Design Time Validation for the Correct Execution of BPMN Collaborations

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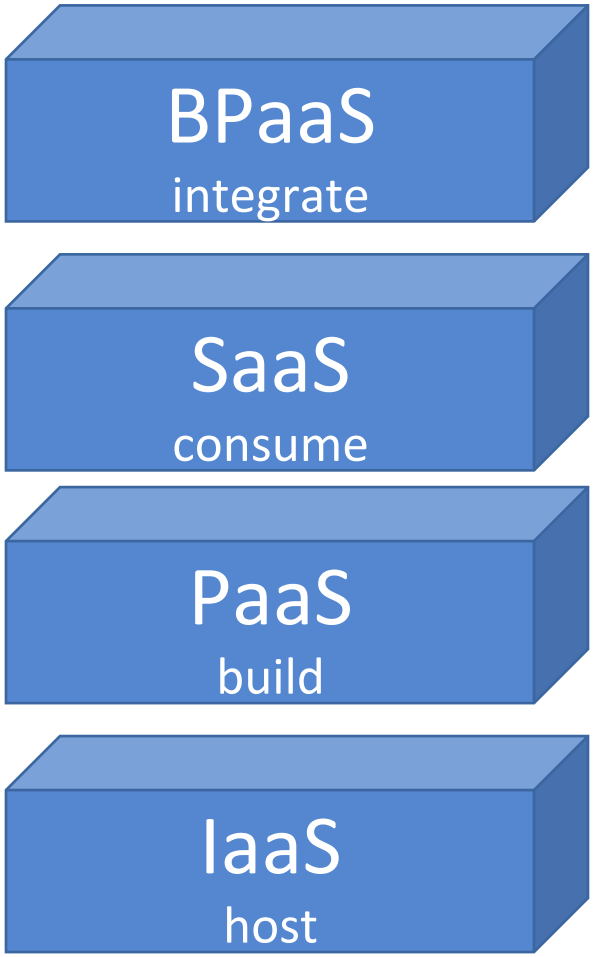
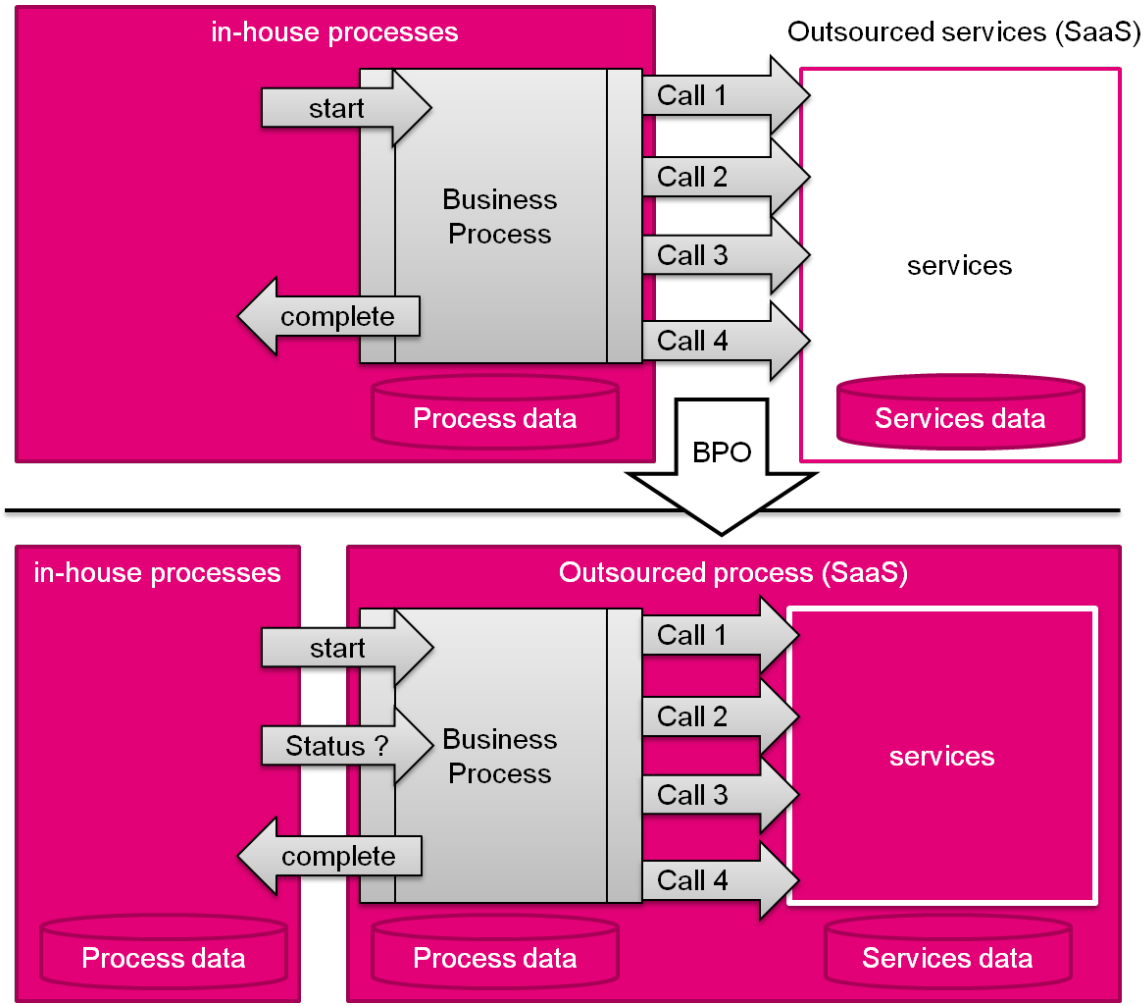
BPaaS (Business Process as a Service) – a novel cloud paradigm

