BPMN – IV
Event Oriented Modeling

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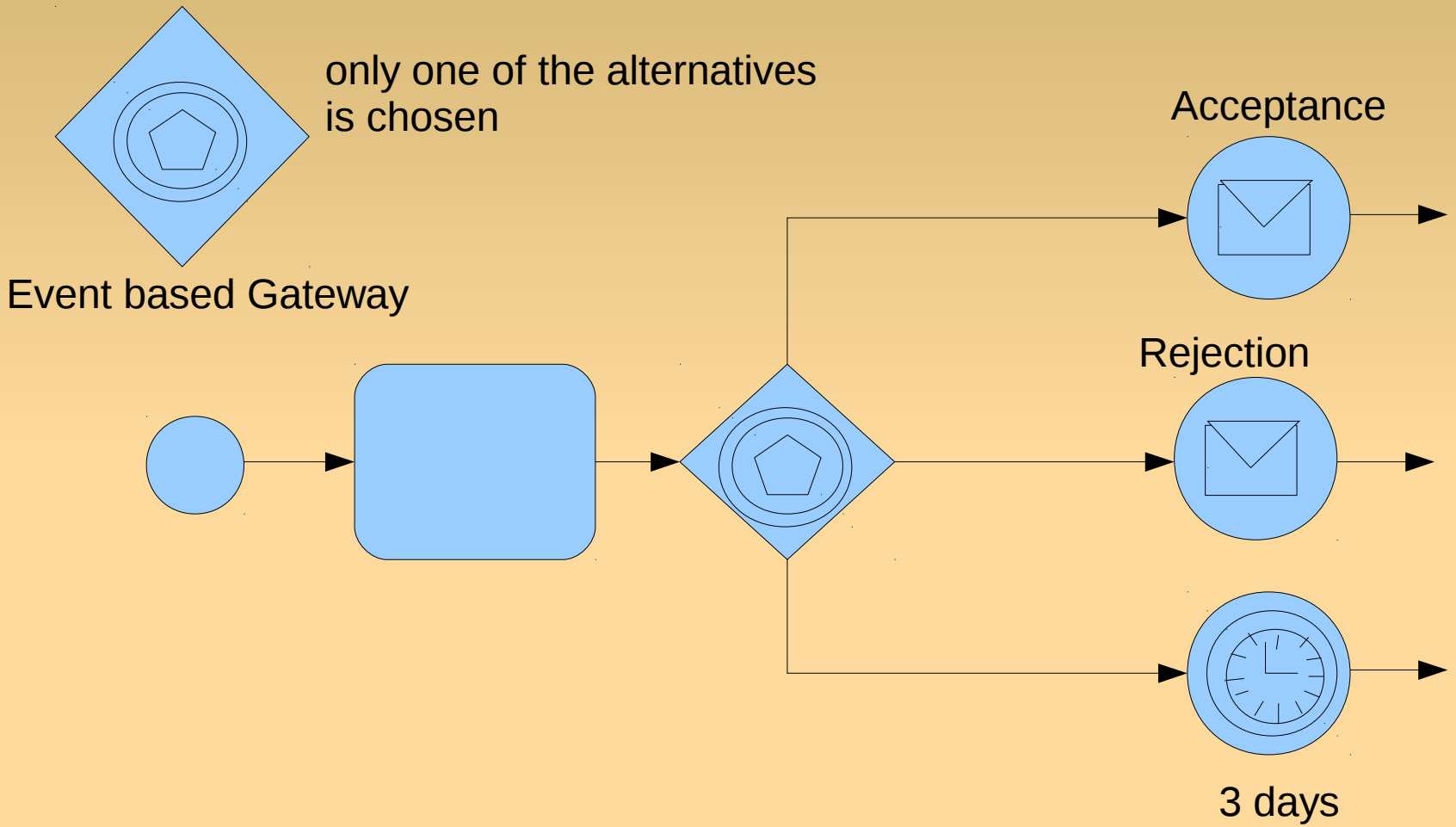
Events

- Something that happens during flow
- e.g. start of an activity, end of an activity, a message that arrives, change in data state
- Event driven processes can be described
- **Start events** indicate where a process will start
- **End events** indicate where a process will end
- **Intermediate events** indicate something happening during a process execution

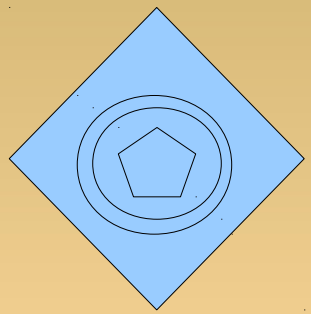
Events

- **Catching Events**
  - Some events catch a trigger
  - all start events, some intermediate events
- **Throwing Events**
  - Some events throw a result
  - all end events, some intermediate events throw a result
  - a thrown result may be caught by another event
    - trigger carries the information from throwing scope into catching scope

