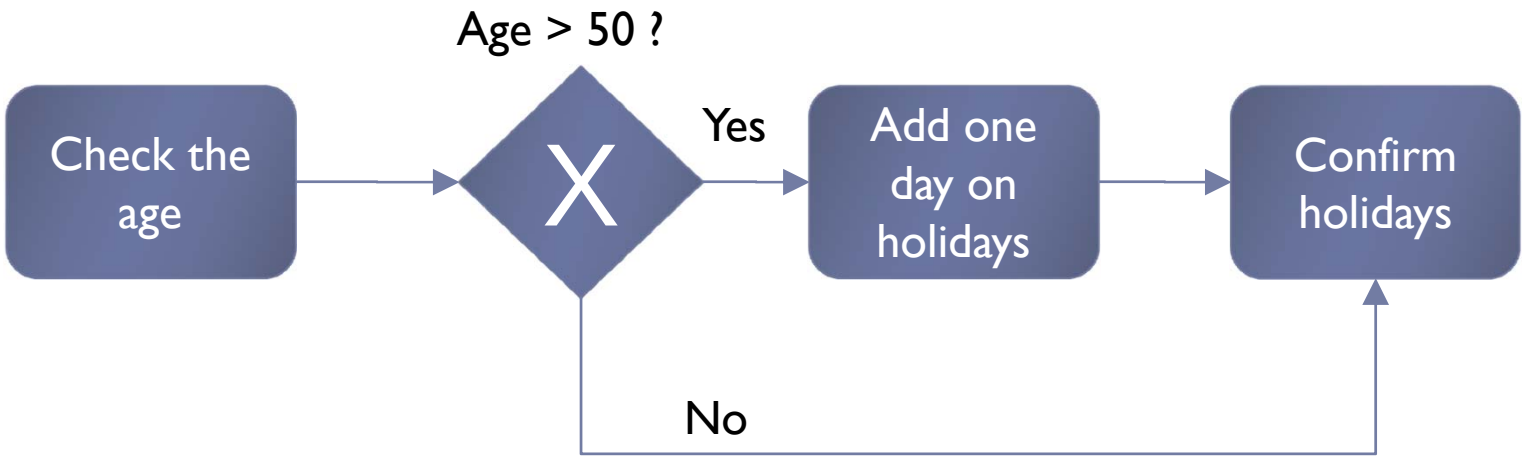


Gateway basis – exclusive path

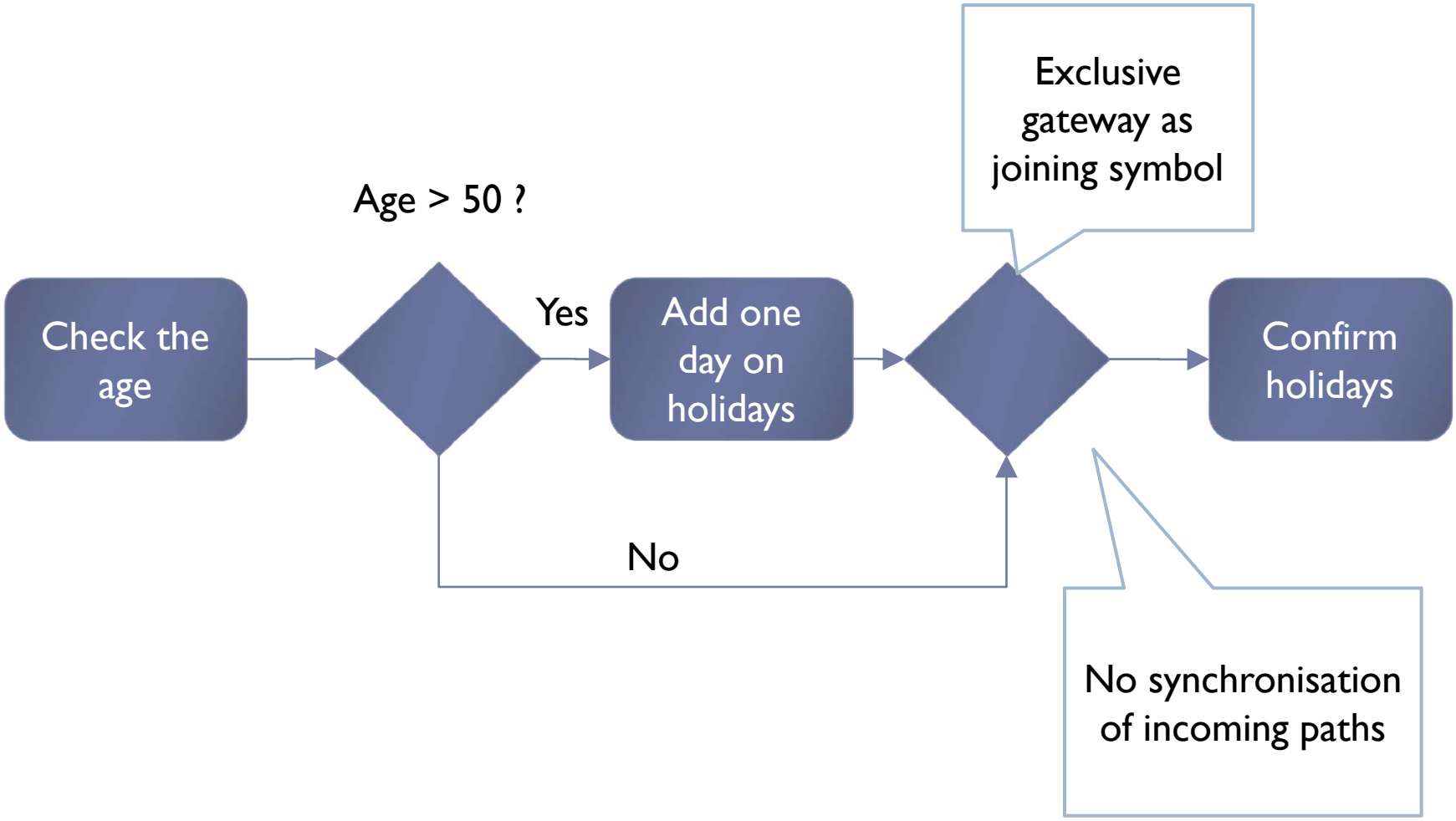
- IF condition=1 THEN do A ELSE do B



Exclusive Gateway sample

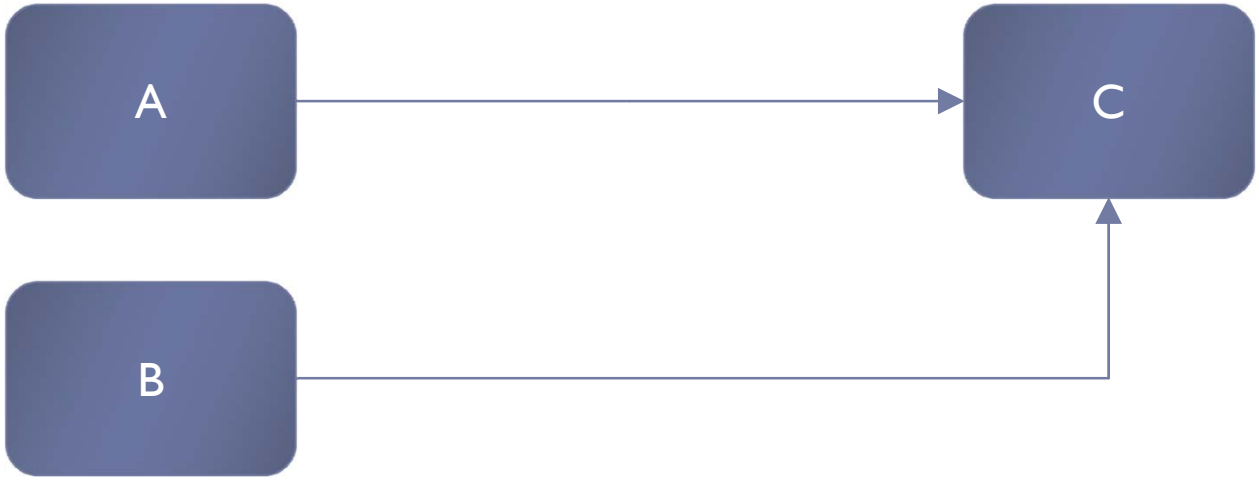


Exclusive Gateway sample - joining

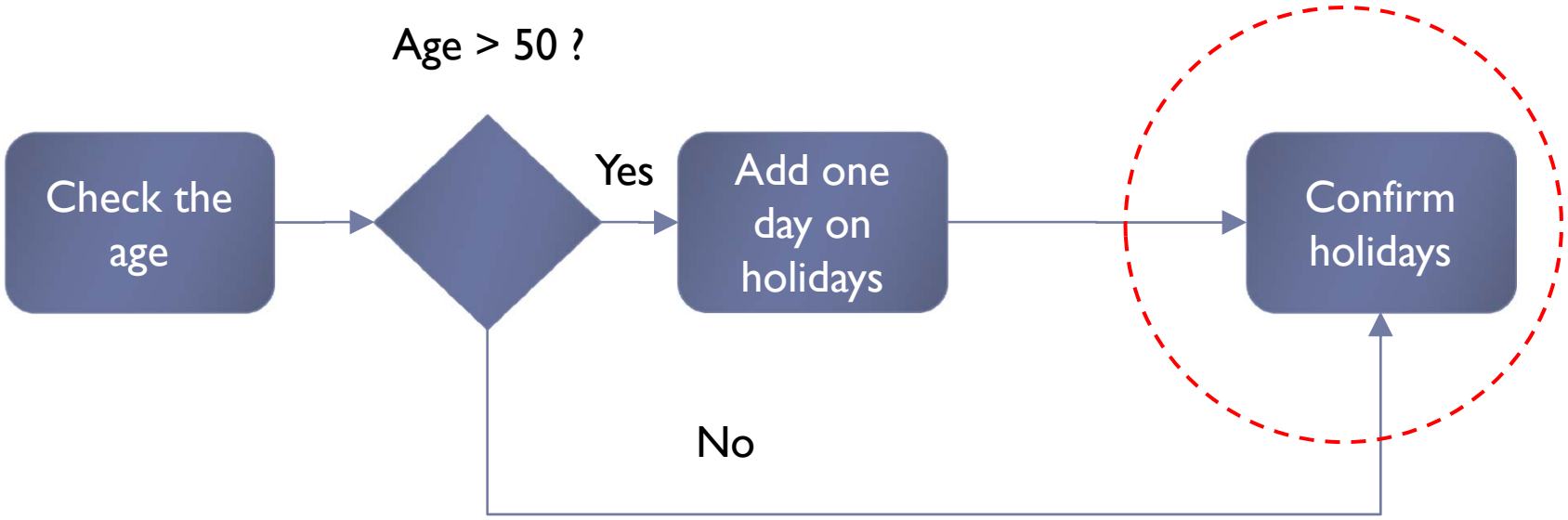


Merging, equivalence

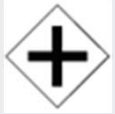
- No symbol, many inputs on the same activity



Exclusive Gateway – joining (2)

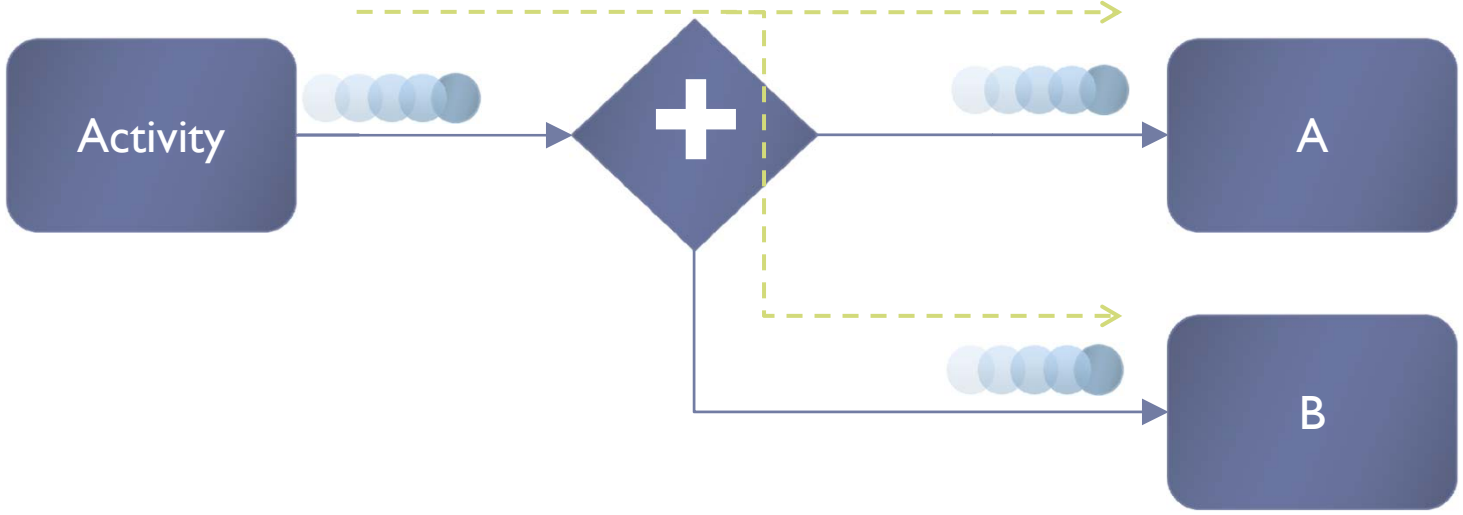


Gateway Categories

Symbols	Category	Description
	Exclusive	Choice between alternatives paths. *IF condition THEN ELSE* situations
	Parallel	Each output path receives a token
	Inclusive	All conditions are evaluated and for each that are true, the path is selected. *OR*
	Event Based Intermediary	The first intermediary triggered event definitely choose the path
	Event Based Start	The first triggered event choose the path.
	Parallel Event Based	Catch any triggered events that start the process. Many instances are created.
	Complex	Many conditions are defined in order to define one or more output paths

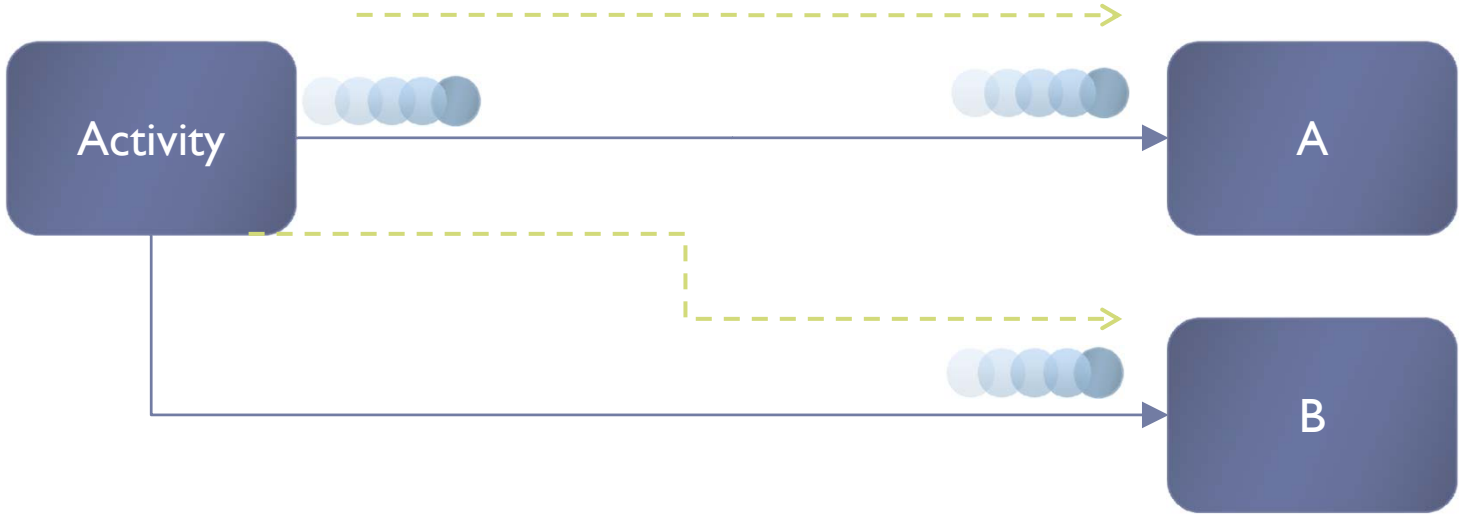
Parallel Gateway

- Many inputs, many outputs, no conditions…
- A and B are activated on the same time



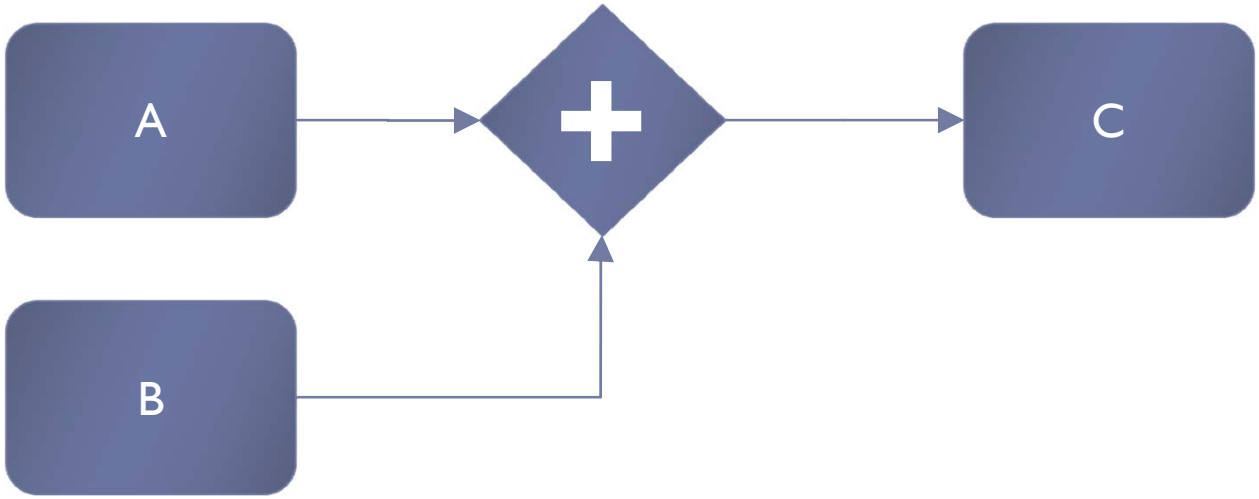
Parallel Gateway Equivalent

- No symbol, many output from the same activity
- A and B are activated on the same time



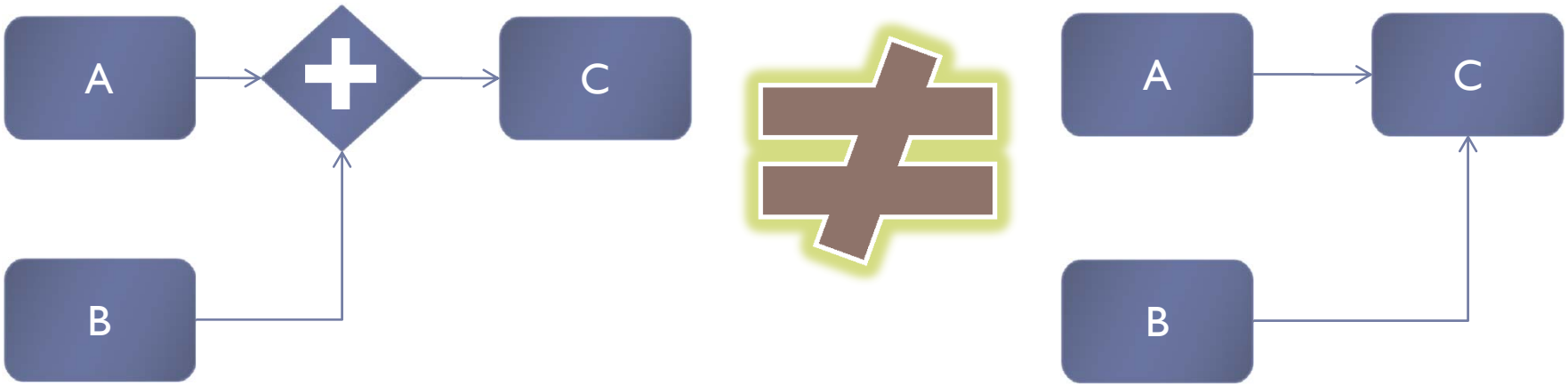
Parallel Gateway - Synchronisation

- Wait until **all** incoming paths.
- C is activated once A **and** B are both finished



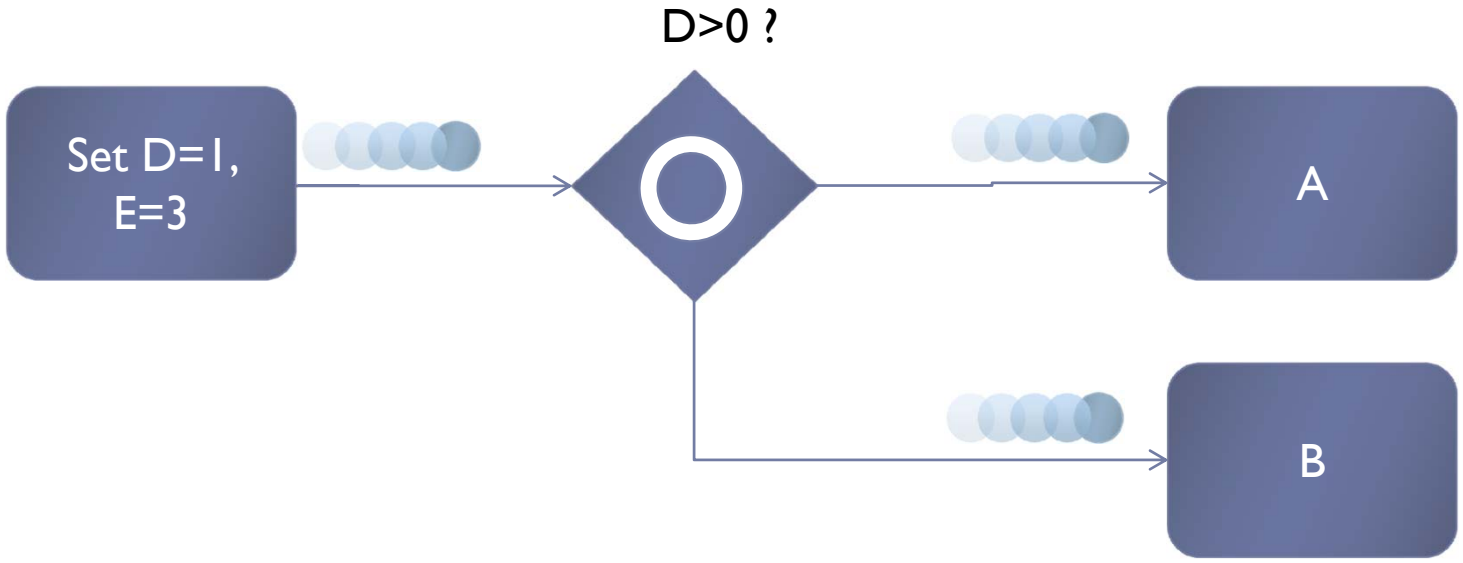
Care !

- Not the same !

