BPMN 2.0 Tutorial

Daniel Brookshier
Distinguished Fellow
No Magic Inc.

About the Tutorial

- Generated from MagicDraw UML
- Based on current BPMN 2.0 for UML reference implementation.
- Developed by Daniel Brookshier, Distinguished Fellow, No Magic Inc. danielb@nomagic.com

TRACEABILITY

THE BEST WAY TO REDUCE RISK IS

TRACING REQUIREMENTS TO THE THINGS THAT CAN BITE YOU.

What is BPMN ?

- Business Process Modeling Notation
- Developed by Business Process Management Initiative (BPMI), and is currently maintained by the Object Management Group since the two organizations merged in 2005
- Supports business process management for technical and business users
- Bridge communication gap between business process design and implementation

What?

- BPMN is simple
- Process diagrams business people like
- Less complex (business likes that too)
- Under the covers, technical enough for techies

What Does BPMN Not Do?

- State transitions
- Functional decomposition
- Organizational hierarchies
- Data modeling

What is BPMN Like?

- Similar to flowcharts and UML Activity diagrams
- Flow of activities with various messaging and data
- Can be used for service orchestration in SOA

Primary Components

Why BPMN?

- Standard notation
- Model concepts and/or implementation of business process
- Models high-level process concepts
- Notation is not complex

Issues With BPMN

- Limited complexity
- Process/conversation oriented
- Very high level
- Cannot see details of tasks or data

Solving BPMN Issues ViaUML

- BPMN as an extension to UML
- Enhanced ability to implement complexity
- Link implementation with orchestration
- Greater tool support
- Fill in gaps with details state, decomposition, data, implementations

BPMN for UML specification in progress at OMG

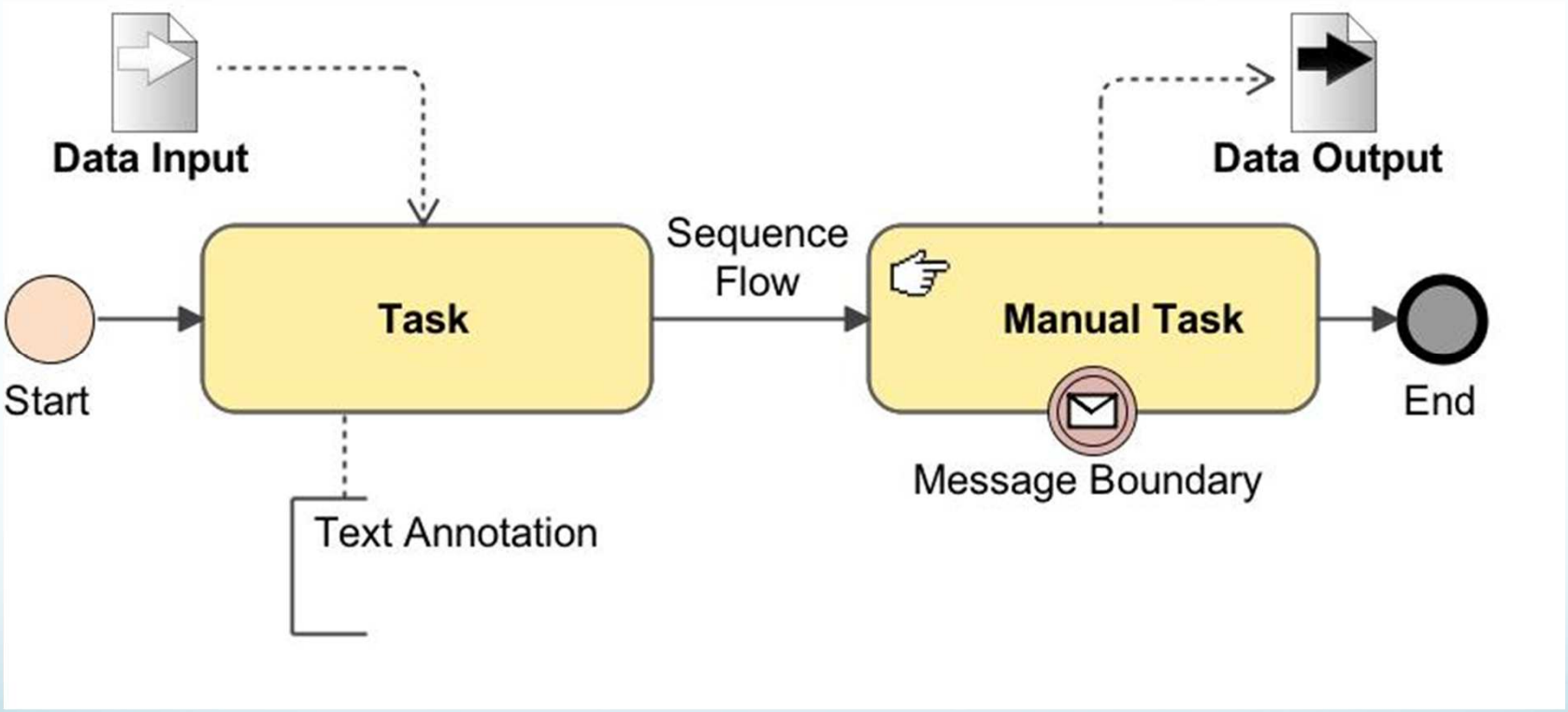
Executable Verses Non-executable

- Process flows can be executable or non executable
- Executable process follows specific rules
- Formal condition expressions are typically not included in non-executable form
- Executable does not have Manual, Abstract, and other non-execution elements

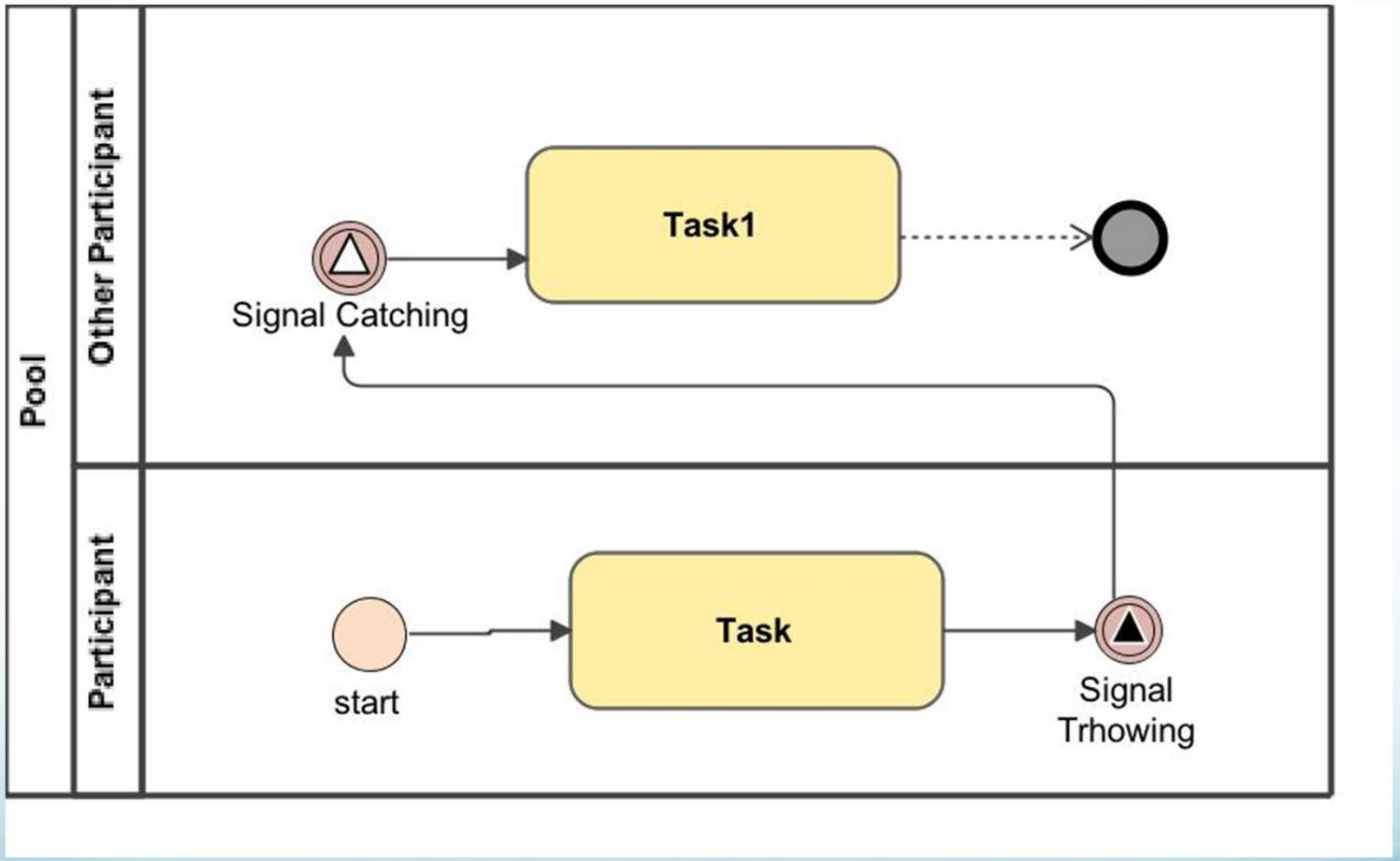
BPMN Diagram Zoo

- Process – Flow of activity, decisions, data and events
- Collaboration – Conversations and interactions (also process)
- Choreography – Tasks performed by participants and how participants coordinate interactions via messages.

