ANALYTIC BPMN

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BPMN Events

- Level 1 events:
  - Start: None, Message, Timer
  - End: None, Message, Terminate
- Level 2 events:
  - Intermediate events
  - Additional Triggers
  - Main: Timer, Message, Error
  - Others: Escalation, Signal, Conditional, Link
  - Also: Cancel, Compensation

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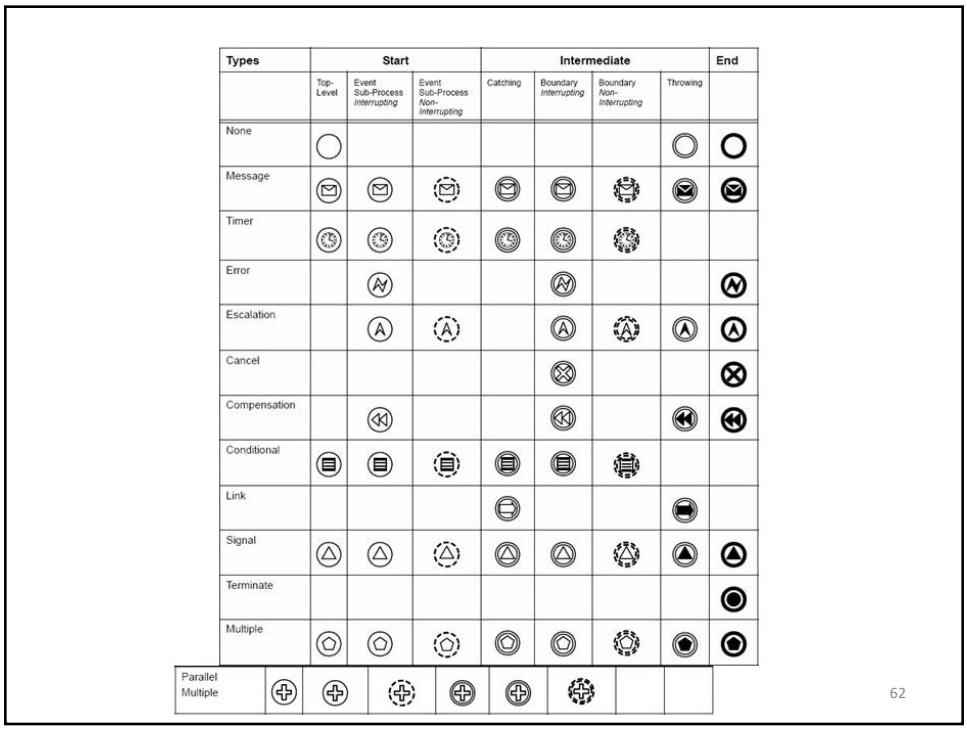
Types
Start
Intermediate
End
Top-Level
Event Sub-Process Interrupting
Event Sub-Process Non-Interrupting
Catching
Boundary Interrupting
Boundary Non-Interrupting
Throwing
None
Message
Timer
Error
Escalation
Cancel
Compensation
Conditional
Link
Signal
Terminate
Multiple
Parallel Multiple
62

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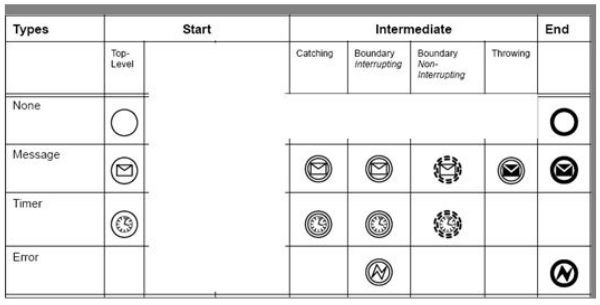
Types
Start
Intermediate
End
Top-Level
Catching
Boundary Interrupting
Boundary Non-Interrupting
Throwing
None
Message
Timer
Error
63

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Throwing vs Catching

Catching Message event in sequence flow

Throwing Message event in sequence flow

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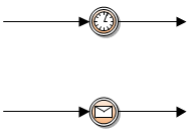
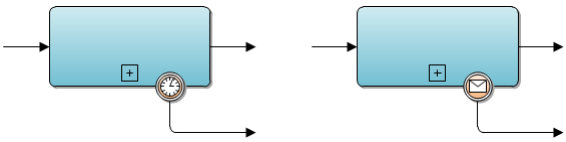
Sequence Flow vs Boundary