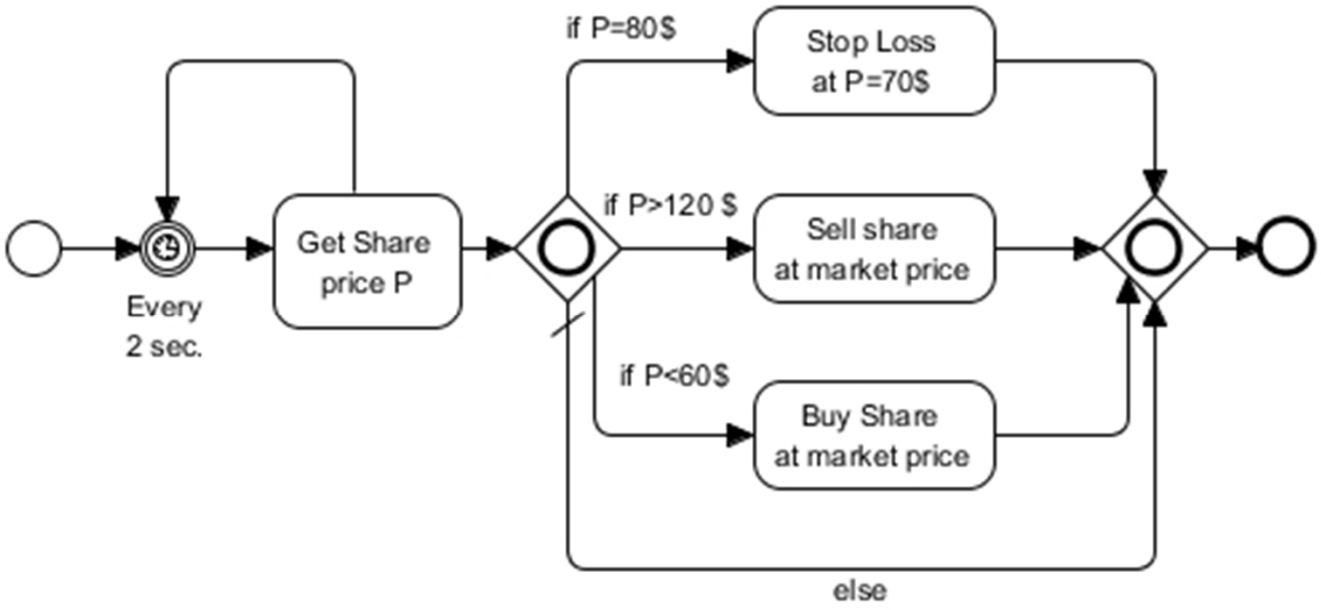


Inclusive Gateway

- All conditions are evaluated
- Each true condition opens the gate
- Represents the ***OR*** logical operator

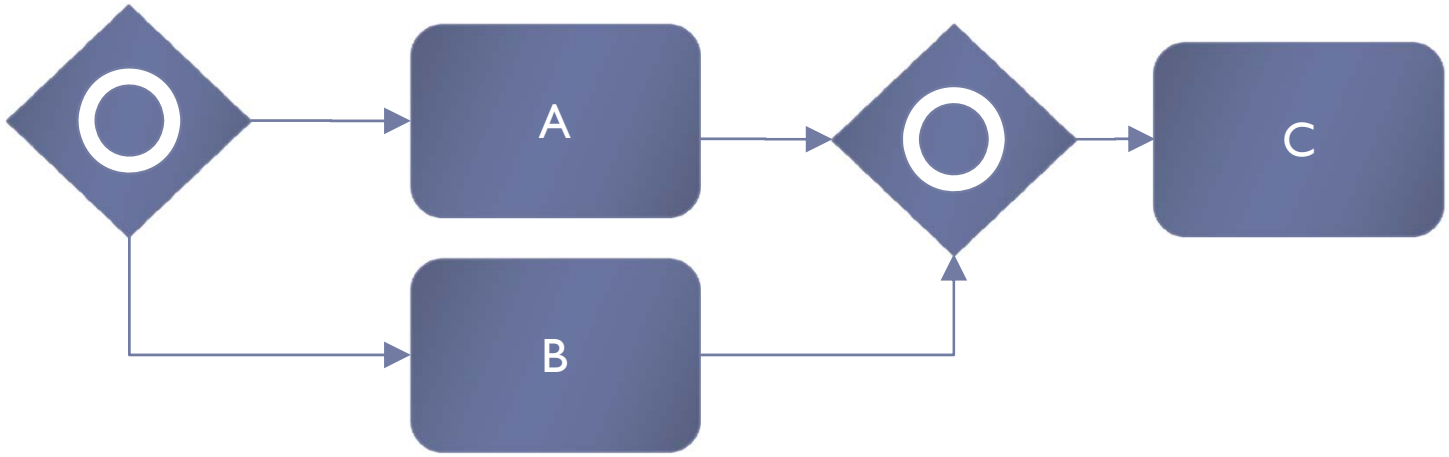


Inclusive Gateway - Sample



Inclusive Gateway - Synchronisation

- Wait until **all** incoming paths previously initiated by an Inclusive Gateway.
- C is activated depending on the first inclusive gateway true conditions



Gateway, Practice

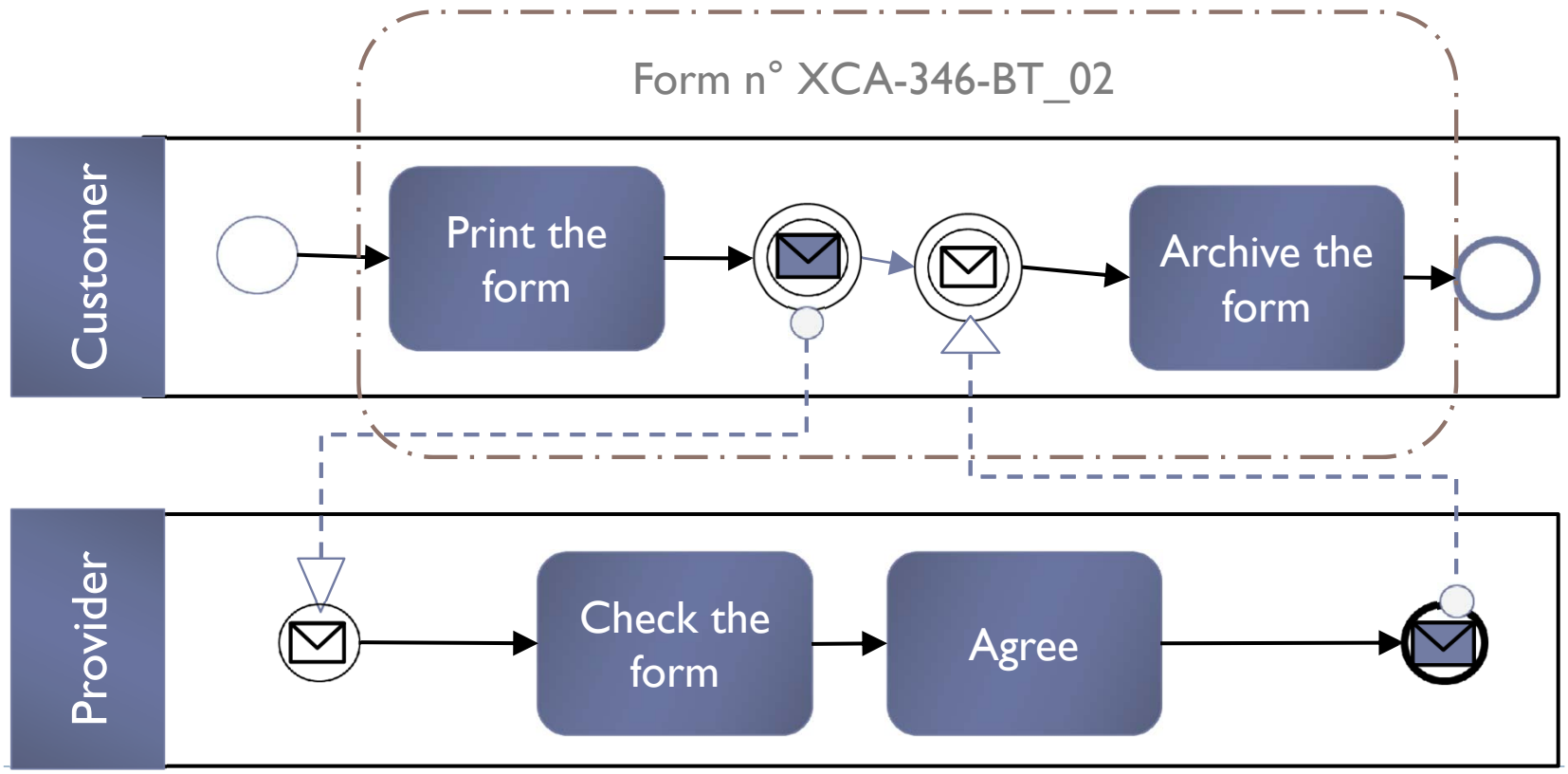
- What is a gateway ?
- What is the main gateway shape ?
- Draw the following situation:
  - "if price is greater than one thousand, then we apply a 10% discount, then after we send the box to the customer"
- Draw the following situation:
  - "We produce the Car on the same time than the scooters"
- Draw the following situation:
  - "Sometimes we receive the message from the marketing dept or by the R&D, either by both. We do not read the one sent by the R&D (put in the bin). "
- Draw the following situation:
  - "We continue the production once we received both part 1 and part 2 of the wheel"

Artifacts

- The possibility to add contextual information
- Complete the process and elements understanding
- No influences on process execution
- Two artifacts categories:
  - Group
  - Annotation

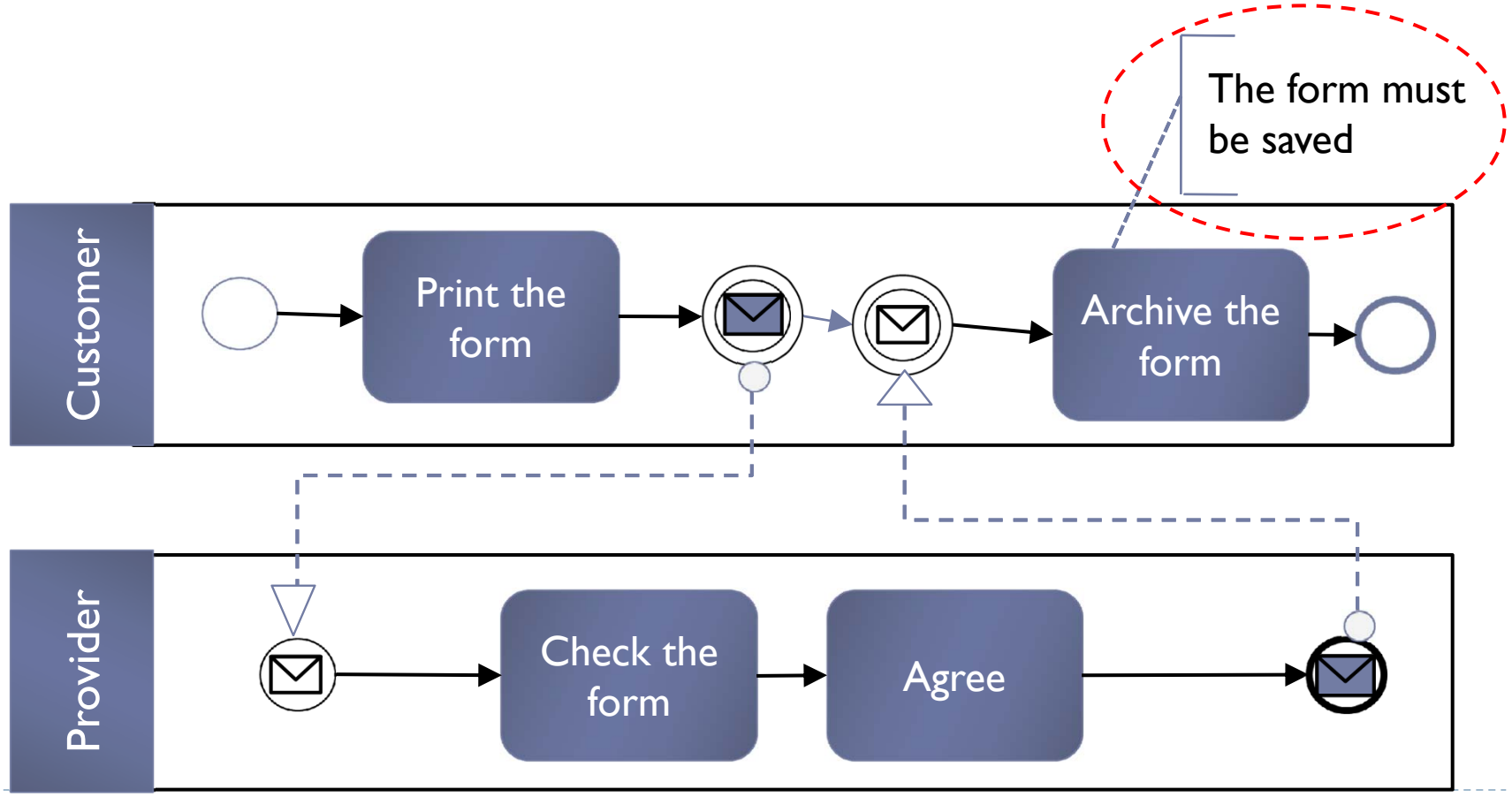
Artifact - Group

- Visual representation of a set of process' elements



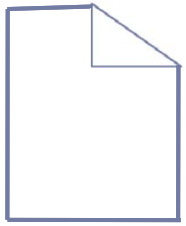
Artifact - Annotation

- A simple piece of textual information sets to one or more process' element



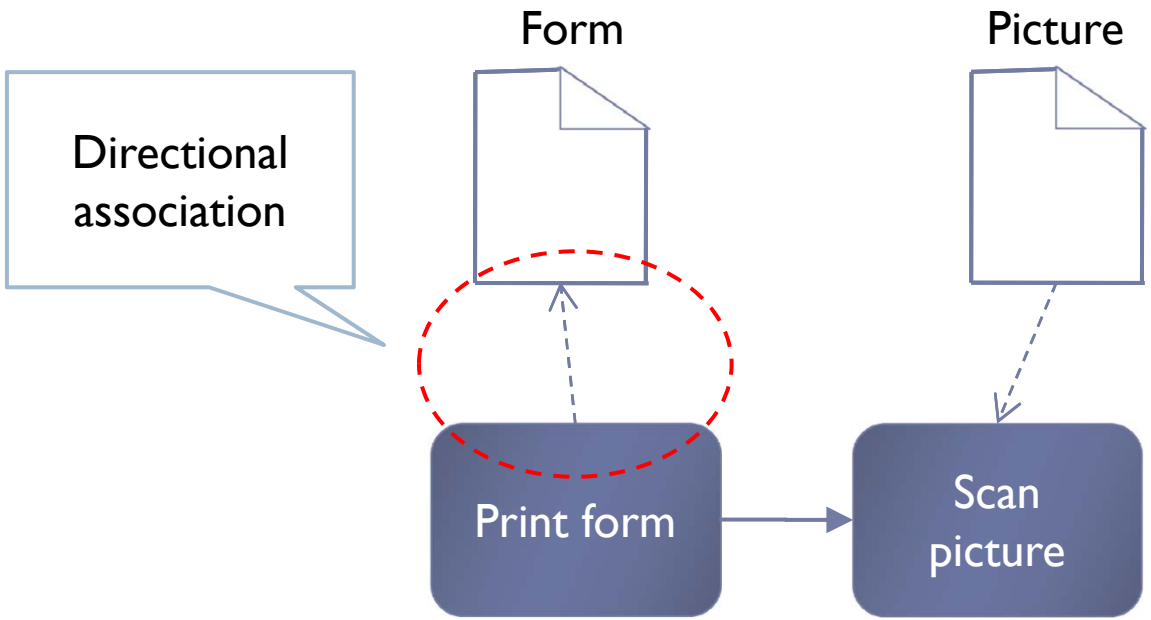
Data Objects

- Represents manipulated items within the process execution



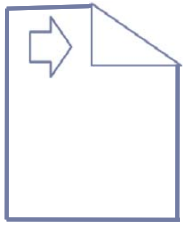
Data Object

Data Object association

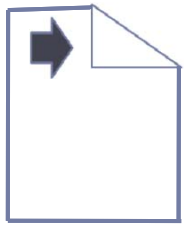


Data input – Data ouput

- Represents data used directly by activities

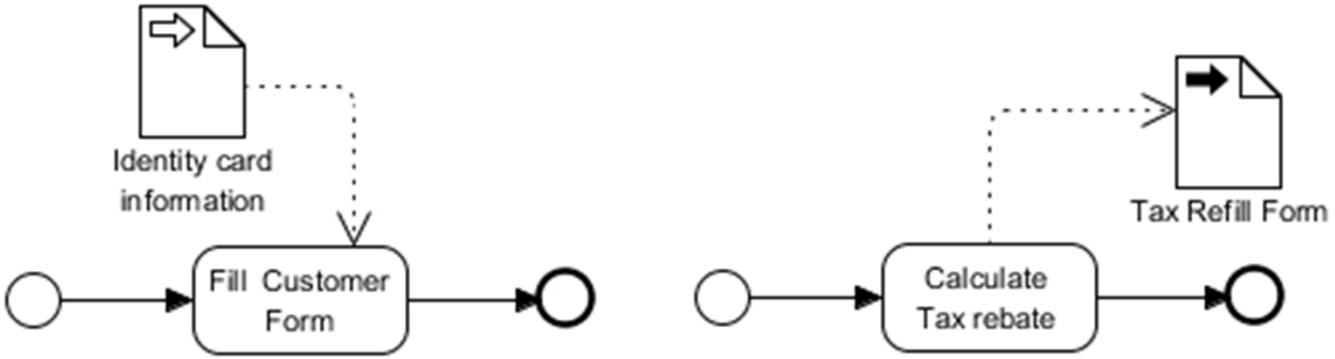


Data Input



Data Ouput

Data Input/Output - Samples



Datastore

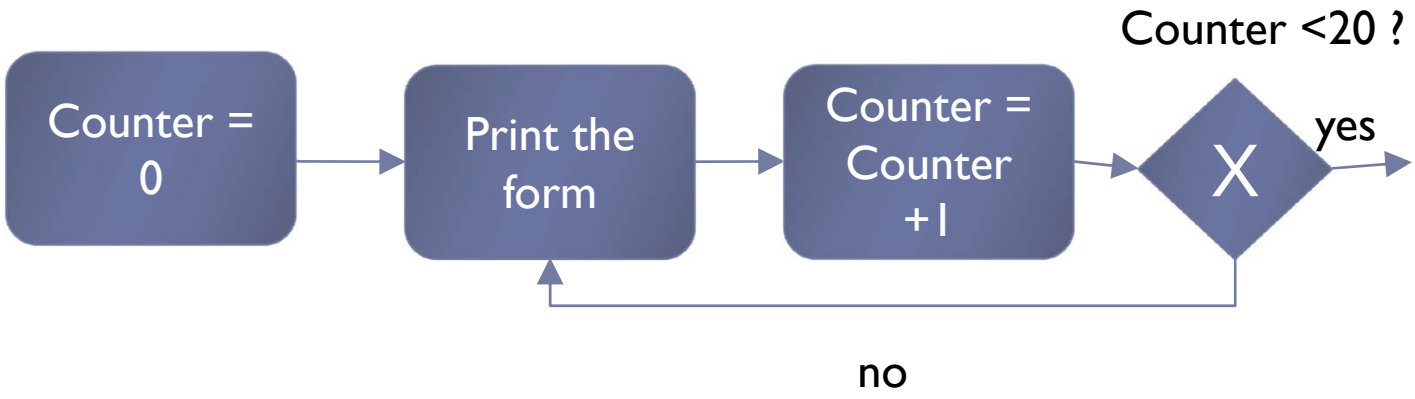
- Activities using data or informations systems

Artifacts & Data objects, Practice

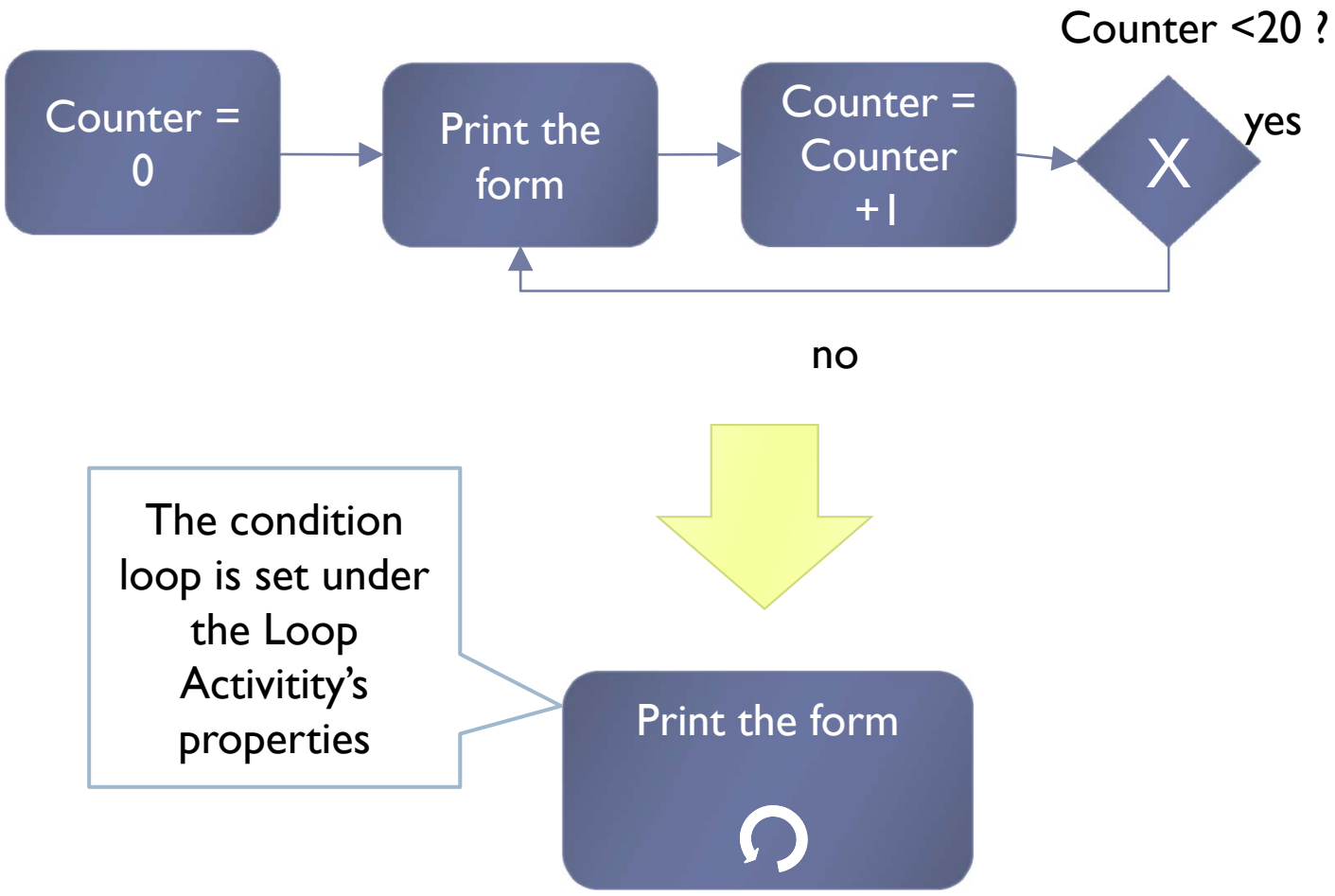
- What is an artifact ?
- Does artifacts modify the business process execution behavior ?
- Draw the following situation:
  - "We extract the information from the database ABCDEF with MS Excel, then we produce the report saved under the file folder named /TTYUI. Finally we send the report to the customer"

Loop - Principles

- Doing many times the same task



Loop - Symbol

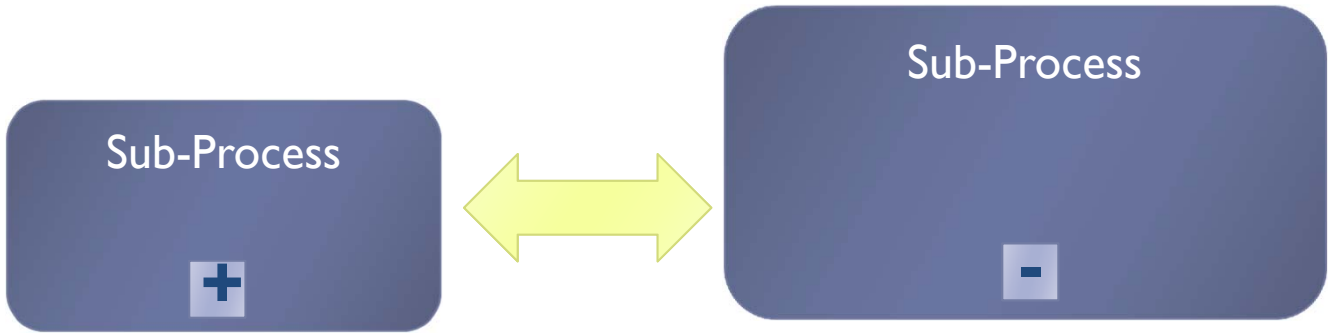

Counter = 0
Print the form
Counter = Counter +1
Counter <20 ?
X
yes
no
The condition loop is set under the Loop Activitity's properties
Print the form

Loop, practice

- What is a loop ? When to use it ?
- Draw the following situation:
  - The R&D receives a set of 10 documents from the marketing department. For each document, the R&D team's member stamp it. After that, he puts all documents in the R&D 's 'incoming basket'.

Sub-Processes

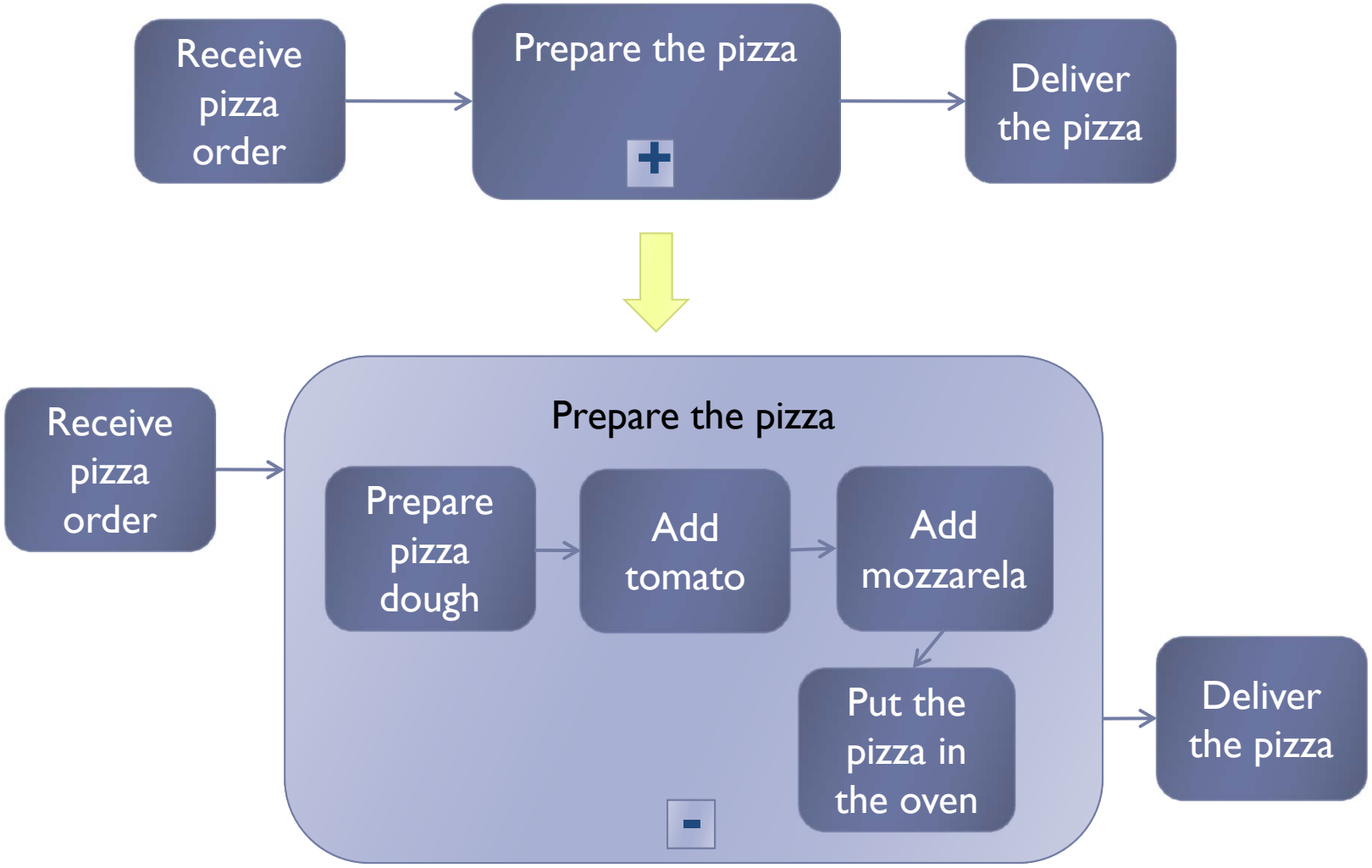
- The sub-processes allow the possibility to create sets of compound activities, events, sequence flows and others sub-processes
- Introduced within the process flow like the Abstract Activity = Embedded sub-process



Collapsed sub-process

Expanded sub-process

Sub-Process sample



Sub-Process, practice

- What is a sub-process ?
- How the sub-process is visually represented ?
- Describe the sub-process mechanism with its representations ?
- Draw the following situation:
  - The R&D receives a set of 10 documents from the marketing department. For each document, the R&D team's member read it, check the name of the product, add a comment and stamp it. After that, he puts all documents in the R&D 's 'incoming basket'.