Event based Gateways: Use of intermediate events

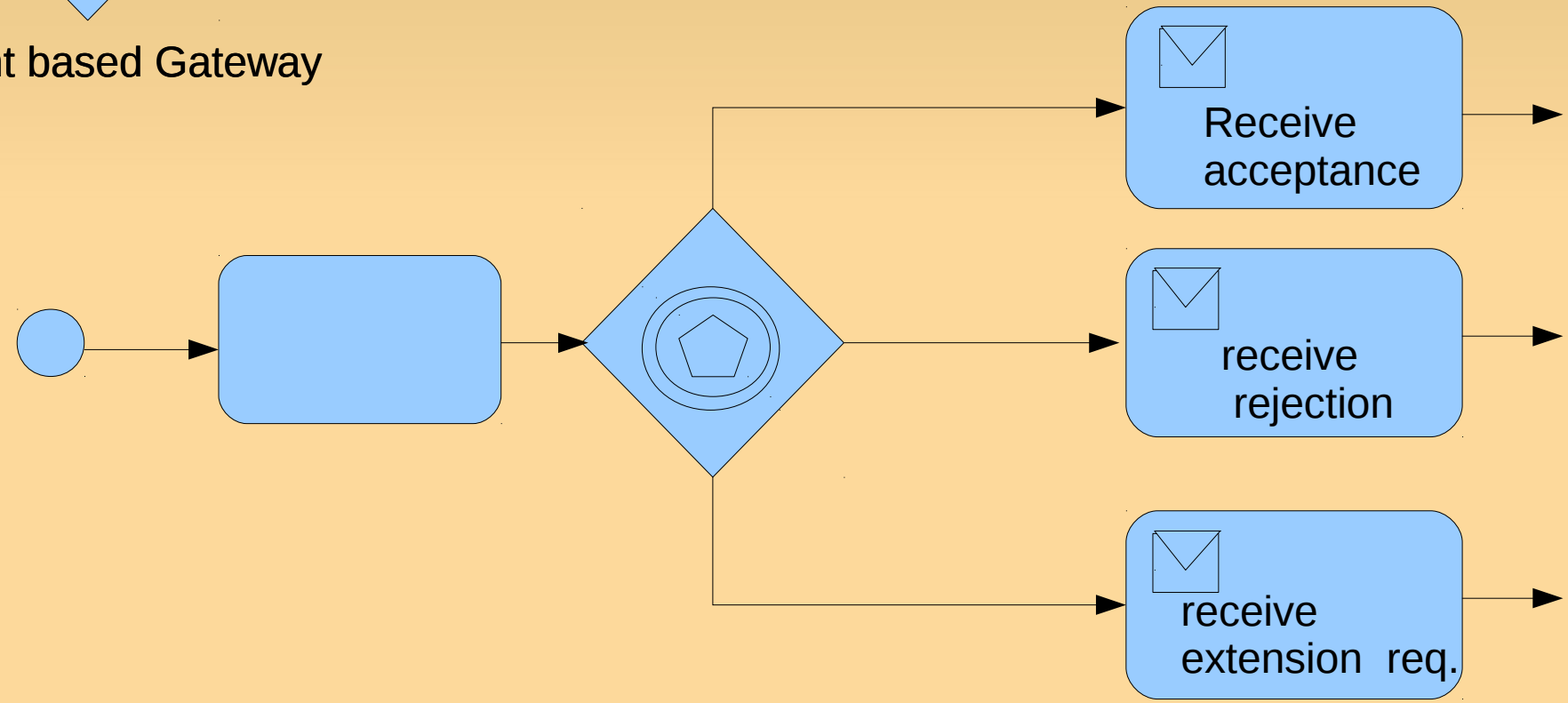


Event based Gateways: Use of Receive tasks



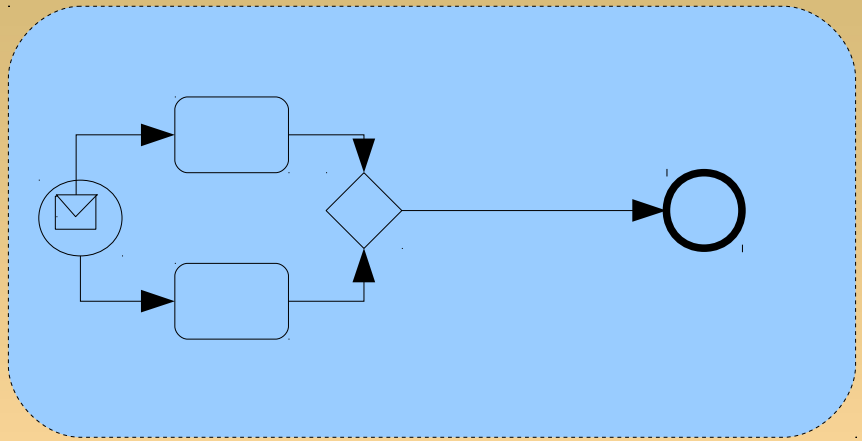
only one of the alternatives is chosen

Event based Gateway

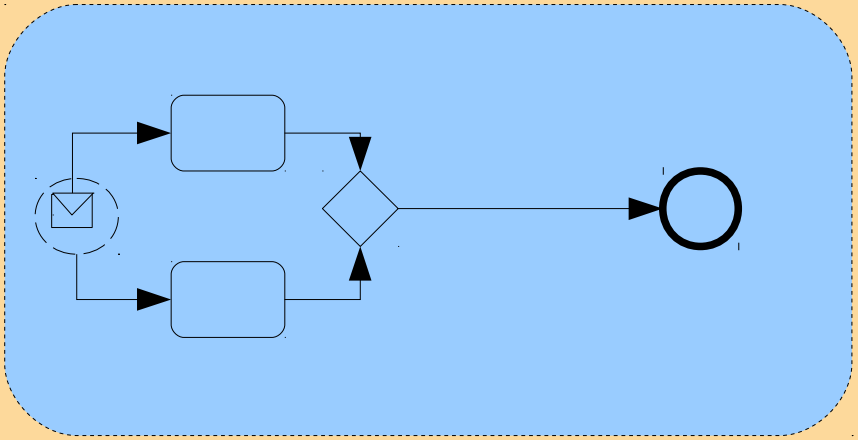


Event subprocesses

- Interrupting subprocess
  - parent process is interrupted
  - an interrupting start event is used
  - boundary of the event is solid

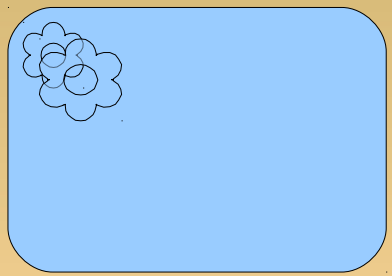


- Non-interrupting subprocesses
  - parent process continues after the completion of the subprocess
  - a non-interrupting start event is used
  - boundary of the event is dashed