- Sequence flow:
  - Catching event waits



- Boundary:
  - Catching event listens



65

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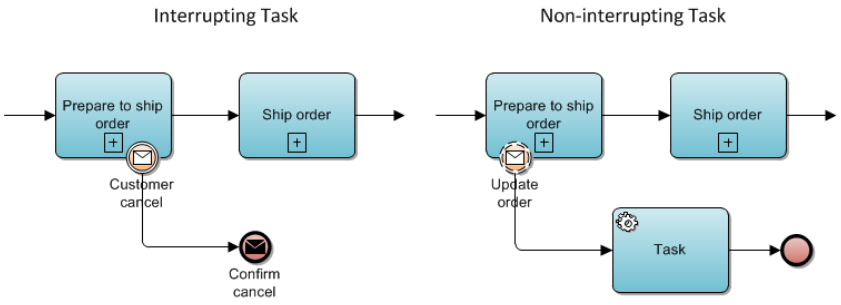
Boundary Events: Interrupting vs Non-interrupting



66

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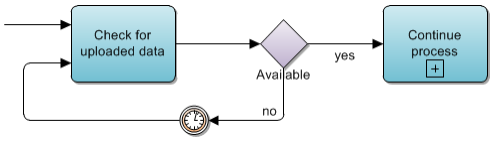
Timer Events

- Catching == delay
  - Wait for some duration



  - Wait until specified time

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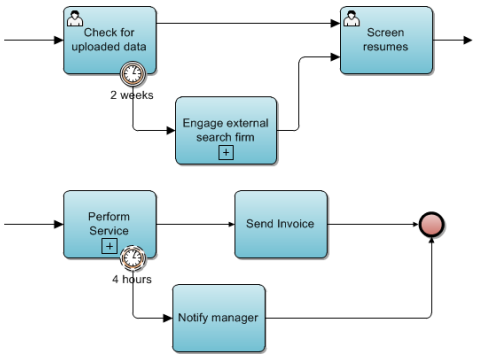
Timer Events

- Timer Boundary Event
  - Time to completion
  - Starting when sequence flow arrives



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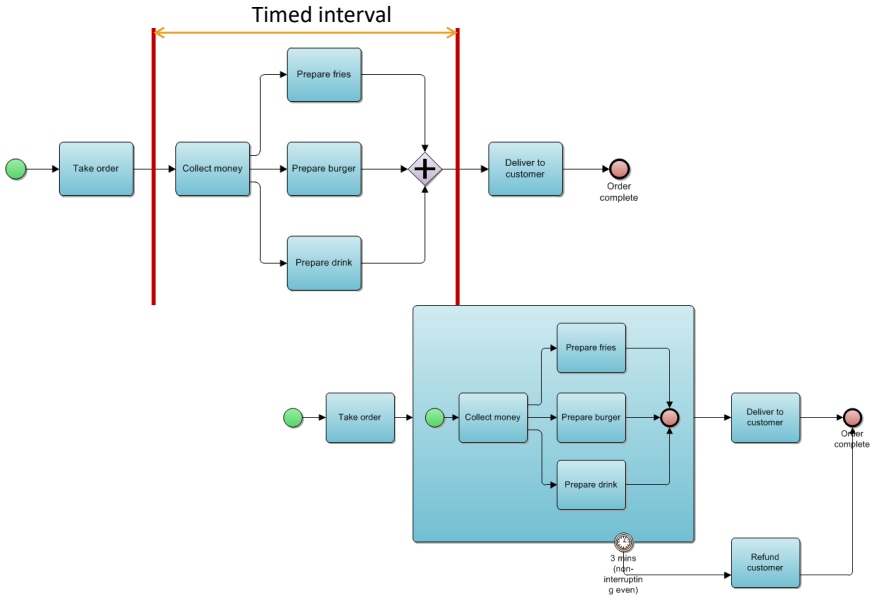
Timed Interval



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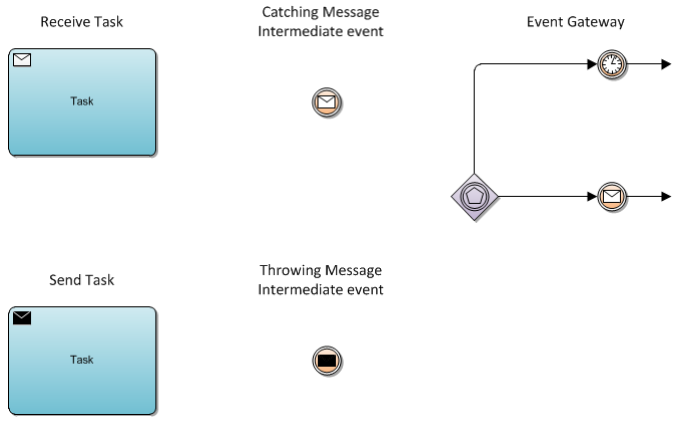
Message Send & Receive