Final Practice

- Read Case 1 (word file)
- Draw the depicted situation

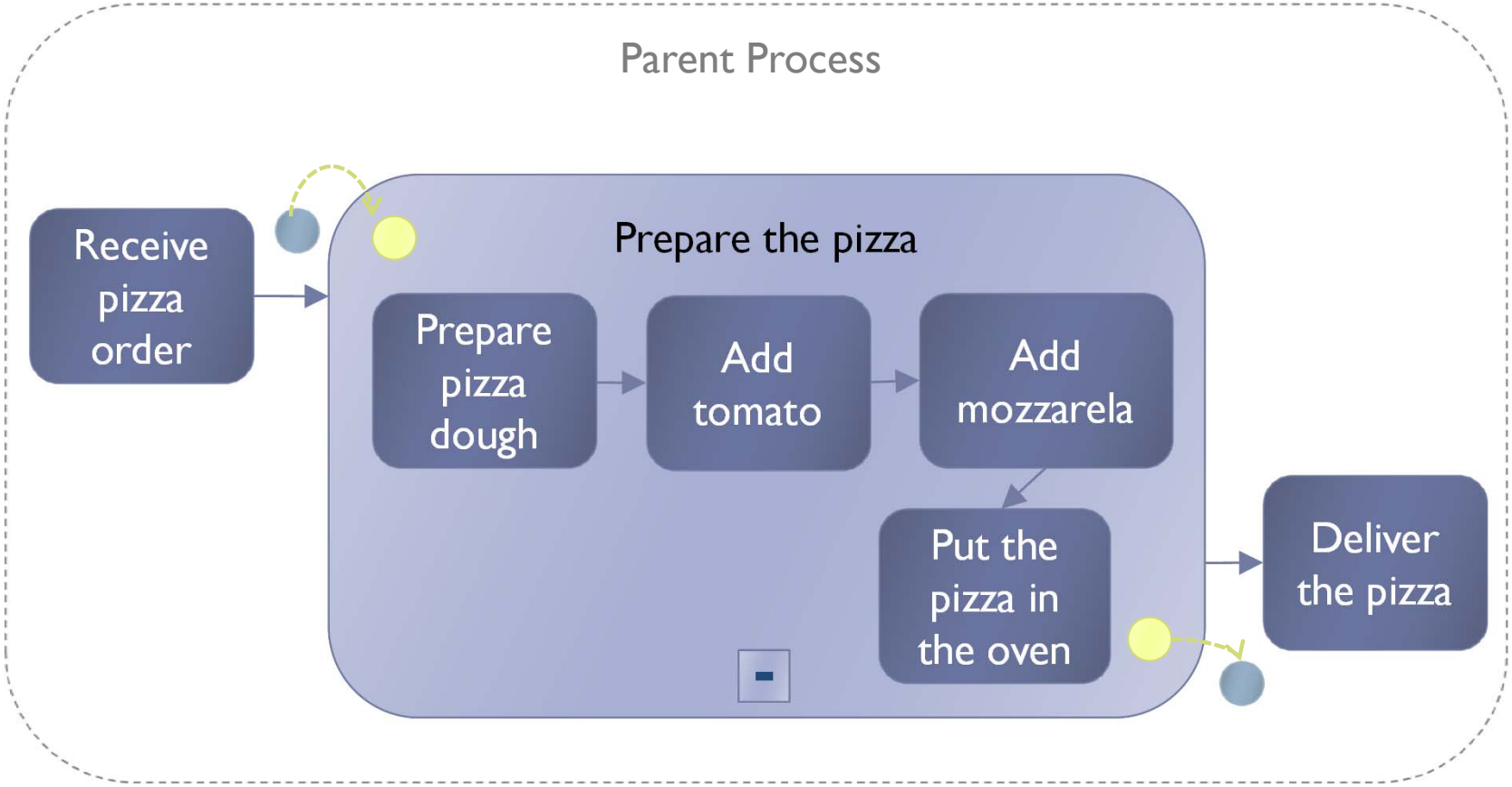
Advanced BPMN elements

- Sub-Processes
- Multi-Instances
- Conditional Sequences
- Call Activity
- Events
- Error, Transaction and Compensation handling
- Advanced Sub-Processes
- Advanced Gateways

Sub-Process categories

Category	Description
Embedded	The sub-process execution is *embedded* within the parent process
Reusable	The sub-process is reusable among many parent-processes
Transaction	All activities contained within the sub-process are submitted to a transactional behavior. 'All-or-nothing'. Is something wrong happened at one of these activity, all yet executed activities are rolled back.
Event	A speciliazed inner sub-process triggered exclusively by an event.
Ad-Hoc	The performer of the Ad-hoc suprocess defines itself the course of the sub-process' activities

Embedded Sub-Process



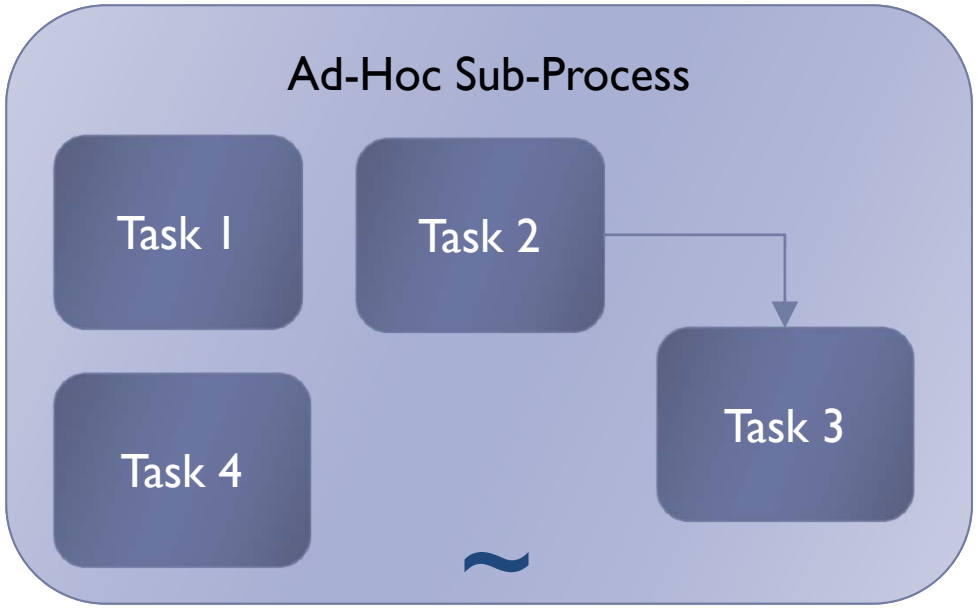
The *Parent Process* waits for the completion of the sub-process in order to continue its course

Reusable Sub-Process

- The Called Sub-Process is not caller's context dependant
- The Sub-Process may be reused many times independtly of the context
- No visual differences with the sub-process' shape

Ad-hoc sub-process

- The perform decides itself the tasks execution order
- However, may contains some sequence flows



Sub-process (1) - Practice

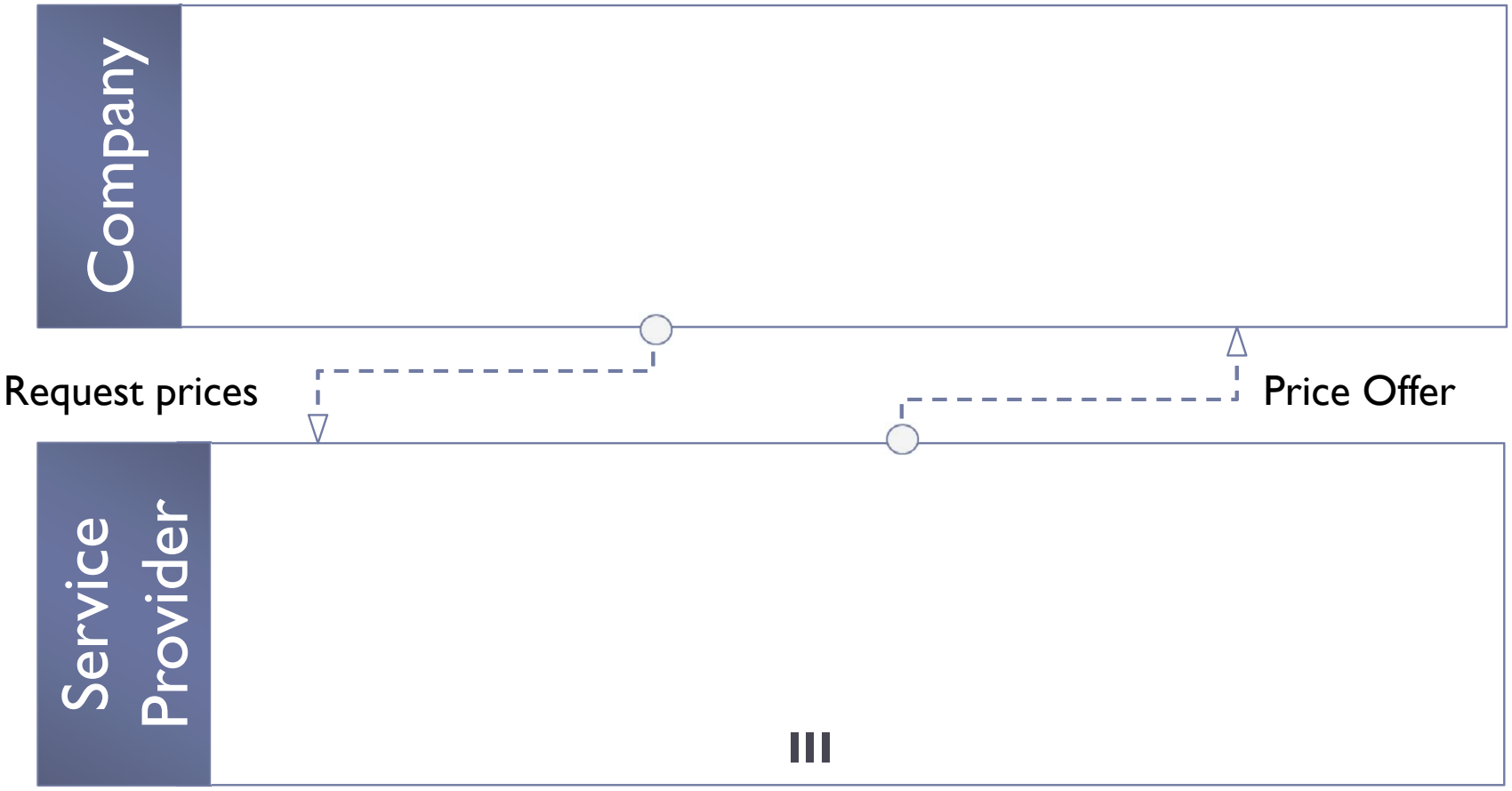
- Explain the difference between:
  - Embedded sub-Process
  - Reusable Sub-Process
  - Ad-hoc Sub-Process
- Draw the following situation:
  - "- In my department, the Engine Sales, once we received the completed customer's form, we send it to the Customer Data Center which saves it and archives the document within the customer information database.
    - And what's about the ABS Sales, are they doing the same ?
    - Yes, exactly the same, they send the documentation to the Customer Data Center…."

Multiples instances

- During the process execution, instanciates new objects
- More than a simple loop
- Multi-instance available on the following objects :
  - Pools
  - Activities (parallel and sequential)
  - Sub-Processes (parallel and sequential)
  - Data Objects

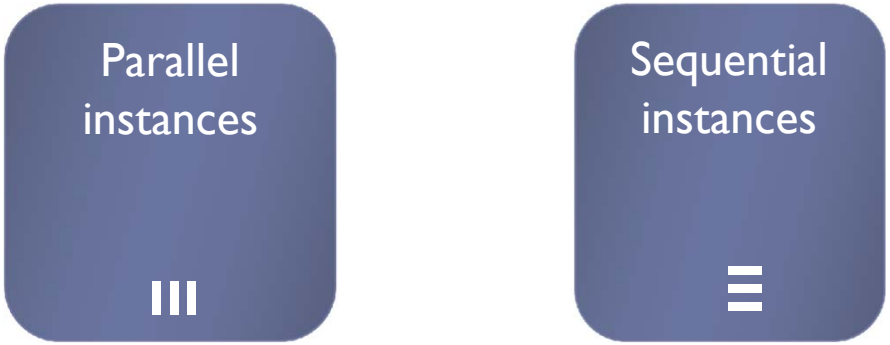
Multi-instance pool

The Company request prices from *many* Service Providers on the same time (in parallel)

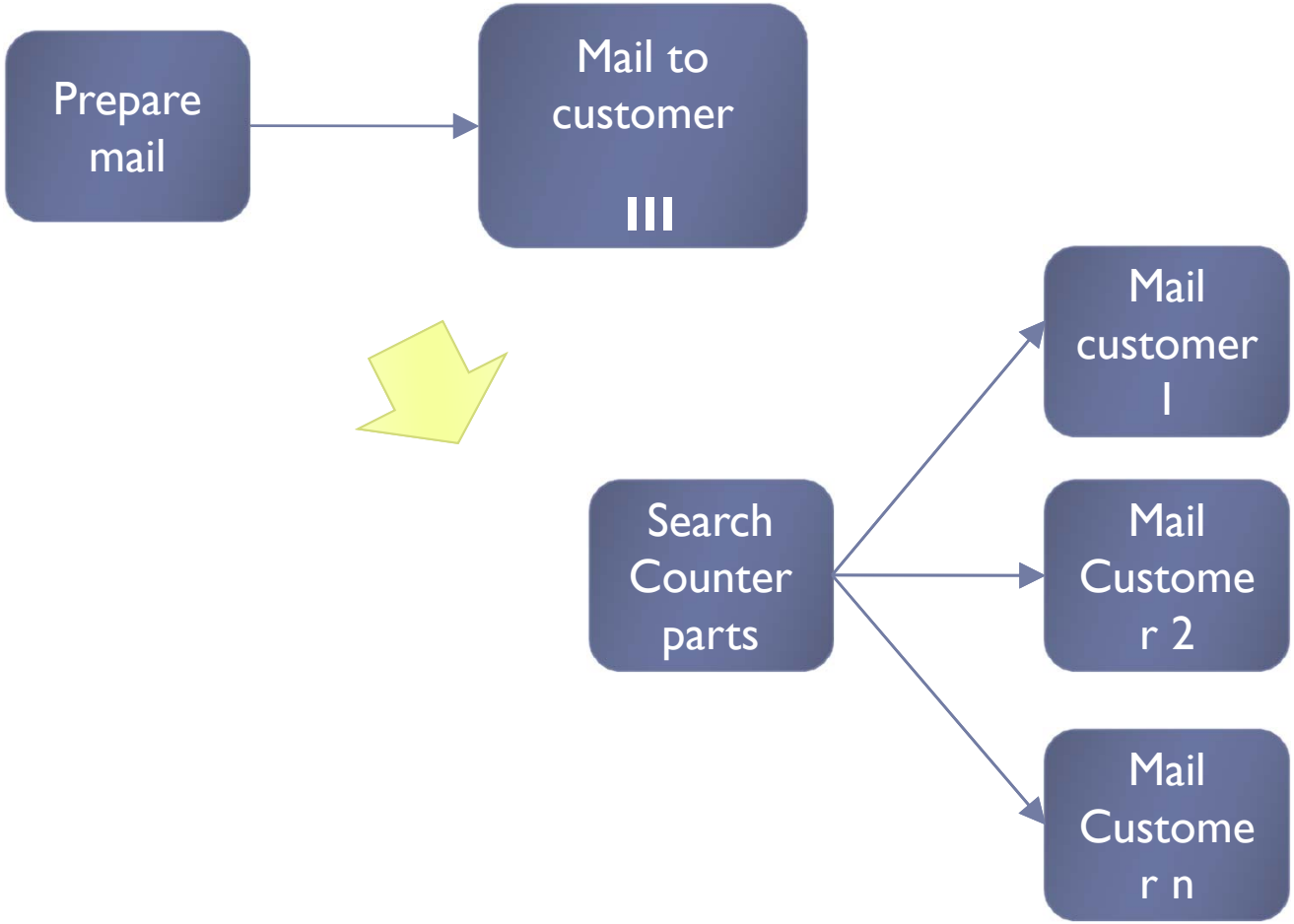


Multi-instance Activities

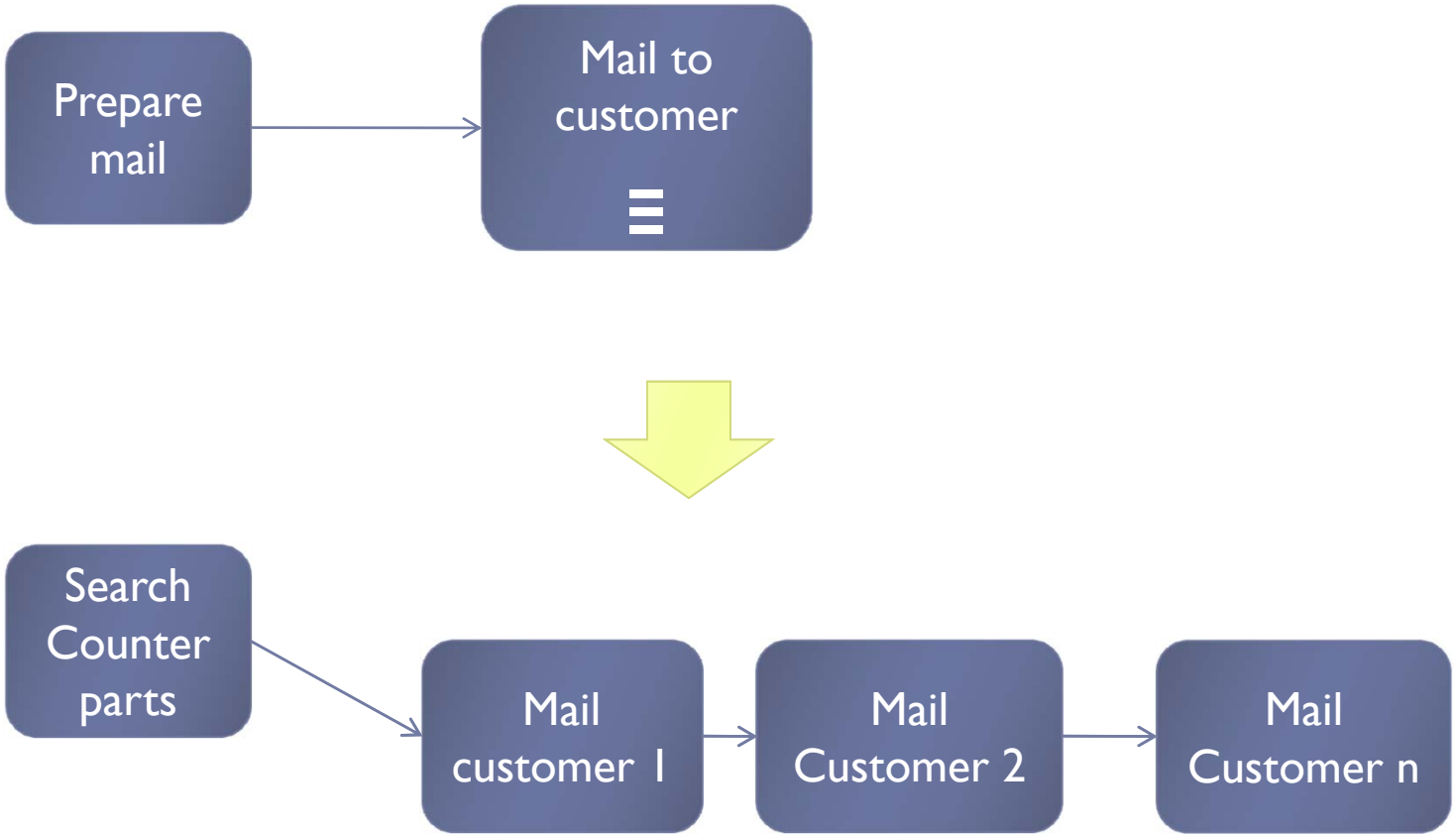
- Two categories
  - Parallel
  - Sequential



Multi-instance Activity Parallel

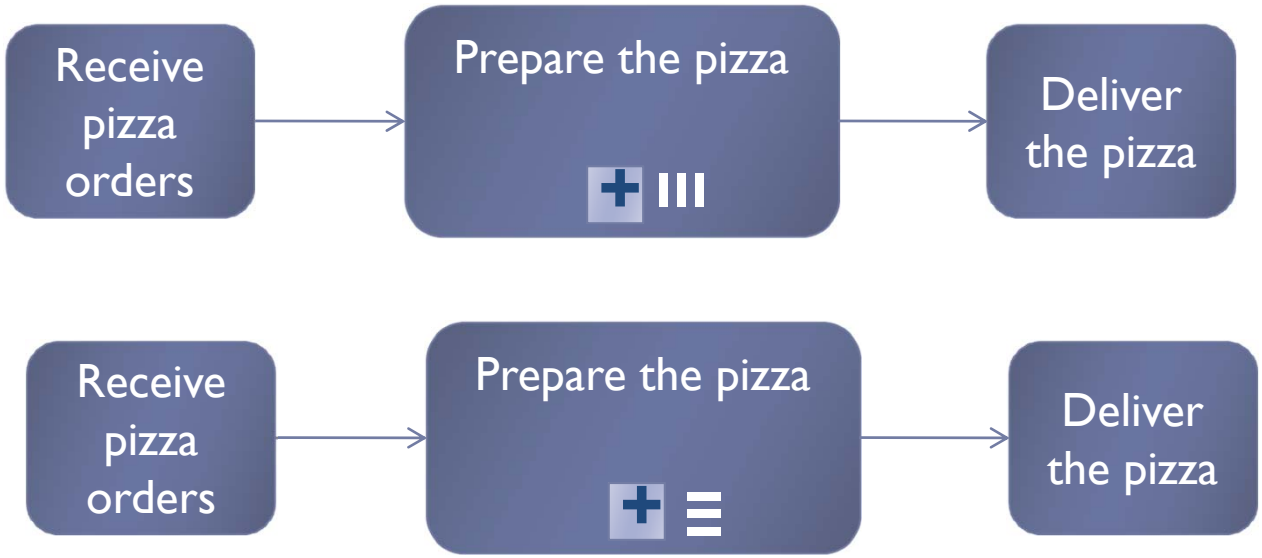


Multi-instance Activity Sequential



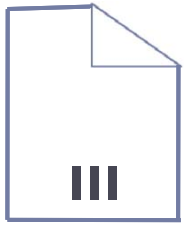
Sub-process multi-instances

- The Sub-process is called many times
- Be Parallel or Sequential



Data Objects Multi-instances

- Produce or use many copy of the same Data Object (=having the same characteristics)



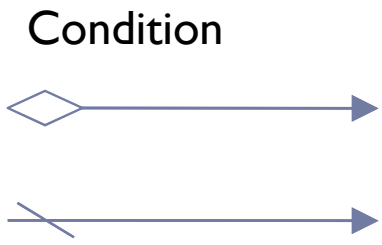
Data Object
Multi-instance

Multi instance- Practice

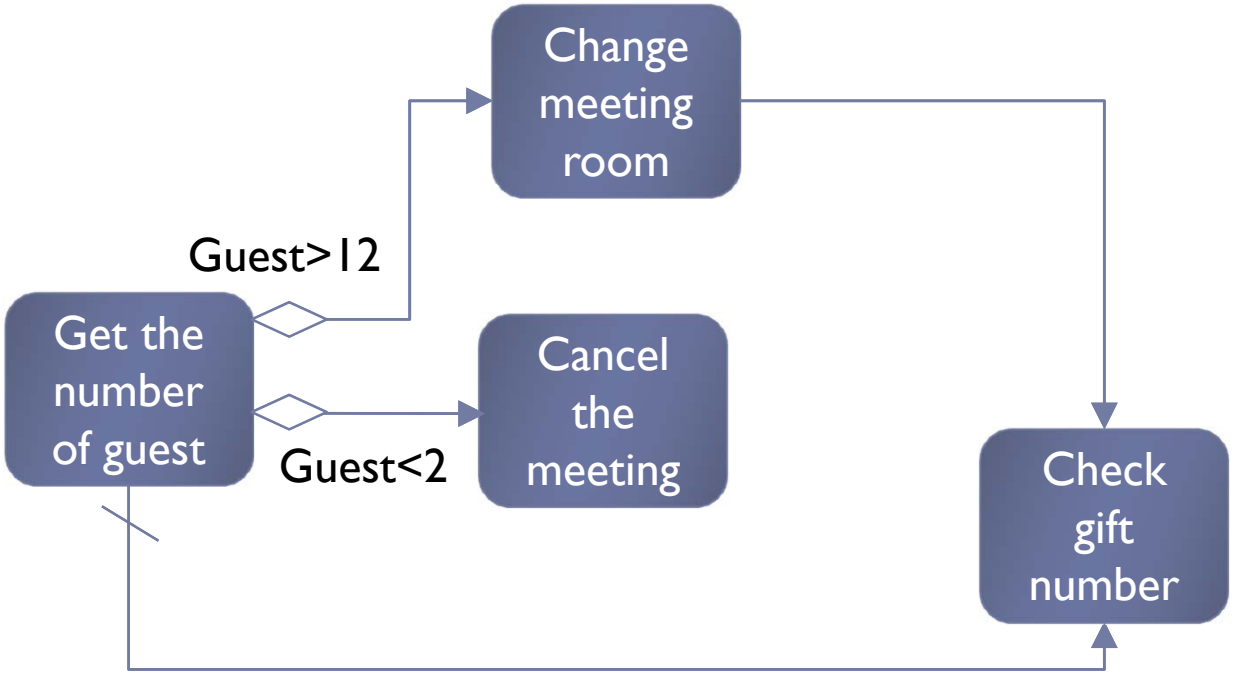
- Draw the following situations:
  - The Front Office send many documents to all of its customers.
  - Once we receive the form, we forward it to all of ours local providers, once we've received the an answer, we just continue the buying process with the chosen partner.
  - We sends twice the same document to the printing process as requested.
  - On the same times, we send the form to the customer from one side and on the other side, we are waiting for proposal of our many external providers.