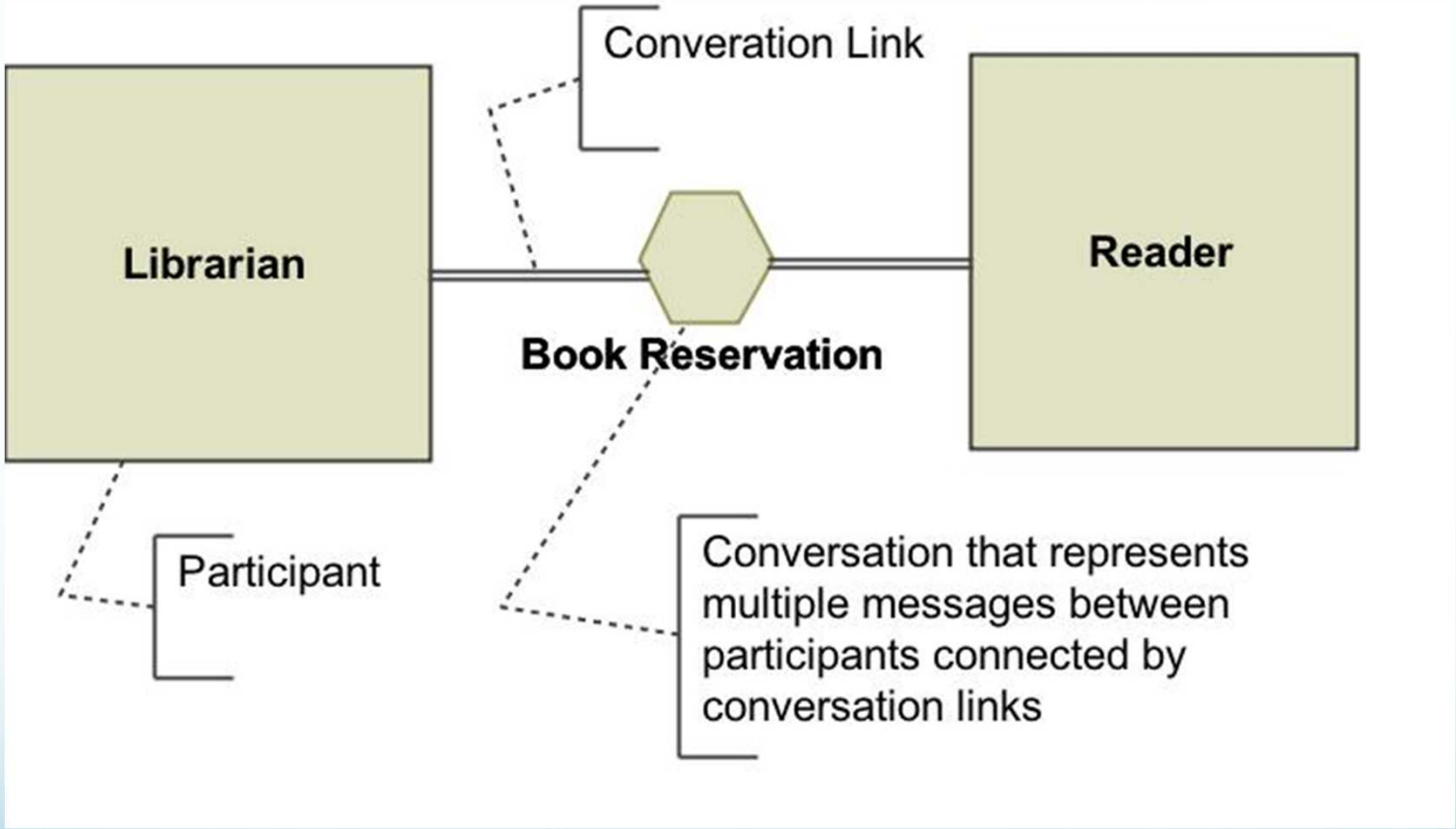
Simple BPMN Process Diagram



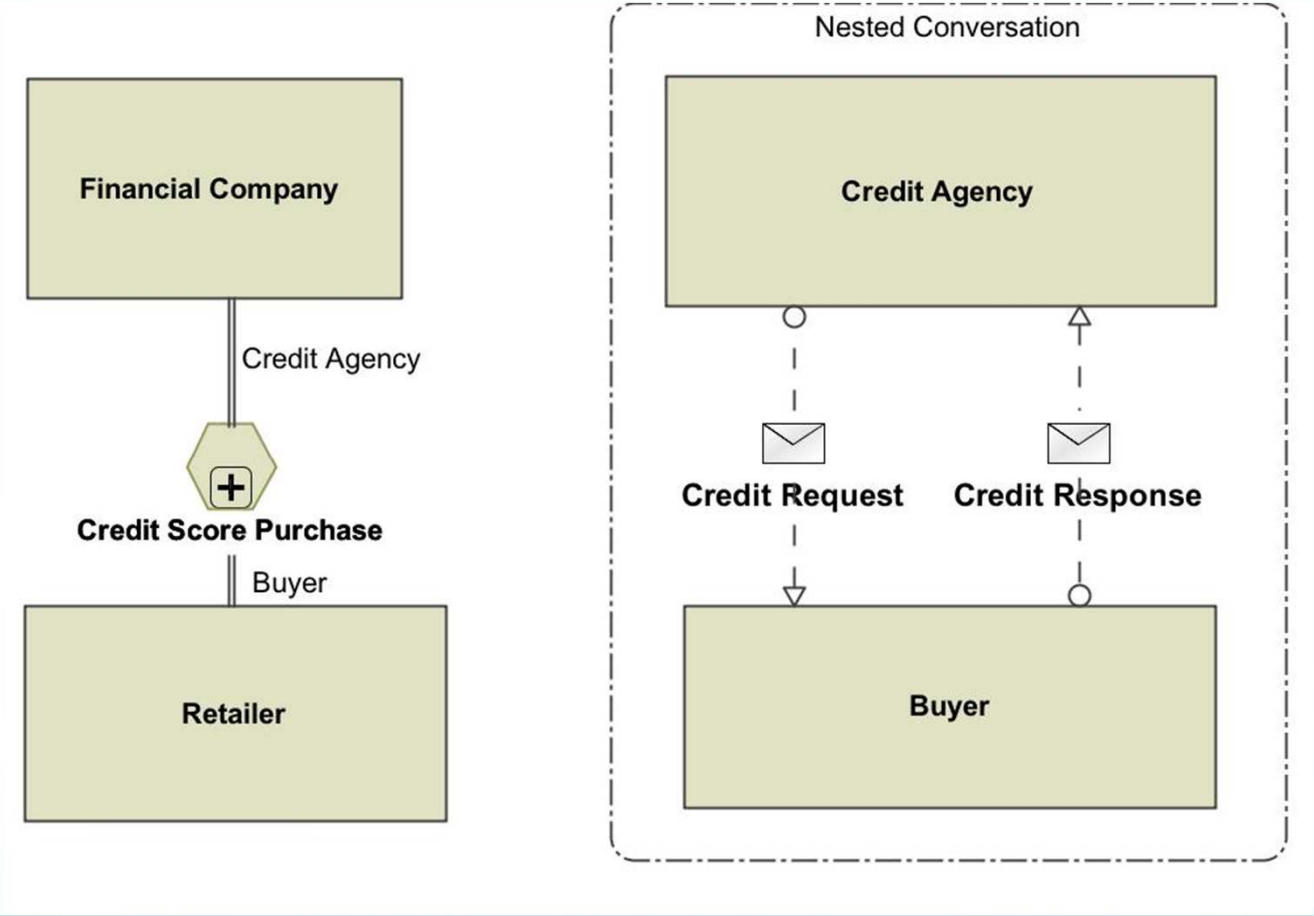
Process with Pools and Lanes



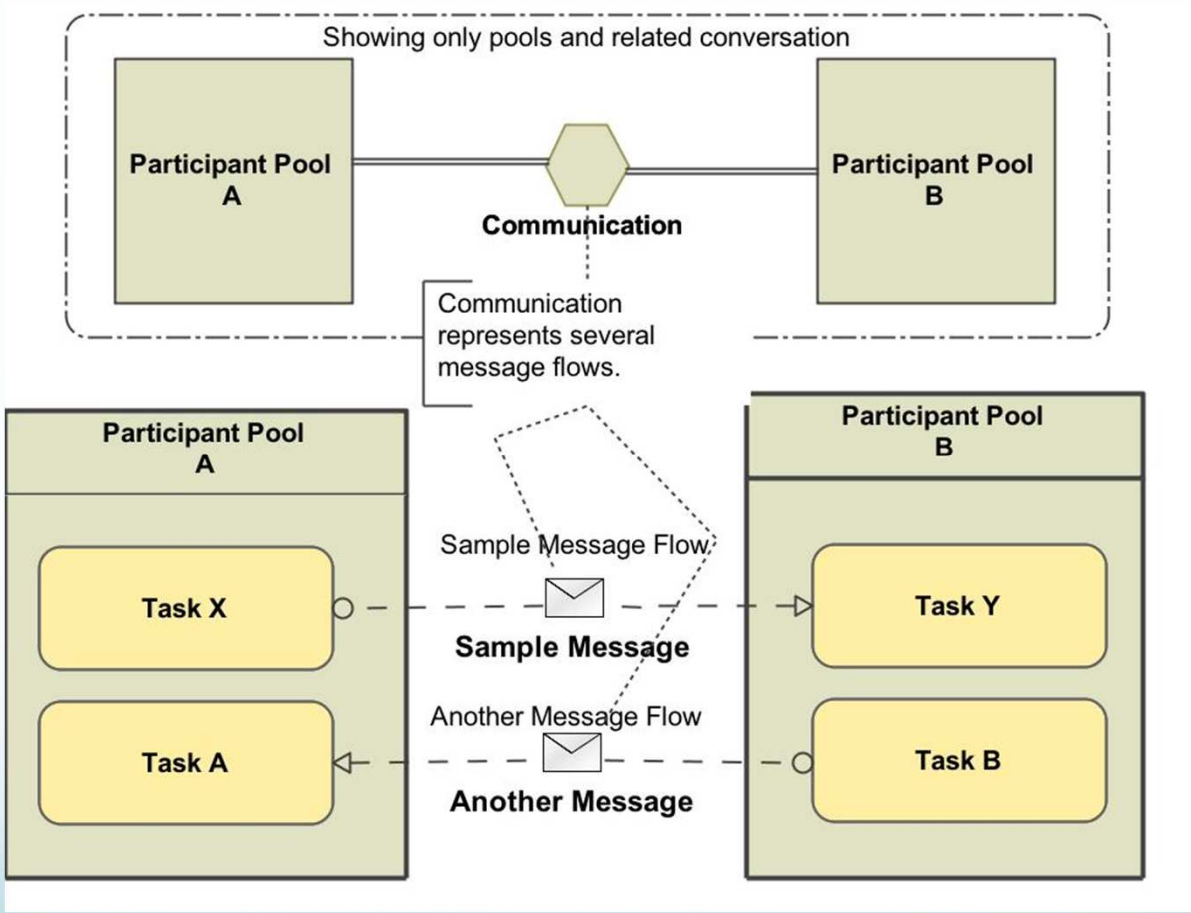
Simple Collaboration



Simple Collaboration



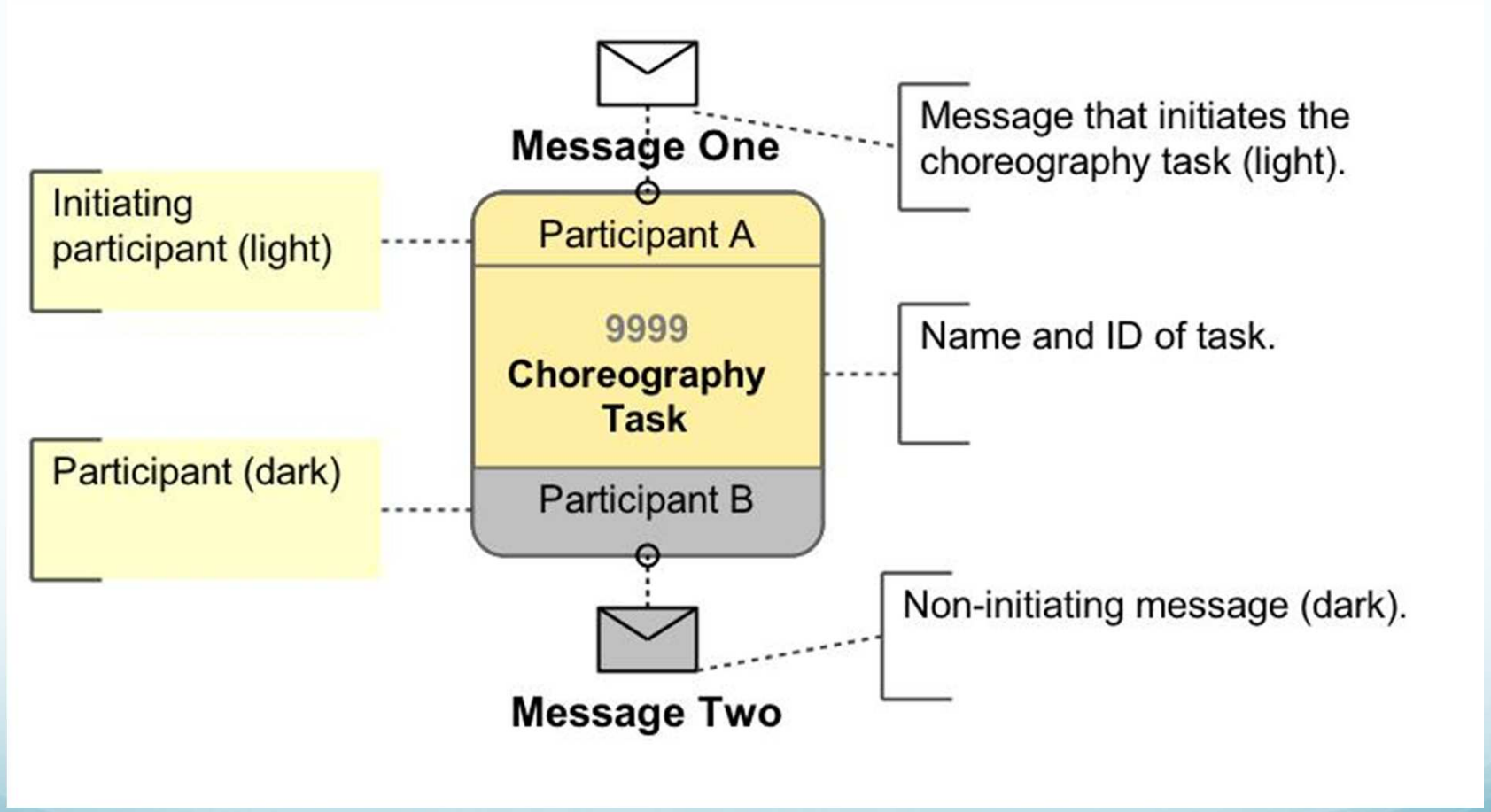
Understanding Collaborations



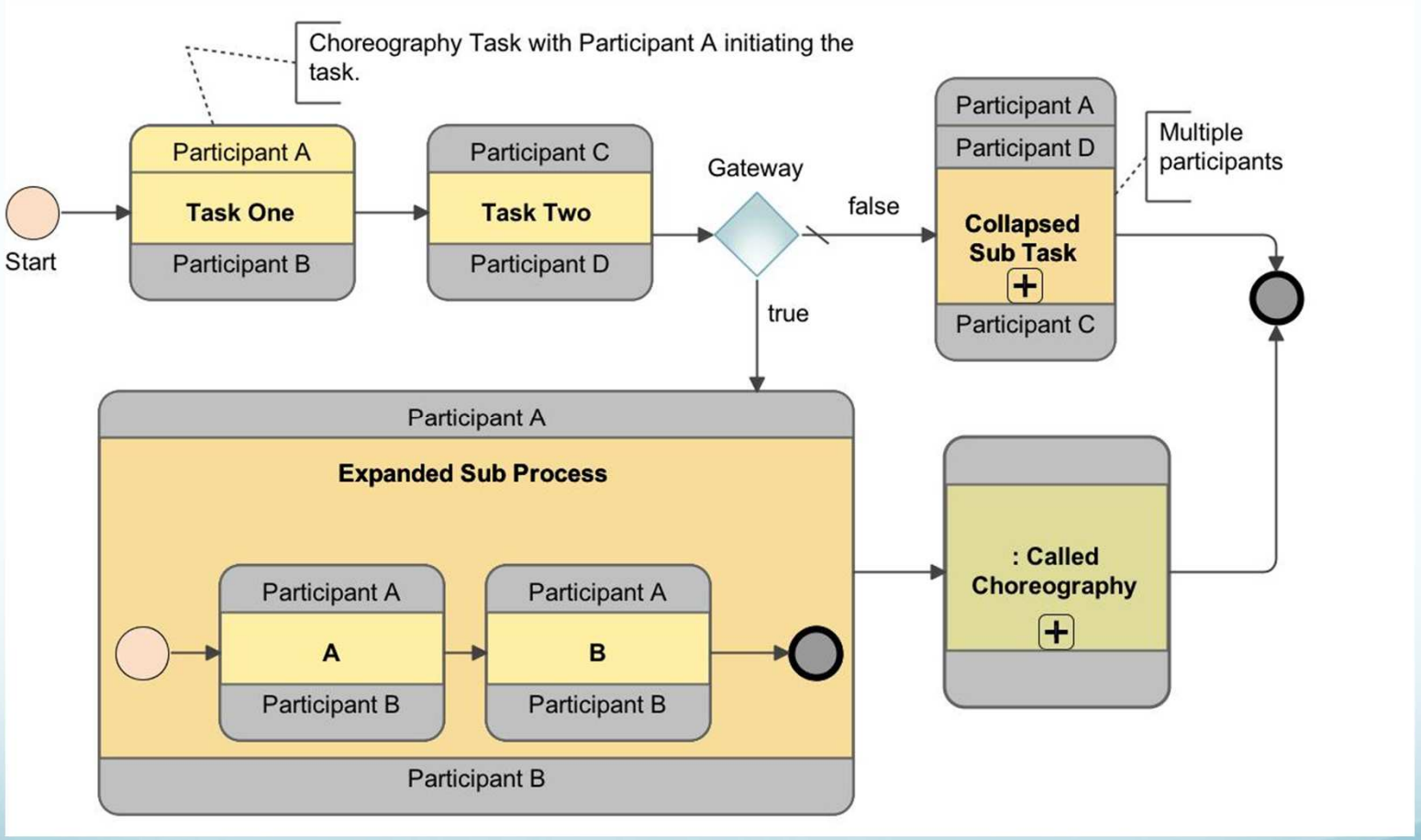
BPMN Choreography

- Sequence of interactions between Participants.
- Choreographies exist outside of or in between Pools.
- A Choreography Task is an atomic Activity in a Choreography Process.
- The task represents an Interaction, which is one or two Message exchanges between two Participants.
- Helps to show who initiates the activity and the first message.