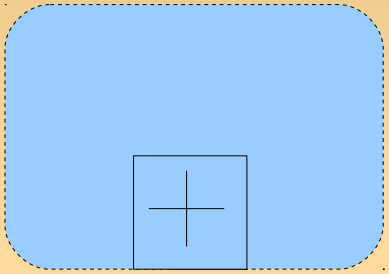


More Markers

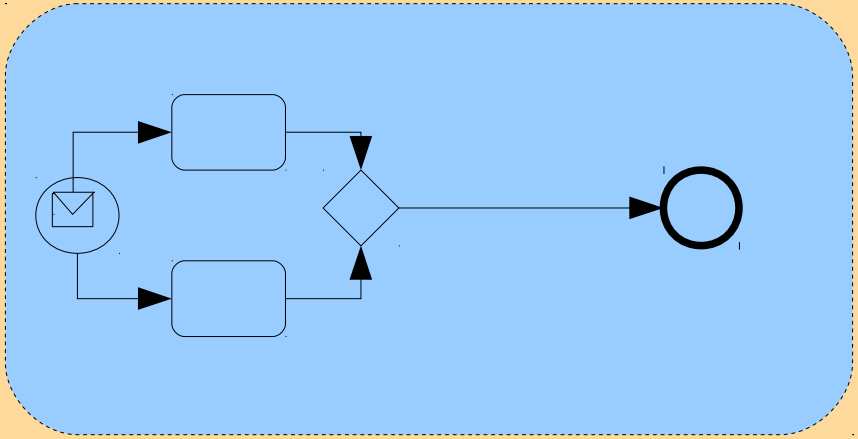
- Service



- Event subprocesses

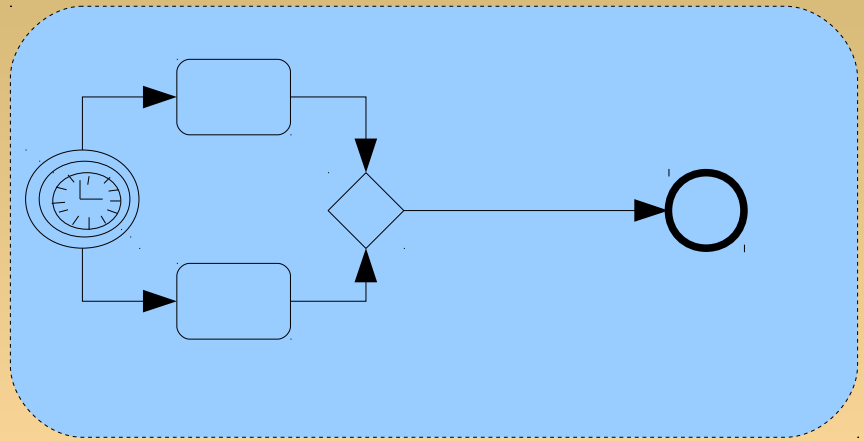


- Event subprocess expanded

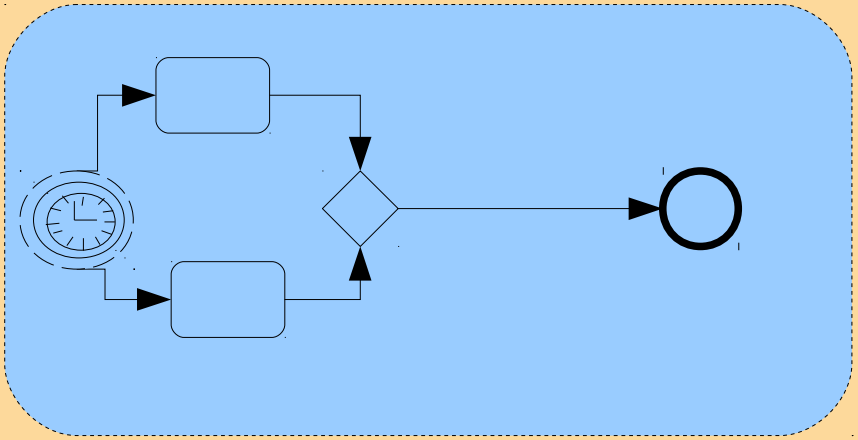


Use of various types of start events for event sub-processes

- Interrupting timer start event



- Non-interrupting timer start event



Use of various types of start events for event sub-processes