Conditional Sequence Flow

- The order of task execution
- There are two more sequence flows categories :
  - Conditional sequence flow
  - Default sequence flow
- Draw a second way of Exclusive Gateway representation

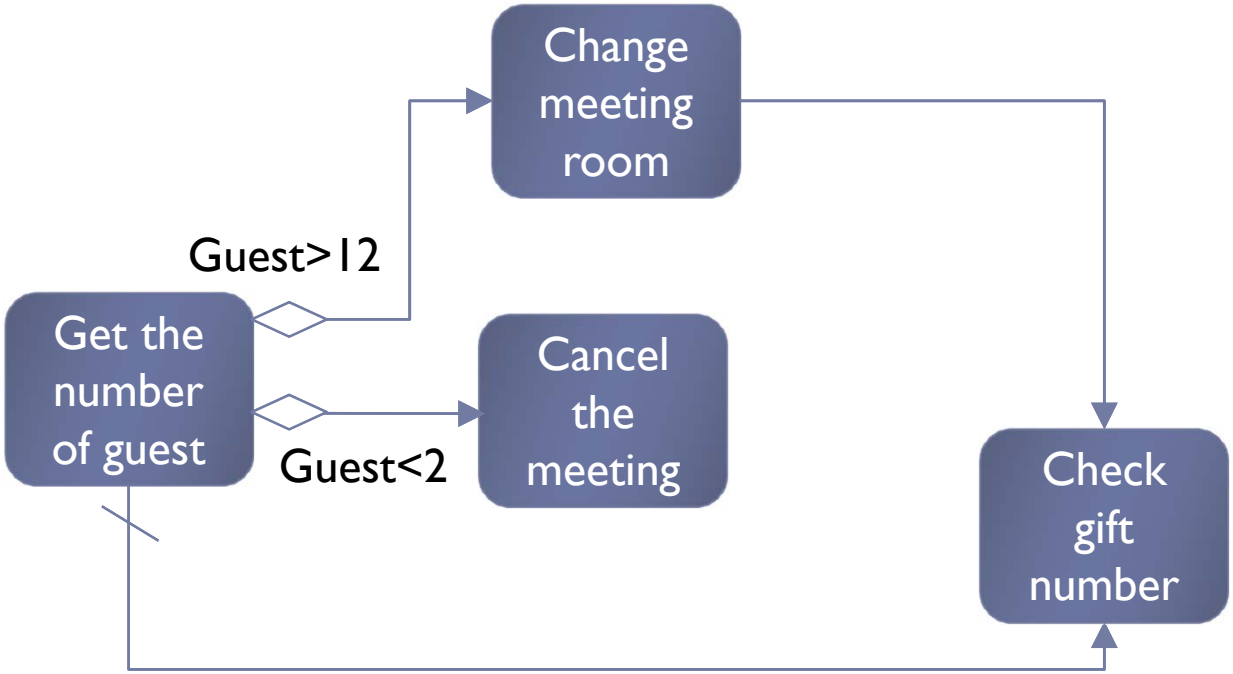


Conditional Sequence Flow - Sample



Conditional Sequence Flow- Practice

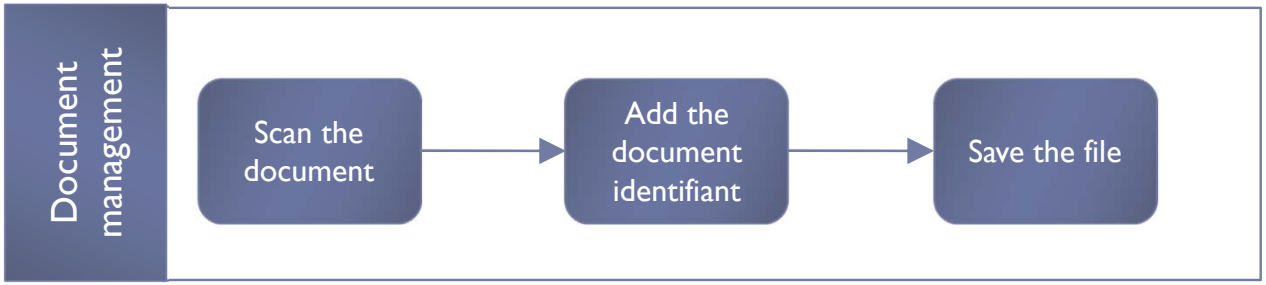
- Draw the following process by using the Gateway symbol:



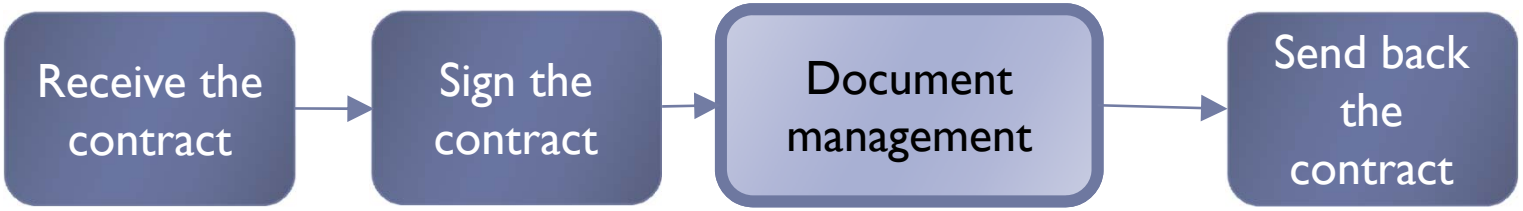
Call Activity

- Identifies a point in the process where a global process or a global task is used
- It acts as a wrapper for the invocation of a global process or a global task within the execution
- The Control is transferred to the called Process

Call activity sample



1)

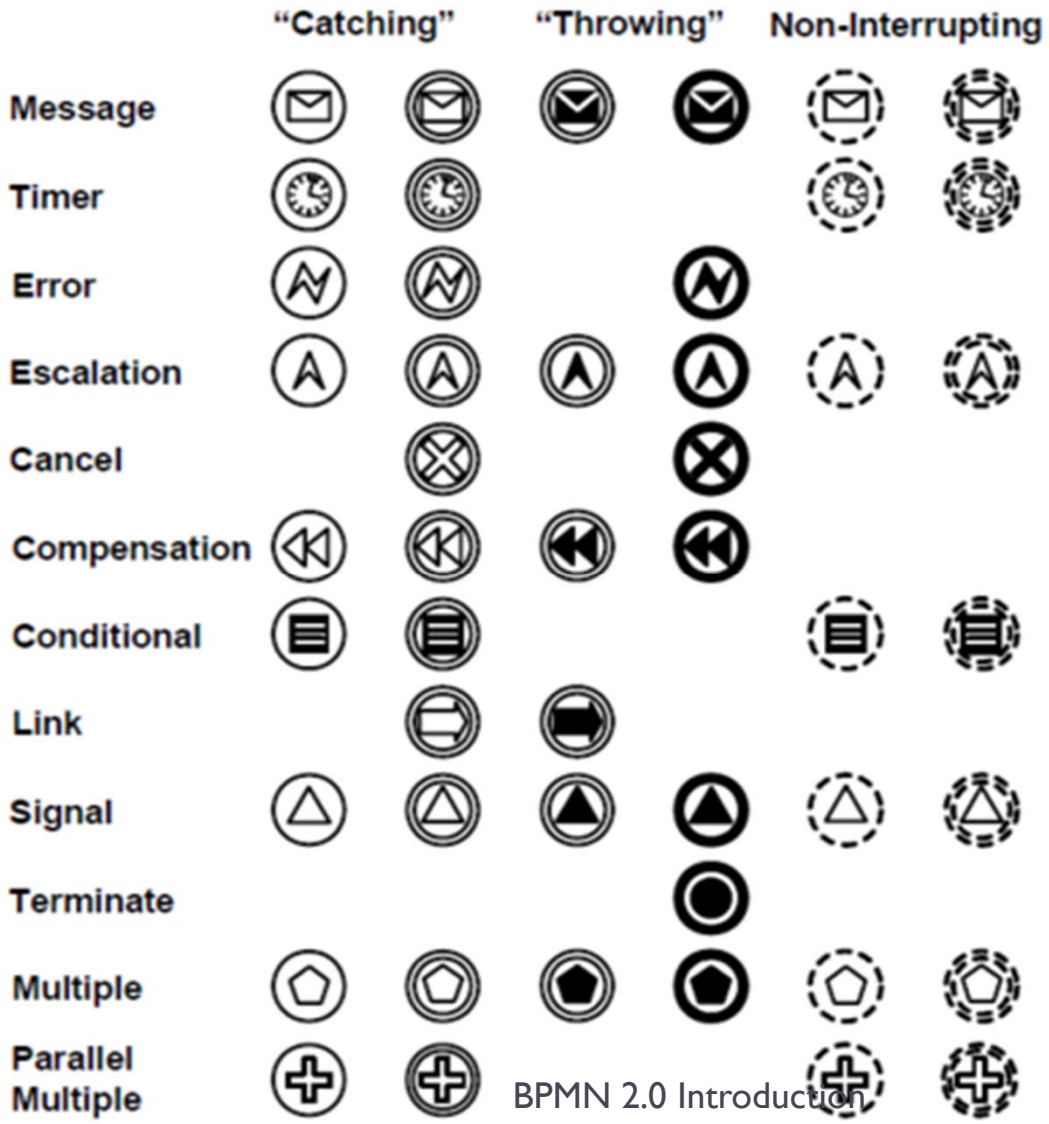


2)

Call activity- Practice

- Draw the following situations:
  - The Printing process is used within the Customer Invoicing process, Customer Request Management process, Order Management process and Accounting process.
- What is the difference between a Call Activity and a Reusable Sub-Process ?

Events Categories



Intermediate Event

- Events occurred during the process execution
- Between the start and end events
- Four categories:
  - Catch
  - Throw
  - Boundary Interrupting
  - Boundary Non-Interrupting

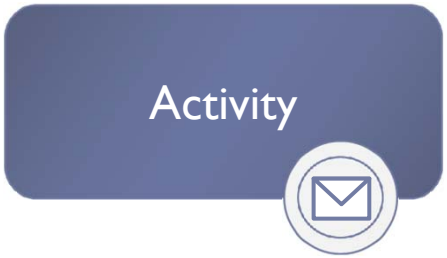
Catching and Throwing Events

- Reminder
  - Catching: the process execution is stopped and wait the reception of the corresponding event then continues the process execution

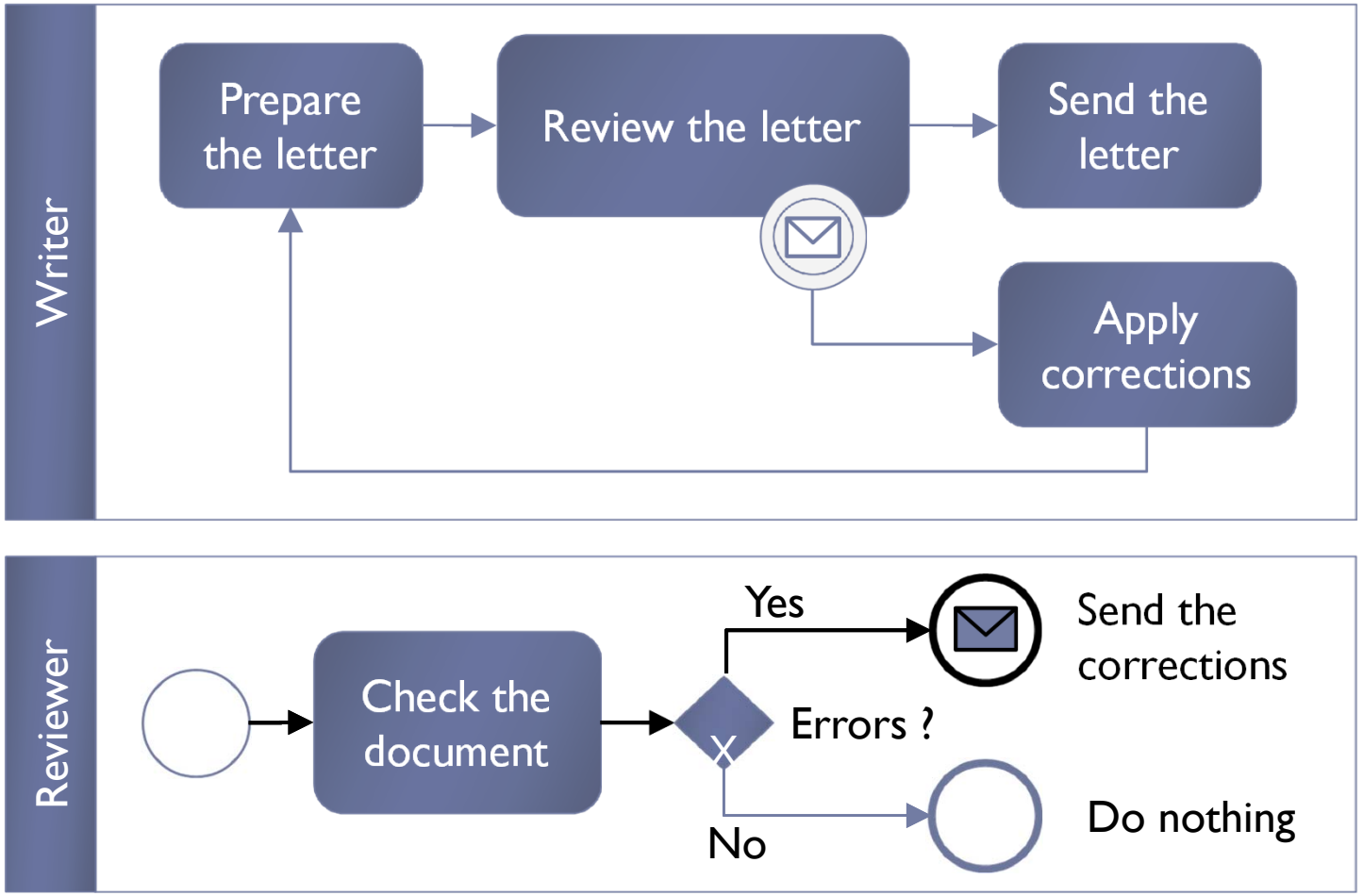
  - Throwing, the event is thrown and the process continues its execution

Boundary Event

- The event is placed directly to the Activity's boundary
- Catching events only !
- It means: if something happened, it stops the activity exection … and execution continues within the event flow



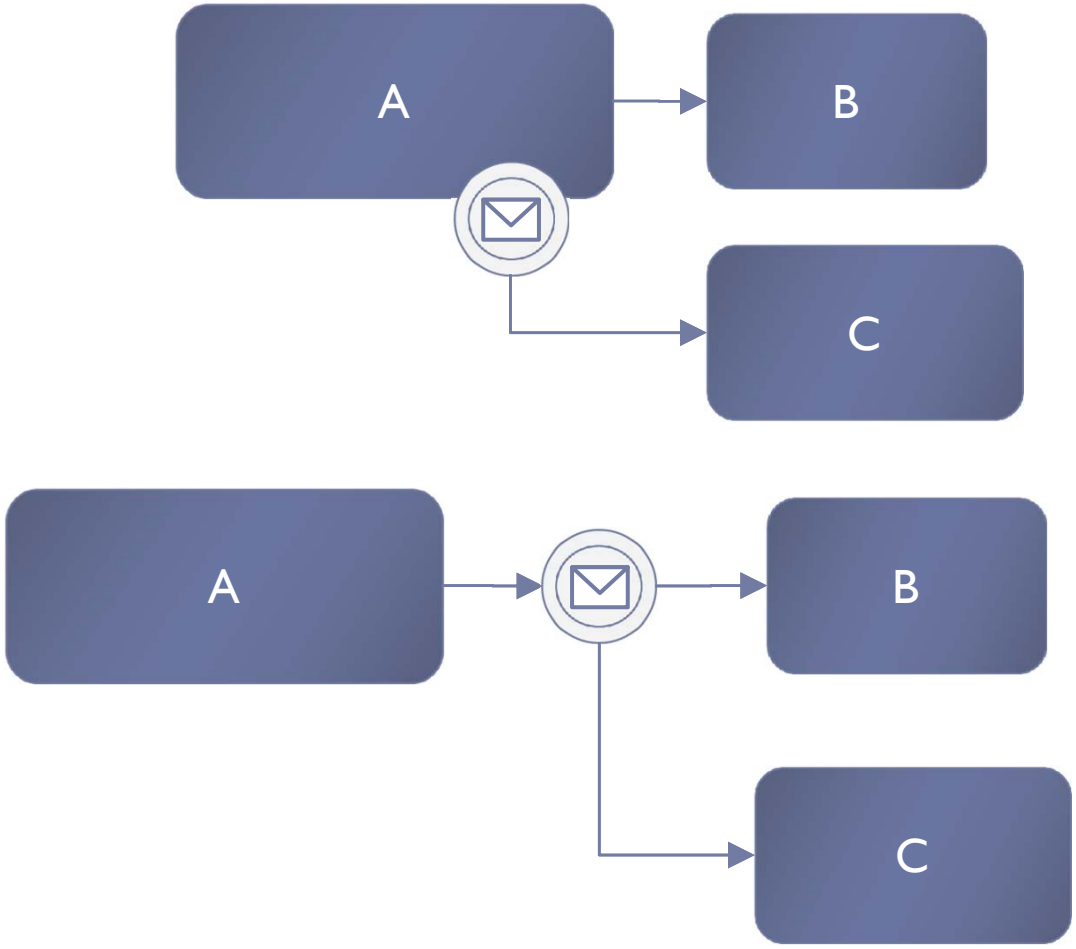
Boundary Event - Sample



While the Writer is currently reviewing the letter, if he receives on the same time the reviewer's corrections, the Writer stops reviewing, and apply the corrections else he sends the letter

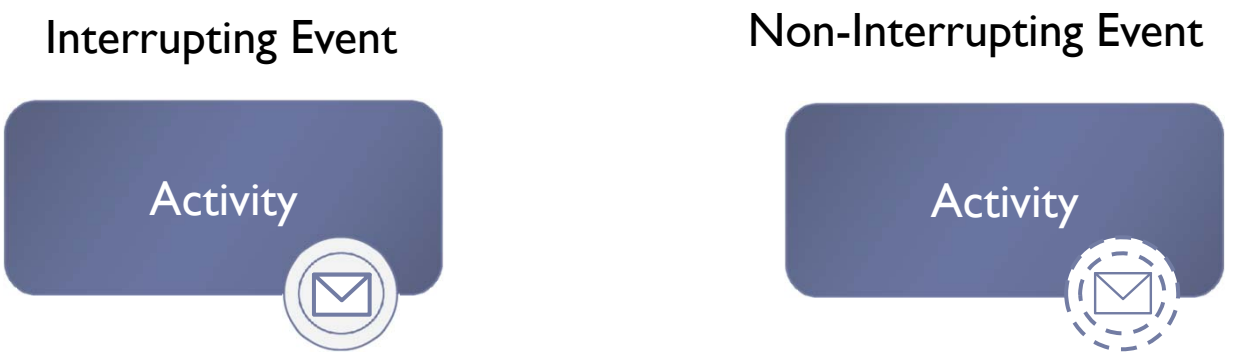
Simple boundary Event- Practice

- Explain the difference between these two flows:

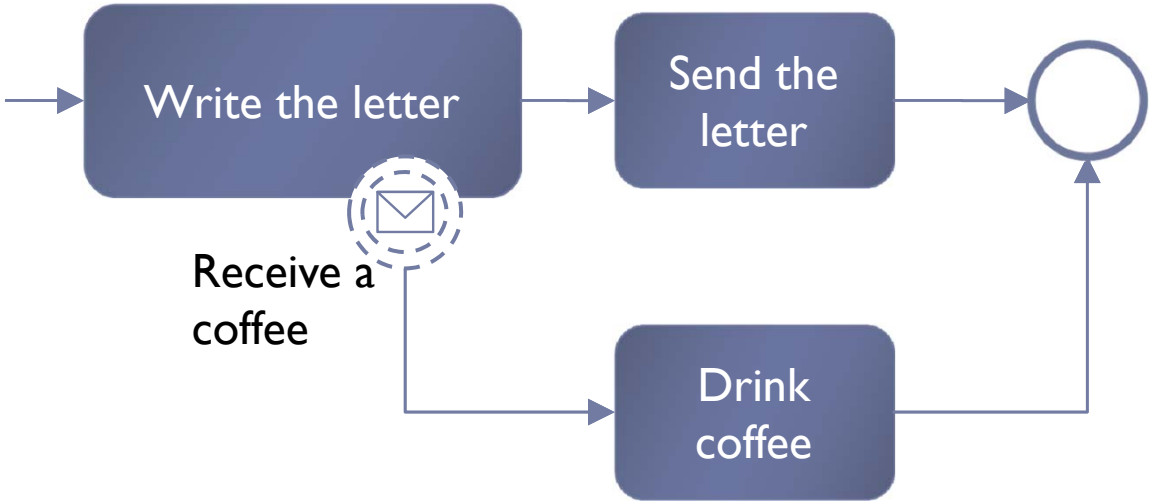


Interrupting and non-interrupting

- By default, boundary event interrupts the its activity execution, the normal sequence flow is interrupted
- There is a second possibility to avoid the interruption : non-interrupting boundary event



Non Interrupting Event sample

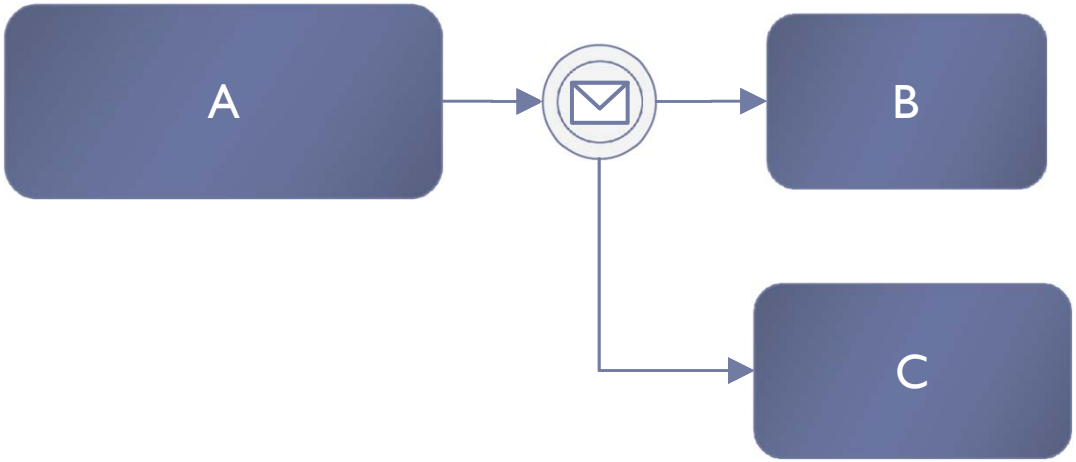


If the Writer receives a coffe cup, he drinks it, but this event does not avoid to send the letter.

The normal sequence flow is not interrupted !

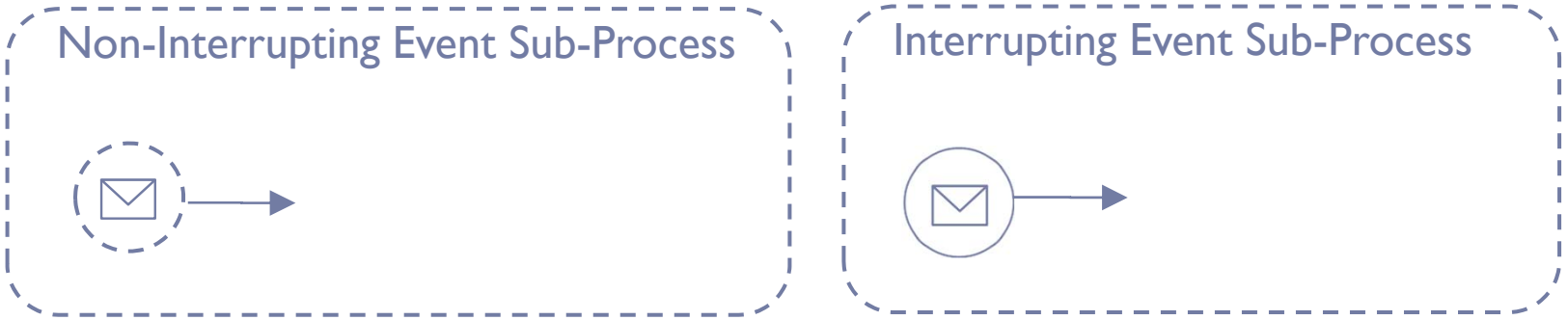
Non-Interrupting Event- Practice

- Draw the same behavior with the corresponding boundary event :

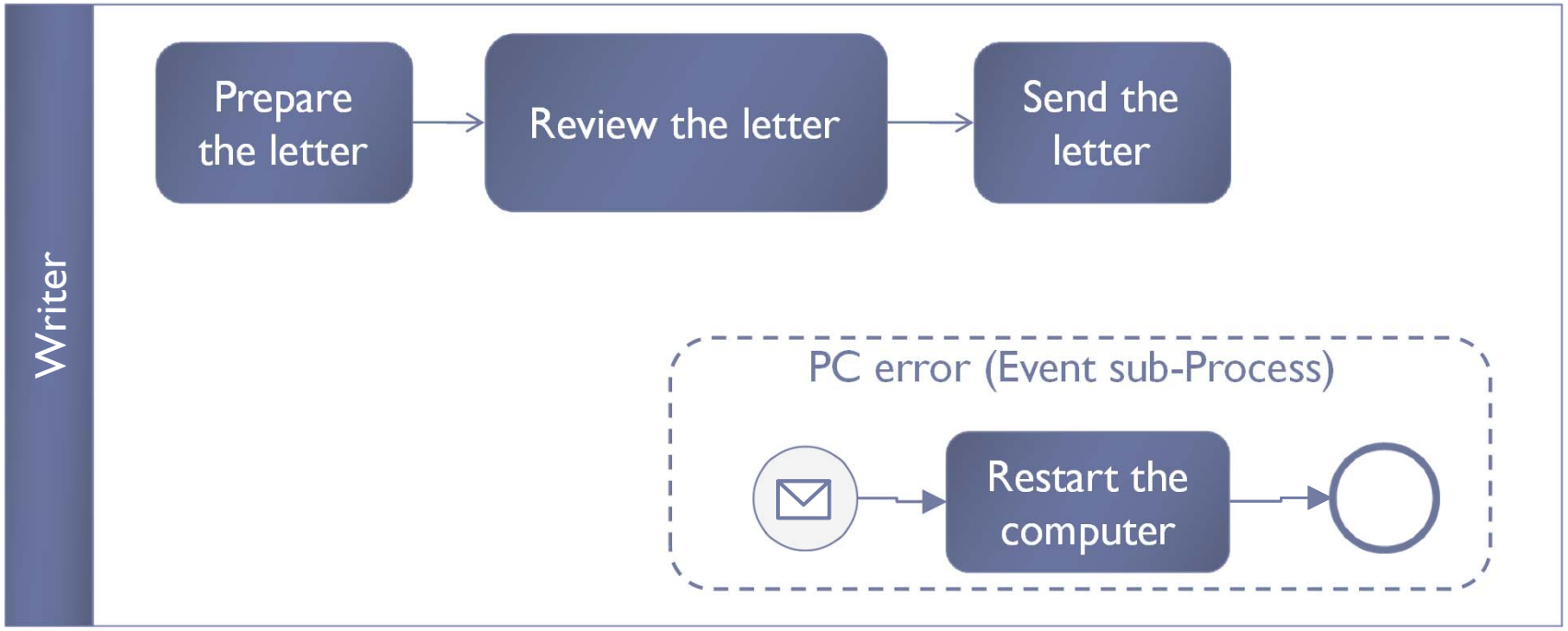


Event Sub-Process

- A specialized inline Sub-Process *triggered by an event*
- *Interrupting* and *Non-Interrupting*
- Interruption behavior is defined by its *starting event*