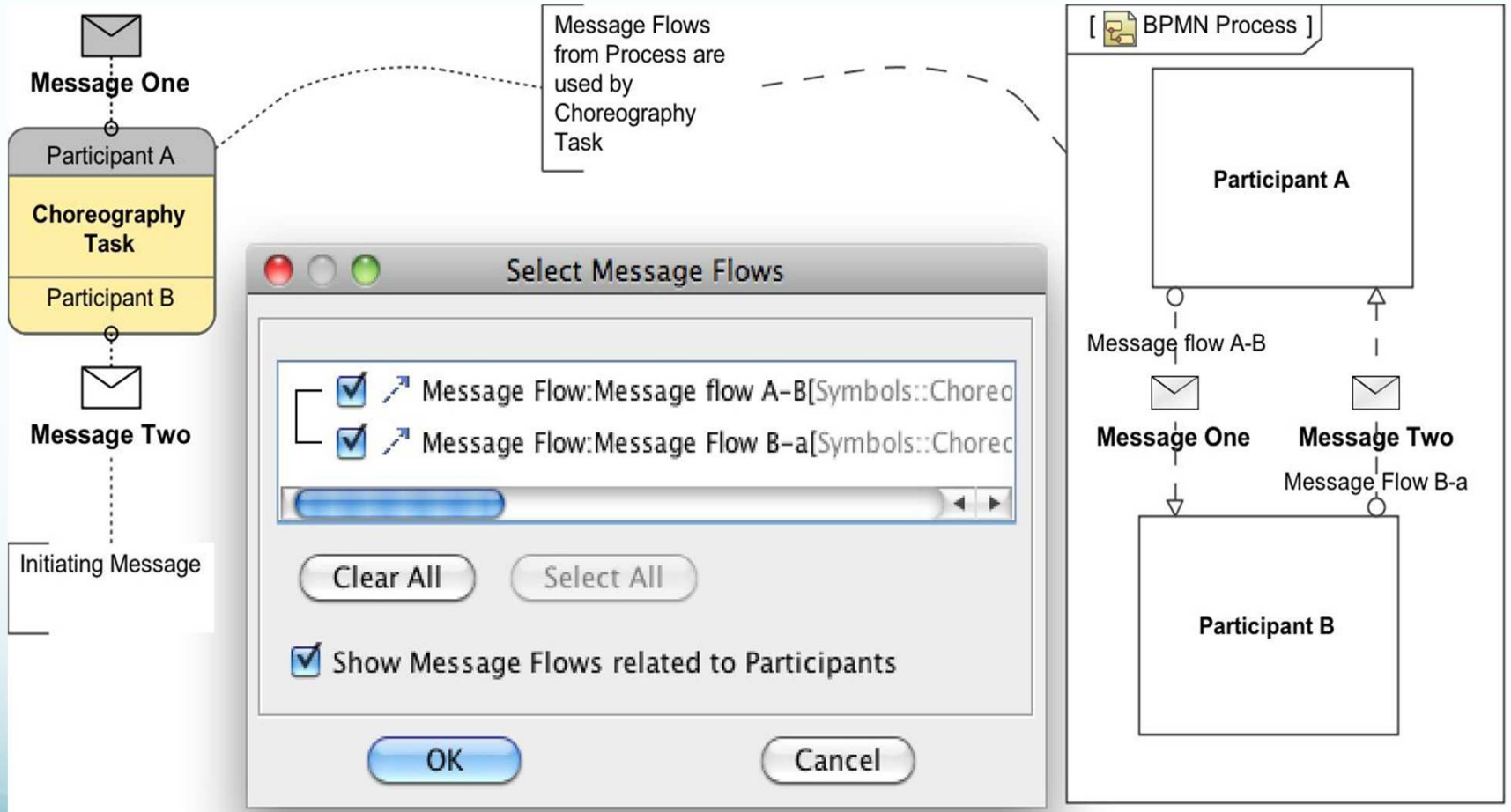
Simple Choreography Task With Messages



BPMN Choreography Diagram

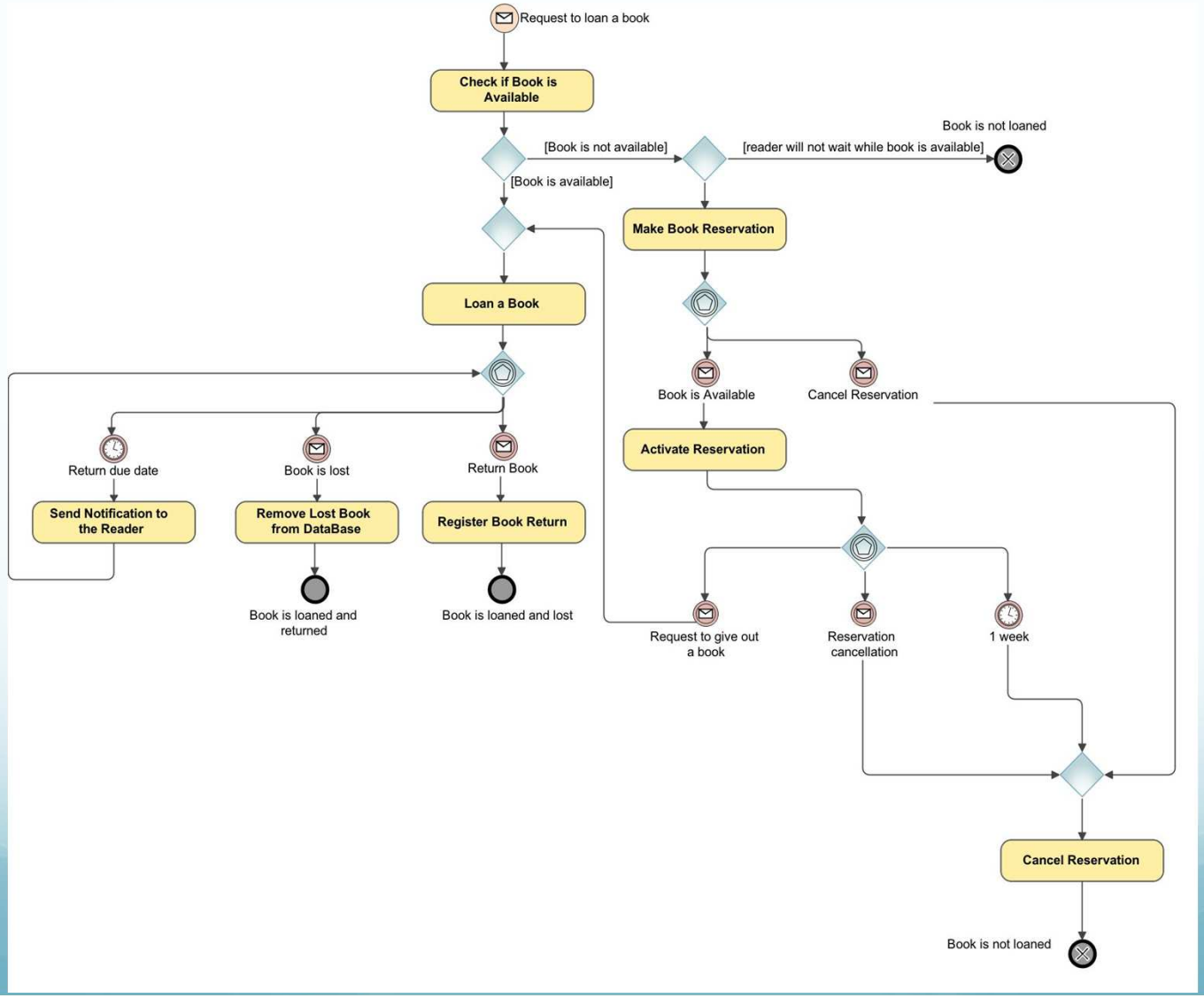


Setting Messages on Choreography

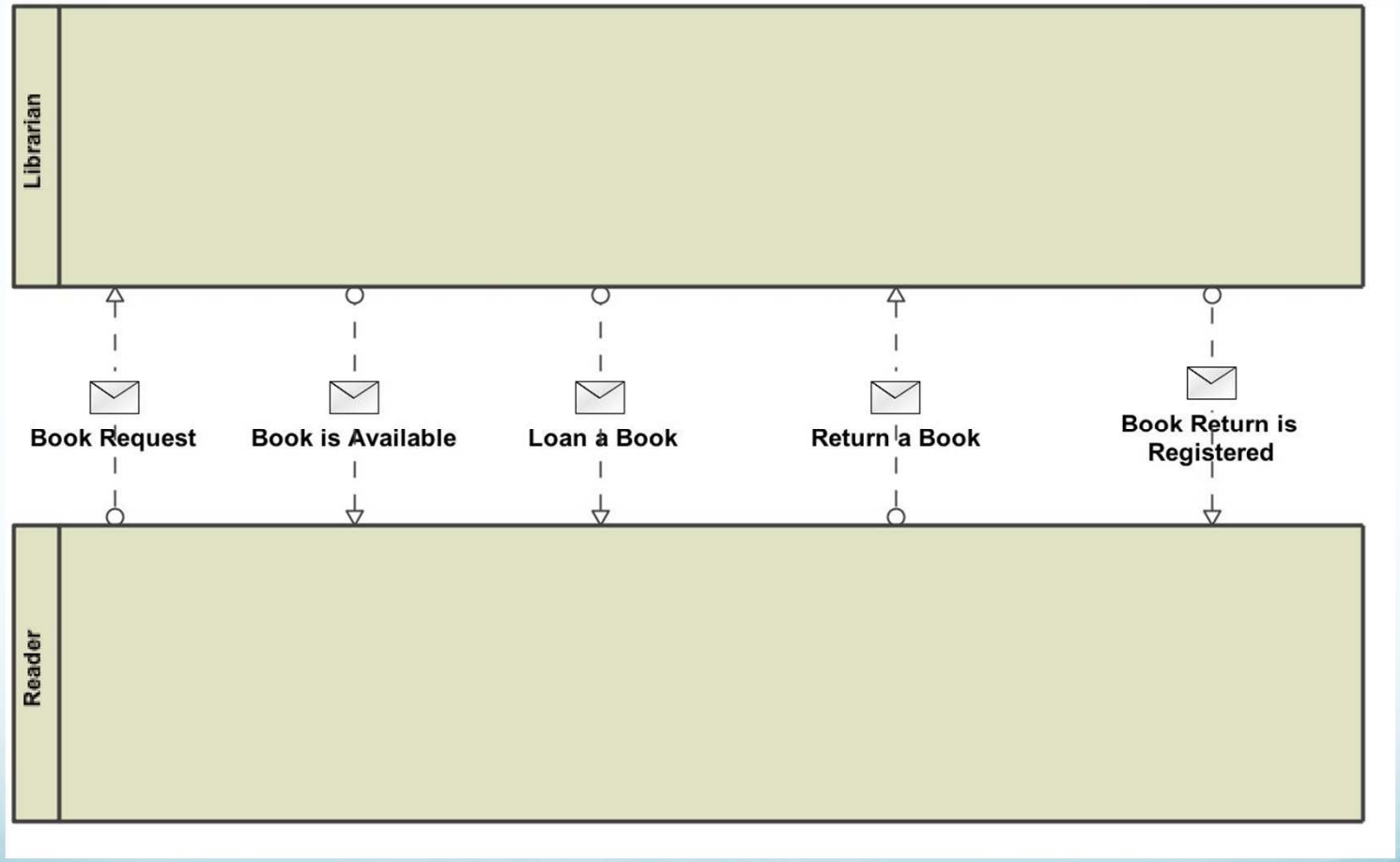


Example BPMN Diagrams

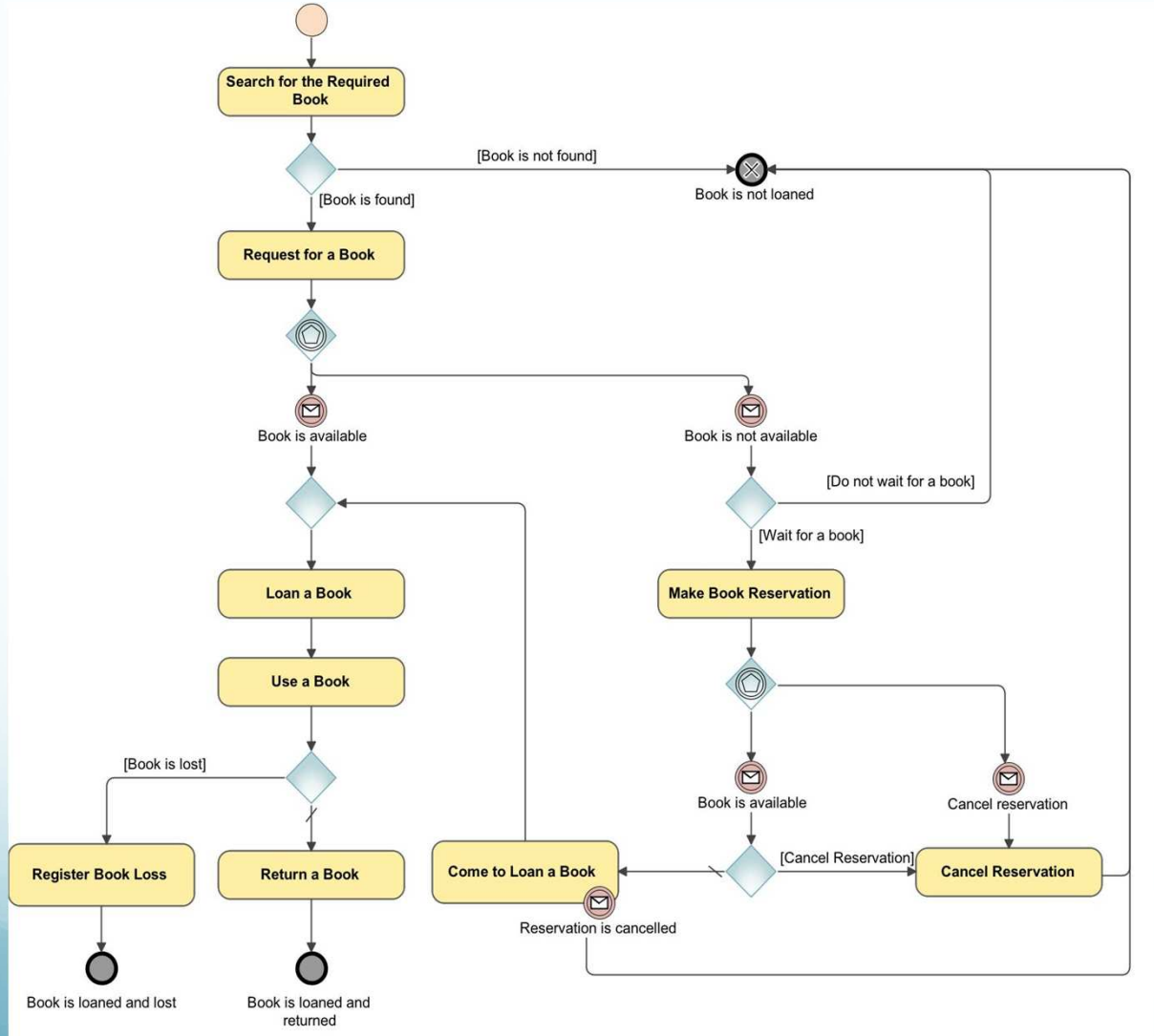
Book Loan and Reservation (Librarian Perspective)