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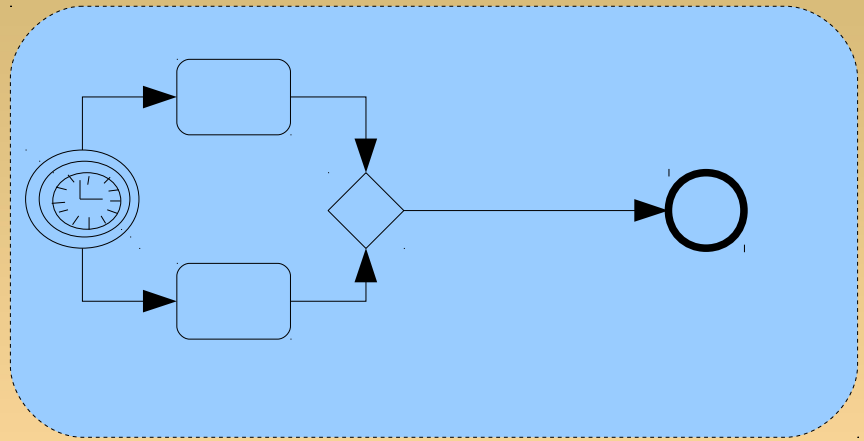
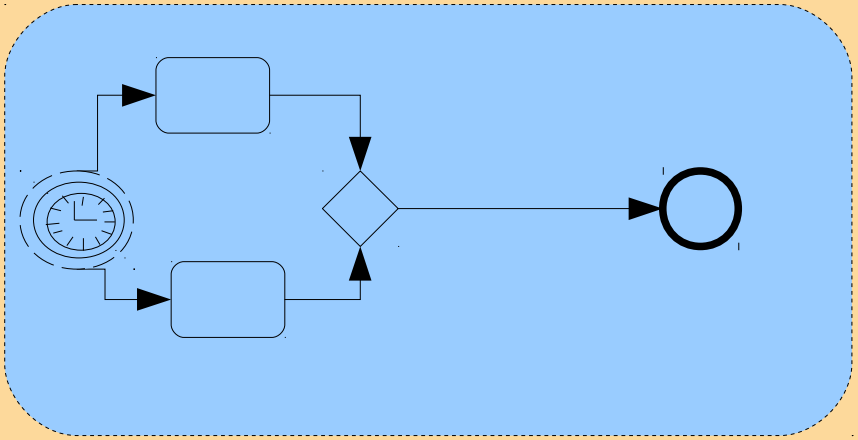


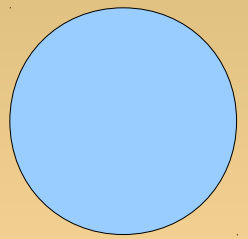
- Non-interrupting timer start event



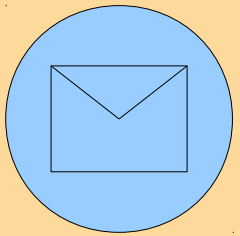
Start Events

Start Events for top level processes

- None Event
  - does not have a defined trigger
  - only such a process can be called from a call activity
  - processes using other types of start event cannot be called by call activities