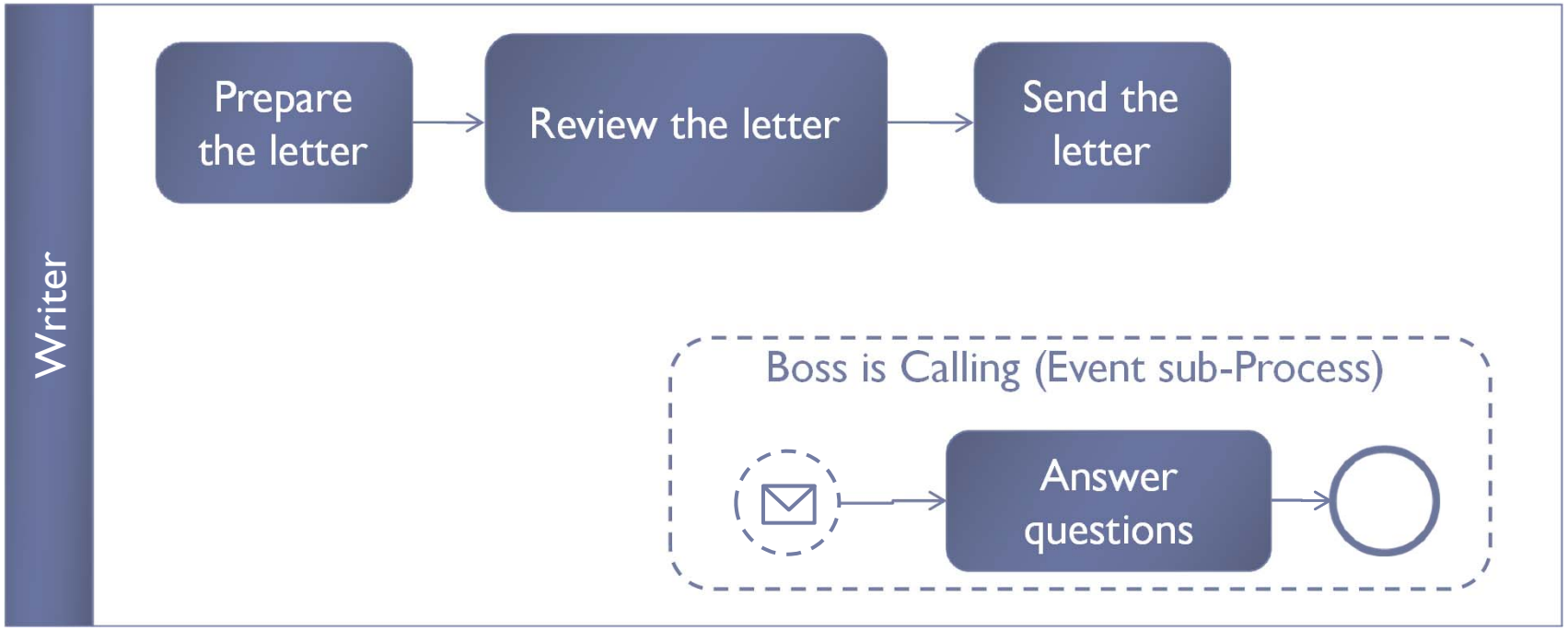


Interrupting Event Sub-Process Sample



If the Writer receives a Message "PC error", he stops its process execution and restarts its computer.

Non-Interrupting Event Sub-Process Sample



If the Writer receives a call from its boss, he can continue its process and answer its boss.

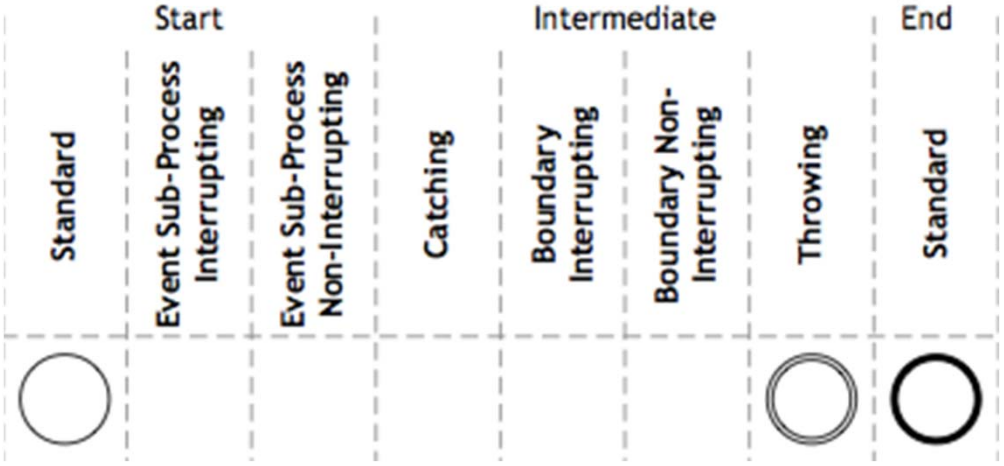
Event Sub-Process- Practice

- Draw the following situation:
  - "The production line starts when we receive the raw material. Then we follows some steps to produce the good:
    - unpack the raw material
    - fill the tank with the raw powder
    - open the water tap
    - push the start button
    - put the piece on the treadmill
    - go to the other side of the machine
    - receipt the painted piece

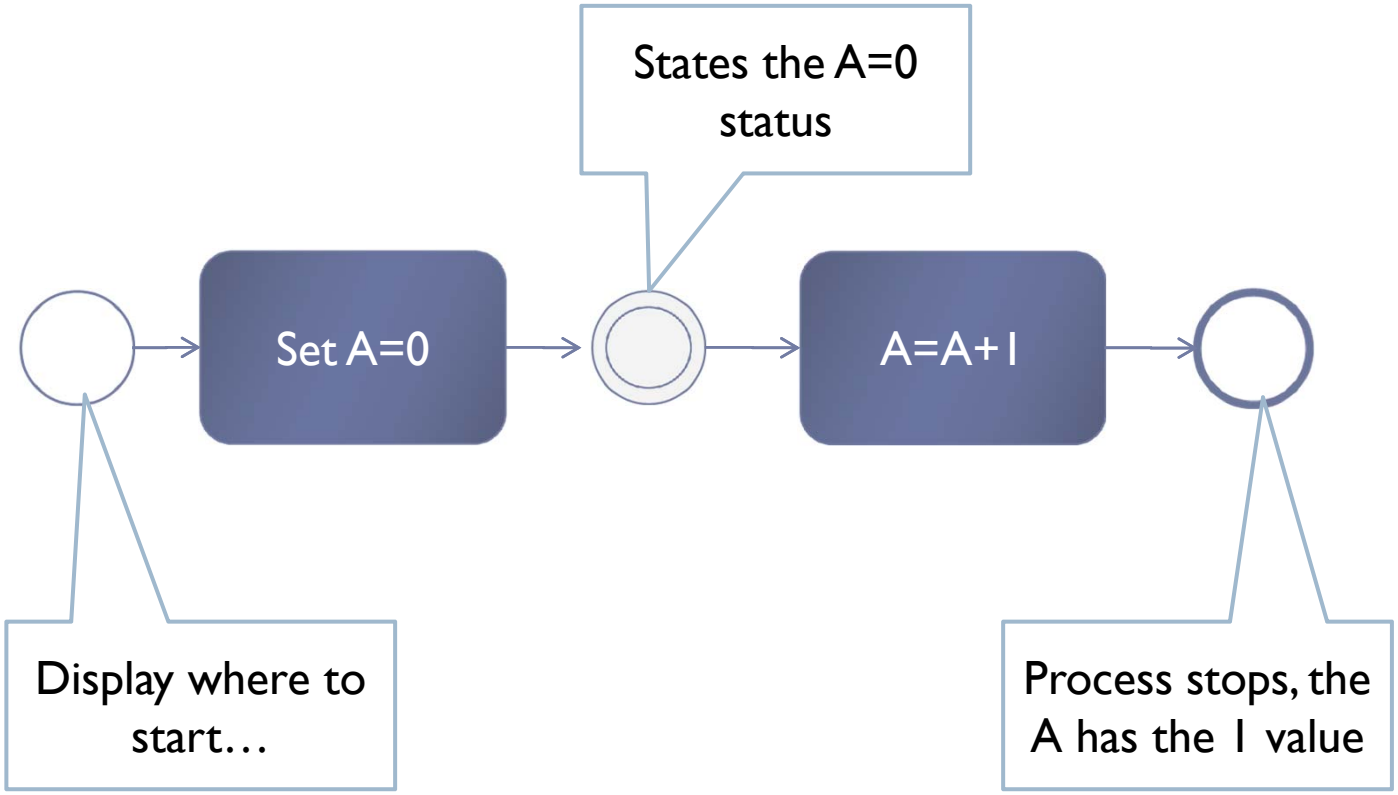
    However, if something goes wrong, we are warned with the red light. If this happen, we push immediately the stop button. A message is then automatically sent to the Support team. The latter comes and diagnose, and repair the equipment failure."

None Event

- Indicates Start, End and Change states
- Only as Start, End and Intermediate Throwing Event

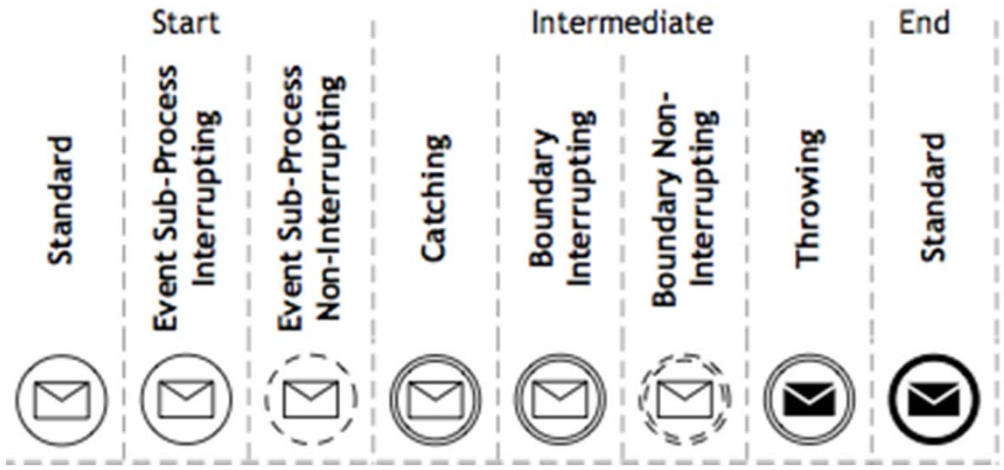


None Event Sample

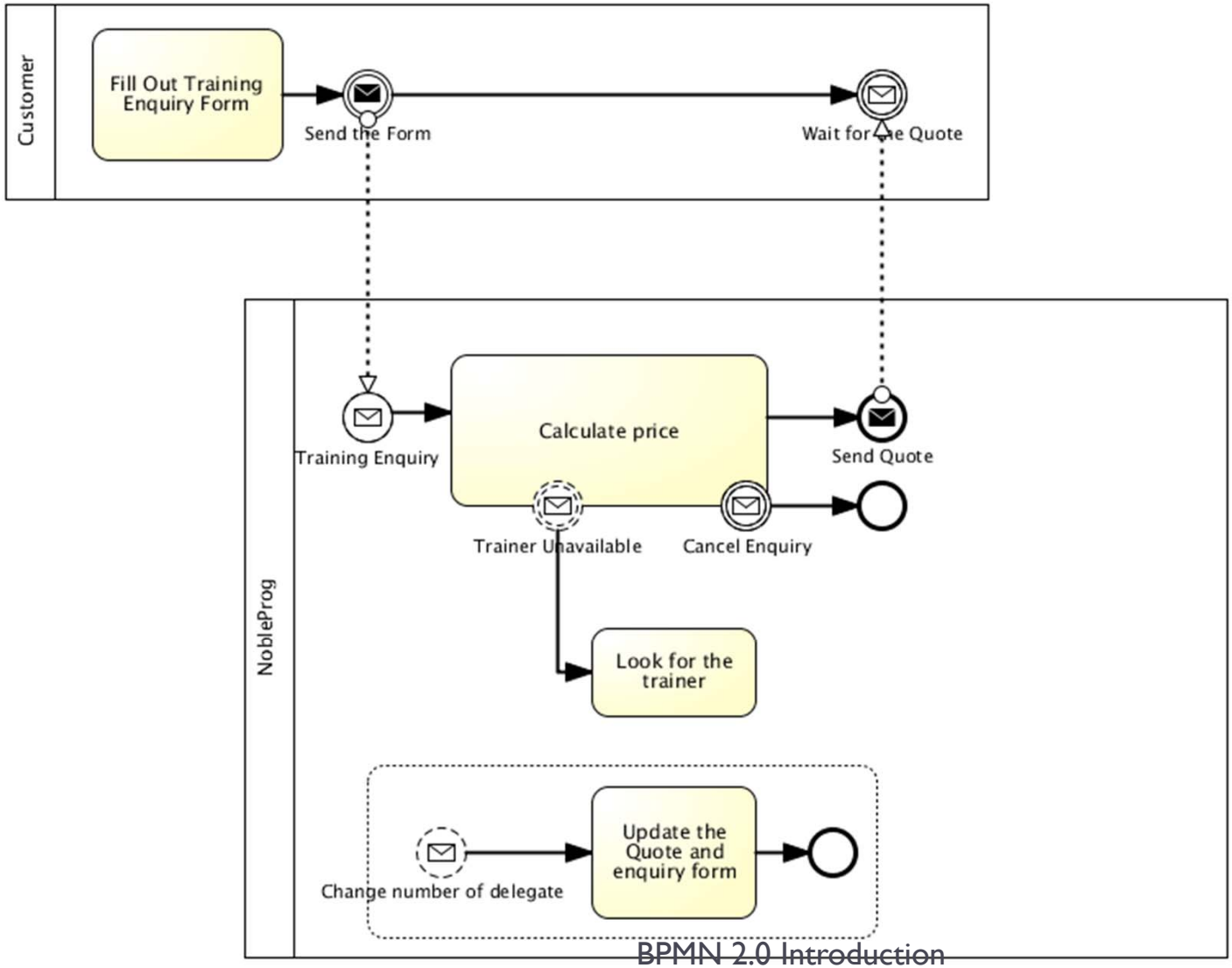


Message Event

- Message exchange, almost between process participants
- All event's categories are covered

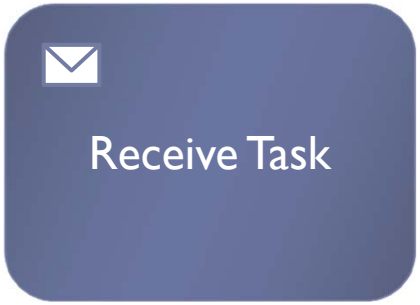


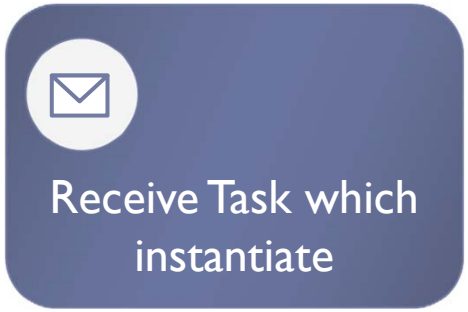
Message Event -Sample



Send-Receive Tasks (i)

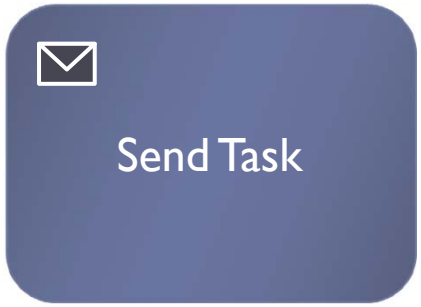
- Receive tasks, two possibilities
  - 1. Wait for an incoming message and execute directly the task
  - 2. Instantiate a new process execution each time a message arrives





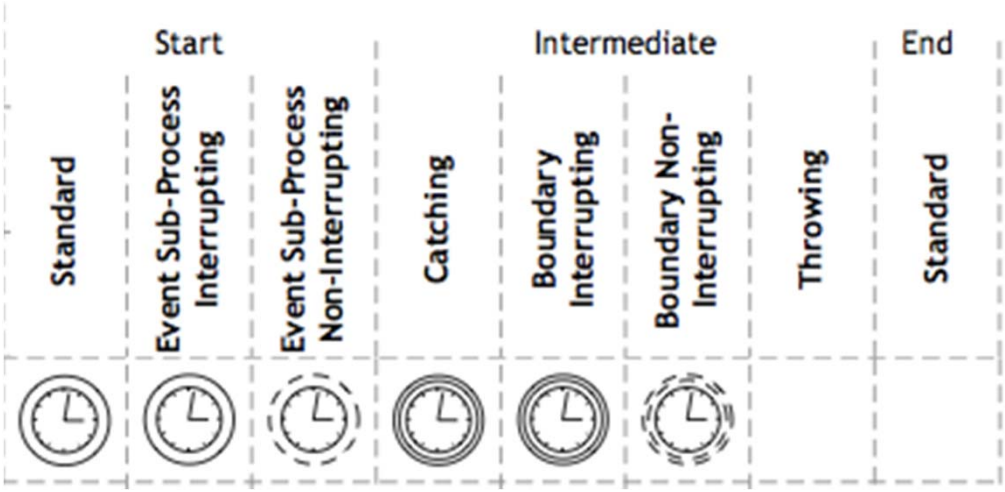
Send-Receive Tasks (ii)

- Send
  - After execution of the task, a message is directly send



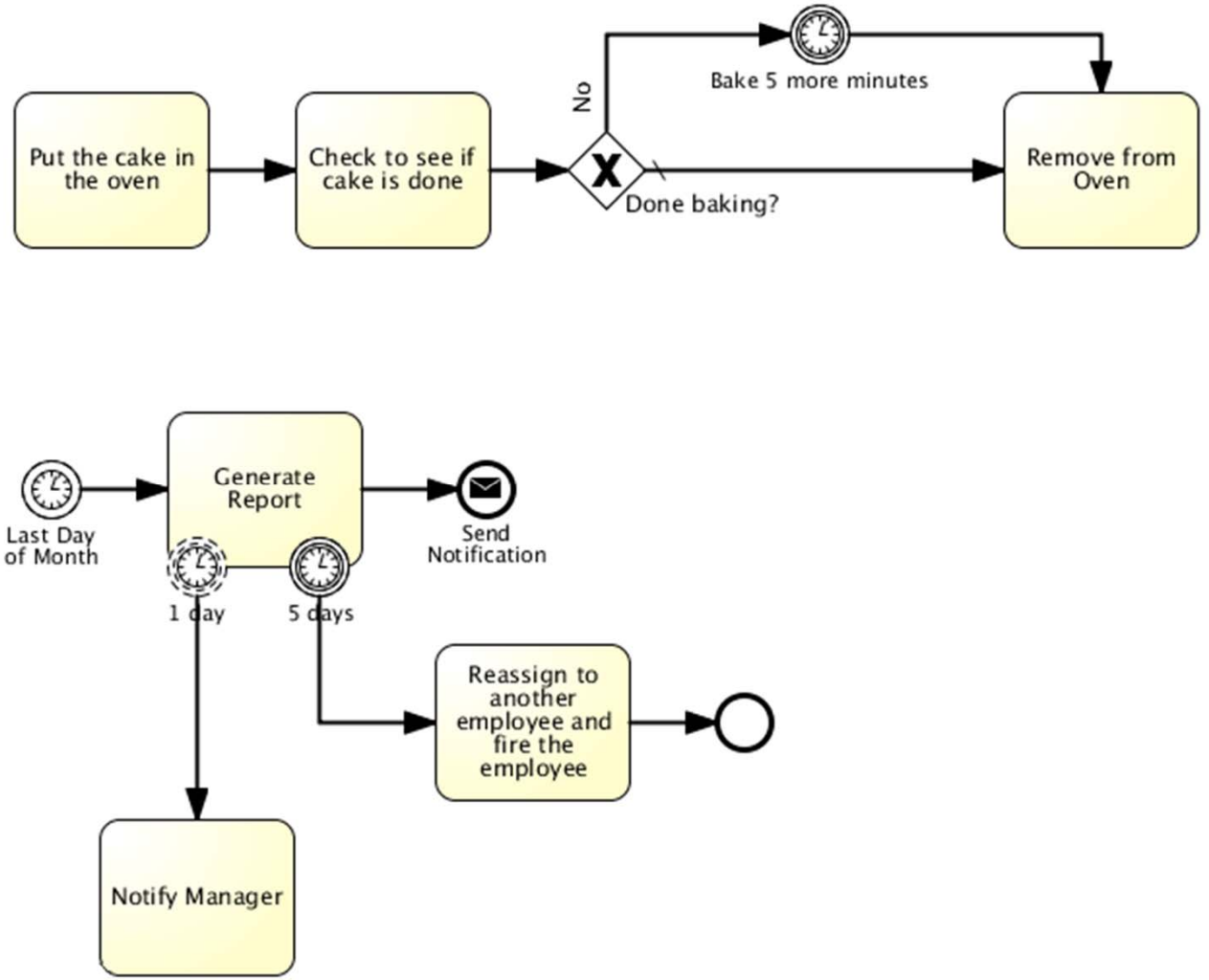
Timer Event

- Cyclic timer events
- Points in time
- Time spans
- Timeouts



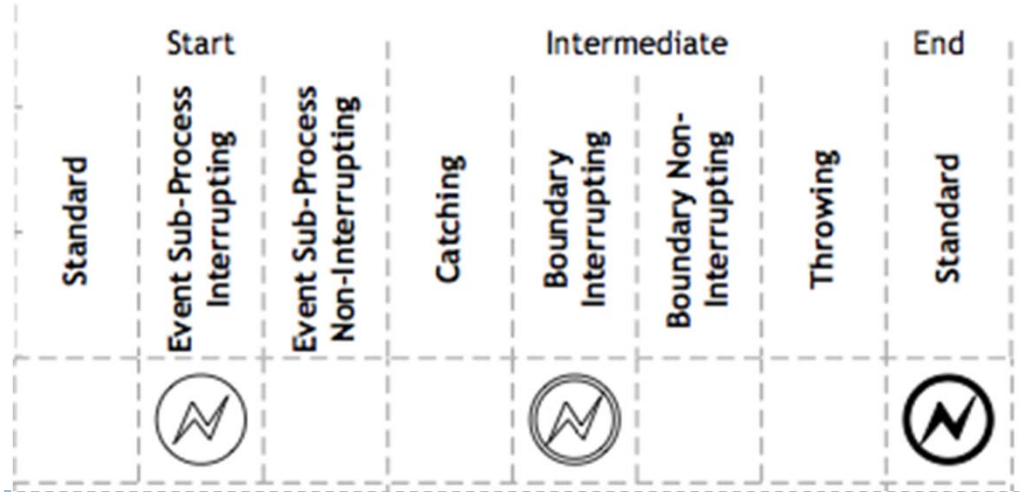
- Only catching event !