- Possibility vs certainty of message send



70

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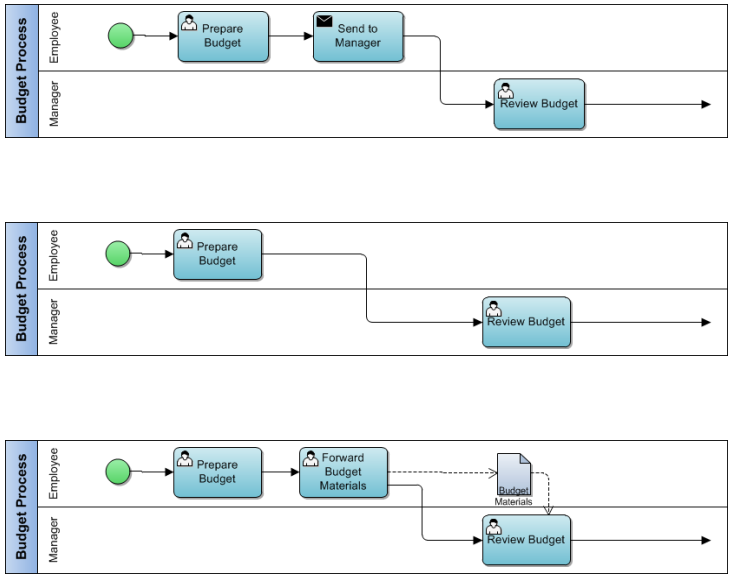

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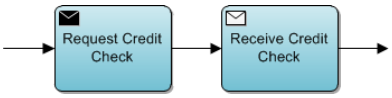
Synchronous vs Asynchronous Messaging

- Synchronous

- Asynchronous



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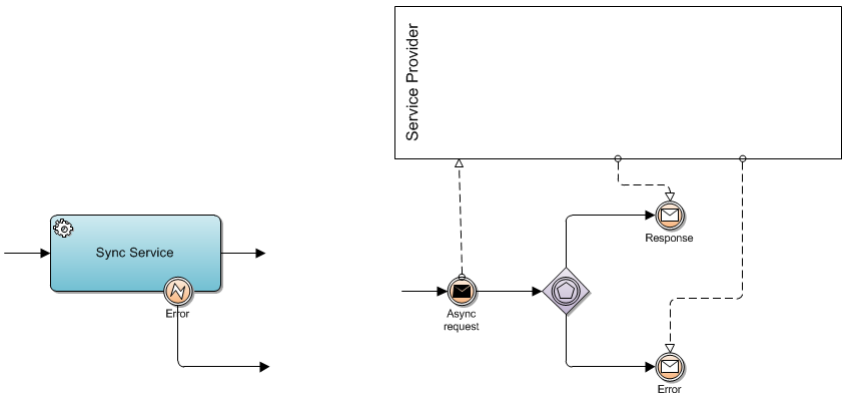
Synchronous and Asynchronous



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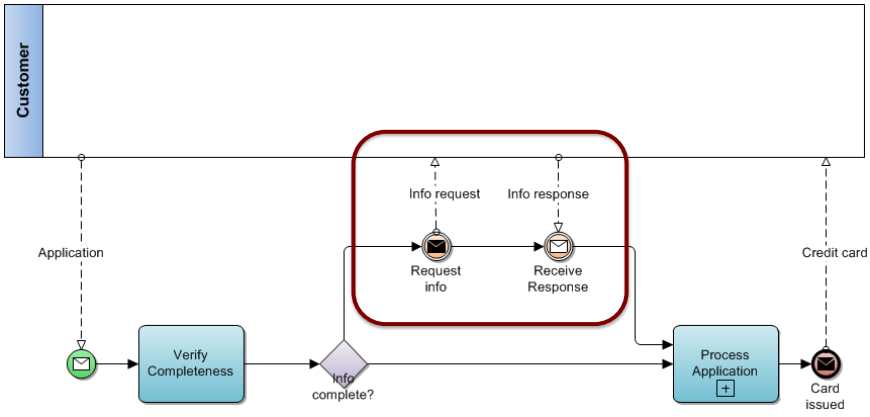
Throwing and Catching