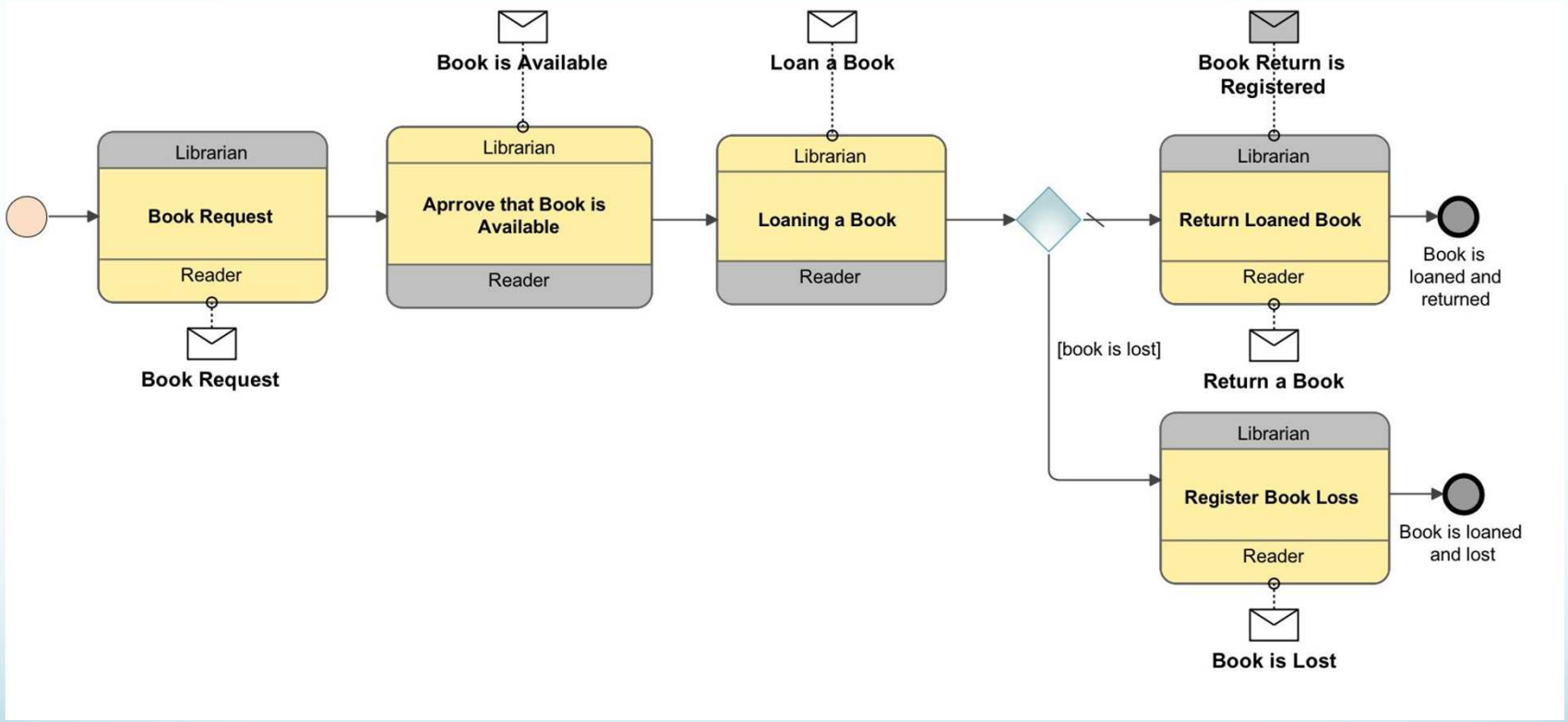
Loan a book (main scenario)



Book Loan and Reservation (Reader Perspective)



Loan a Book


Librarian
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Reader
Book is loaned and returned
Return a Book
Librarian
Register Book Loss
Reader
Book is loaned and lost
Book is Lost

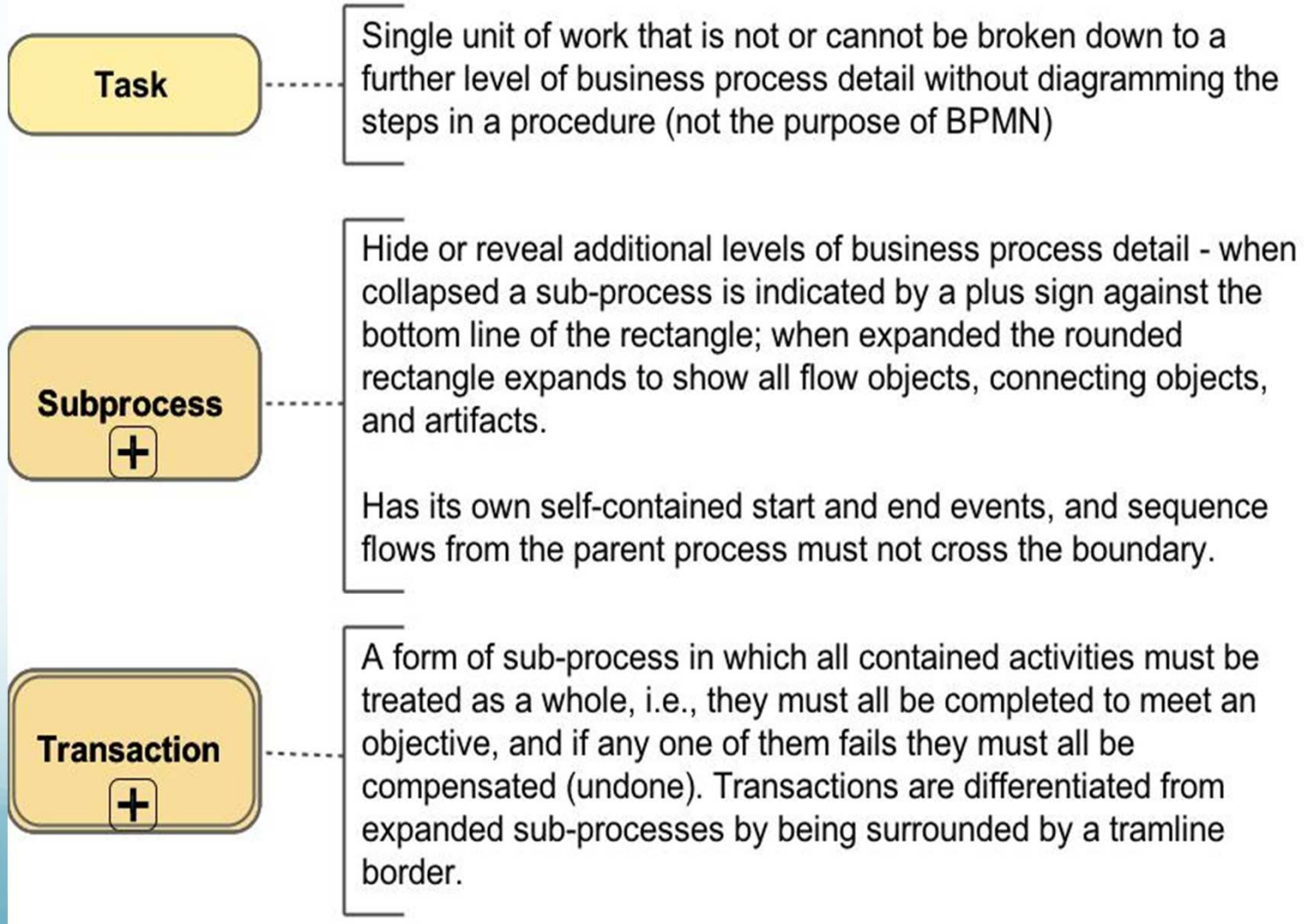
Process Symbols

Activities

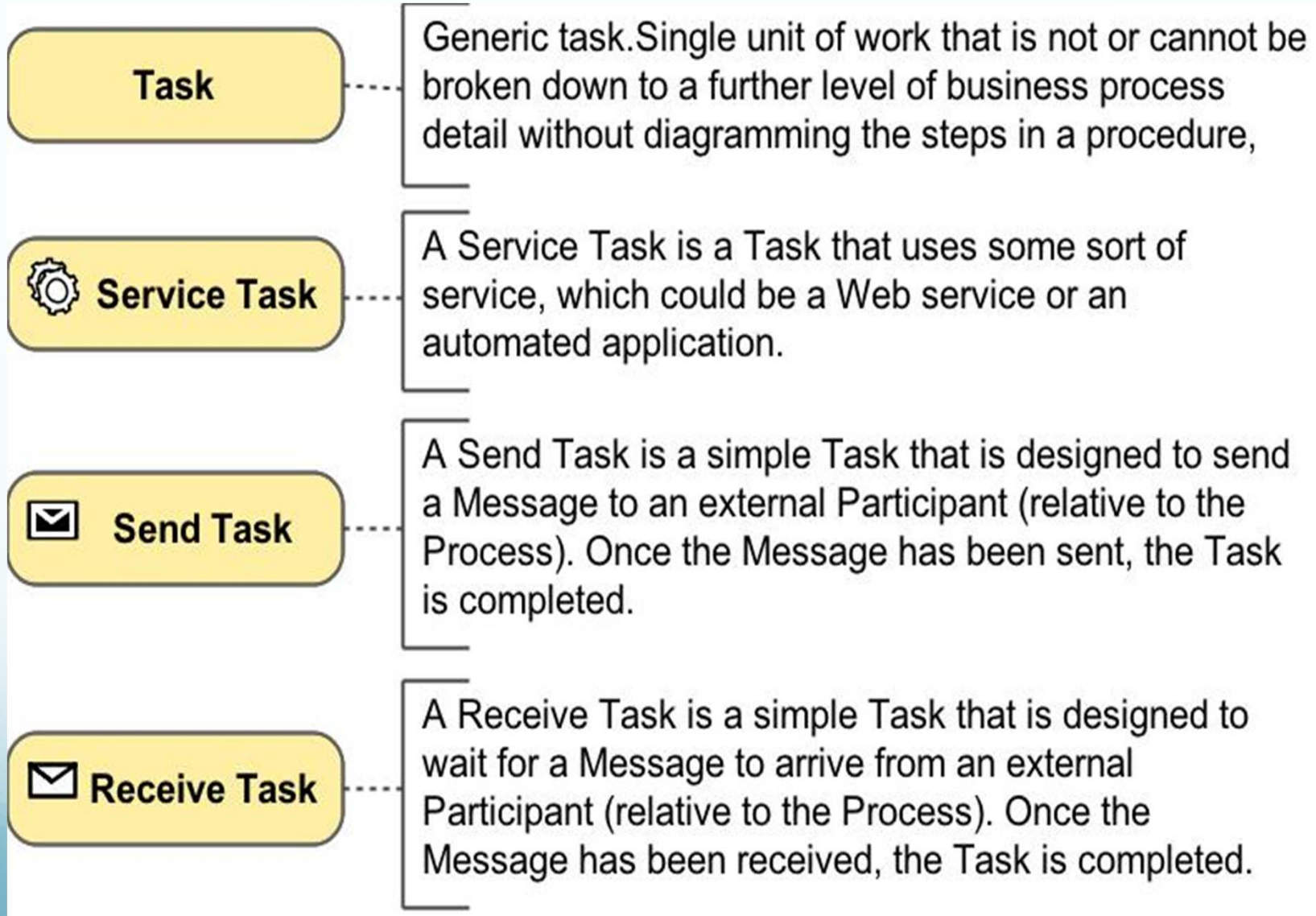
- Work that is performed within a Business Process.
- Activity can be atomic or non-atomic (compound)
- High-level, so does not describe the activity detail (not the job of BPMN)
- Three types: Task, Sub-process, and Transaction

Activiy Symbols

An Activity is work that is performed within a Business Process. An Activity can be atomic or non-atomic (compound).



Task Symbols (1 of 2)



Task Symbols (2 of 2)

A User Task is a typical “workflow” Task where a human performer performs the Task with the assistance of a software application and is scheduled through a task list manager of some sort.

A Manual Task is a Task that is expected to be performed without the aid of any business process execution engine or any application. An example of this could be a telephone technician installing a telephone at a customer location.