Timer Event


Put the cake in the oven
Check to see if cake is done
No
Bake 5 more minutes
Done baking?
Remove from Oven
Last Day of Month
Generate Report
Send Notification
1 day
5 days
Reassign to another employee and fire the employee
Notify Manager

Error Event

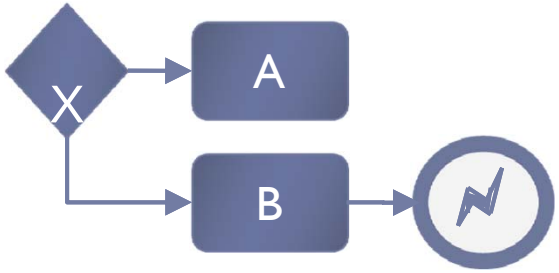
- Catching or throwing named errors.
- Throwing is done at the end of a process sequence flow
- Always interrupt a process or activity



Rising an Error

- If something wrong, then rise an error
- Two ways :
  - Explicit Error rising
  - Implicit Error rising

Explicit Error rising

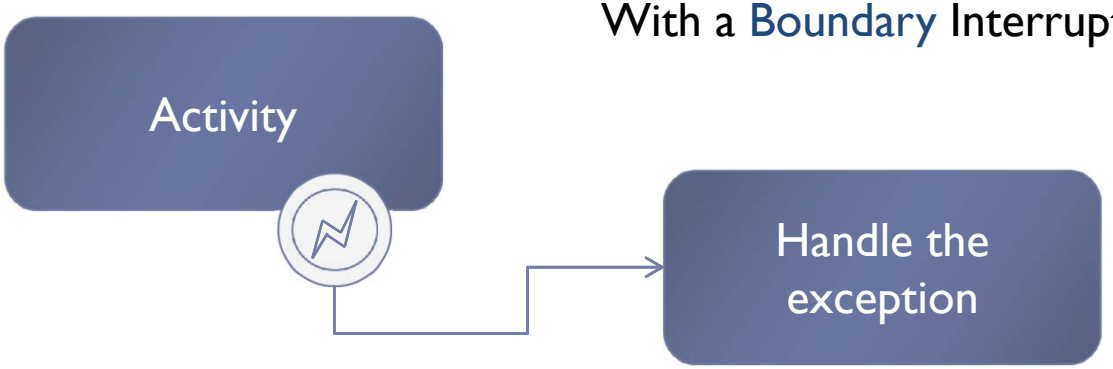


Implicit Error rising

The error is set to its properties and may be rised if something happened during the A activity execution

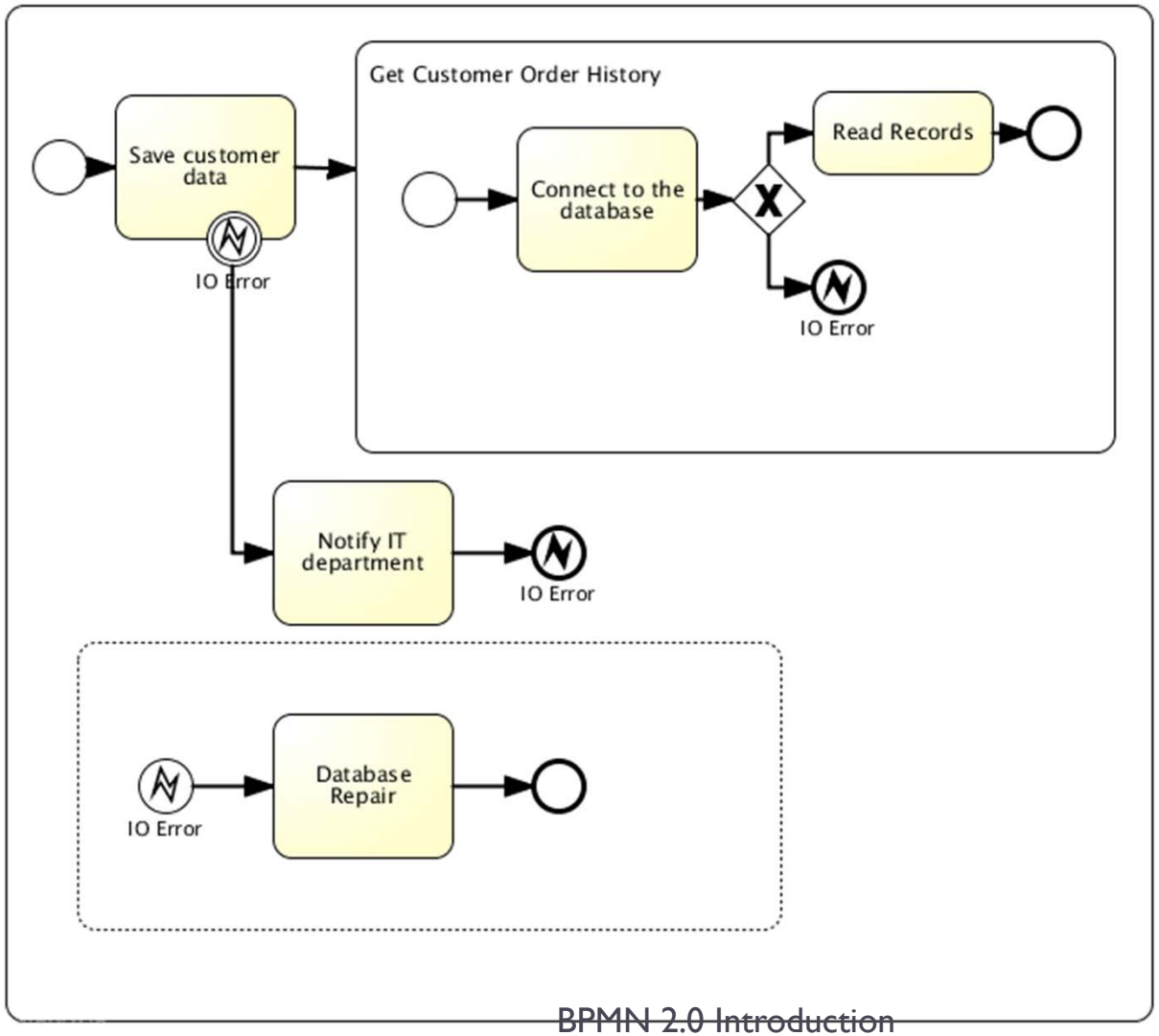
Handling error

With a Boundary Interrupting Event



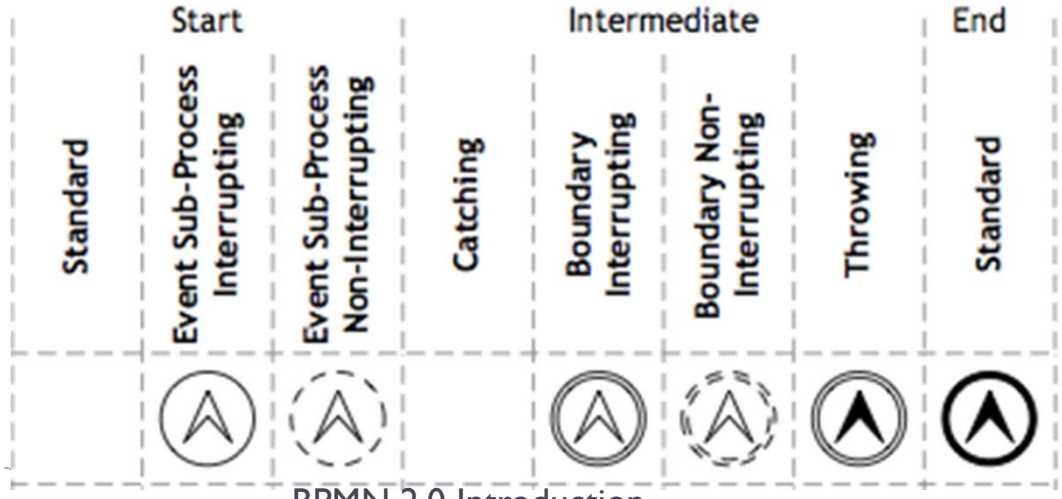
…..Or With a Interrupting Event-Sub Process

Error Event Sample



Escalation Event

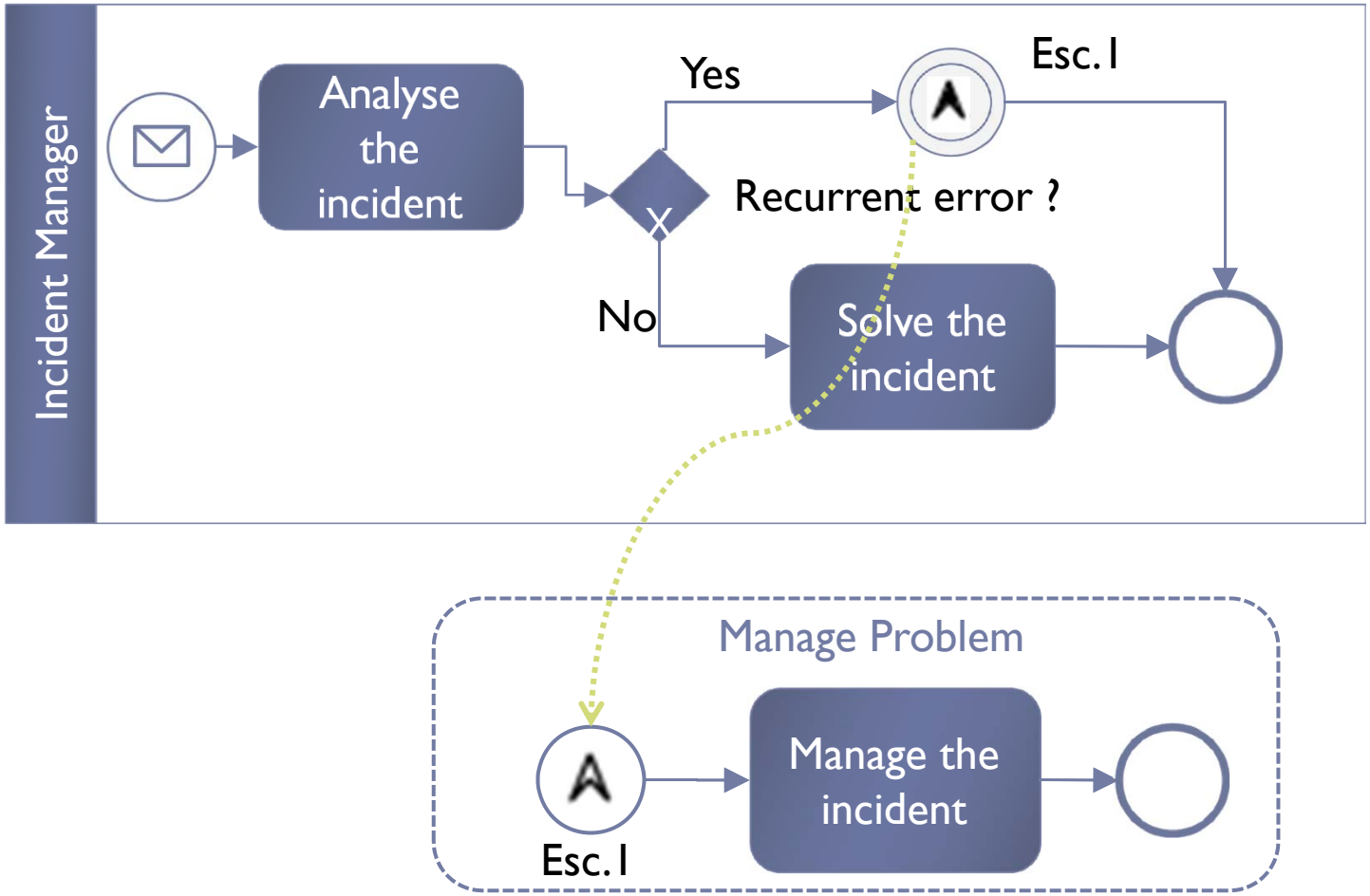
- Escalating to an higher level of responsibility
- Throwing as Intermediate or End Event
- Only caught within an Event-Sub Process or Intermediate Boundary Event



Escalation situations

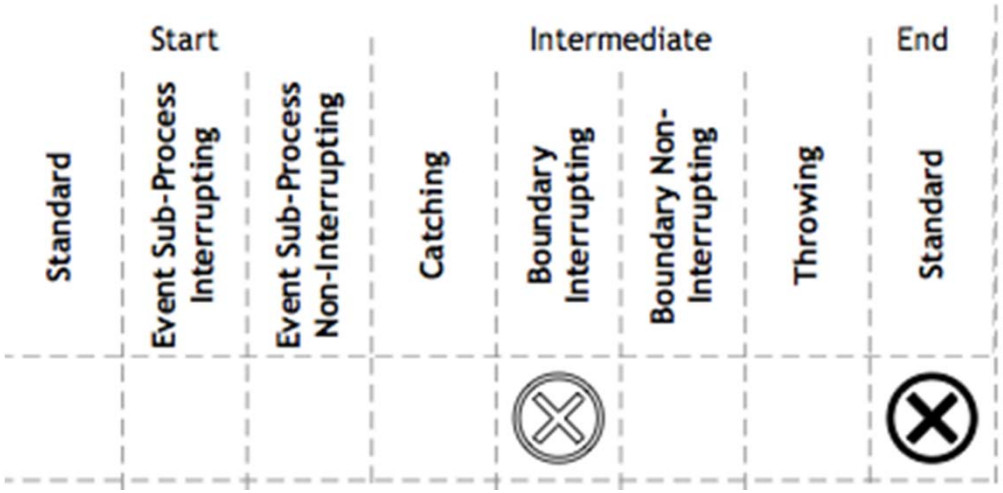
- Typically used when:
  - A deadline is not respected and the course of activities must be escalated to another level
  - Setting a priority execution among the activities ‘emergency case’
  - An incident must be raised since it happens many times

Escalation sample



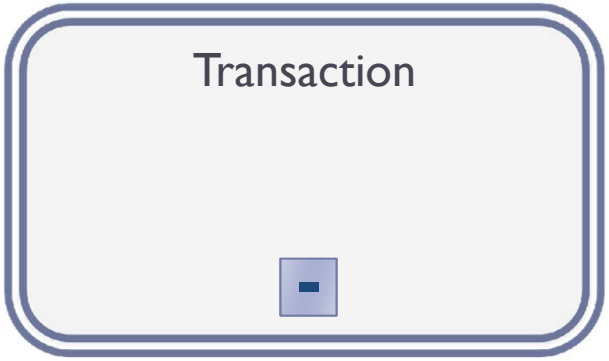
Cancel Event

- Reacting to cancelled transactions or triggering cancellation.
- Request a Transaction
- Cancel thrown at the end of the sequence flow

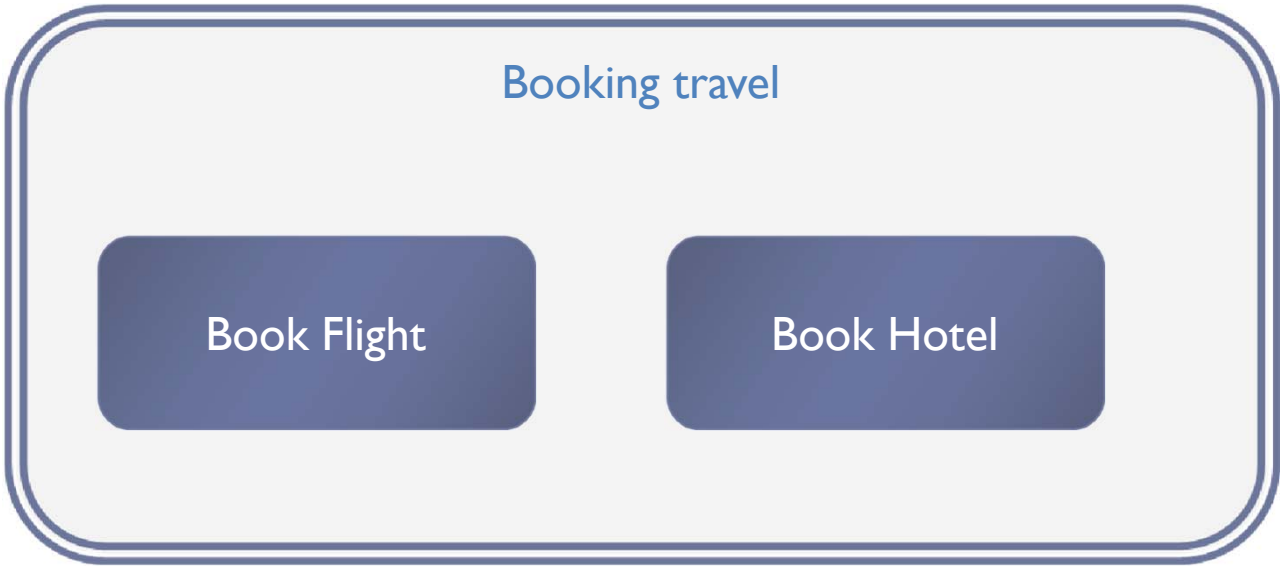


Transaction handling

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

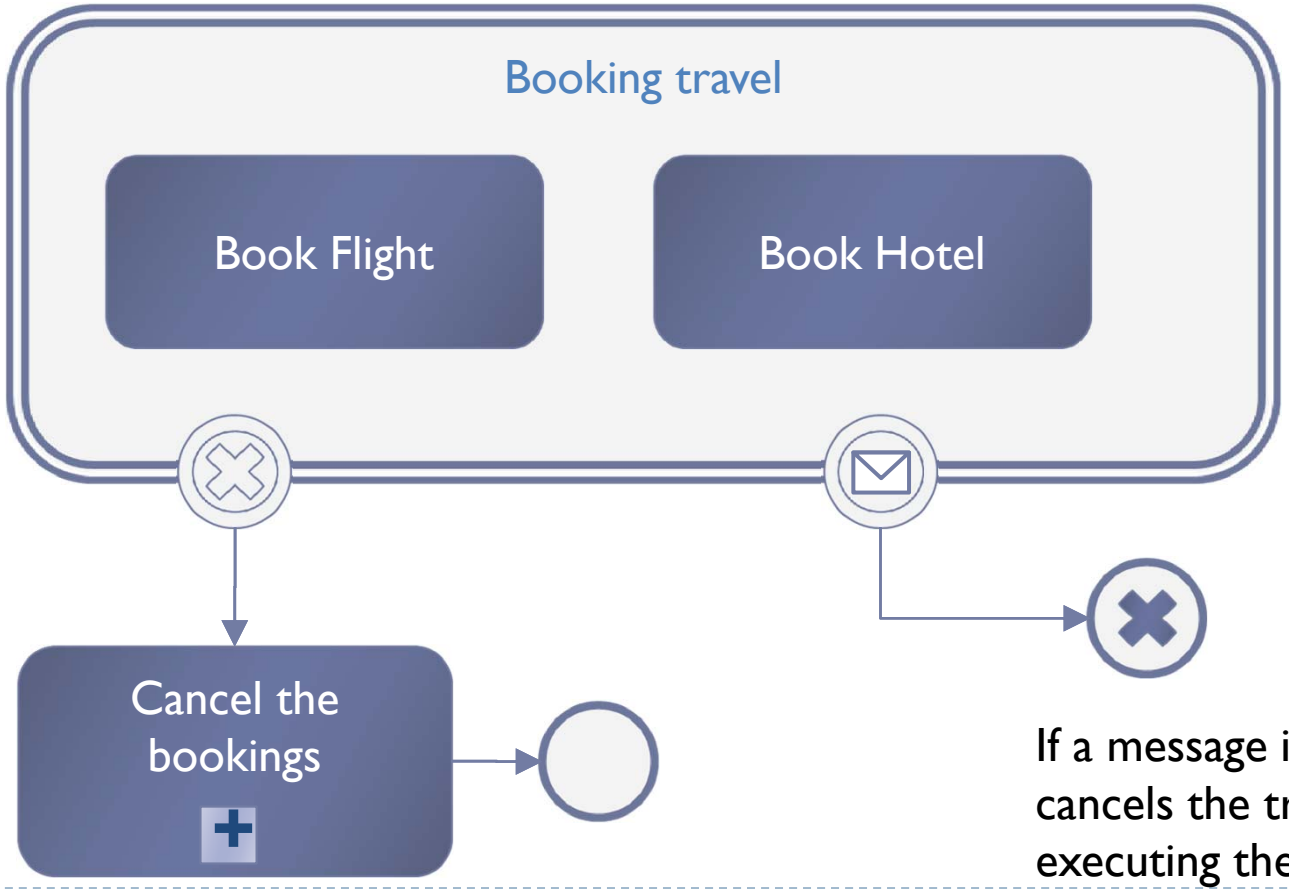


Transaction sample



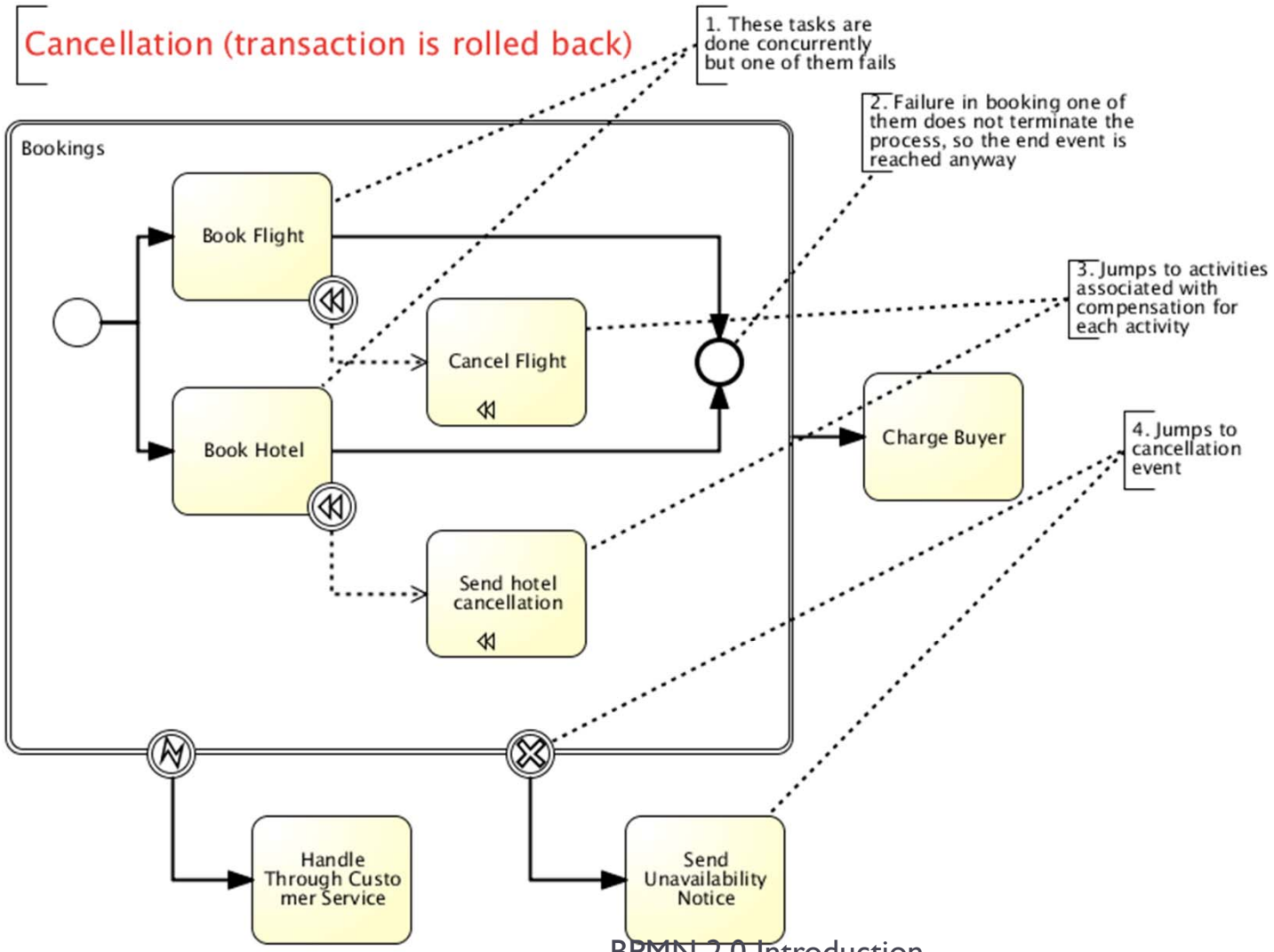
The activities *Book Flight* and *Book Hotel* are linked… if one is not possible, it will necessary to cancel all bookings.

Cancel Event Sample



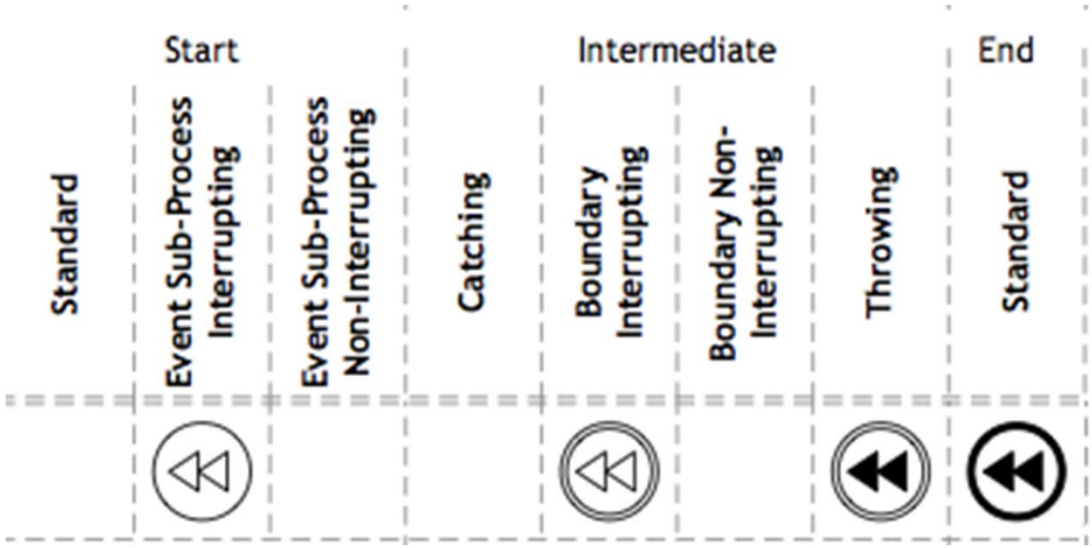
If a message is received, it cancels the travel booking by executing the Cancel the Bookings sub-process

Cancel Event



Compensation Event

- Handling or triggering compensation

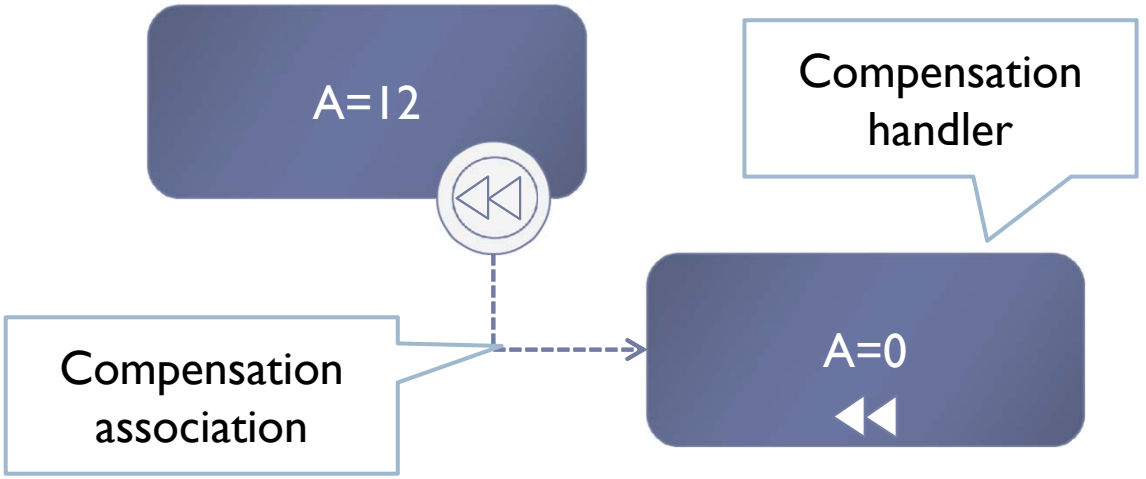


Compensation usage

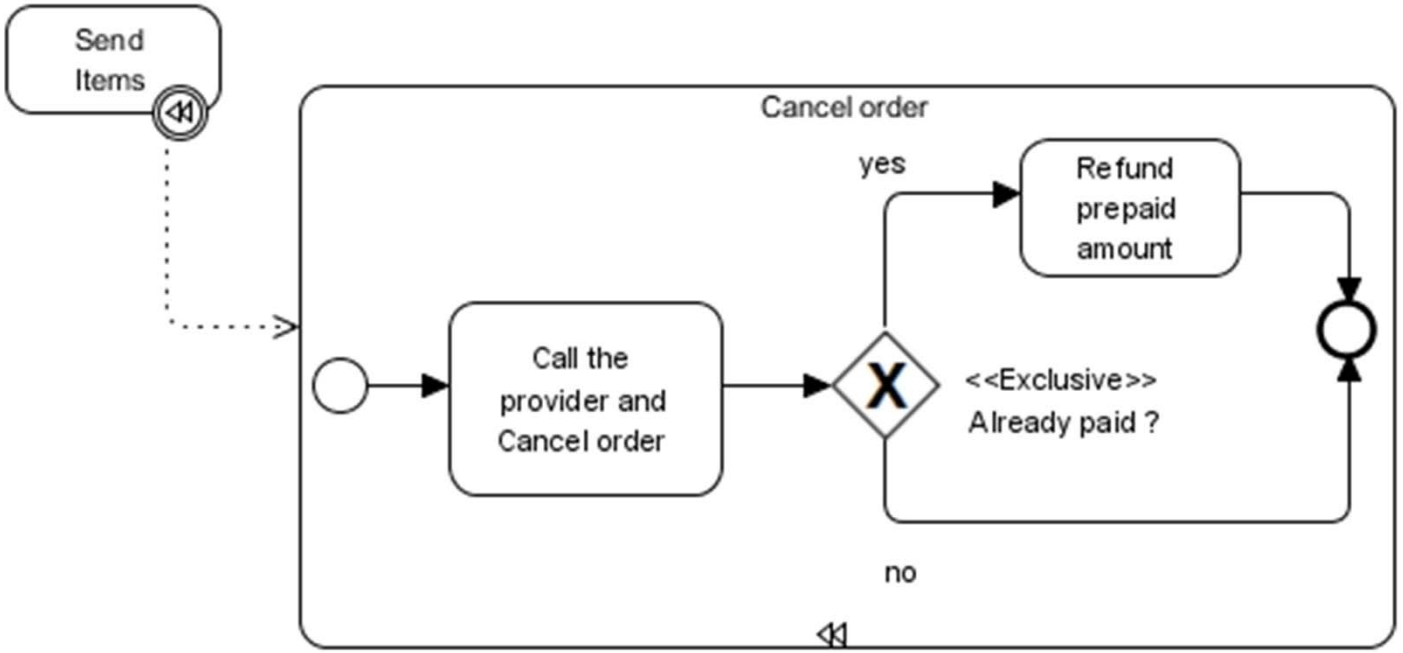
- The Compensation mechanism is used when it is necessary to cancel in order a set of activities
- Like an ‘undo’ in order to:
  - Restore a copy of the initial data values
  - Overwriting changes
  - Invoking some defined activities to remove the effects of the finished ativities