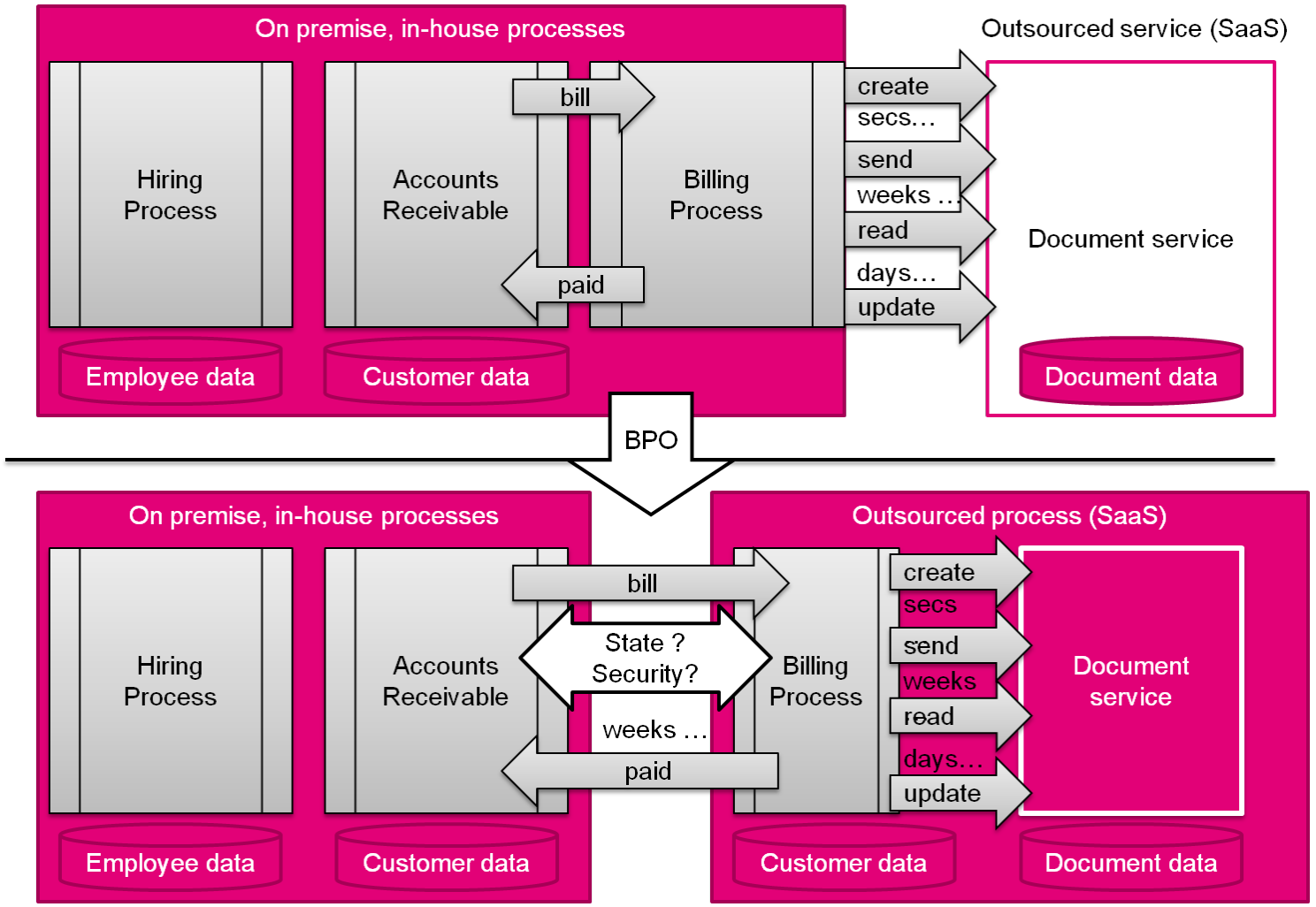


BPaaS – extending SaaS with BPO

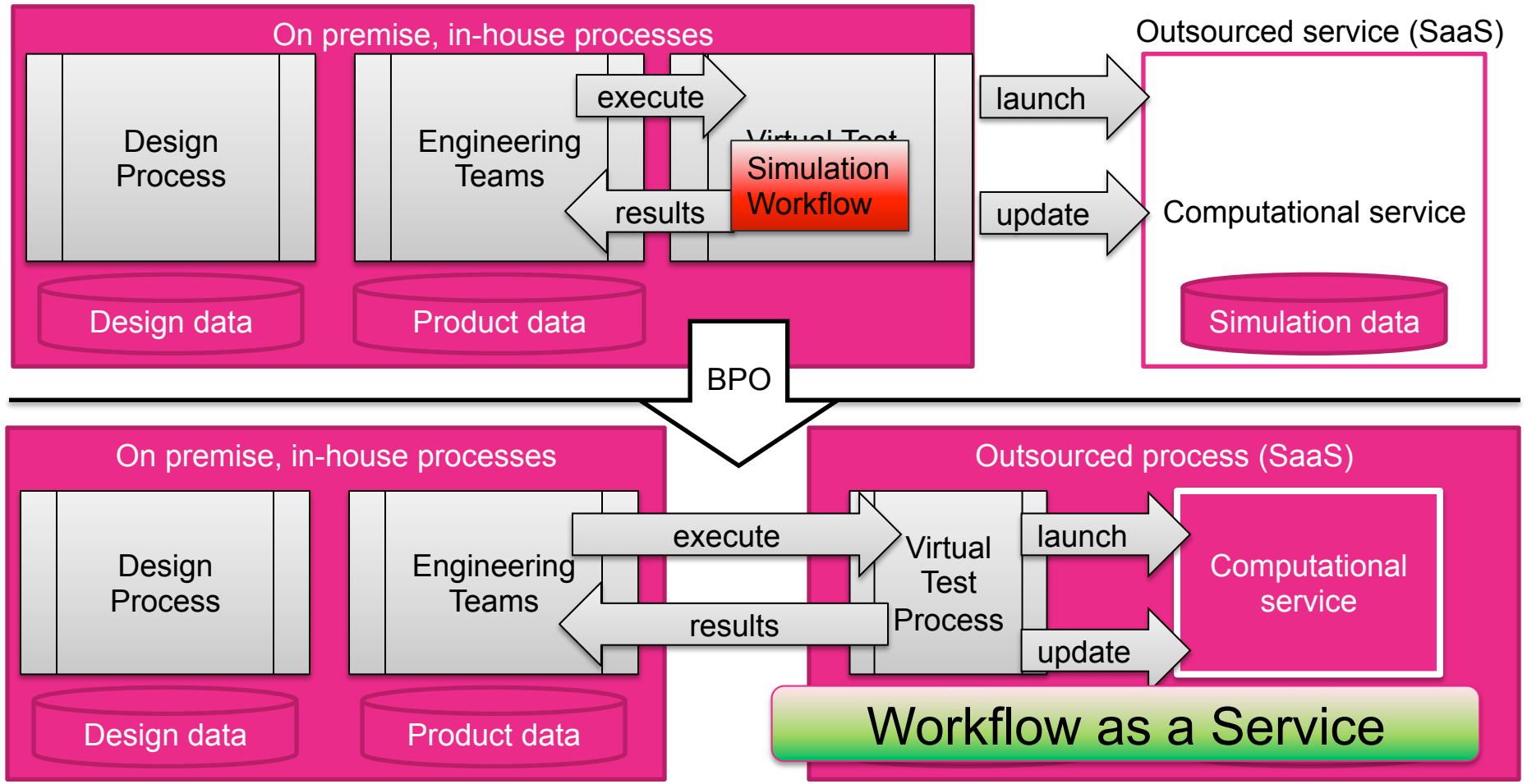
- BPO: Business Process Outsourcing
- Examples of BPO: HR, accounting, billing, customer support, business operations,…



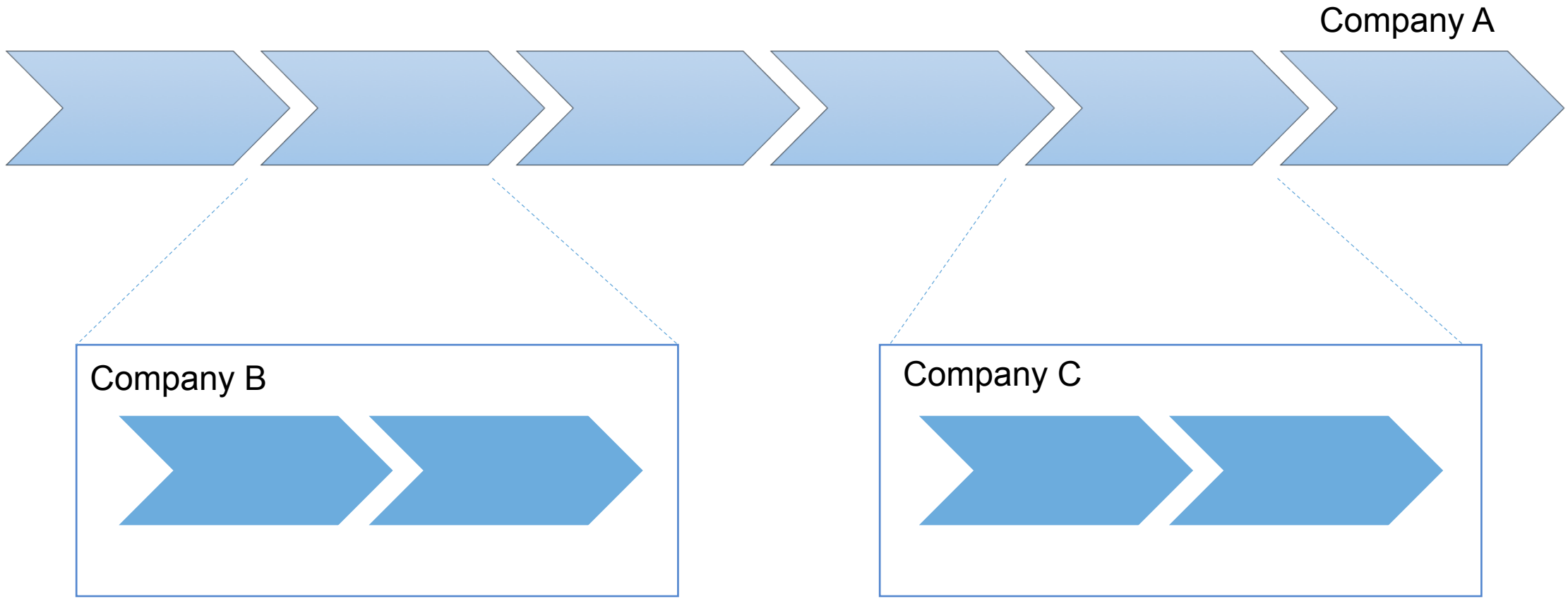
Example: from document management services to billing process as a service