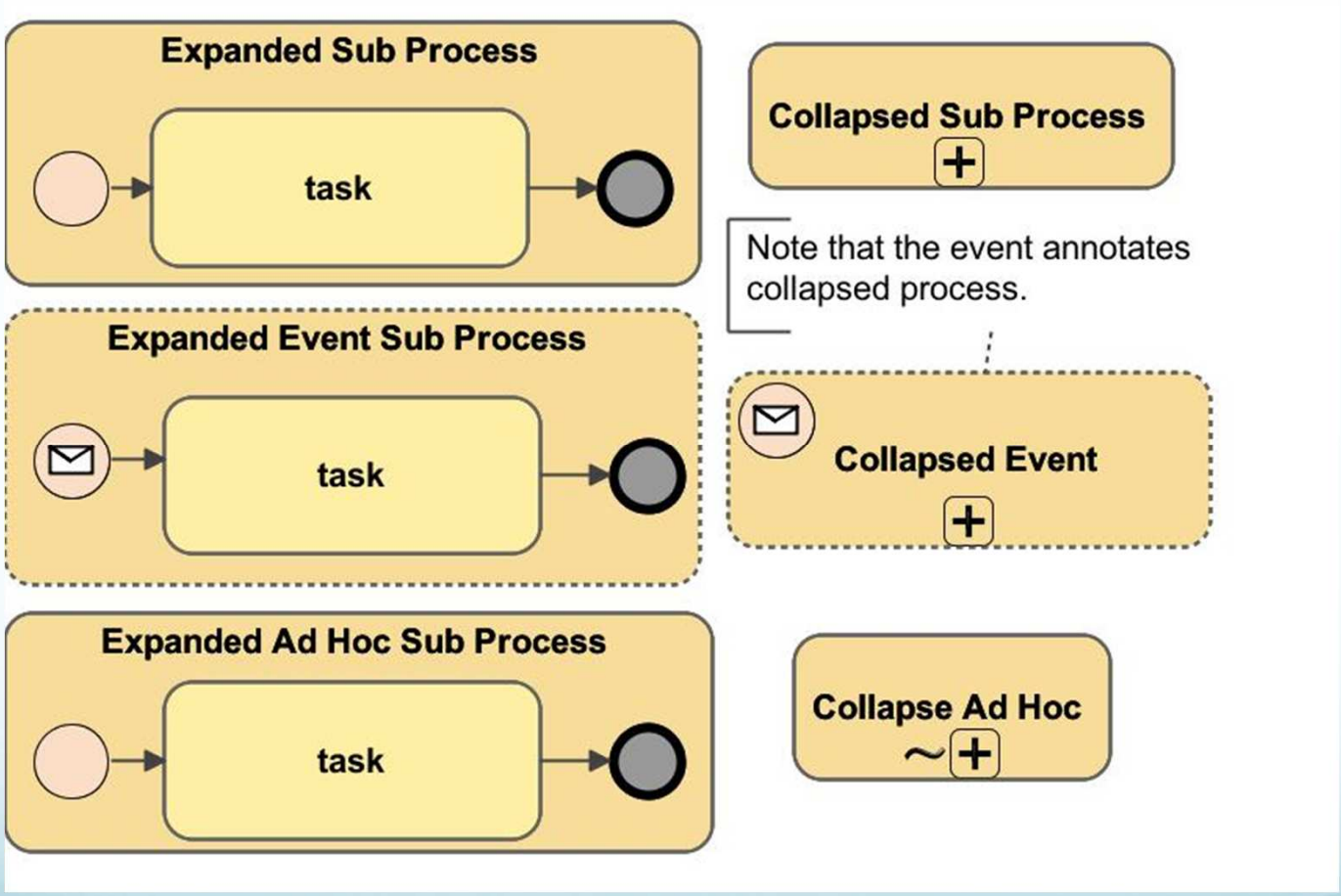
A Business Rule Task provides a mechanism for the Process to provide input to a Business Rules Engine and to get the output of calculations that the Business Rules Engine might provide. The InputOutputSpecification of the Task will allow the Process to send data to and receive data from the Business Rules Engine.

A Script Task is executed by a business process engine. The modeler or implementer defines a script in a language that the engine can interpret. When the Task is ready to start, the engine will execute the script. When the script is completed, the Task will also be completed.

What are Sub Processes?

- Is in the context of the process and can access the contextual data.
- Can be expanded or collapsed to show detail of the sub-process or to hide the detail.
- Sub process MUST define an internal process with a start and end event.
- A sub process is only reusable within the parent process (i.e. it is not reusable in the overall design).

Sub Process Symbols



Gateways

- Gateways are used to control how Sequence Flows interact as they converge and diverge within a Process.
- Capable of consuming or generating additional tokens.
- Define decisions/branching (exclusive, inclusive, and complex), merging, forking, and joining.

Gateway Symbols

Gateways are used to control how Sequence Flows interact as they converge and diverge within a Process.

Exclusive

A diverging Exclusive Gateway (Decision) is used to create alternative paths within a Process flow. This is basically the “diversion point in the road” for a Process. For a given instance of the Process, only one of the paths can be taken.

Inclusive

Inclusive Gateway (Inclusive Decision) can be used to create alternative but also parallel paths within a Process flow. The true evaluation of one condition Expression does not exclude the evaluation of other condition Expressions. All Sequence Flows with a true evaluation will be traversed by a token.

Complex

The Complex Gateway can be used to model complex synchronization behavior. An Expression activationCondition is used to describe the precise behavior.

Event Based

The Event-Based Gateway represents a branching point in the Process where the alternative paths that follow the Gateway are based on Events that occur, rather than the evaluation of Expressions using Process data (as with an Exclusive or Inclusive Gateway). A specific Event, usually the receipt of a Message, determines the path that will be taken.

Parallel

A Parallel Gateway is used to synchronize (combine) parallel flows and to create parallel flows.

About Data Symbols

- Data Objects provide information about what Activities require and/or what they produce
- Represent a singular object or a collection of objects
- Data Input and Data Output provide the same information for Processes

Data

Data Object

Primary construct for modeling data within the Process flow. DataObject has a well-defined lifecycle, with resulting access constraints.

Data Store

Provides a mechanism for Activities to retrieve or update stored information that will persist beyond the scope of the Process.

Data Input

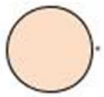
Data Input is a declaration that a particular kind of data will be used as input of the InputOutputSpecification.

Data Output

Data Output is a declaration that a particular kind of data can be produced as output of the InputOutputSpecification.

Event Symbols Types

An Event is something that “happens” during the course of a Process or a Choreography These Events affect the flow of the model and usually have a cause (Trigger) or an impact (Result). Events are circles with open centers to allow internal markers to differentiate different Triggers or Results. There are three types of Events, based on when they affect the flow: Start, Intermediate, and End.

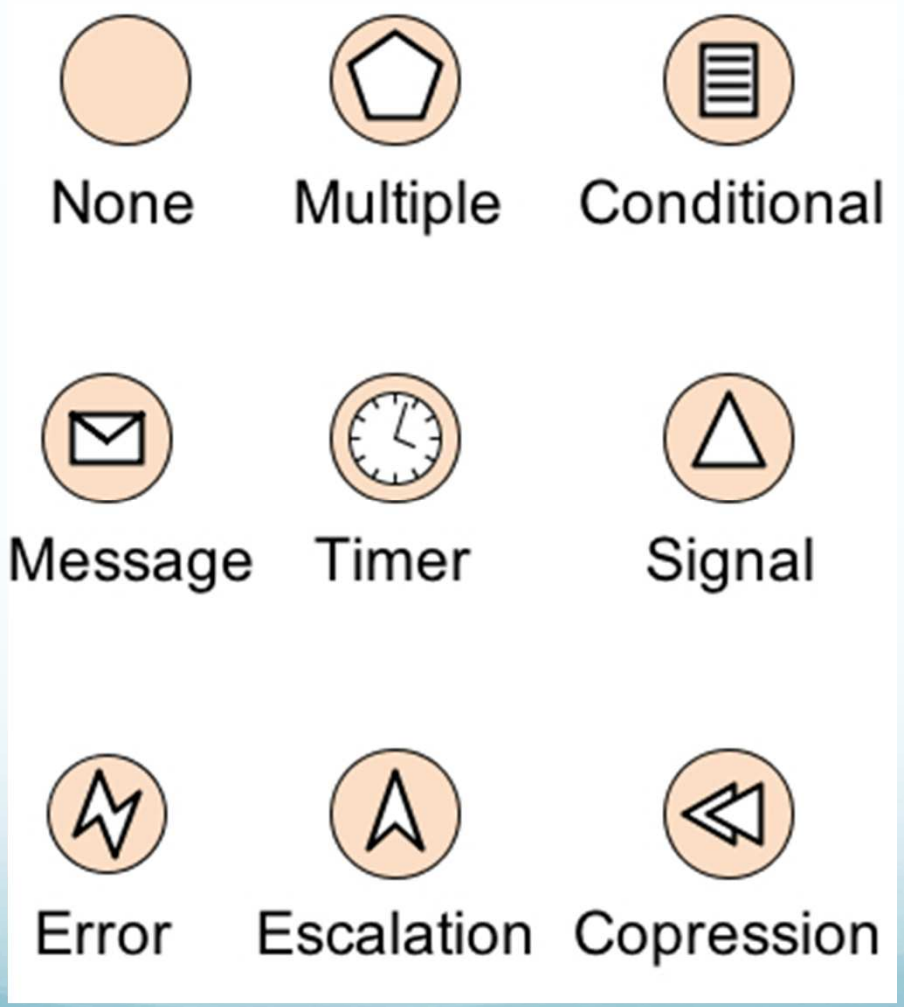


Start Event indicates where a particular Process or Choreography will start.

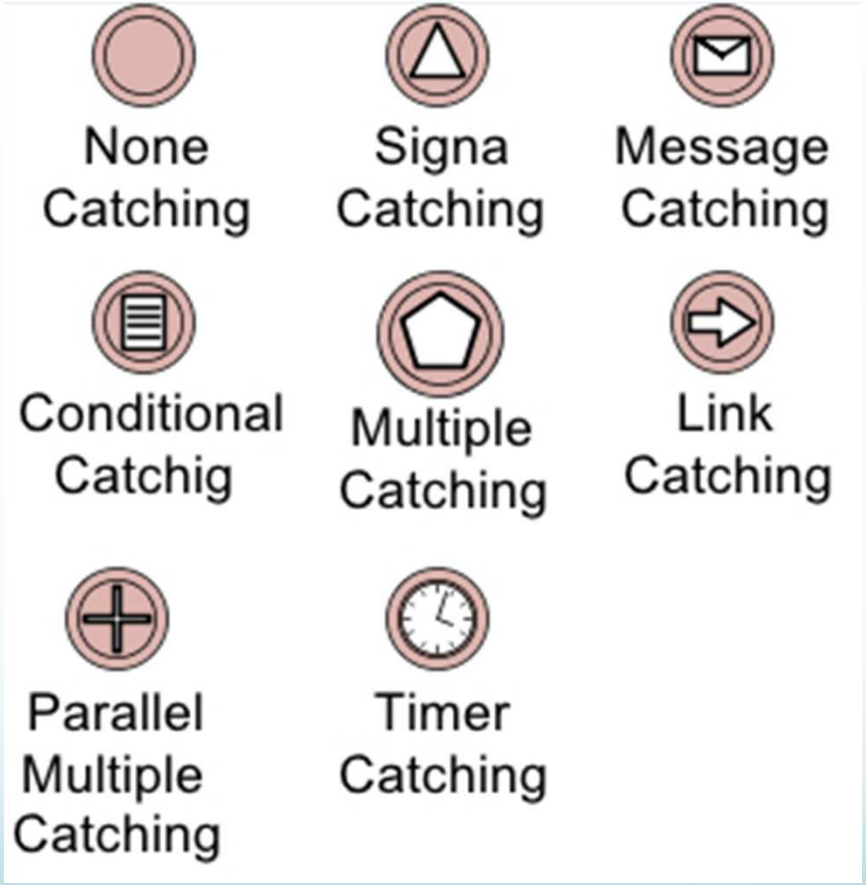
Intermediate Events occur between a Start Event and an End Event. They will affect the flow of the Process or Choreography, but will not start or (directly) terminate the Process.

End Event indicates where a Process or Choreography will end.