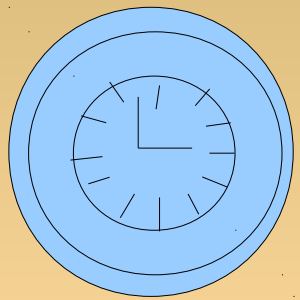


- Message Event
  - arrives from a participant and triggers the start of a process

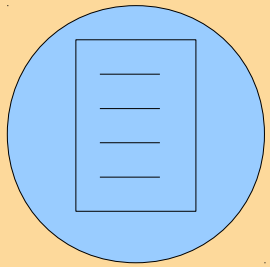


Start Events for top level processes

- Timer Event
  - a specific time, or period can be set to trigger the start of a process

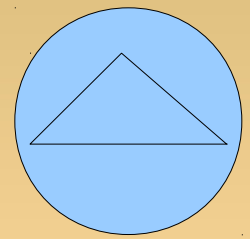


- Conditional
  - based on conditions such as “arrival rate crosses 120/min threshold”
  - to trigger the event once again, the condition must become false and then true again.
  - it cannot use instance context variables since process instance is not created yet
  - can refer to static attributes in processes, or states of environment entities (how?: not defined in the standard)

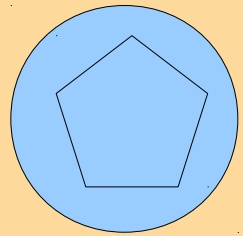


Start Events for top level processes

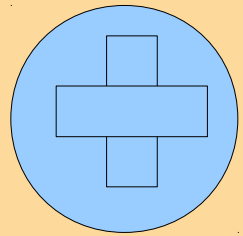
- Signal Event
  - arrival of a signal event that is broadcast from another process
  - signal is not a message
  - multiple processes can use the same signal as start event



- *Multiple* Start Event
  - multiple ways of triggering the Process
  - only one is required

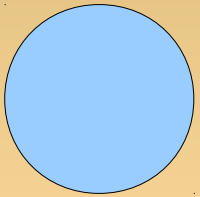


- Multiple Parallel Start Event
  - multiple events are required to trigger the start
  - all events must be triggered



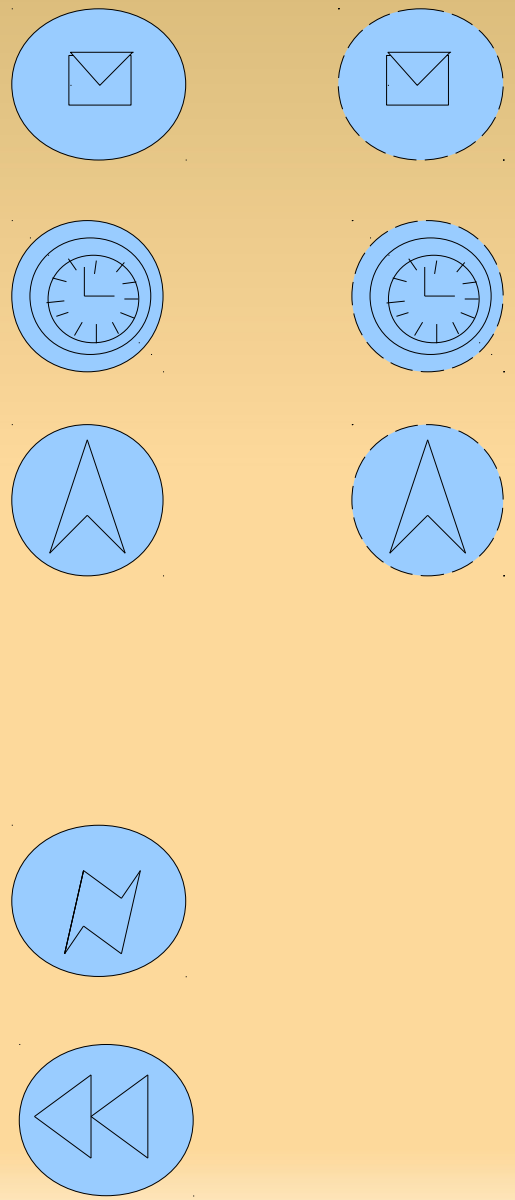
Start Events for sub-processes

- only one type of start event can be used for sub-processes, which is the None Event.
- this is the case for both embedded and called sub-processes
- even if a sub-process has other types of start event along with a none event, the other events will not trigger the subprocess (they may however trigger it as a top level process)