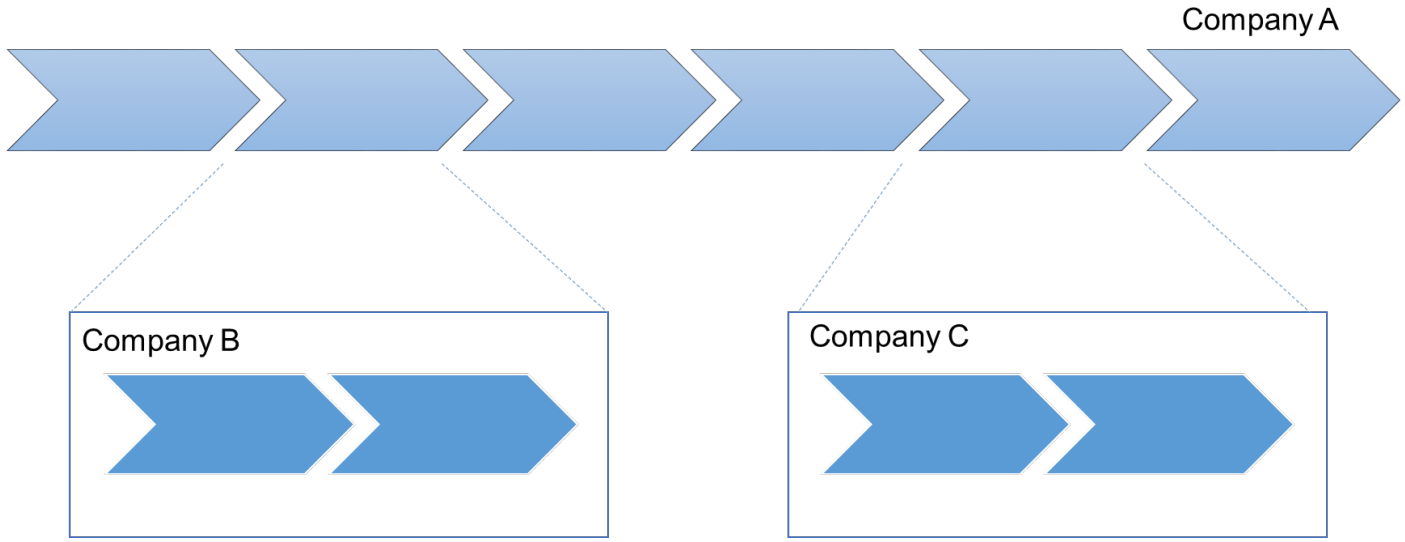
Example: simulation workflow as a service

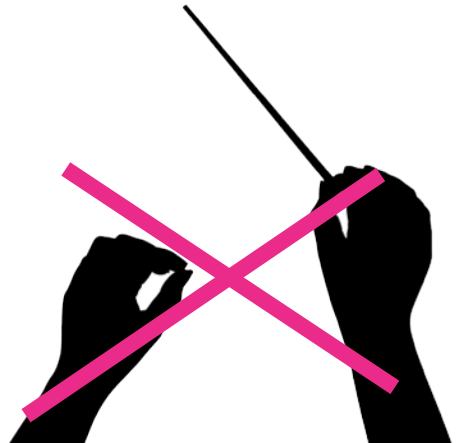


BPO results in decentralized business process flows

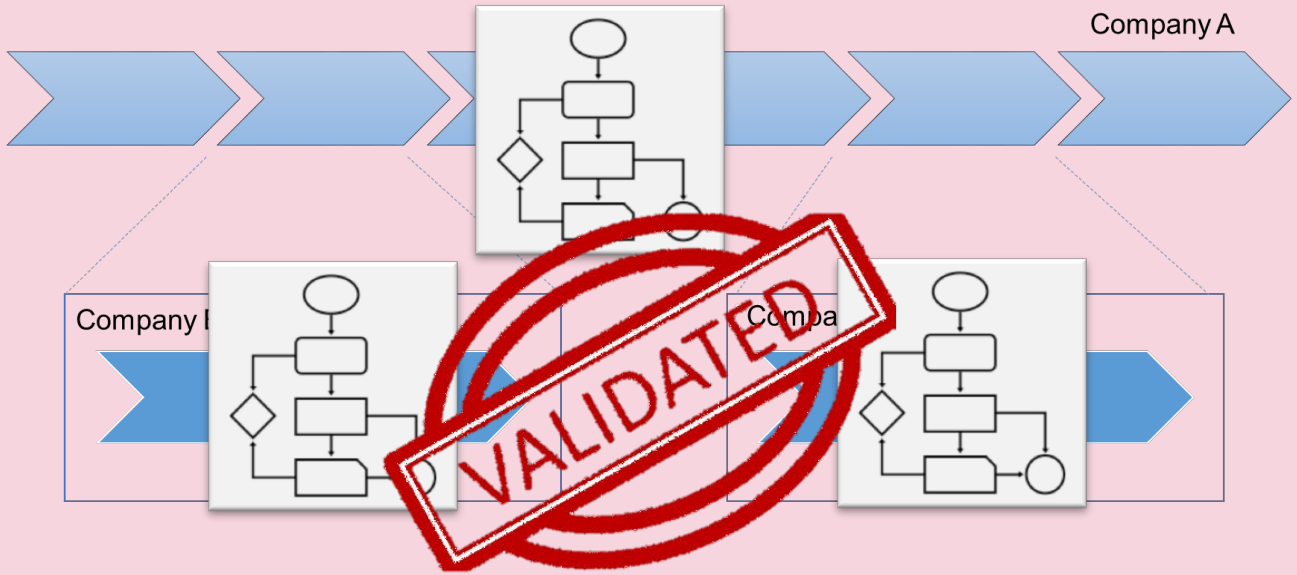


How to **ensure correct execution** of the different interactions in a decentralized workflow **without central coordinator**?

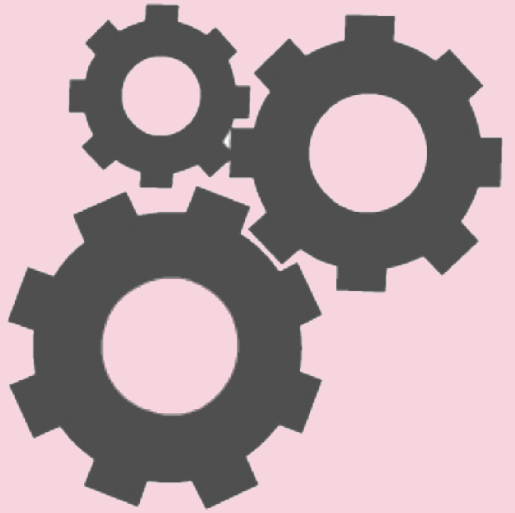




Validation algorithm will check **at design time** if the execution will be conform the model