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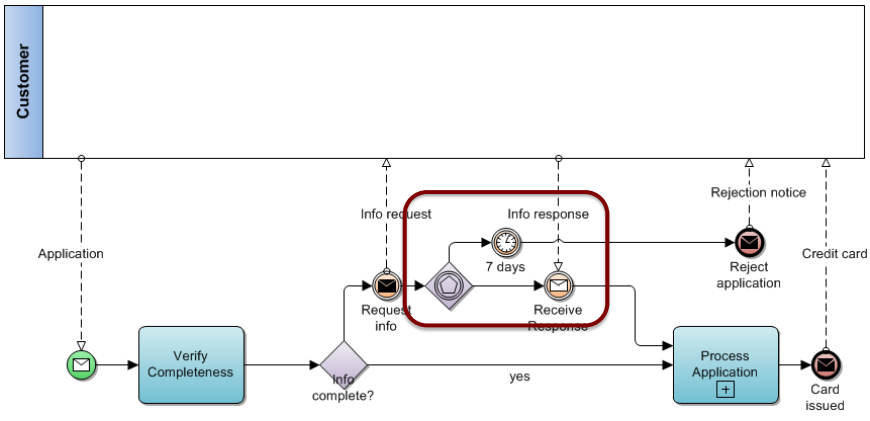
Event Gateway



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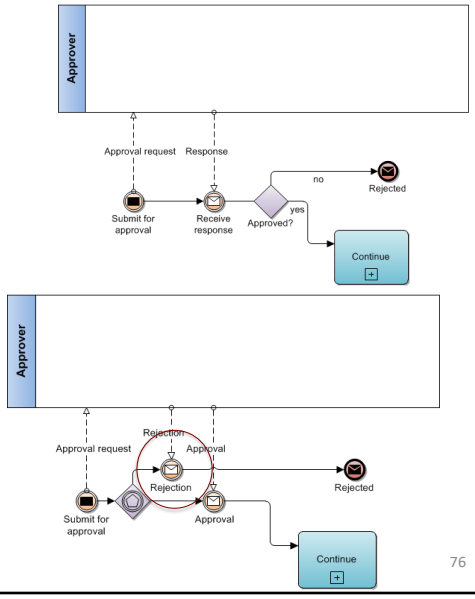
Internal vs External Choice

- Exclusive OR
  - Choice based on internal condition
- Event Gateway
  - Choice based on first event that fires



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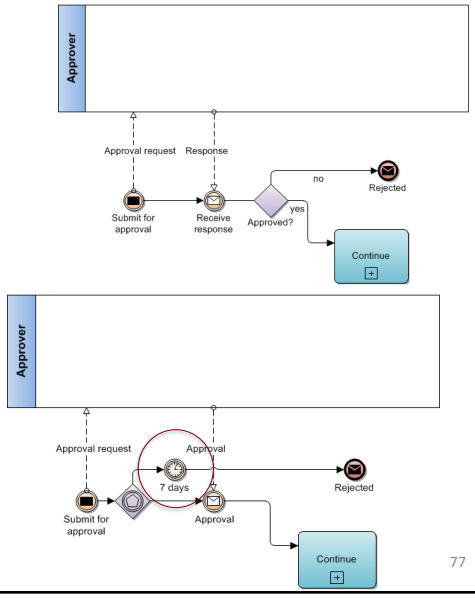
Internal vs External Choice

- Exclusive OR
  - Choice based on internal condition
- Event Gateway
  - Choice based on first event that fires



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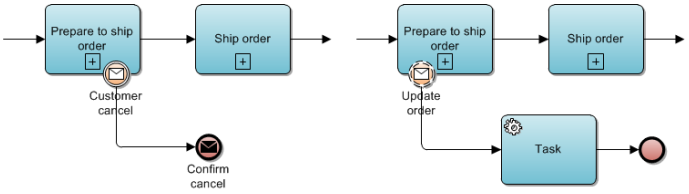
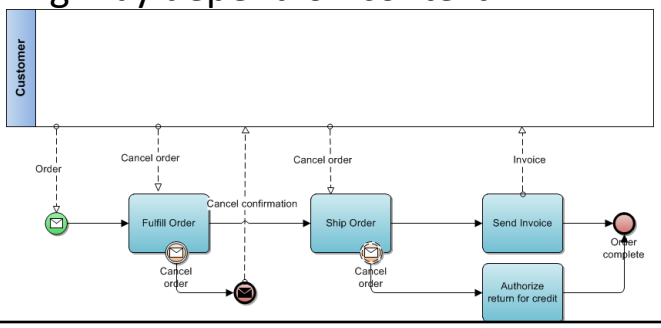
Message Boundary Event