Compensation mechanism

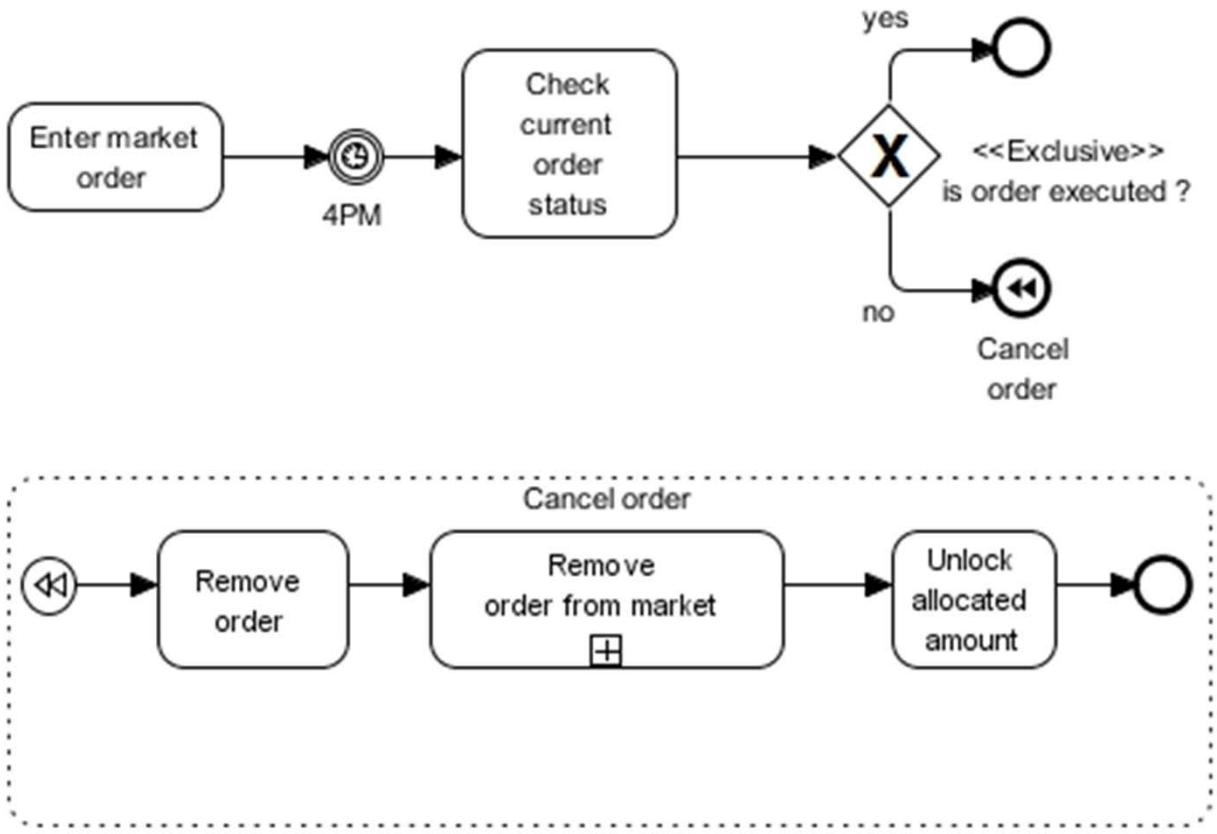
- Performed by a *compensation handler*
  - Performs the steps to reverse the effects on activities' execution



Compensation handler as Sub-Process

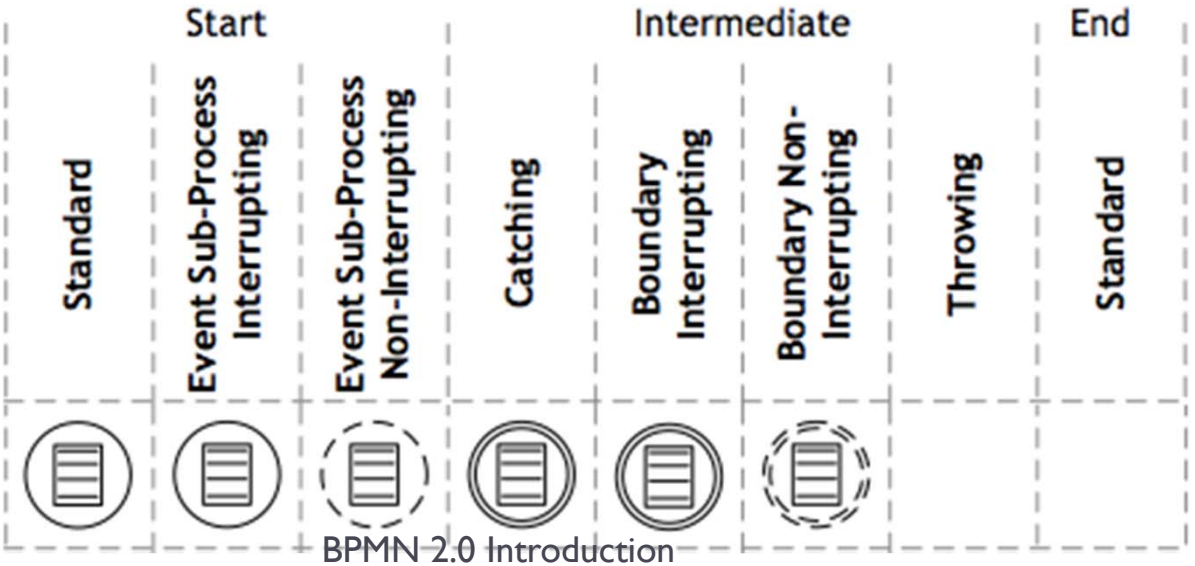


Compensation Sample

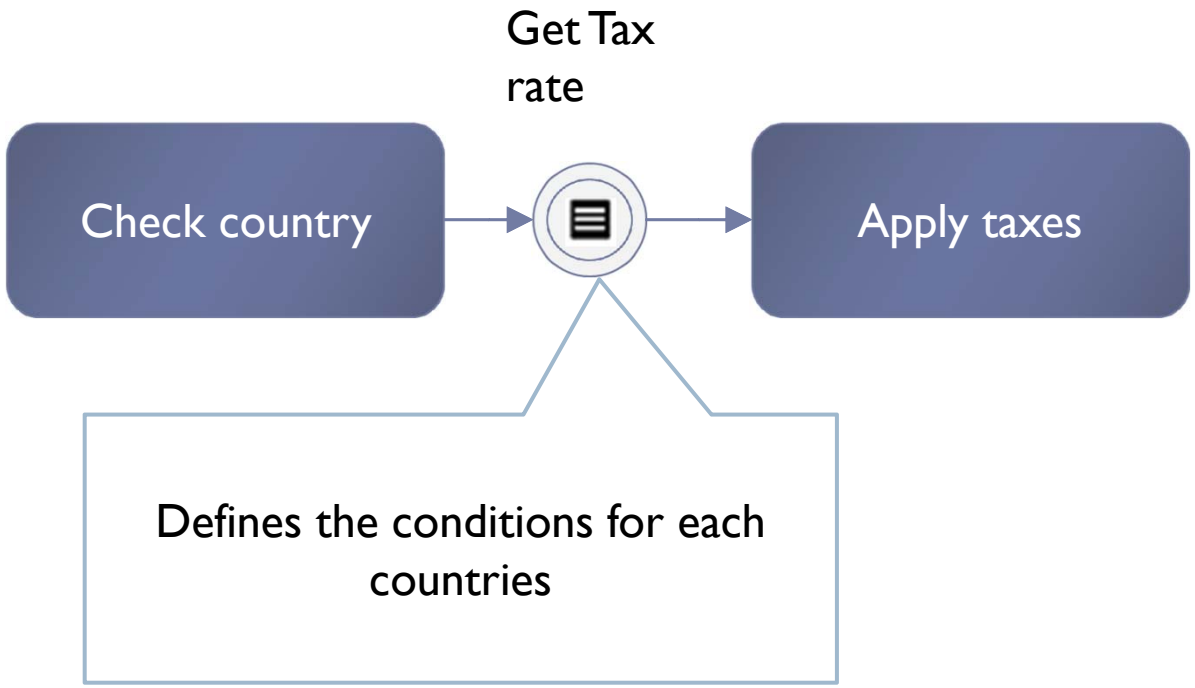


Conditional Event

- Reacting to changed business conditions or integrating business rules.
- No Throwing
- Prior to BPMN 2.0, this was named 'Business Rule'

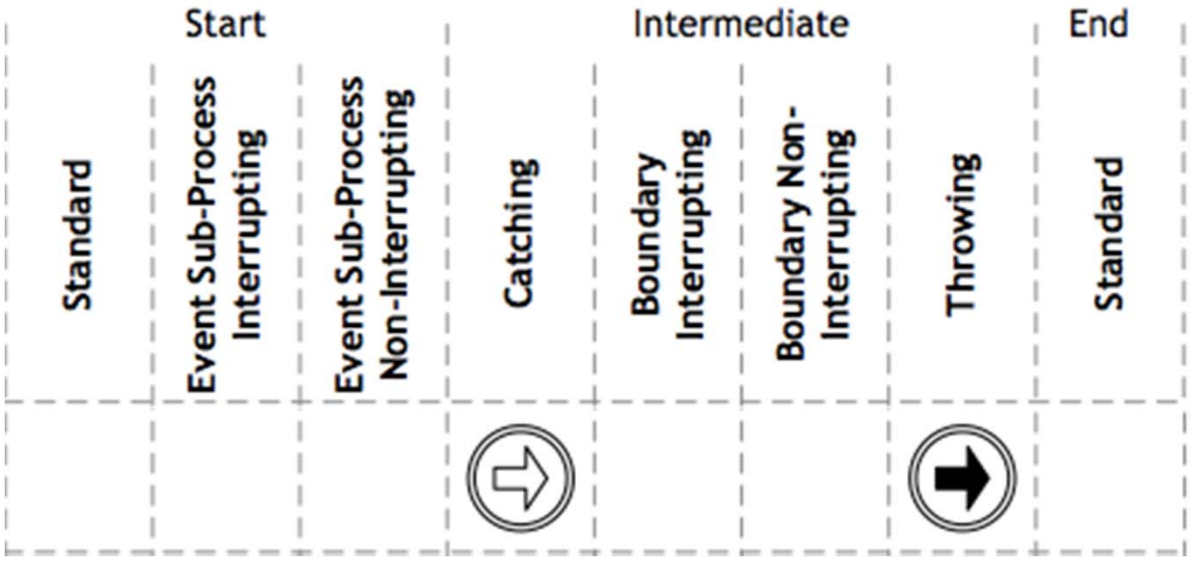


Conditional Event sample

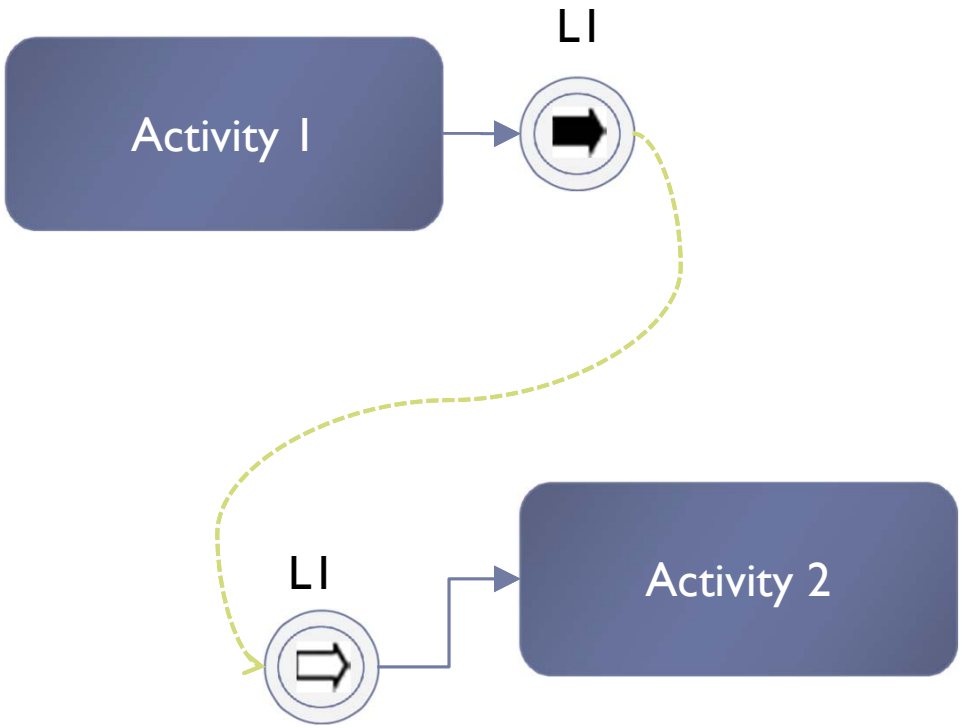


Link Event

- Off-page connectors. Two corresponding link events equal a sequence flow.
- Intermediate Event only

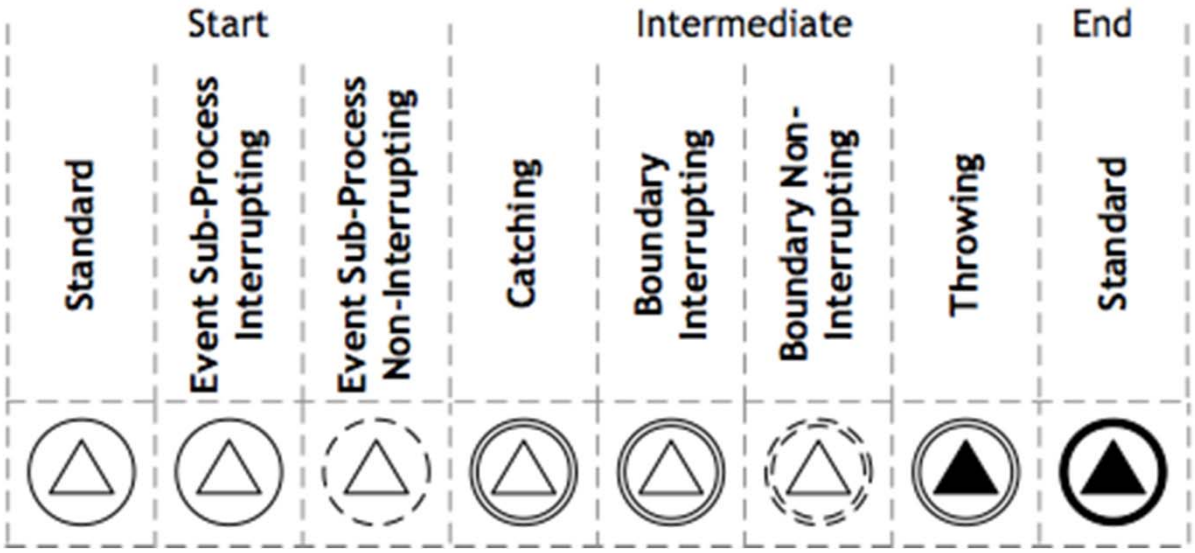


Link sample

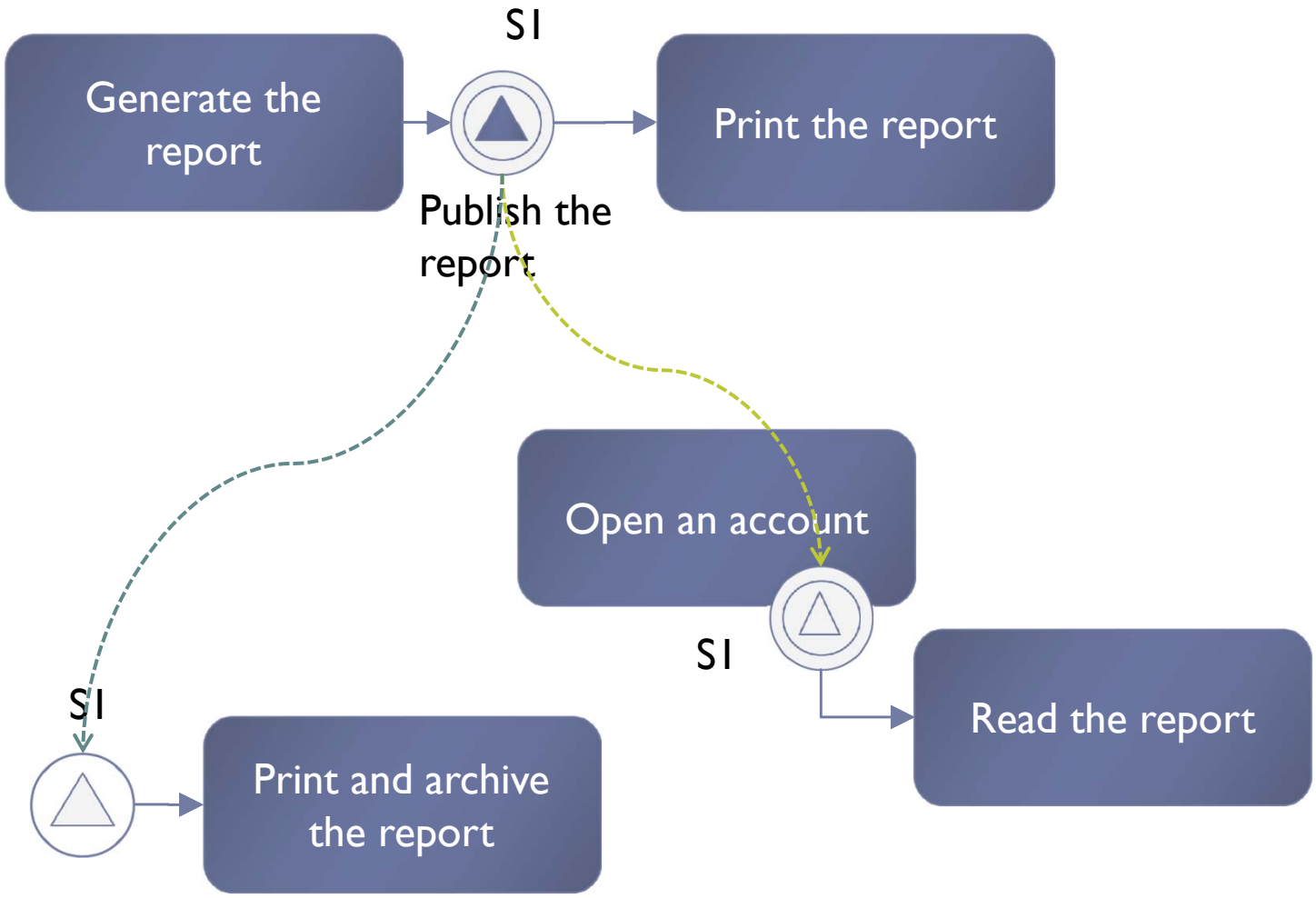


Signal Event

- Signalling across differ- ent processes. A signal thrown can be caught multiple times.
- Broadcasting information

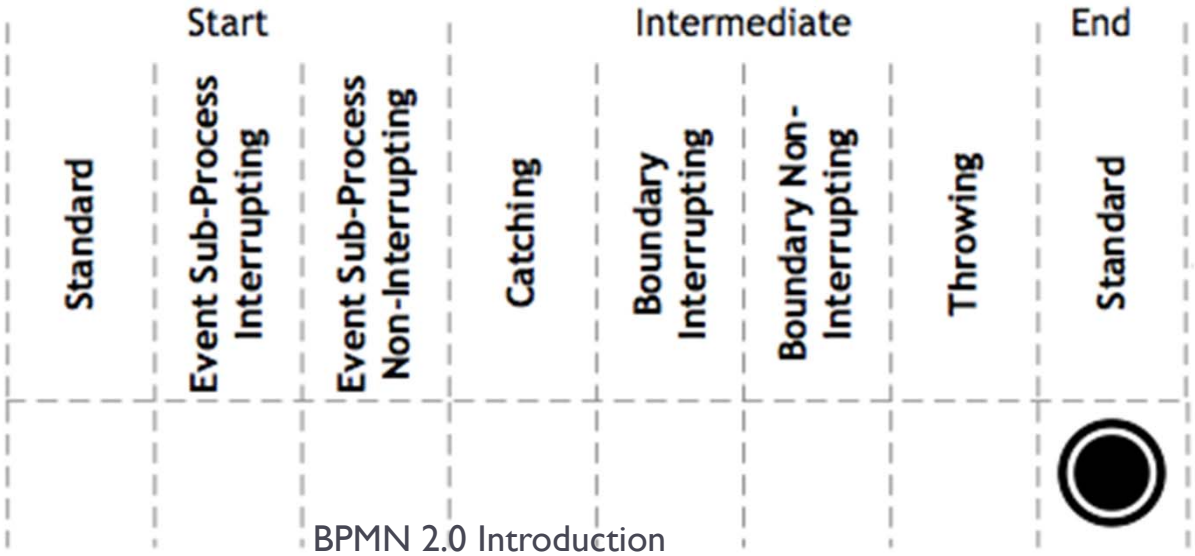


Signal Sample

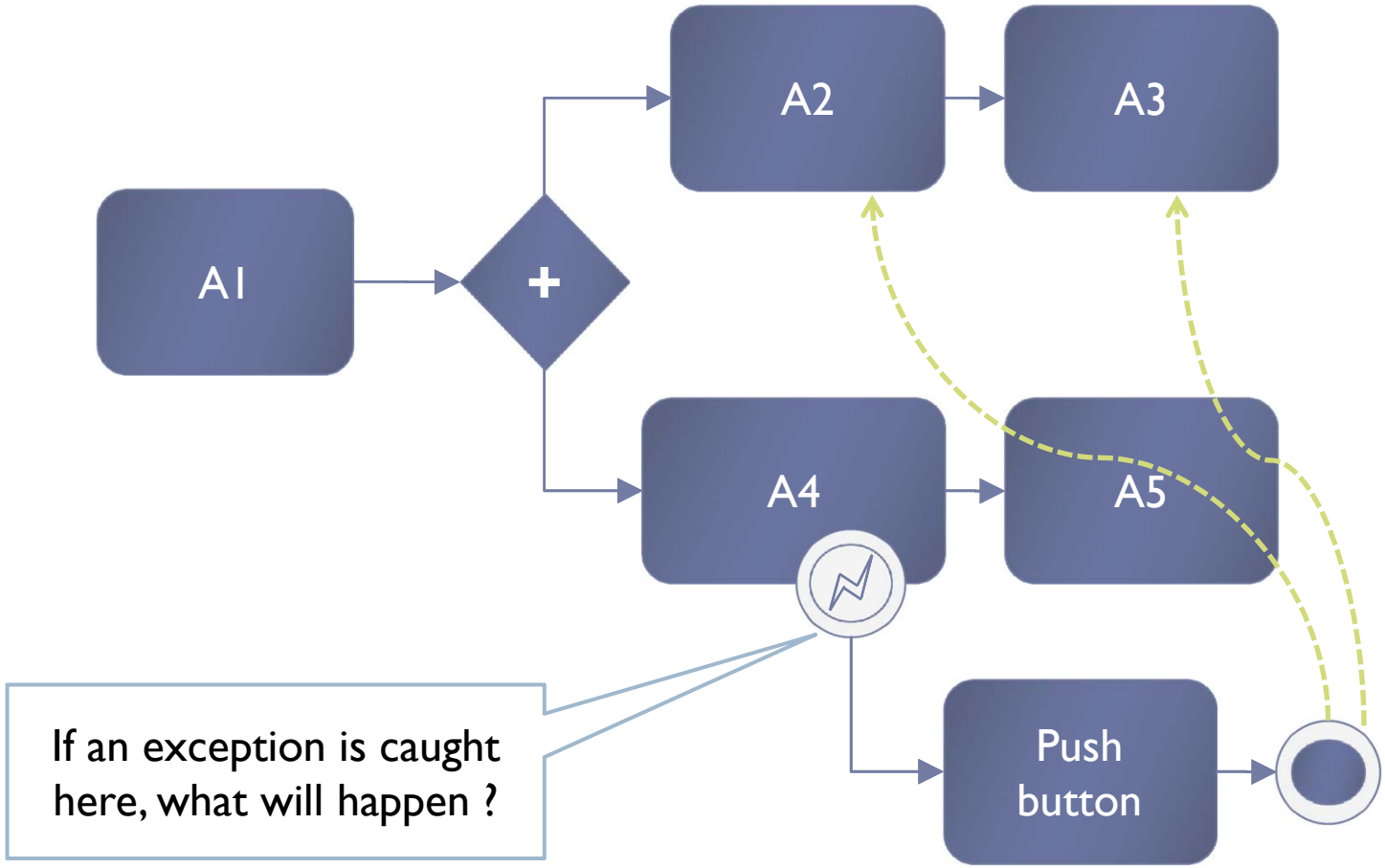


Terminate Event

- Triggering the immediate termination of a process.
- Termination of all executing activities !
- Emergency situations