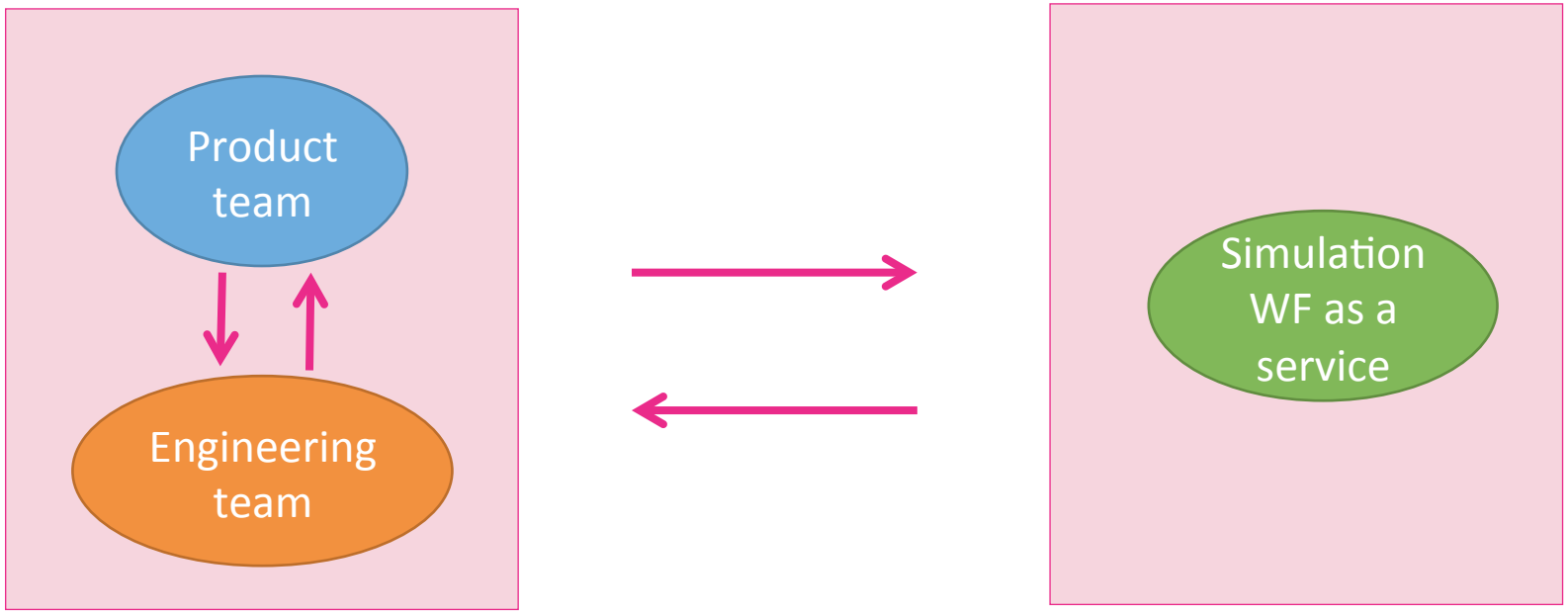


Model



Execution

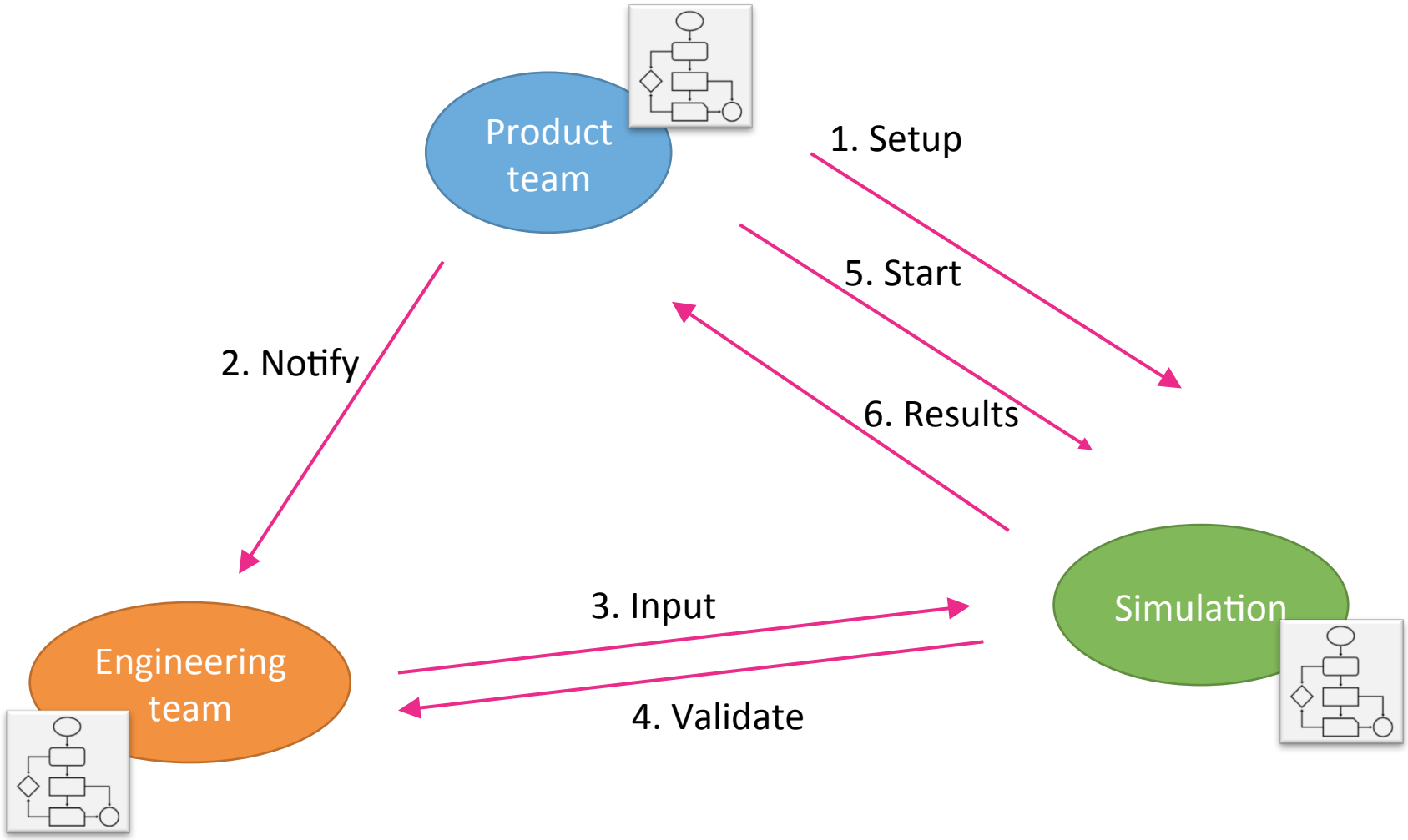
Use case: simulation



Company A

Company B

Use case: simulation

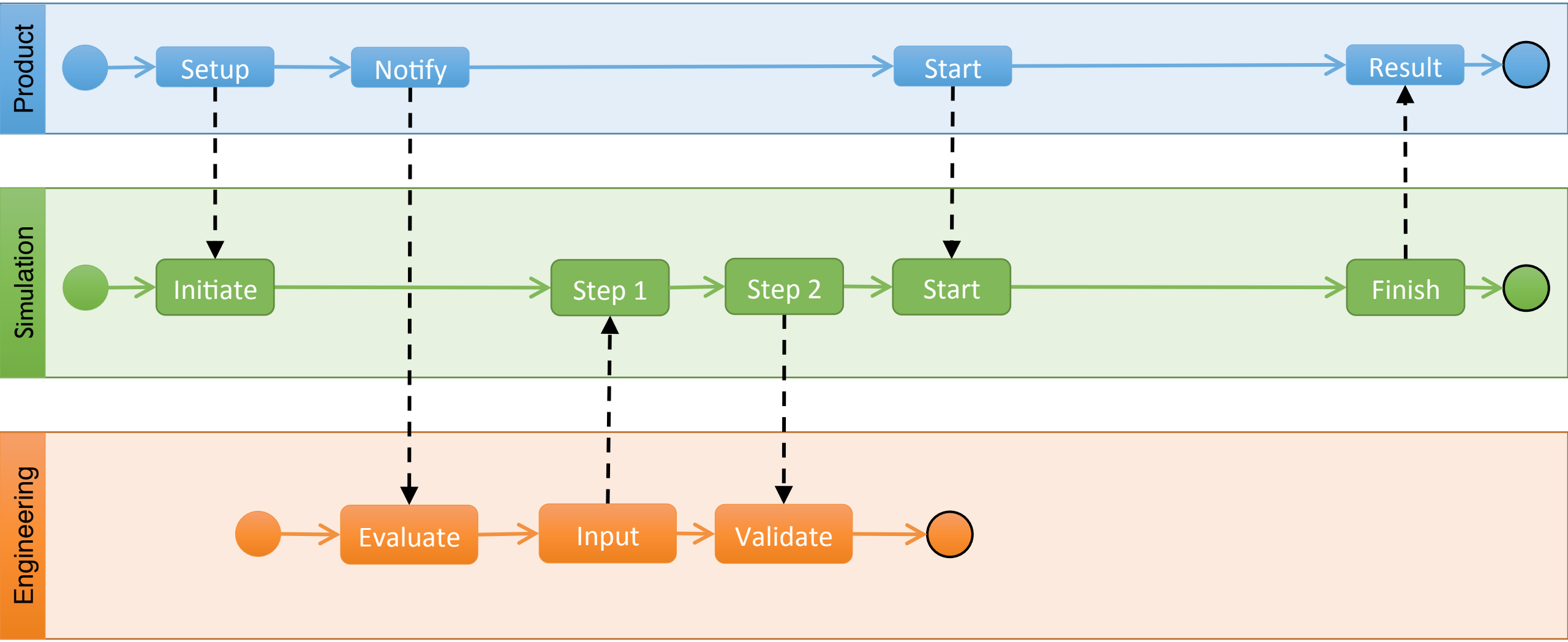


How to model decentralized workflows?