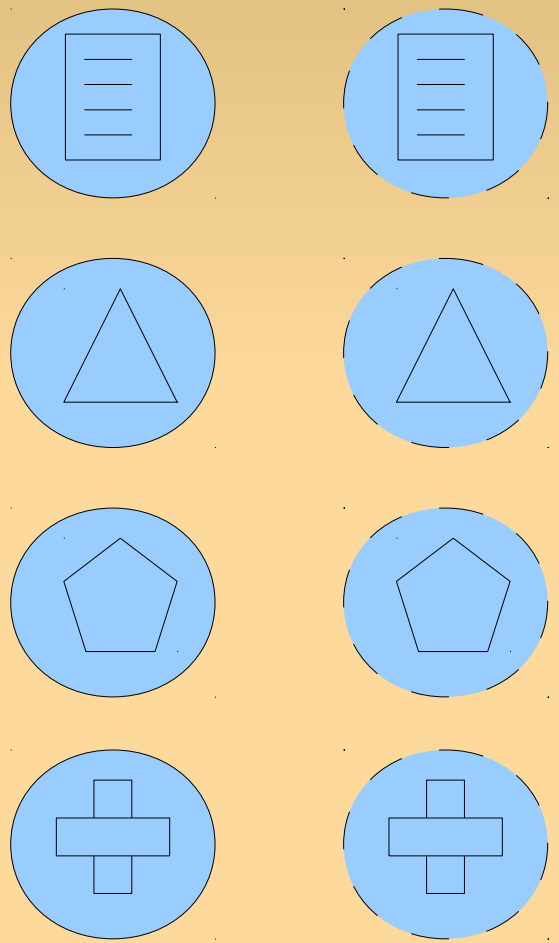
back to event subprocesses..
Start events for event sub-processes

- interrupting and non-interrupting Message event
- interrupting and non-interrupting timer event
- interrupting and non-interrupting escalation event
  - escalation sub-process expedites an activity for which an execution constraint (e.g. deadline) is not satisfied.
- Error start event: interrupting
- compensation start event: interrupting



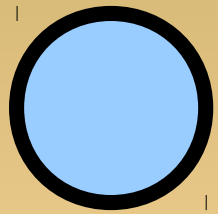
Start events for event subprocesses..

- interrupting and non-interrupting conditional event
- interrupting and non-interrupting signal event
- interrupting and non-interrupting multiple event
- interrupting and non-interrupting parallel multiple event



End Events

End Events: they generate end event results



- none
  - no defined result

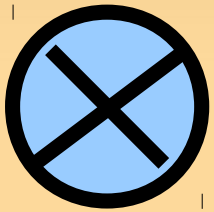
- message
  - message sent to a participant at the end of flow
  - show the participant through a connection

- error
  - named error is generated
  - all active threads in the subprocess are terminated
  - error gets caught by a catch error intermediate event (if it is specified) on the boundary of the nearest enclosing parent activity of this subprocess

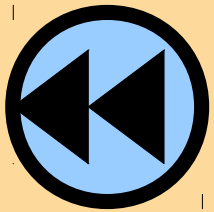
End Events: they generate end event results

- escalation
  - triggers an escalation
  - other active threads continue
  - escalation event is caught by an catch escalation intermediate event on the boundary of the surrounding parent

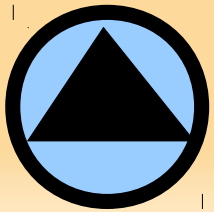
- cancel
  - used in transaction sub-processes
  - it triggers cancel intermediate event attached to the transaction boundary



- compensation
  - indicates that a comensation is necessary

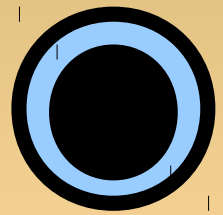


- signal
  - a signal event is broadcasted which can be received by any process that can receive the signal

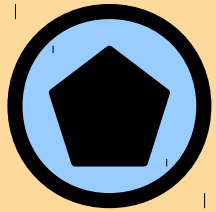


End Events: they generate end event results

- terminate
  - all activities must be ended immediately
  - no compensation etc.



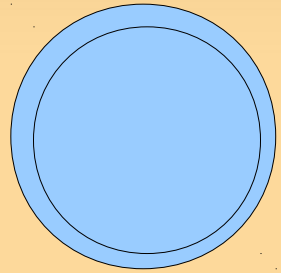
- multiple
  - means multiple consequences of ending
  - all of them will occur



Intermediate Events

Intermediate Events

- Event happens somewhere in between start and end of a process
- It does not directly end or start a process
- Purposes:
  - To show where messages are expected
  - To show where messages are sent
  - To show delays
  - Generate exceptions and disrupt normal flow
  - Compensation: place an intermediate event on the boundary of a task/subprocess, and use an outgoing flow from there