- Handling may depend on context



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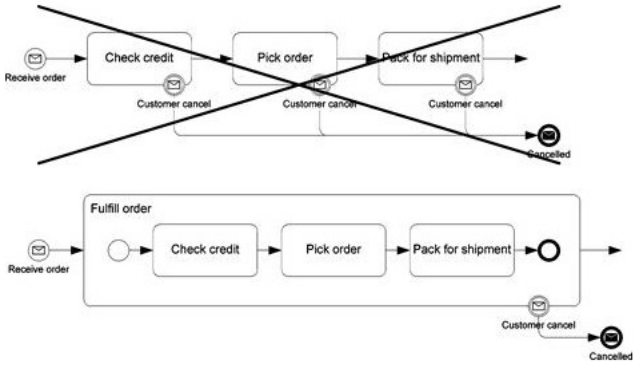
Message Boundary Event



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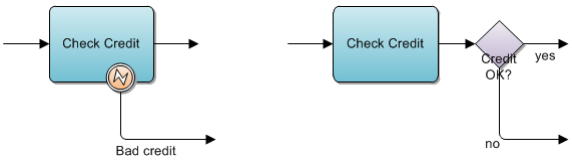
Error Event

- Two flavors
  - Interrupting Error boundary event
  - Error end event



- Subprocess:
  - Error boundary event must have matching end state in expansion

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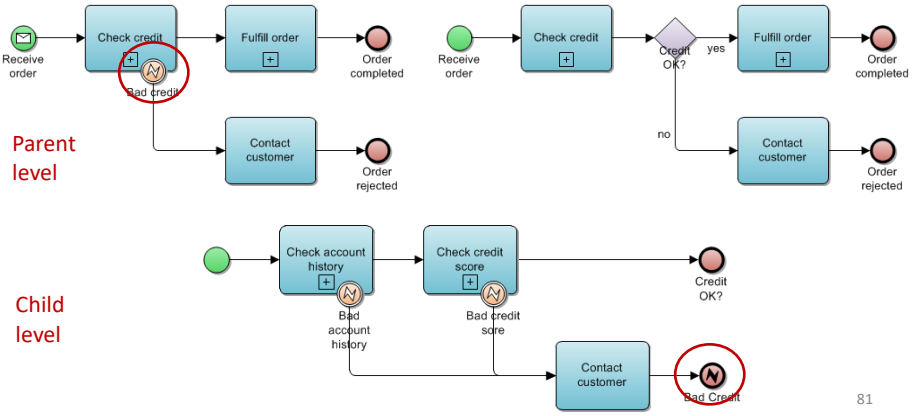
Error Throw-Catch Pattern

- Similar to gateway end state test
  - Parallel paths ⇒ end state = termination



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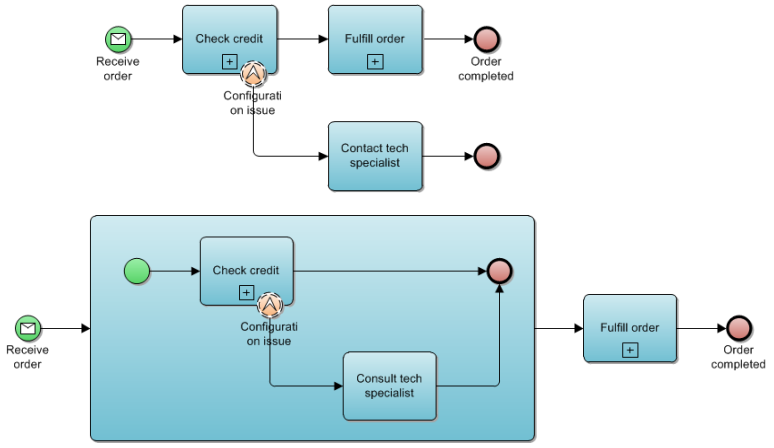
Escalation Event

- Non-interrupting exception



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Escalation Events

- Boundary escalation event is non-interrupting
- Does not imply an error
  - Just additional processing required
- Thrown from end event or throwing intermediate event
- Can *only* be caught in boundary event