Start Events



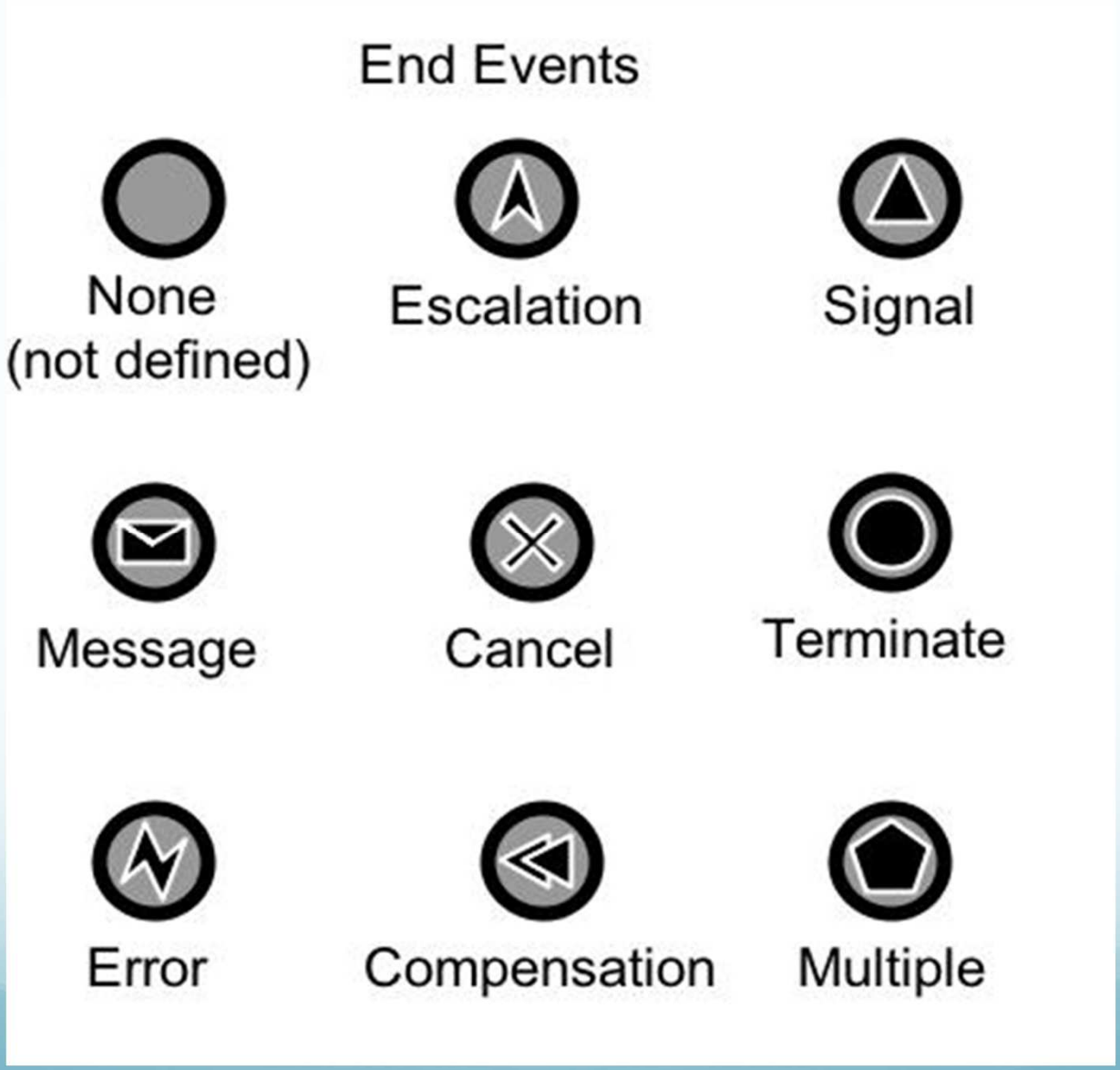
Intermediate Events



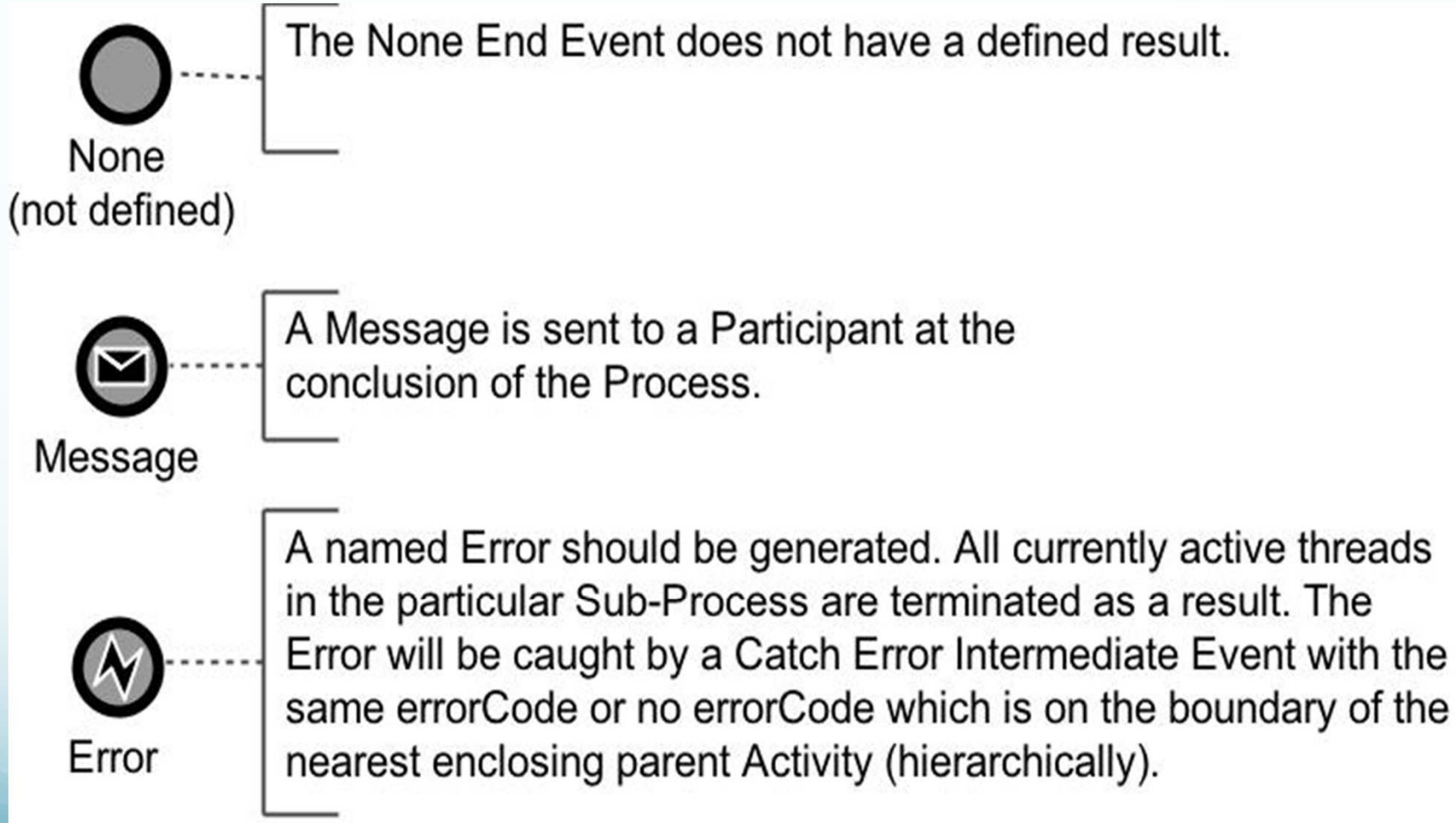
End Events

- End Event indicates where a Process will end.
- In terms of Sequence Flows, the End Event ends the flow of the Process, and thus, will not have any outgoing Sequence Flows.
- No Sequence Flow can connect from an End Event.
- Depending on the type, other rules are enforced (like error handling and/or how the process is terminated).

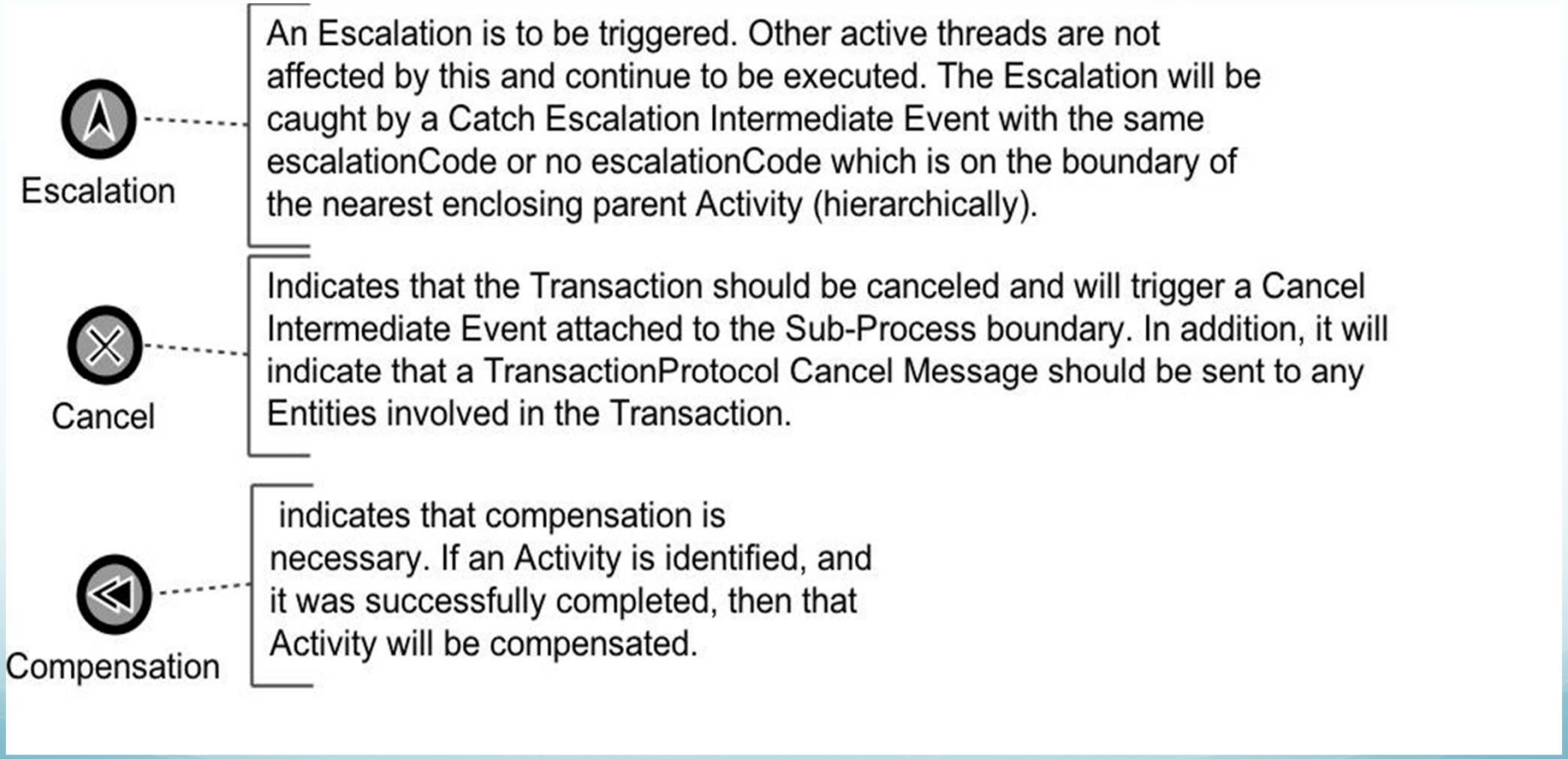
End Event Symbols



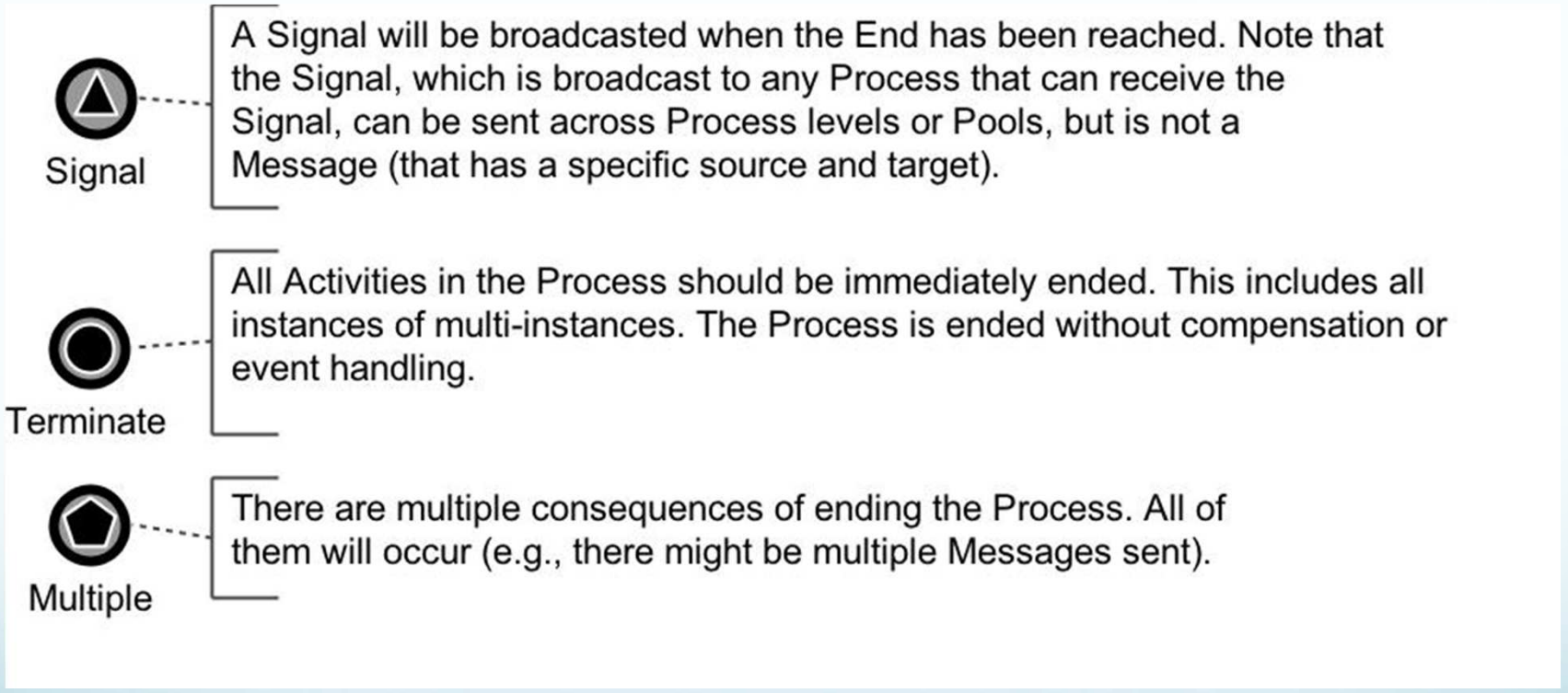
End Events (1 of 3)



End Events (2 of 3)



End Events (3 of 3)