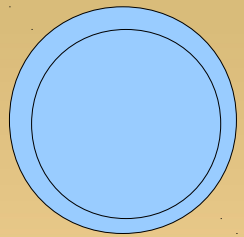
Placement of Intermediate events

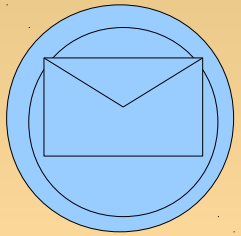
- In the flow
  - To catch event trigger
    - Token stays at event till the trigger occurs (e.g. Message recd.) and then the token moves down the outgoing sequence flow
  - To throw event trigger
    - The trigger of event immediately happens (e.g. message gets sent) and then the token moves down the outgoing sequence flow
- On the boundary
  - To catch the event trigger
- Circles are drawn using double thin line

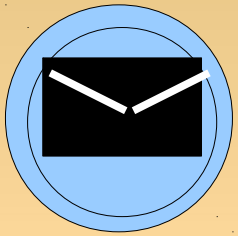
Intermediate Events in normal flow

- None
  - No specific trigger, indicates a point in flow
  - Cannot be used on boundary
- message
  - Catch, Throw messages
  - With catch, process flow continues
  - With throw, the exception handling path is followed
- error” Not used as intermediate event
- Timer Catch
  - Acts as delay
- Escalation

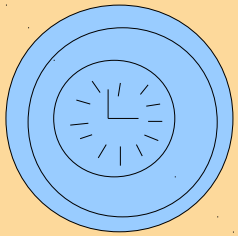
  throws an escalation

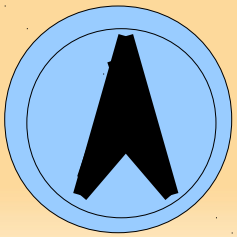






Catch throw

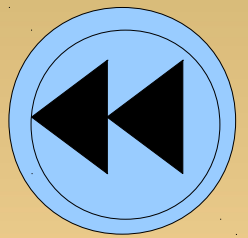




Intermediate Events in normal flow

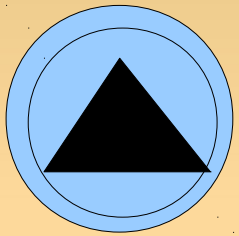
- compensation
  - Throws compensation
  - if the activity is identified, and it successfully completed, it

    will be compensated. The activity must be visible from compensation event
    - compensation intermediate event is contained in normal flow at the same level of subprocess
    - compensation intermediate event is contained in a compensation event subprocess which is contained in subprocess containing the activity.
  - if no activity is identified, all successfully completed activities visible to the compnesation event will be compensated in reverse flow direction
    - those which occur in the same subprocess as that of the compensation event
    - those that occur in the same subprocess that contains the event subprocess in which the compensation event occurs
  - to be compensated, an activity must have
    - a boundary compensation OR
    - a compensation event sub-process

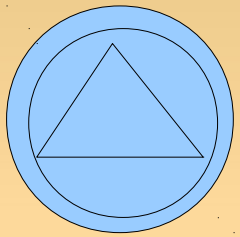


Intermediate Events in normal flow

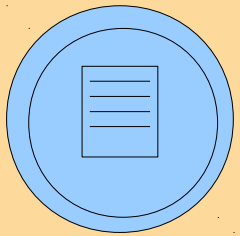
- signal
  - Communication across pools, diagrams
  - Catch and throw type
  - Received by an activity only when attached to boundary
- Conditional
  - Catch event when a condition becomes true



Throw



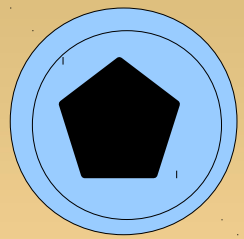
catch



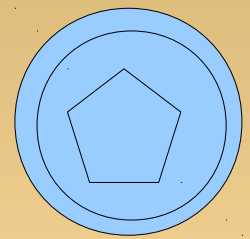
catch

Intermediate Events in normal flow

- Multiple
  - Catch and throw
  - Catch when attached to boundary
    - Only one of the assigned triggers is required
  - When used for throwing, all assigned triggers are thrown

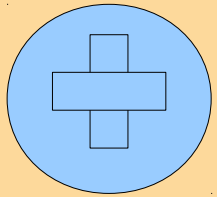


Throw



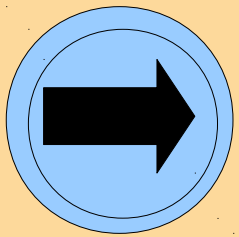
catch

- Parallel Multiple
  - It can only catch the triggers
  - All assigned triggers are required for it to trigger

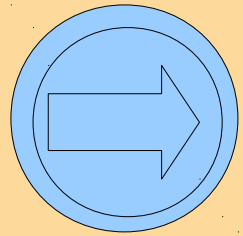


catch

- Link
  - Mechanism for connecting two sections of a process
  - Valid in normal flow only (not used on the boundary)