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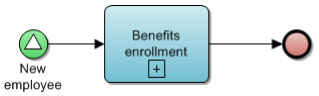
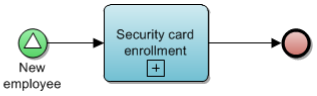
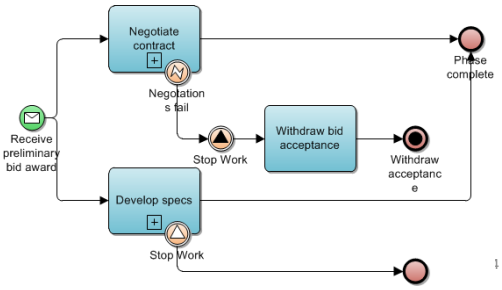
Signal Event

- Two applications:
  - Intra-process signaling (unicast!)
  - Publish-subscribe integration (multicast!)





- More flexible than Terminate



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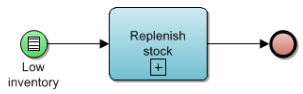
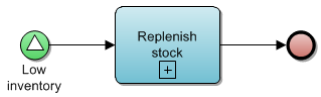
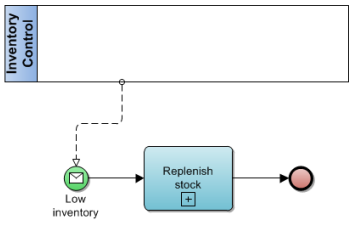
Conditional Event

- Triggered by monitored data



- External trigger:





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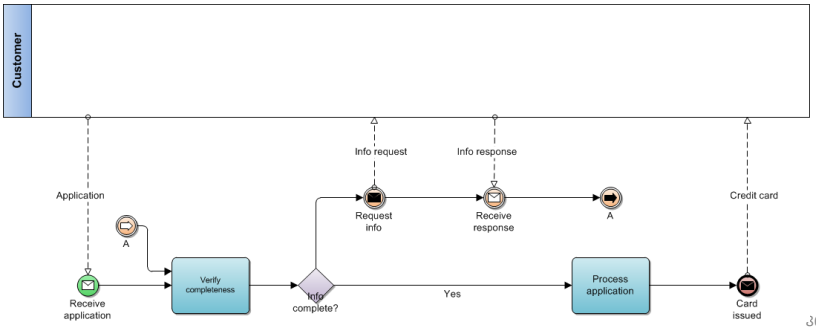
Link Events

- Throwing and catching intermediate events
- Off-page connectors
  - Flat model
- On-page connectors



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PROCESS SPLITTING AND MERGING

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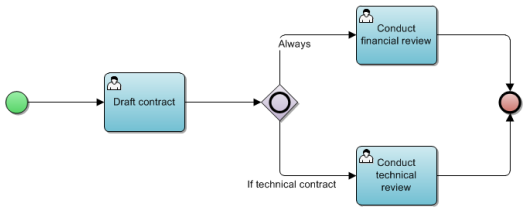
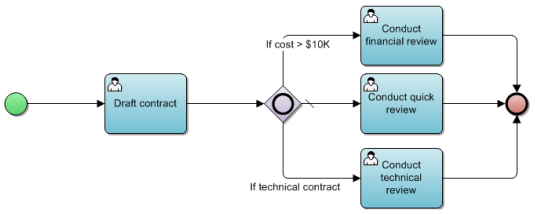
OR Gateway Split

- Inclusive gateway
  - Boolean conditions are independent
  - Parallel execution



  - Default flow



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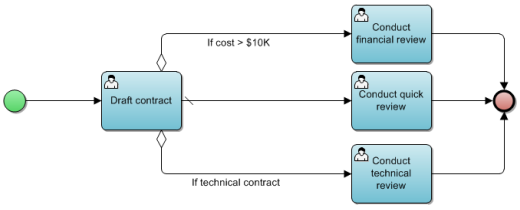
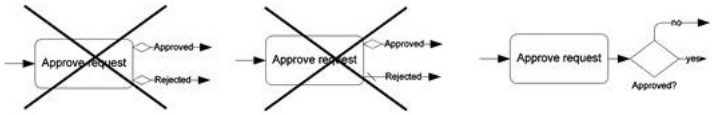
Conditional Sequence Flow

- No gateway
- Only for tasks
- Reserve for conditional parallel flow
  - Not XOR, exclusive choice