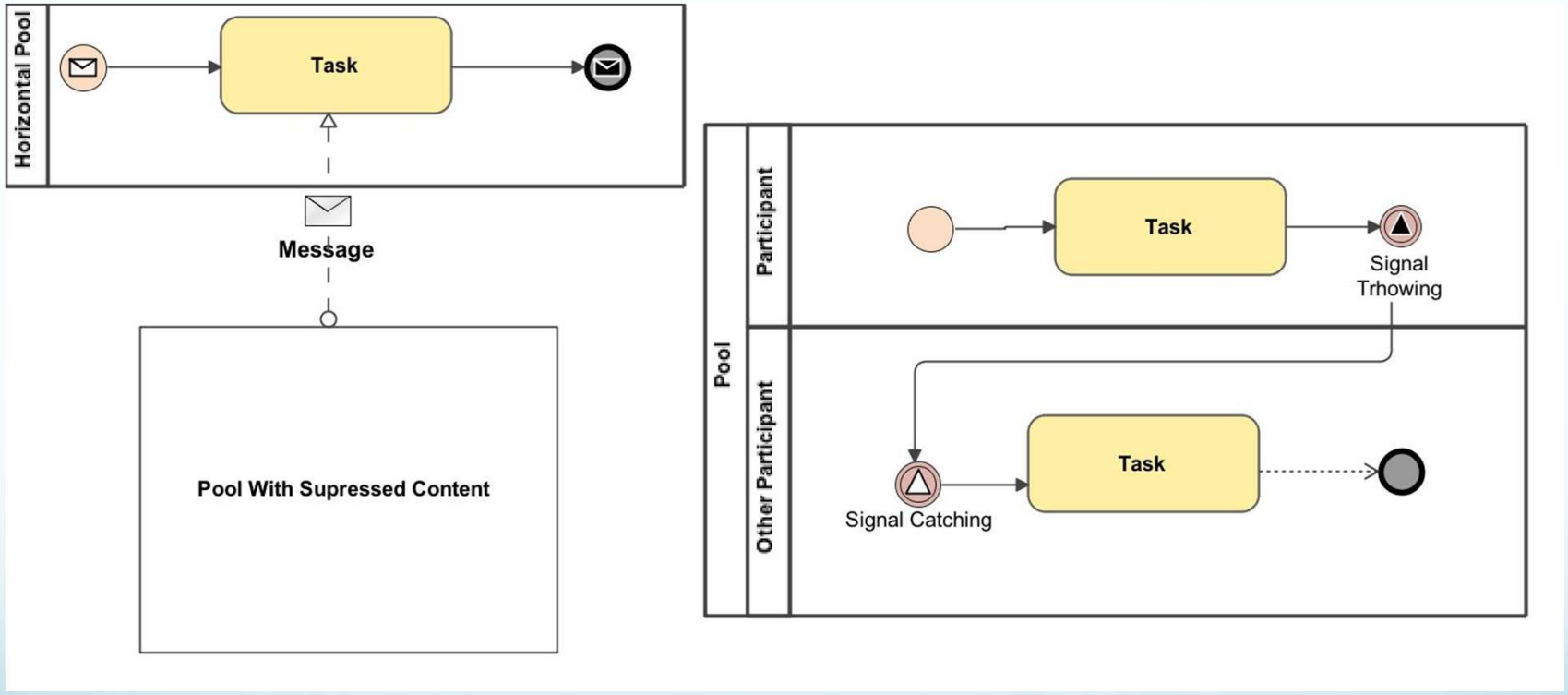
Pools

- A Pool is the graphical representation of a Participant in a Collaboration.
- It also acts as a “swimlane” and a graphical container for partitioning a set of Activities from other Pools
- Usually in the context of B2B situations
- Pool MAY have internal details, in the form of the Process that will be executed
- Pool MAY have no internal details, i.e., it can be a "black box."

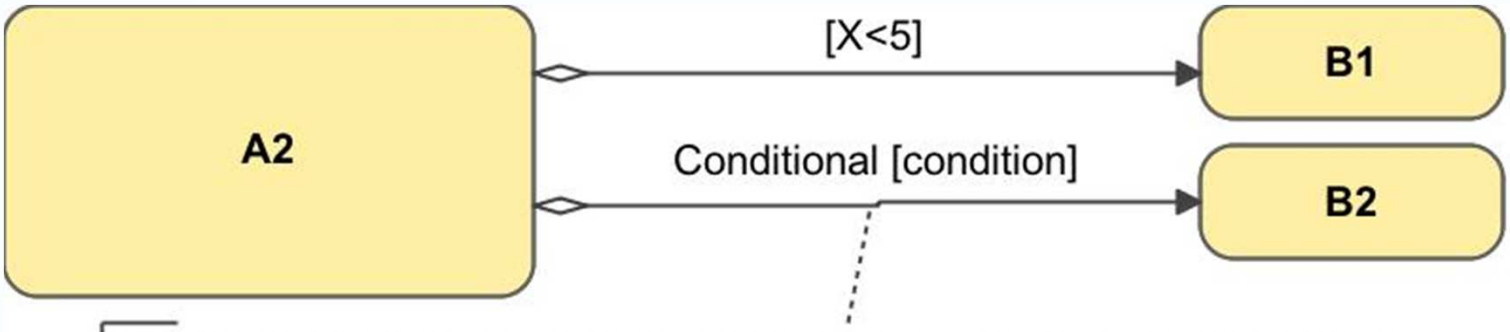
Lanes

- Lane (Swimlane) is a sub-partition within a Process
- Extend the entire length of the Process
- Lanes are used to organize and categorize Activities

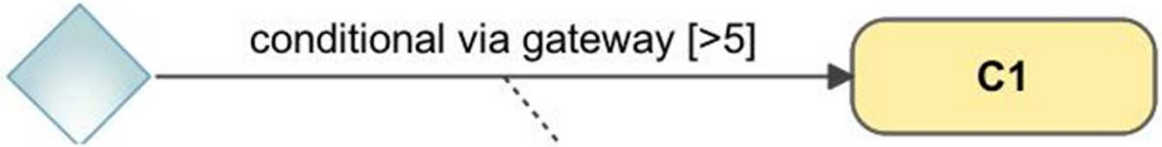
Pool and Lanes



CONDITIONAL FLOW



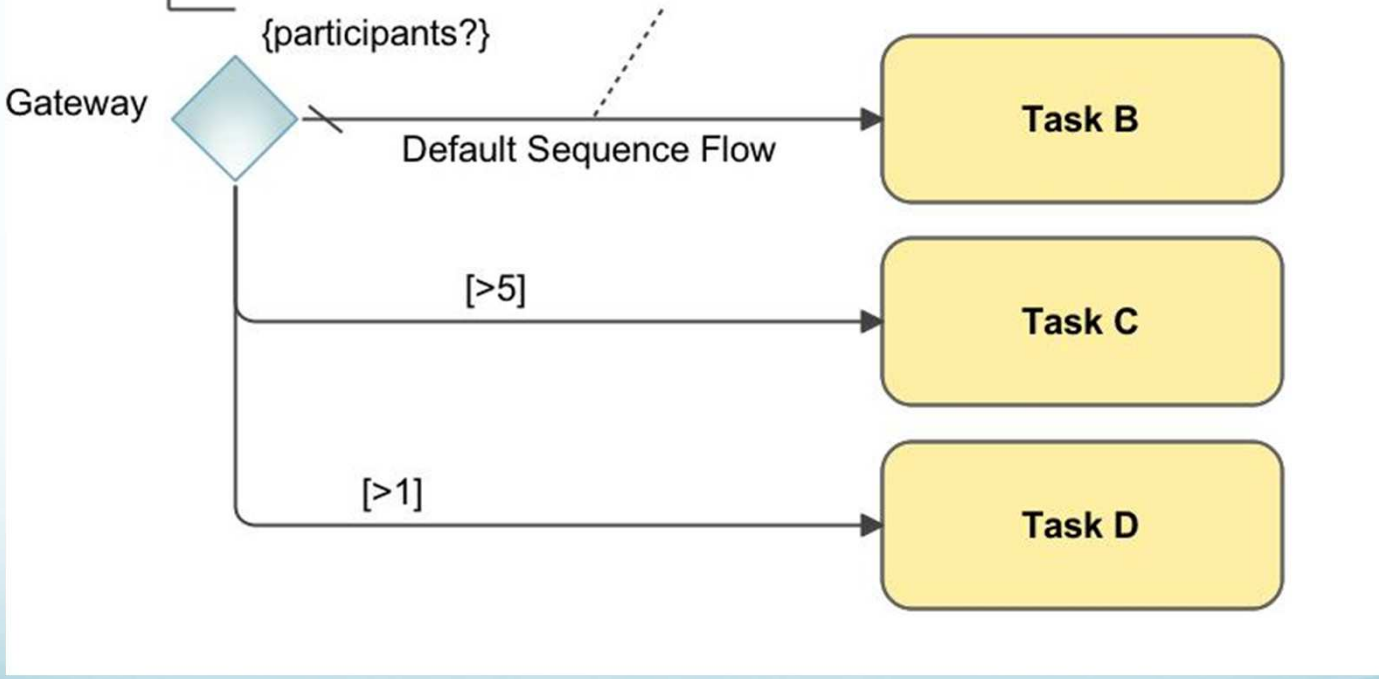
A Sequence Flow can have a condition Expression that are evaluated at runtime to determine whether or not the Sequence Flow will be traversed. If the conditional flow is outgoing from an Activity, then the Sequence Flow will have a mini- diamond at the beginning of the connector.



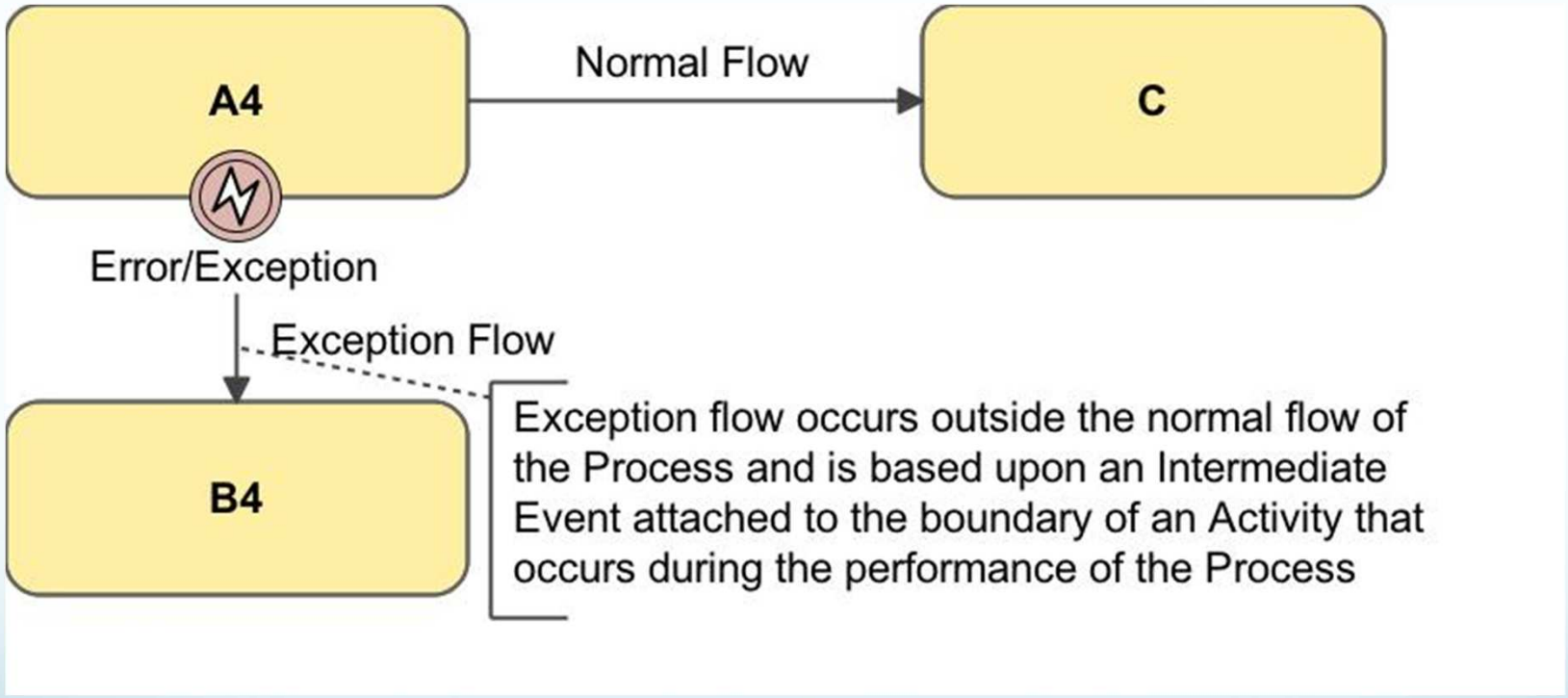
If the conditional flow is outgoing from a Gateway, then the line will not have a mini-diamond.

Default Sequence Flow

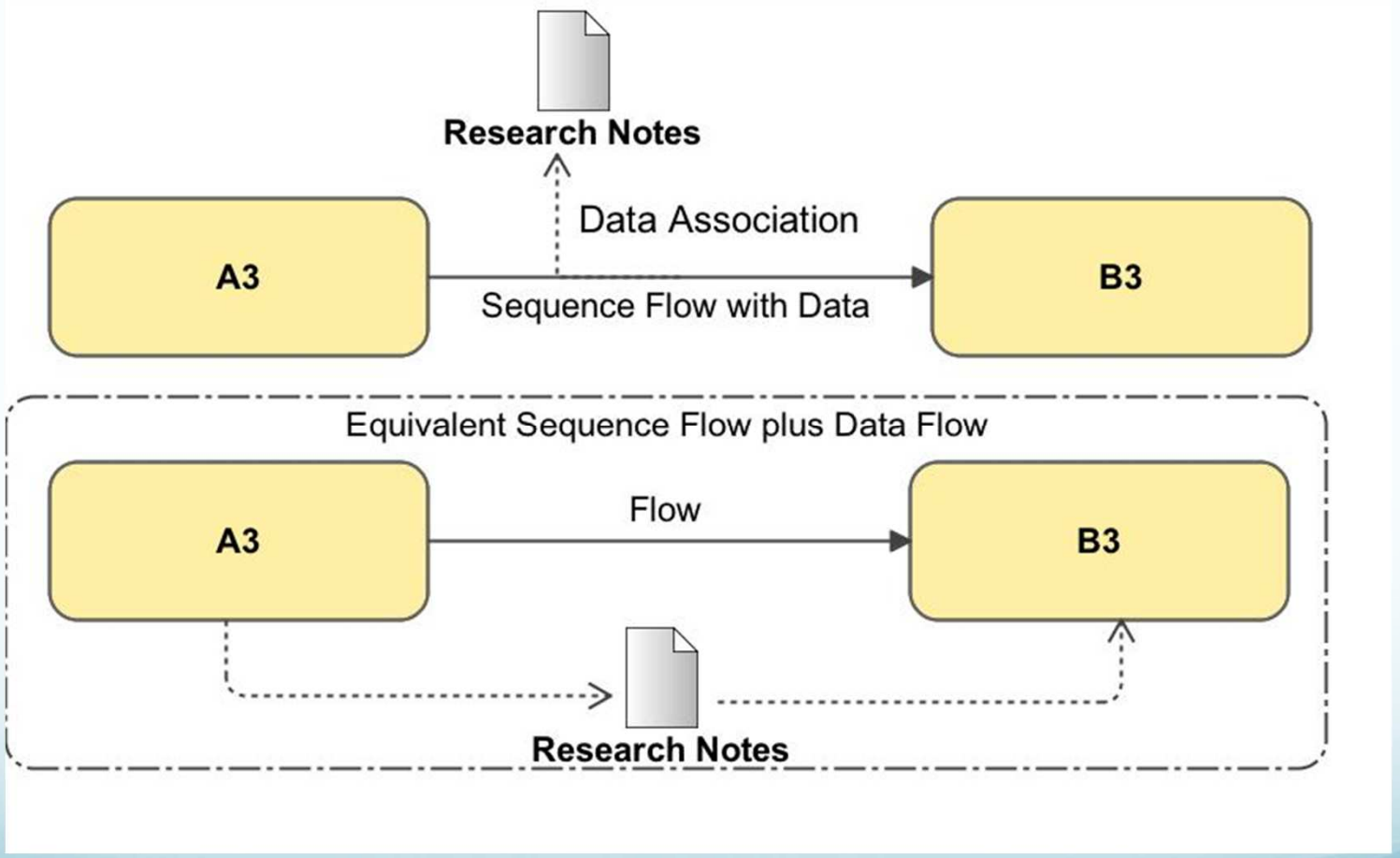
For Data-Based Exclusive Gateways or Inclusive Gateways, one type of flow is the Default condition flow (see page 97). This flow will be used only if all the other outgoing conditional flow is not true at runtime. These Sequence Flows will have a diagonal slash will be added to the beginning of the connector (see the figure to the right).