Throw

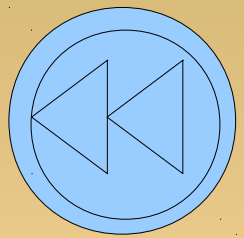


catch

Intermediate events on the boundaries

- On the boundary of an activity, an intermediate event can only catch a trigger
- Interrupting event interrupts the flow, and exception path is followed
- Non-interrupting event resumes the flow
- Both interrupting and non-interrupting
  - Message, timer, escalation, conditional, signal, multiple, parallel multiple
- Only interrupting
  - Error, cancel, compensation

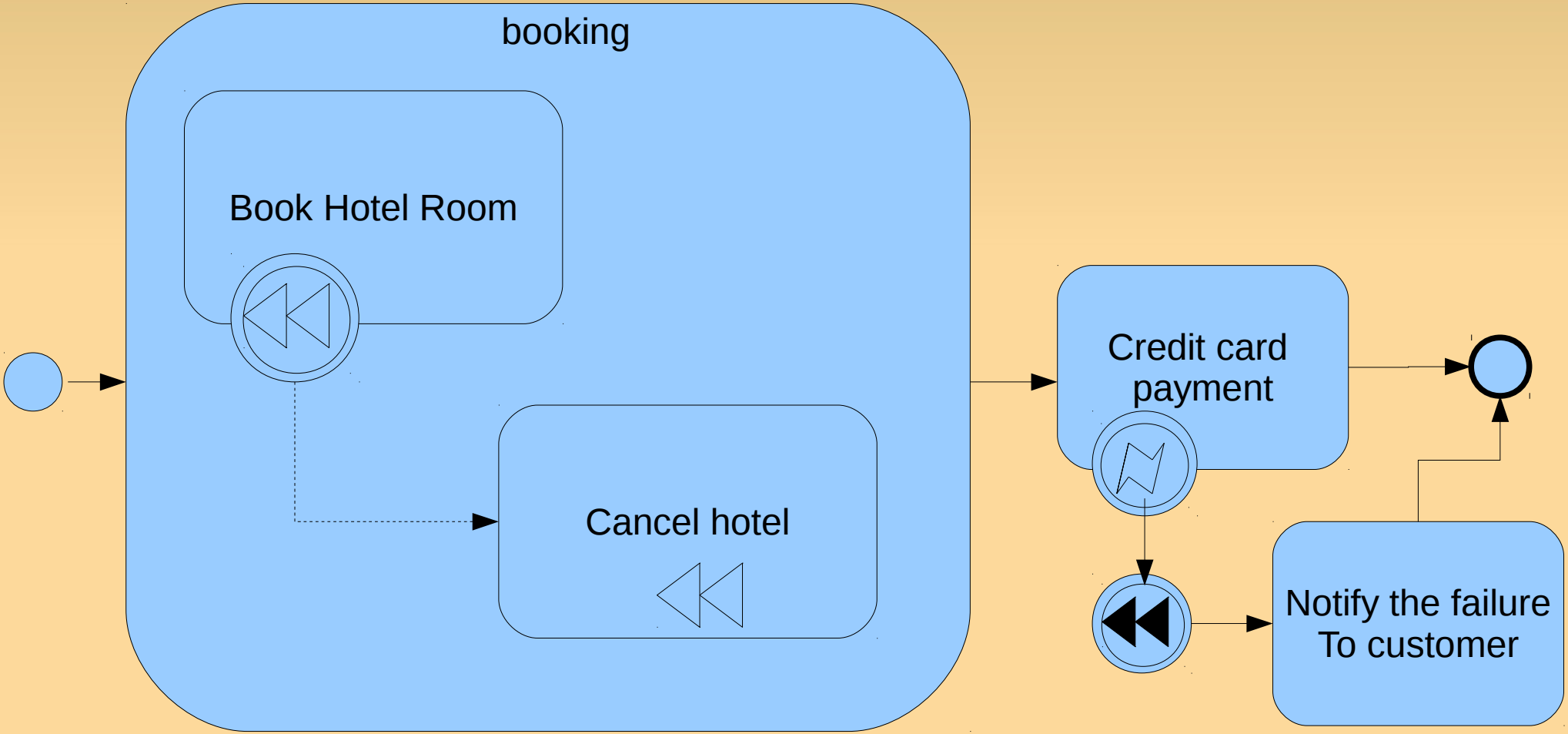
intermediate events on actvity boundaries



- compensation
  - catches compensation
  - the event will be triggered by a thrown compensation targeting this activity
  - when event is triggered, the associated compensation activity is performed
  - compensation is triggered only after the activity is completed, thus they donot interrupt an activity.. so the aspect of interruption vs. non-interruption is not applicable. (they cannot interrupt the activity)

Examples

An example


booking
Book Hotel Room
Cancel hotel
Credit card payment
Notify the failure To customer

Linking events