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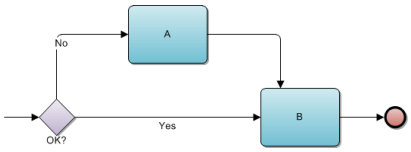
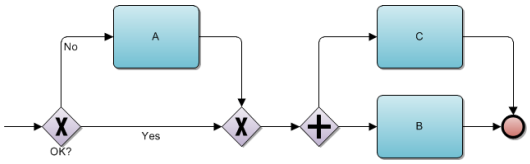
Merging Sequence Flows

- Exclusive OR Split
- Merging Alternative Paths
  - Merge into an activity



  - Merge into XOR gateway



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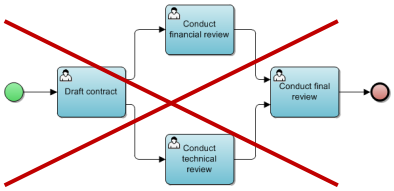
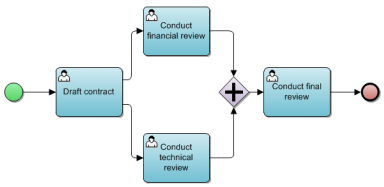
Merging Sequence Flows

- Parallel Split
- AND Gateway Join
  - Do NOT merge into an activity
    - Downstream activities triggered multiple times
    - Multi-merge



  - DO use AND gateway
    - Wait for all paths to complete



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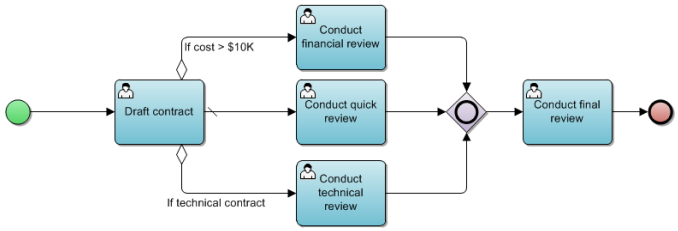
OR Gateway Join

- Use Case #1: Join conditional sequence flows
  - May be parallel



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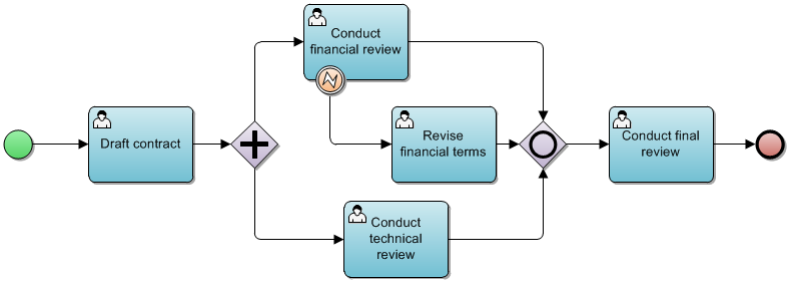
OR Gateway Join

- Use Case #2: Join while ignoring “dead” parallel flows



- Use Case #3: Join exception flow path from non-interrupting boundary event

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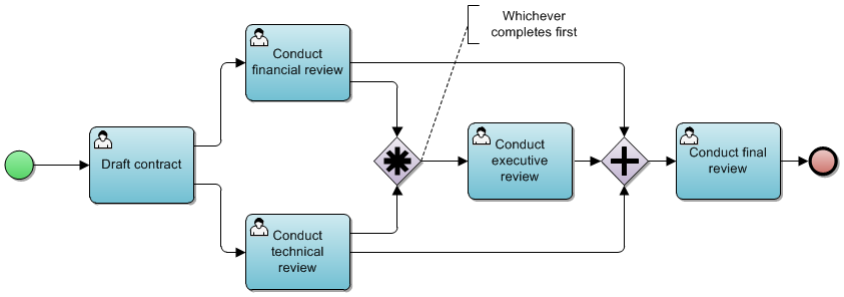
Discriminator Pattern

- Complex Gateway
- Discriminator Pattern:
  - Accept first path
  - Block all others



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TRANSACTIONS AND COMPENSATIONS

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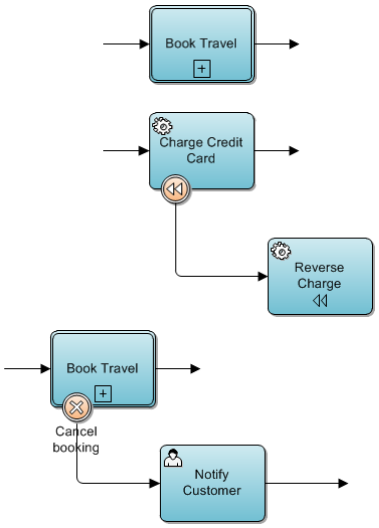
Transactions