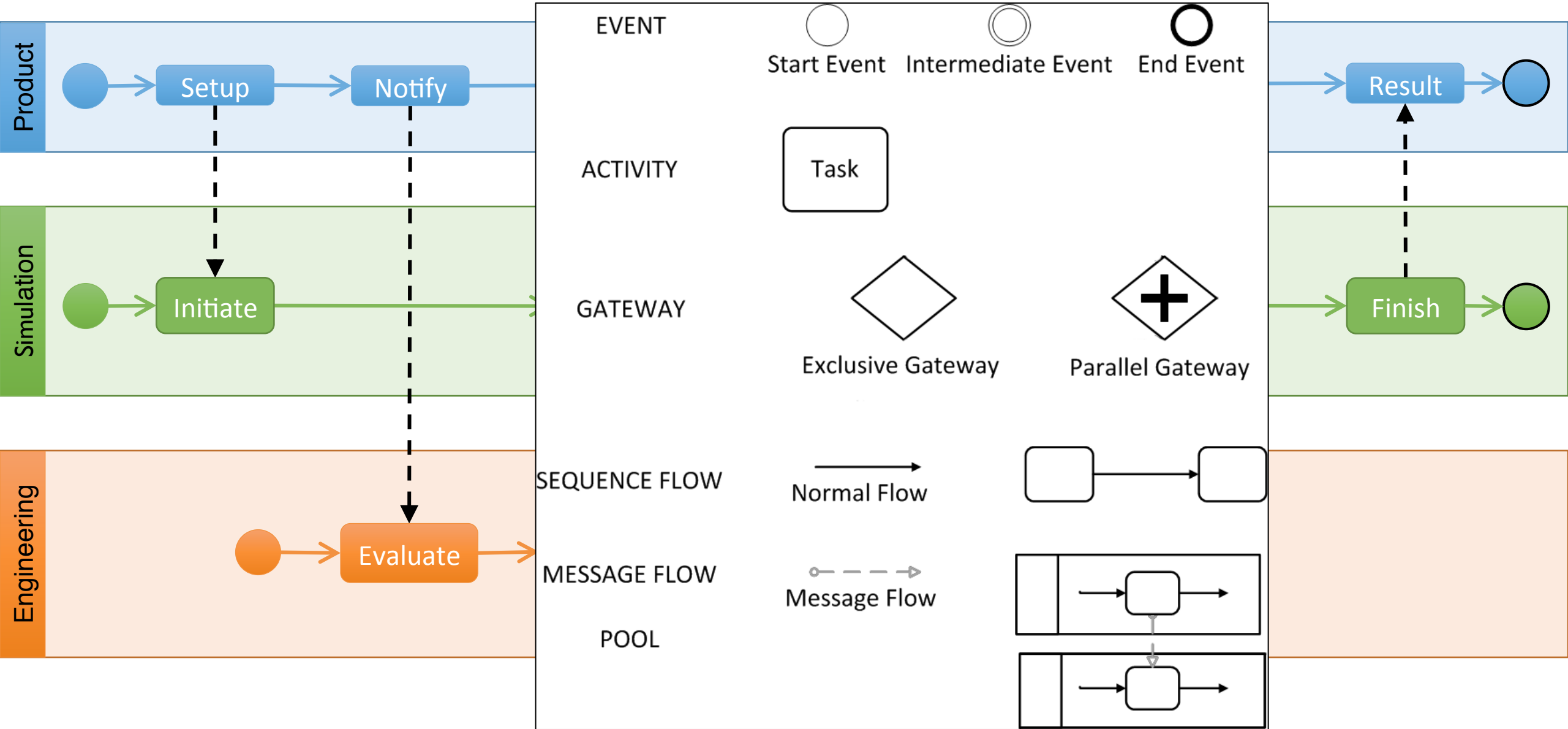
- BPEL (Business Process Execution Language)
- BPMN (Business Process Model and Notation)
- WS-CDL (Web Service Choreography Description Language)
- …