Terminate sample

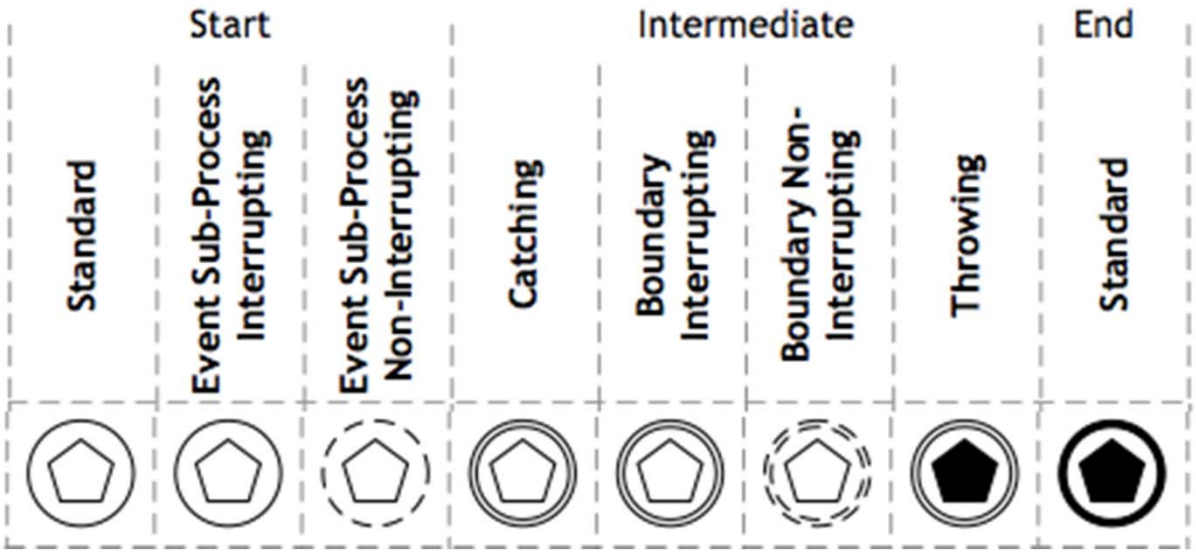


Events - Practice

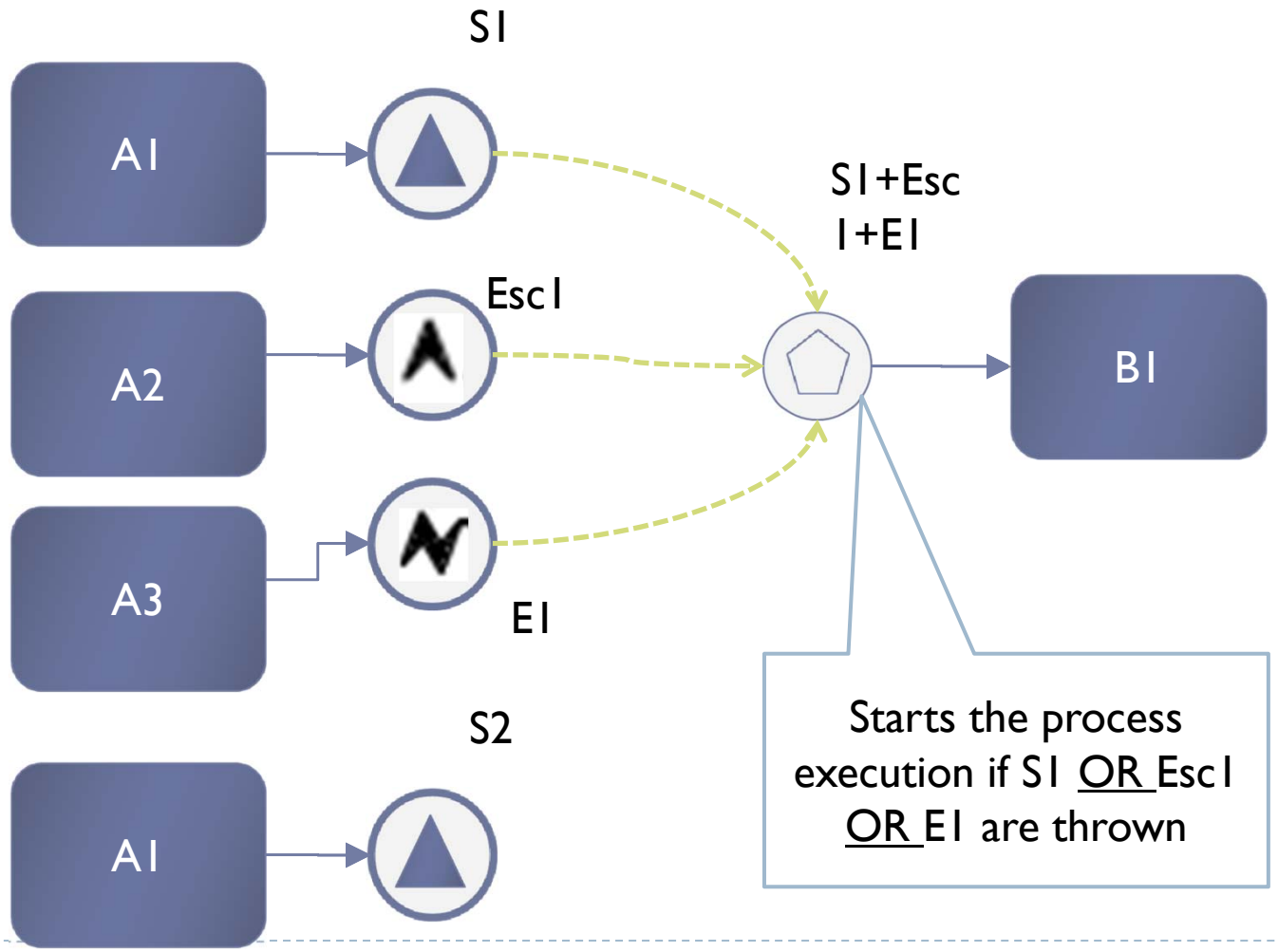
- Draw the following situation:
  - "Every week, I receive a mail from the R&D department, then I start the Transactional Automatic Processing engine. Sometimes an error occurs within that engine and we are immediately notified. After a short analysis and if the issue is critical, we decide to cancel the transaction, reverse the process, broadcast to all entreprise's users the incident message and stop immediately all processes. Otherwise, if it is not critical, we check the rule to apply accordingly to the Error ID found in the Error Rule Table. If the Error code is equal to 0, we esclate it to our manager, but we do not stop the engine in such case."

Multiple Event

- Catching one out of a set of events. Throwing all events defined.

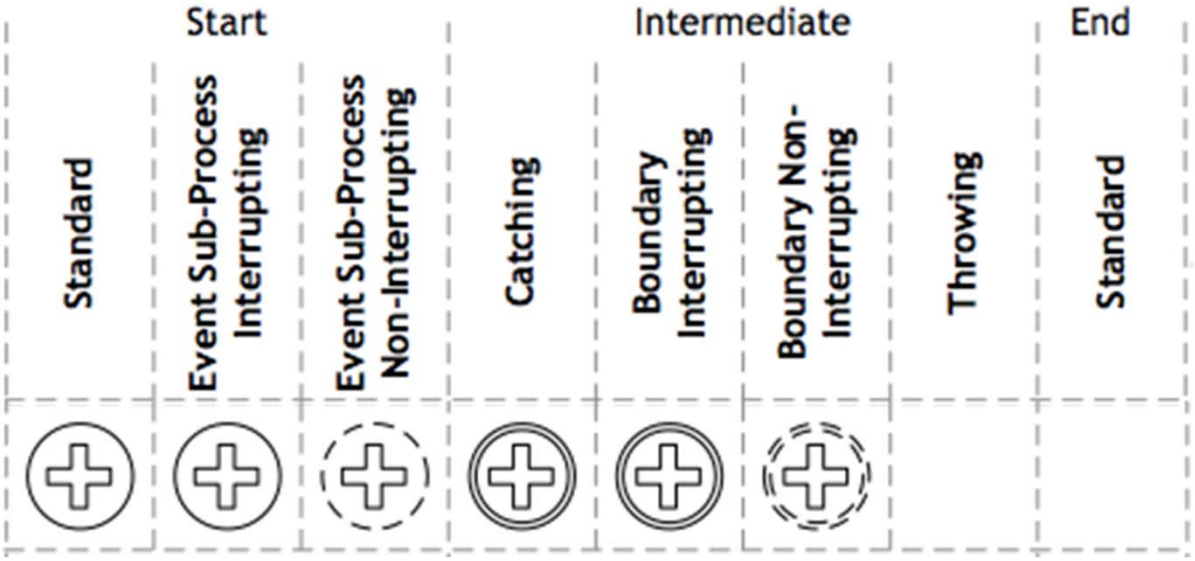


Multiple Event Sample

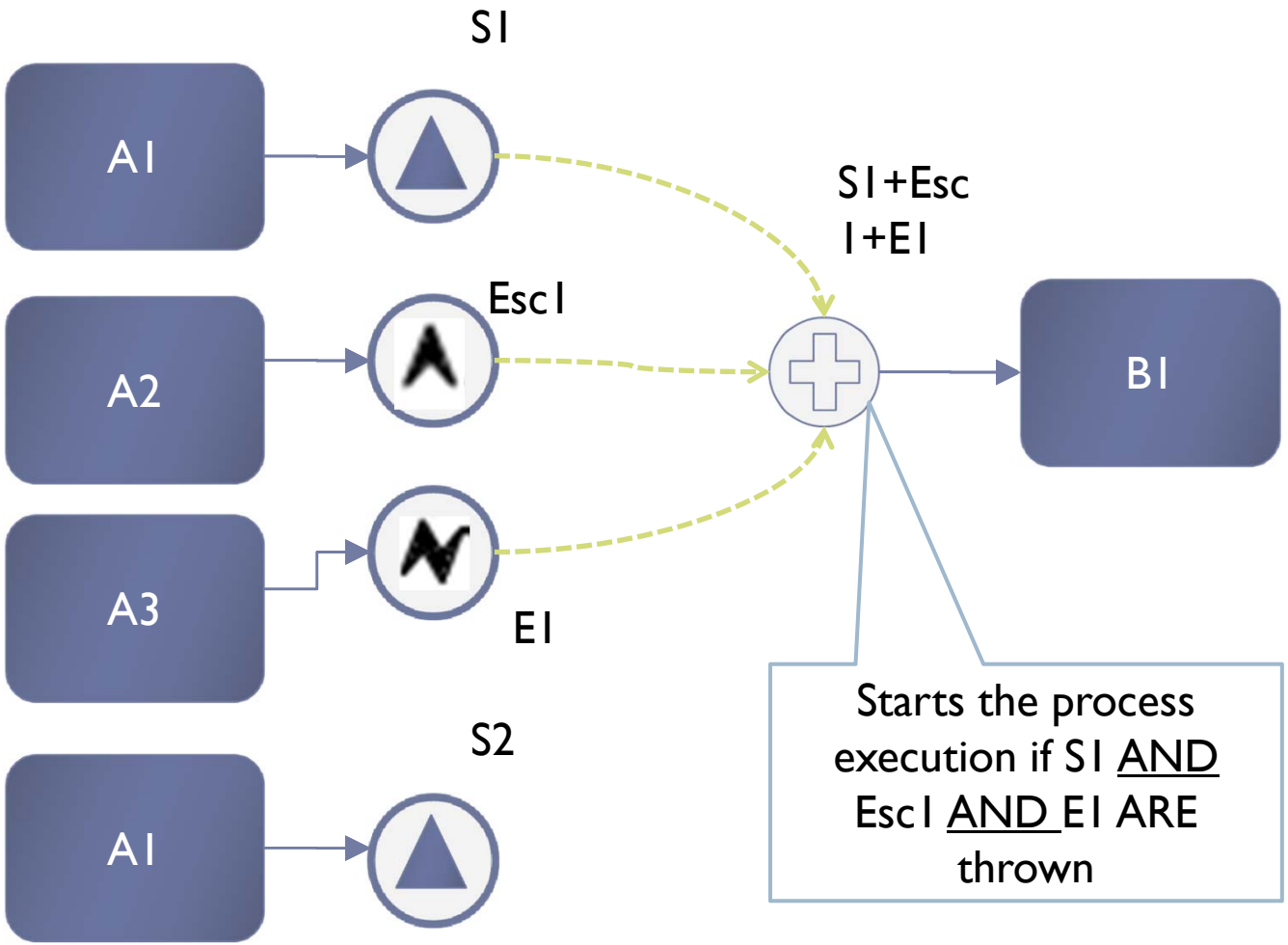


Parallel Multiple

- Catching all out of a set of parallel events.
- Many triggers assigned to the Event
- All events must be triggered !
- Catching only



Parallel Multiple Sample



Events – Practice (2)

- Explain the differences between:
  - Multiple
  - Parallel Multiple

Advanced Sub-Processes

- Sub-Process are activities
- They can also combine dedicated behaviors:
  - Loop
  - Serial execution
  - Parallel execution
  - Ad hoc
  - Compensation

Advanced Sub-Processes I

Task	Symbol	Description
Loop		The sub-processes' activites are reiterated many times
Multiple Instance Parallel		Creates concurrent sub-processes accordingly to the specified instance number
Multiple Instance Serial		Creates sequential sub-processes accordingly to the specified instance number
Ad-hoc		The sub-Process' activities are executed without either a specific order or sequence

Advanced Sub-Process II

Task	Symbol	Description
Compensation		Contains the activities launched when the compensation mechanism is triggered
Compensation and Ad-hoc		Contains the unordered activities launched when the compensation mechanism is triggered

Advanced Gateways

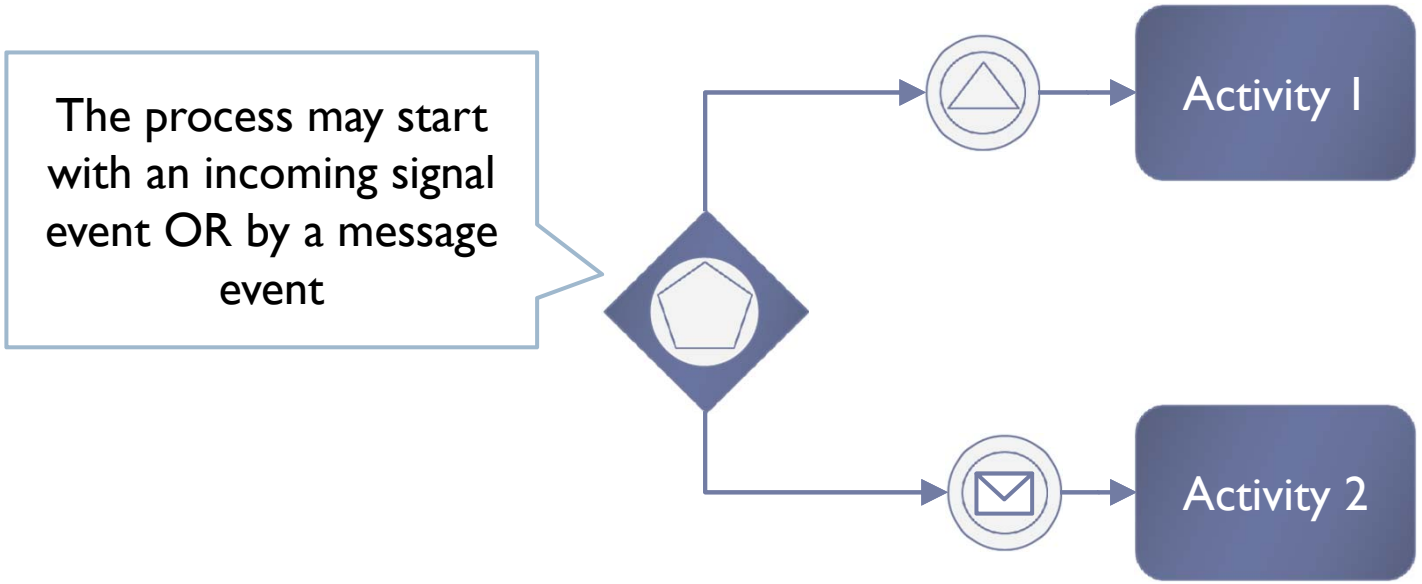
- Event Based
  - Multiple Start
  - Multiple Intermediate
  - Parallel Start
- Complex

Event Based Gateways

- The Event Based Gateway is not based on ***process data***, but rather on ***external messages or events***
- Ever followed by an event or a reception task
- The sequence flow is passed to the event/task which runs first, the other is not activated even if the corresponding event is thrown

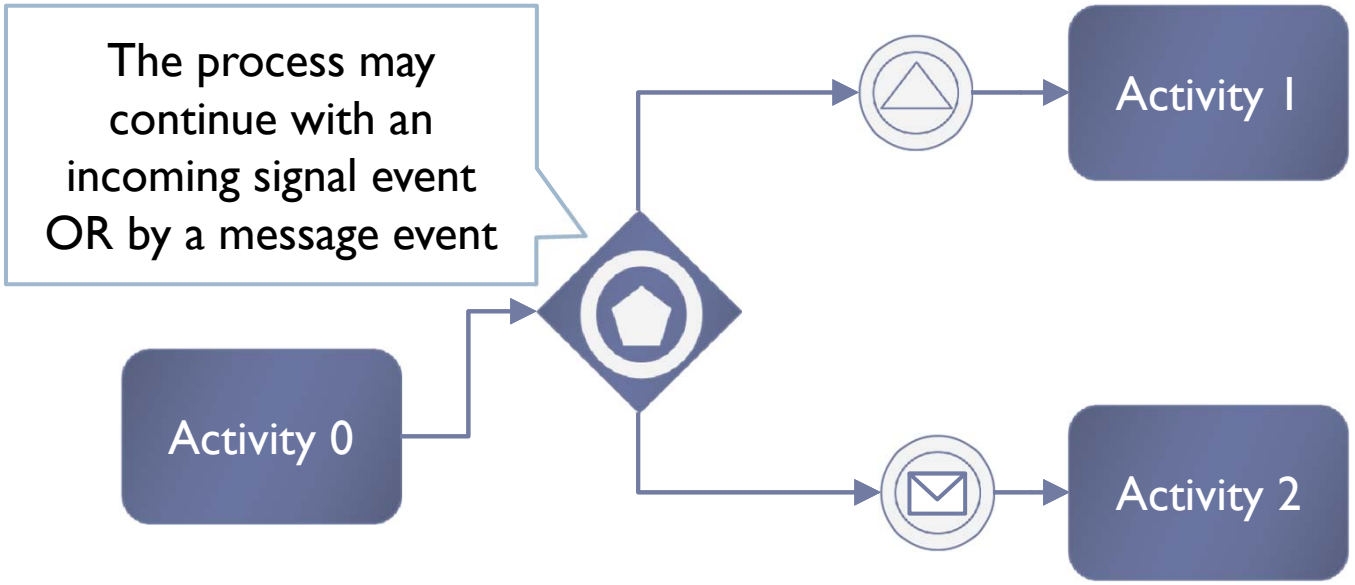
Multiple Start Gateway

- The process' execution starts when a dedicated event is thrown among many possibilities



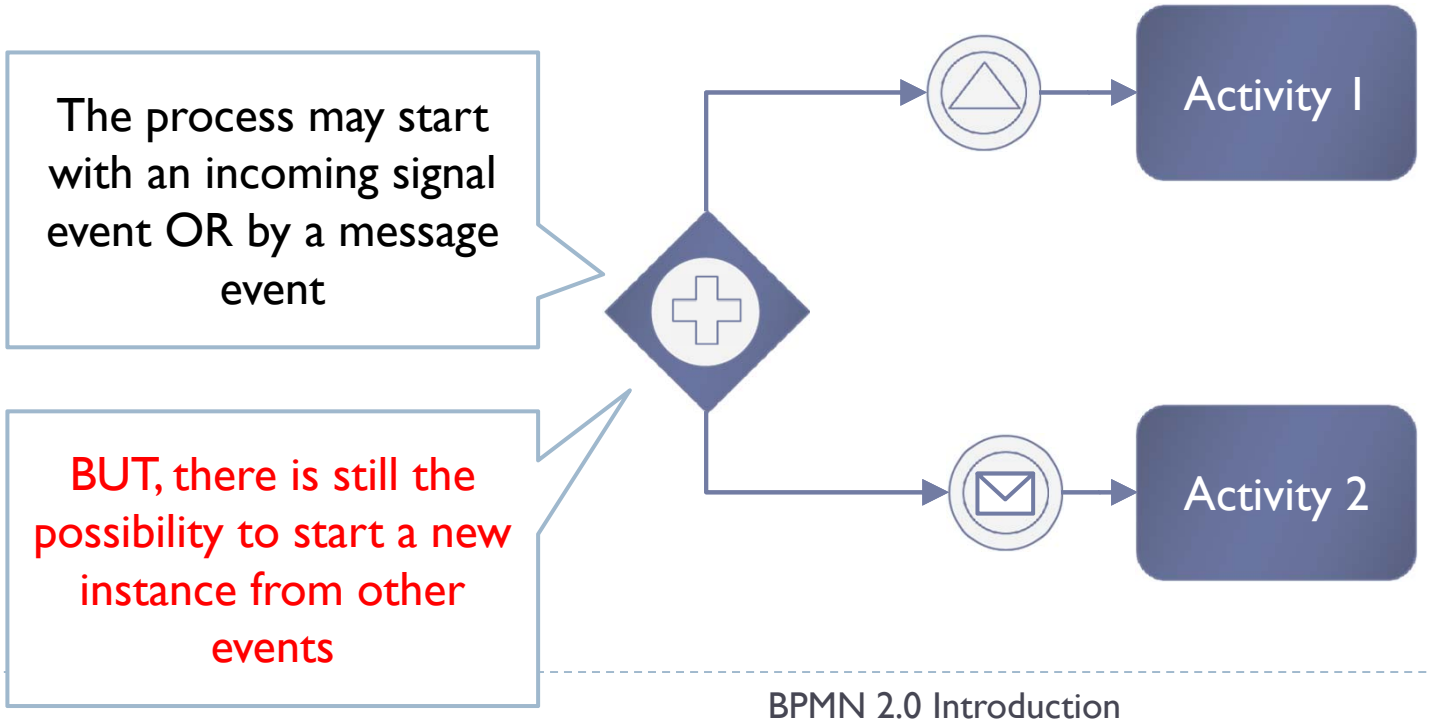
Multiple Intermediate Gateway

- The process' execution continues when a dedicated event is thrown among many possibilities



Parallel Event Based Gateway

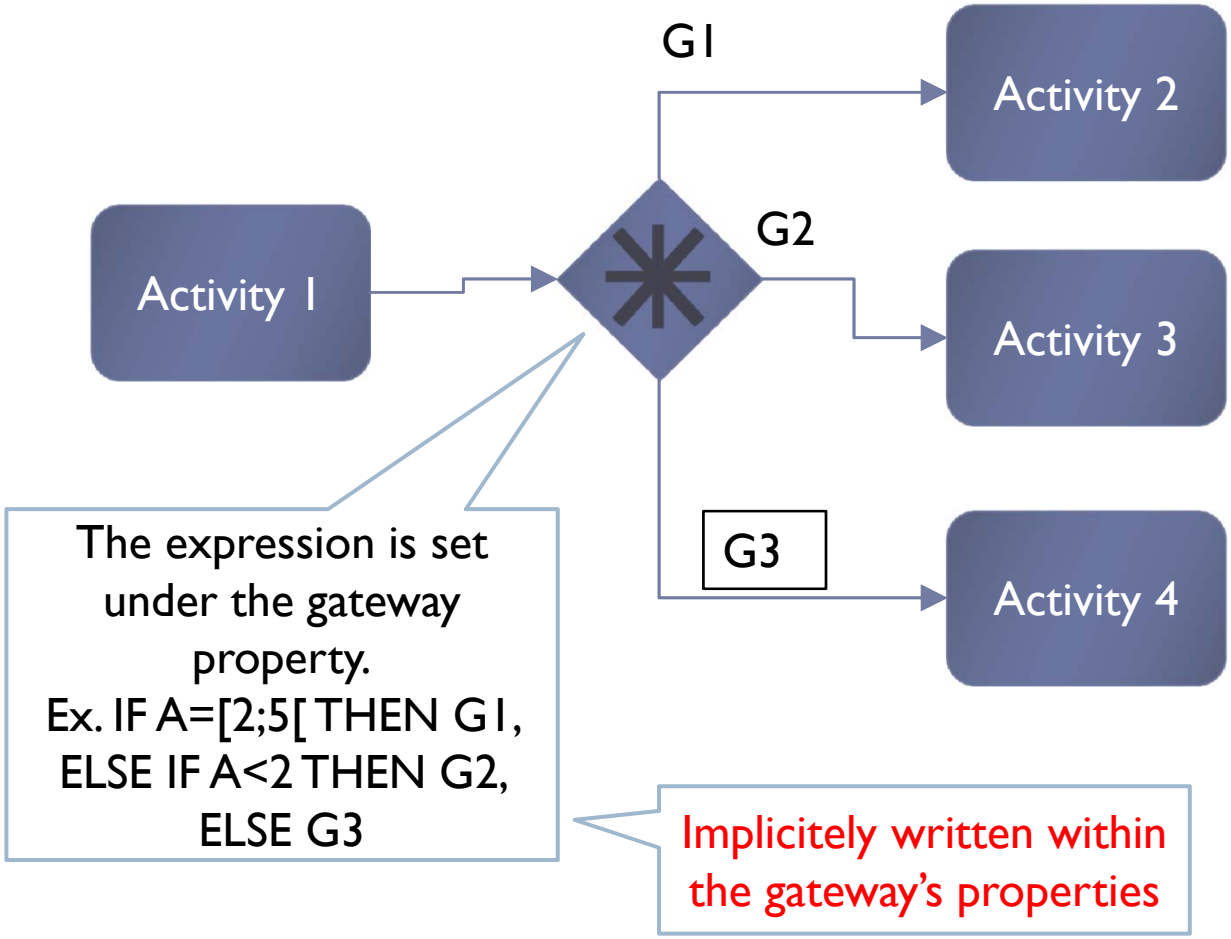
- All events have the possibility to start an new process instance. Starting from the corresponding event thrown.



Complex gateway

- Support situations that are not easily handled by all other gateways
- Output gate selection is done by the gateway's expression evaluation
- Many gates may be activated
- At least one gate muse be choosen

Complex gateway sample



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