- ACID Transactions
  - Short-lived
- Business Transactions
  - Long-lived
- Compensations
- Cancel Event
  - Internal Error event
  - Compensations for nested activities



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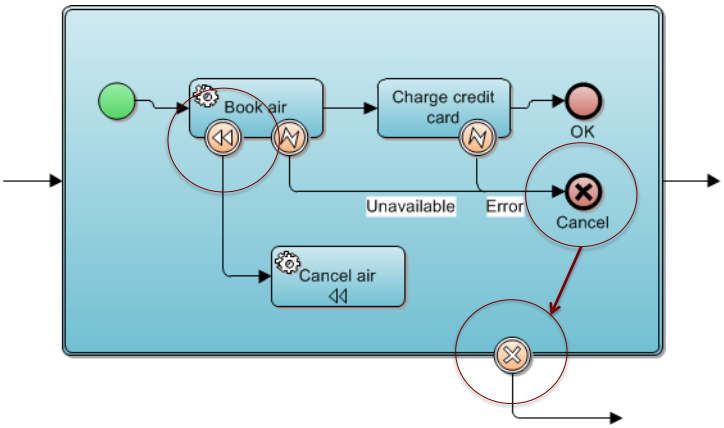
Cancellation

- Simple case: Cancel airline reservation
  - Cause: credit card failure



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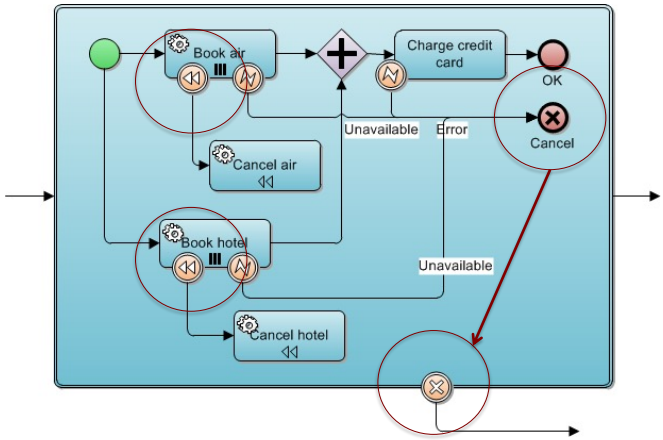
Cancellation

- Complex case: Multiple possible causes of failure



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Compensation Throw-Catch

- Throwing Compensation event
  - Intermediate event
  - End event
- Target: activity to be compensated
  - *Not* a boundary event!
- Use case: undo transaction after completion

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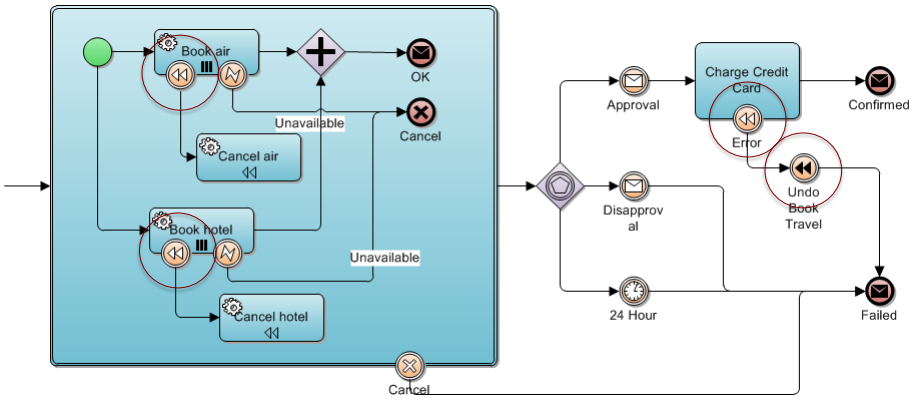
Compensation Throw-Catch

- Undo top-level transaction after completion
  - No Cancel event
  - Compensation does not handle exception



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Summary

- BPMN: Standardized workflow language
- Levels
  - Descriptive
  - Analytic
  - Executable
- Semantics?
  - BPMN: Event-based (pi-calculus)
  - Workflow languages: Flow-based (Petri nets)

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