=> BPMN offers a graphical notation and is a common used standard

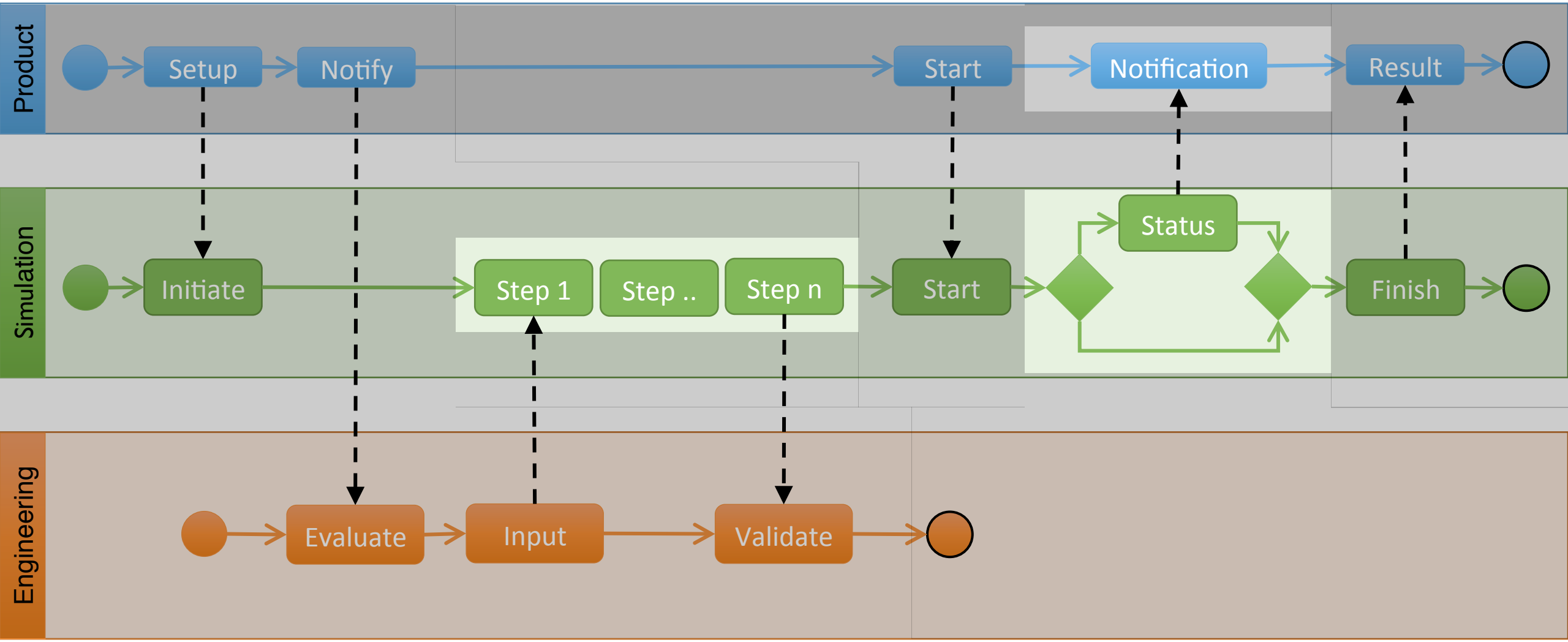
Use case modeled in BPMN



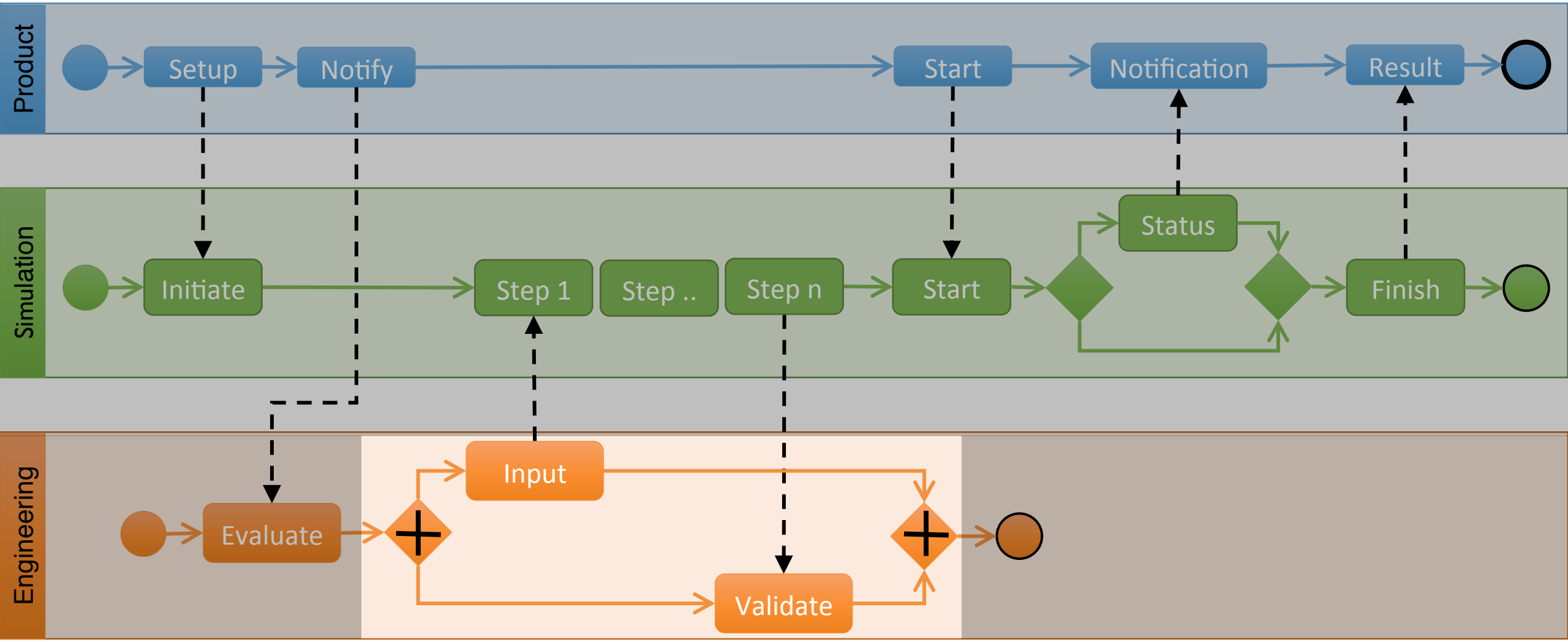
Use case modeled in BPMN



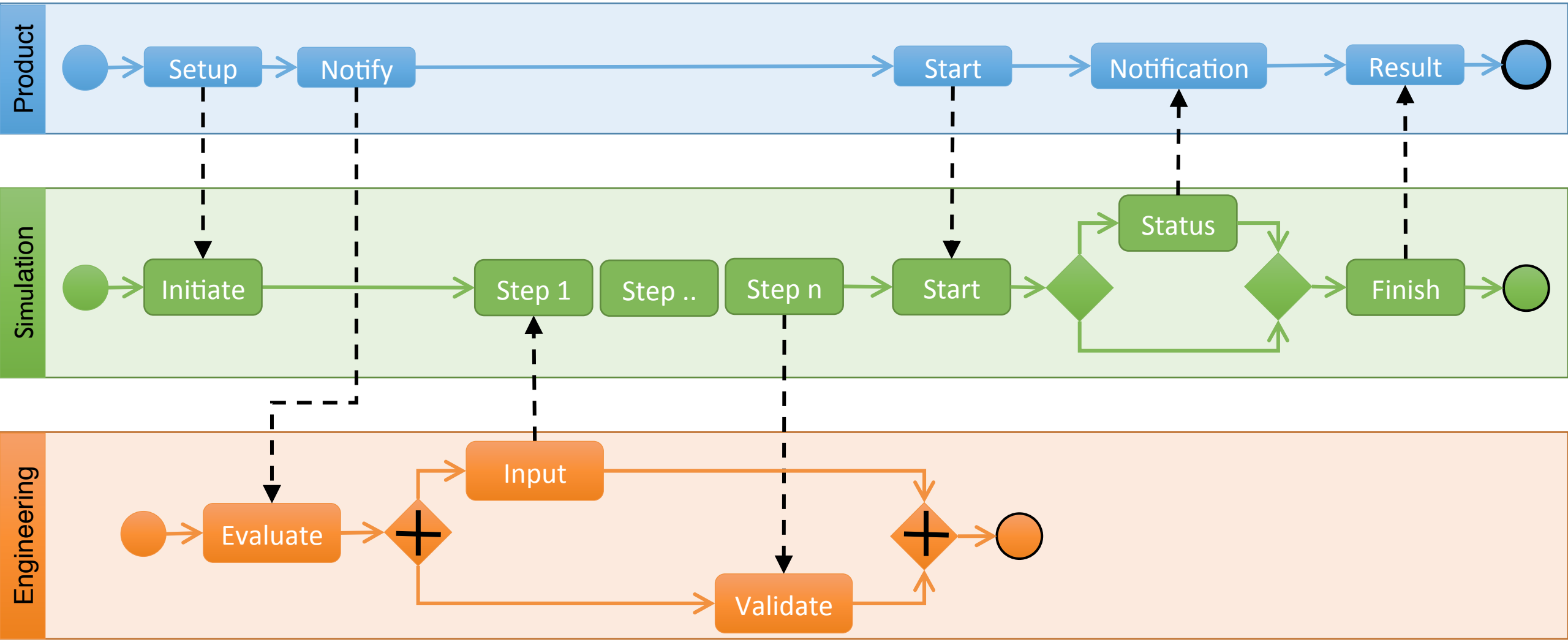
Use case modeled in BPMN



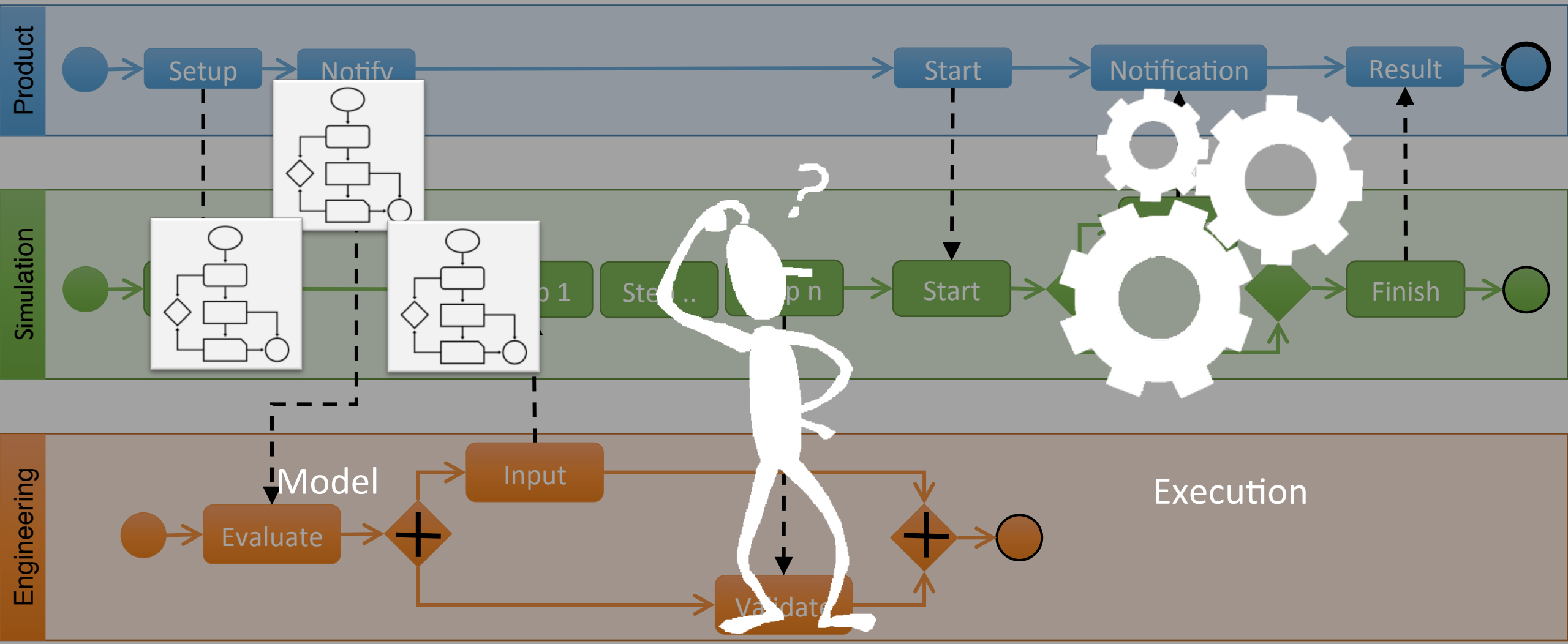
Use case modeled in BPMN



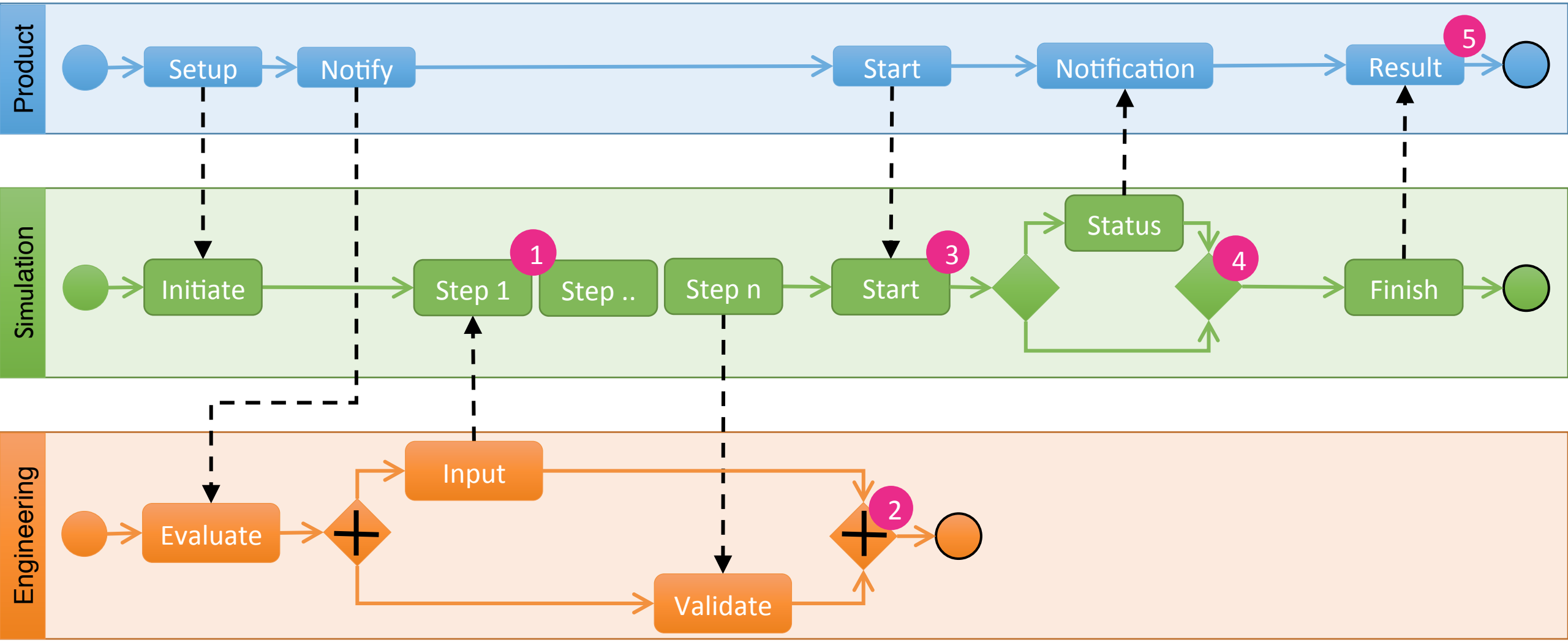