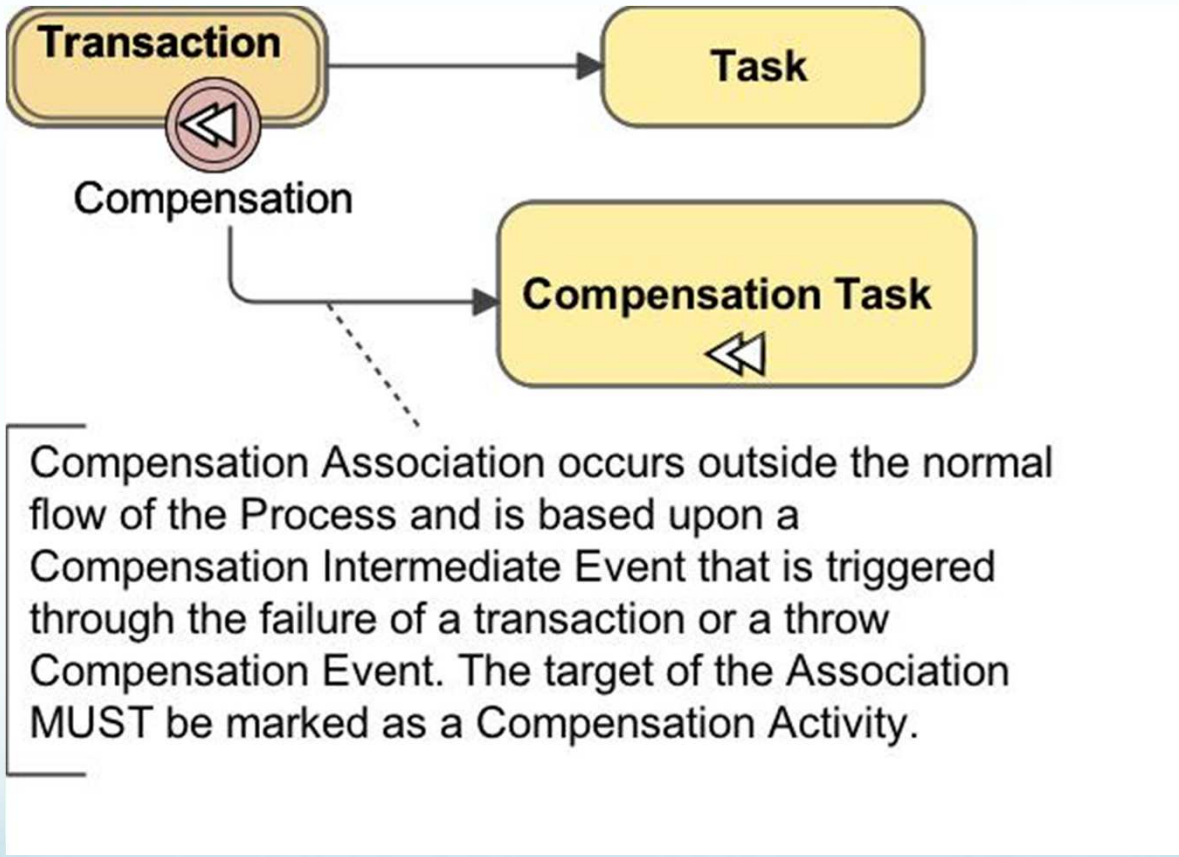
Exception Flow



Data Flow


Research Notes
Data Association
A3
B3
Sequence Flow with Data
Equivalent Sequence Flow plus Data Flow
A3
Flow
B3
Research Notes

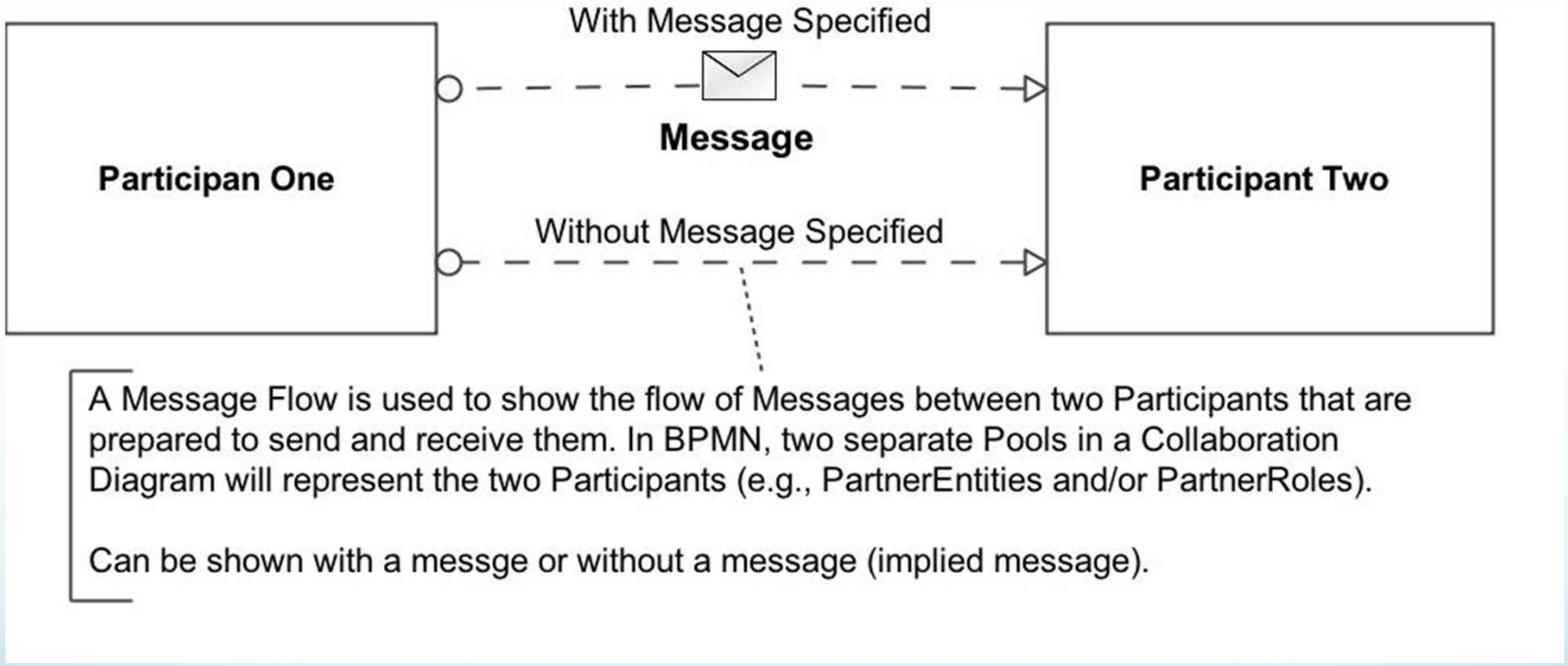
Compensation Flow



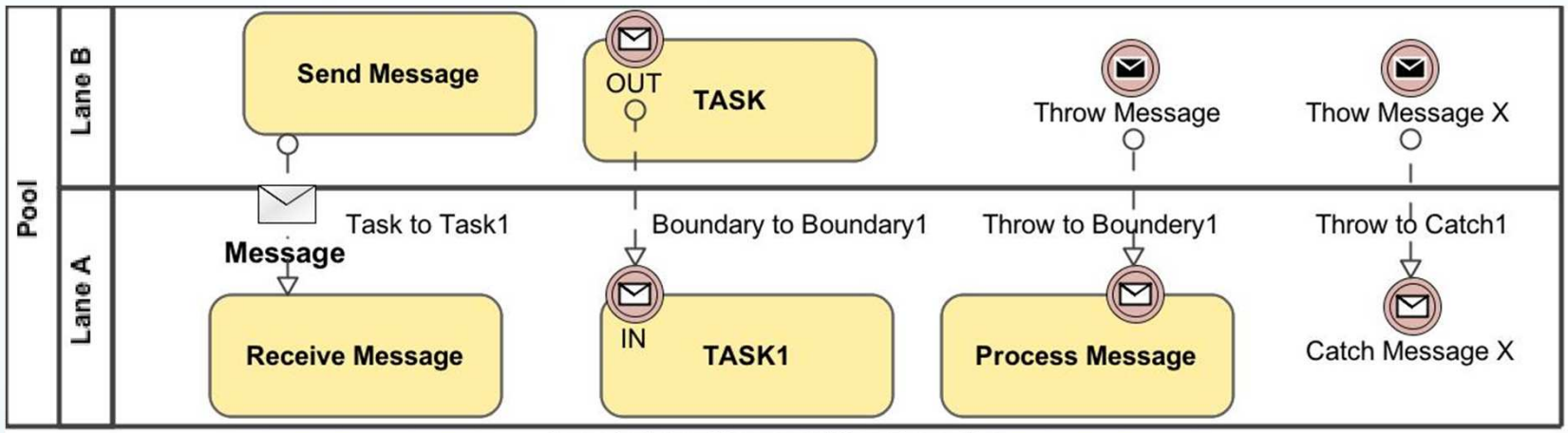
Message Flows

- Flow of Messages between two Participants that are prepared to send and receive them.
- A Message Flow MUST connect two separate Pools.
- They connect either to the Pool boundary or to Flow Objects within the Pool boundary.
- They MUST NOT connect two objects within the same Pool.

Message Flows



Message Flow Between Lanes

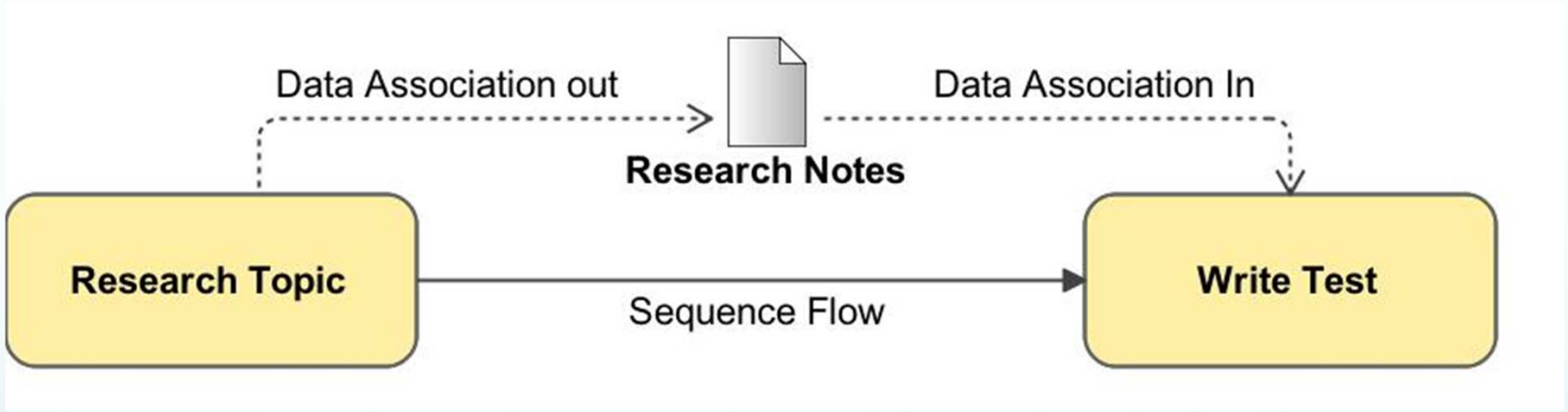


Lane to Lane Message Flow Examples

Data Associations

- Data Associations are used to move data between Data Objects, Properties, and inputs and outputs of Activities, Processes, and GlobalTasks.
- Tokens do not flow along a Data Association, and as a result they have no direct effect on the flow of the Process.
- Used for retrieving data from Data Objects or Process Data Inputs to fill the Activities inputs and push the output values from the execution of the Activity back into Data Objects or Process Data Outputs.

Data Association Example



INCOMPETENCE

THERE ARE THINGS WE KNOW, DONT KNOW AND THE UNKOWN.

INCOMPETENCE IS FROM THE THINGS WE DON'T KNOW WE DONT KNOW.

Thank You

Daniel Brookshier
DanielB@NoMagic.com