Use case modeled in BPMN



Will the execution be conform the model?



This BPMN model contains 5 ambiguities!



Validation Algorithm

- Implemented in Eclipse BPMN2 modeler
- Algorithm originally used for WS-CDL (Van Seghbroeck, 2011)
- Time Vectors
- Adapted for BPMN

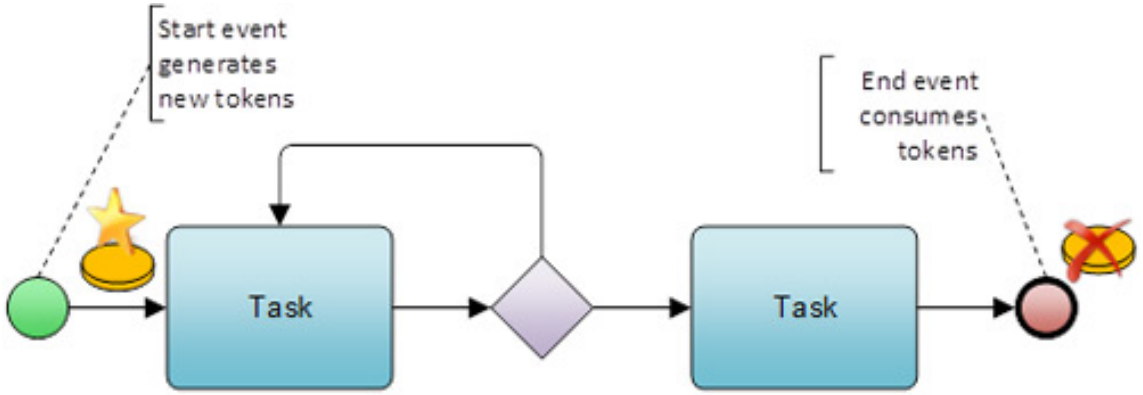


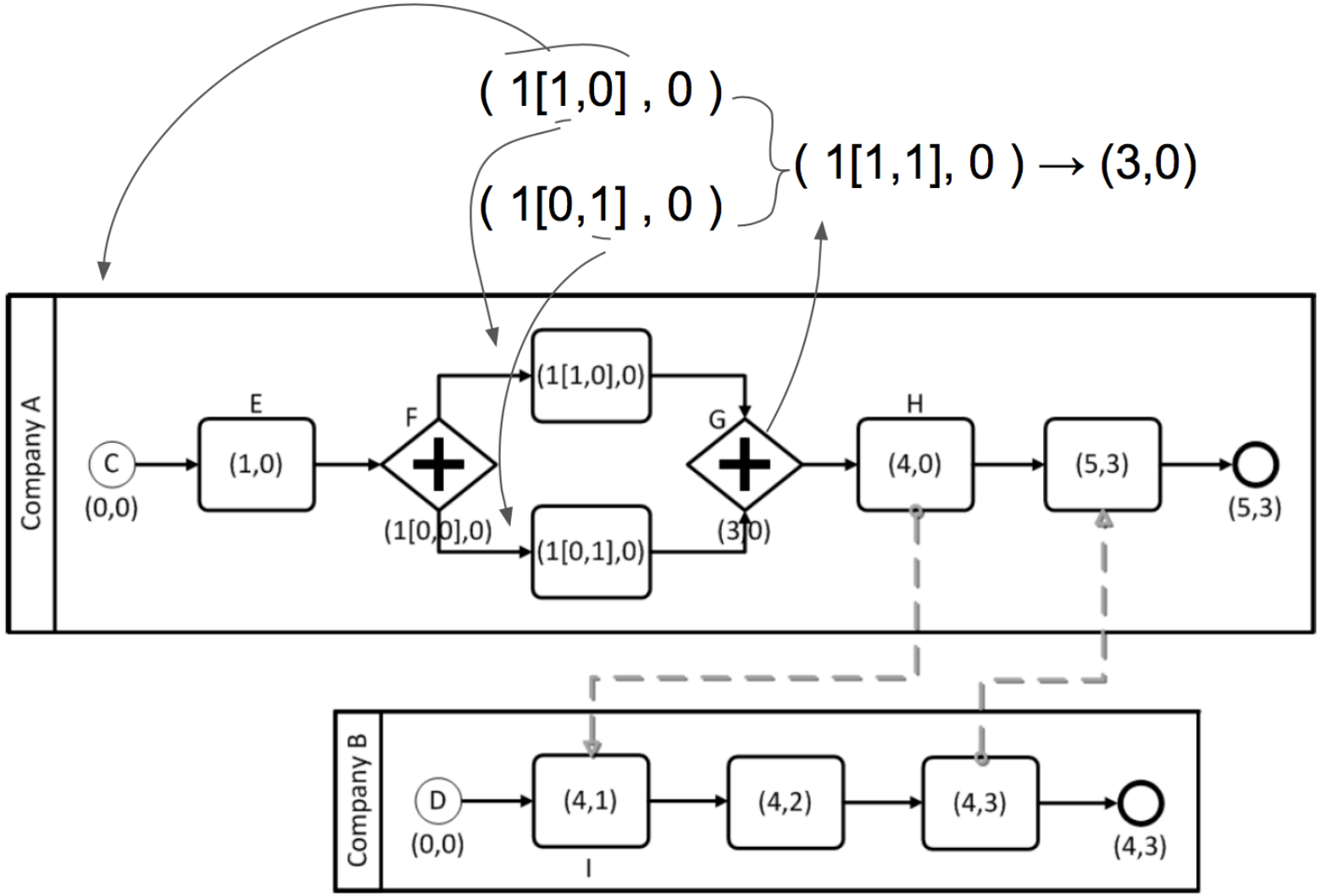
Figure 3: Generation and consumption of tokens

Time Vectors

$x = (t_x, \vec{X})$

Time Object

list of Time Objects



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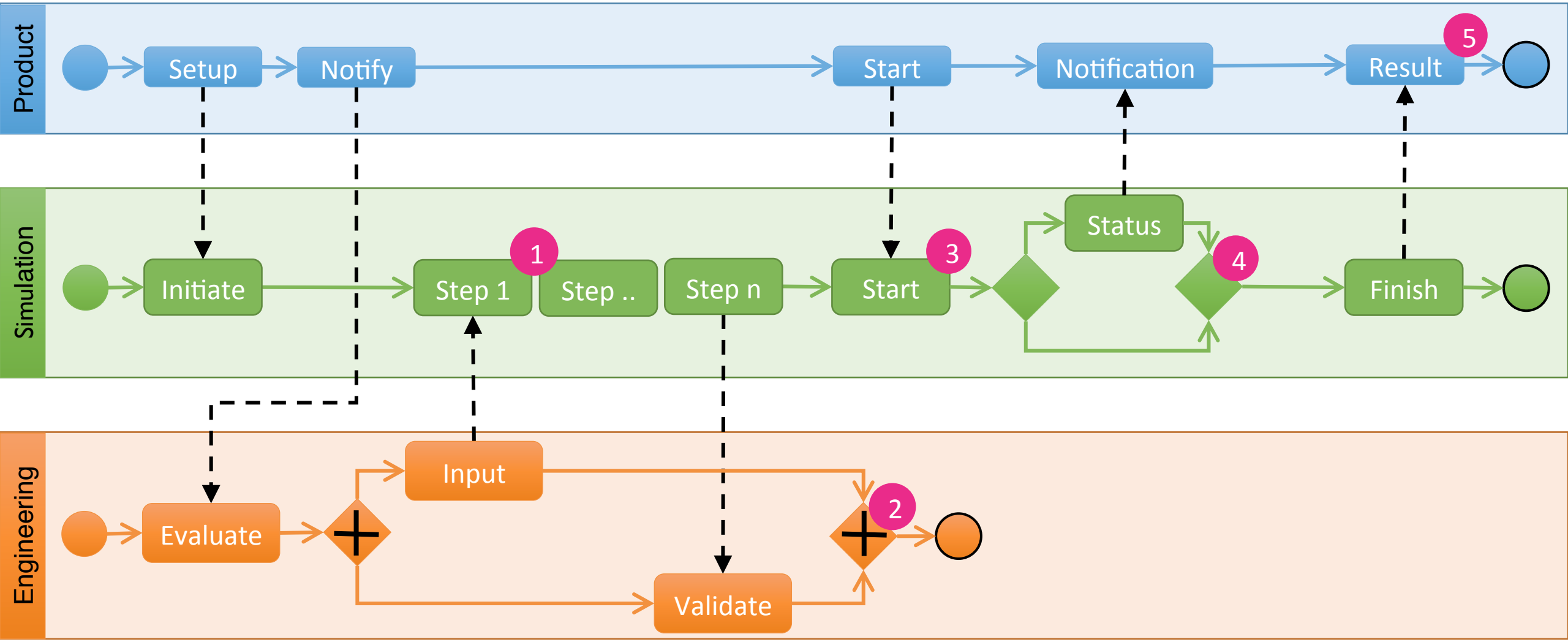
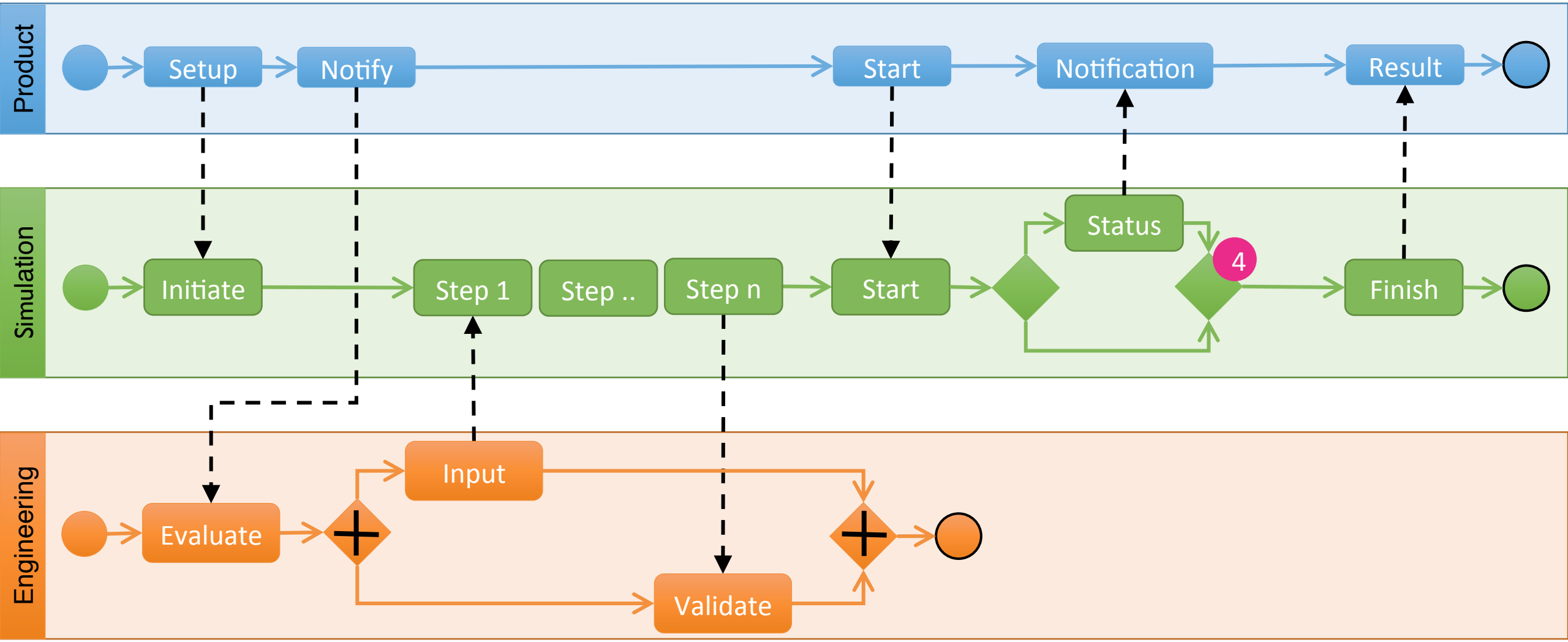
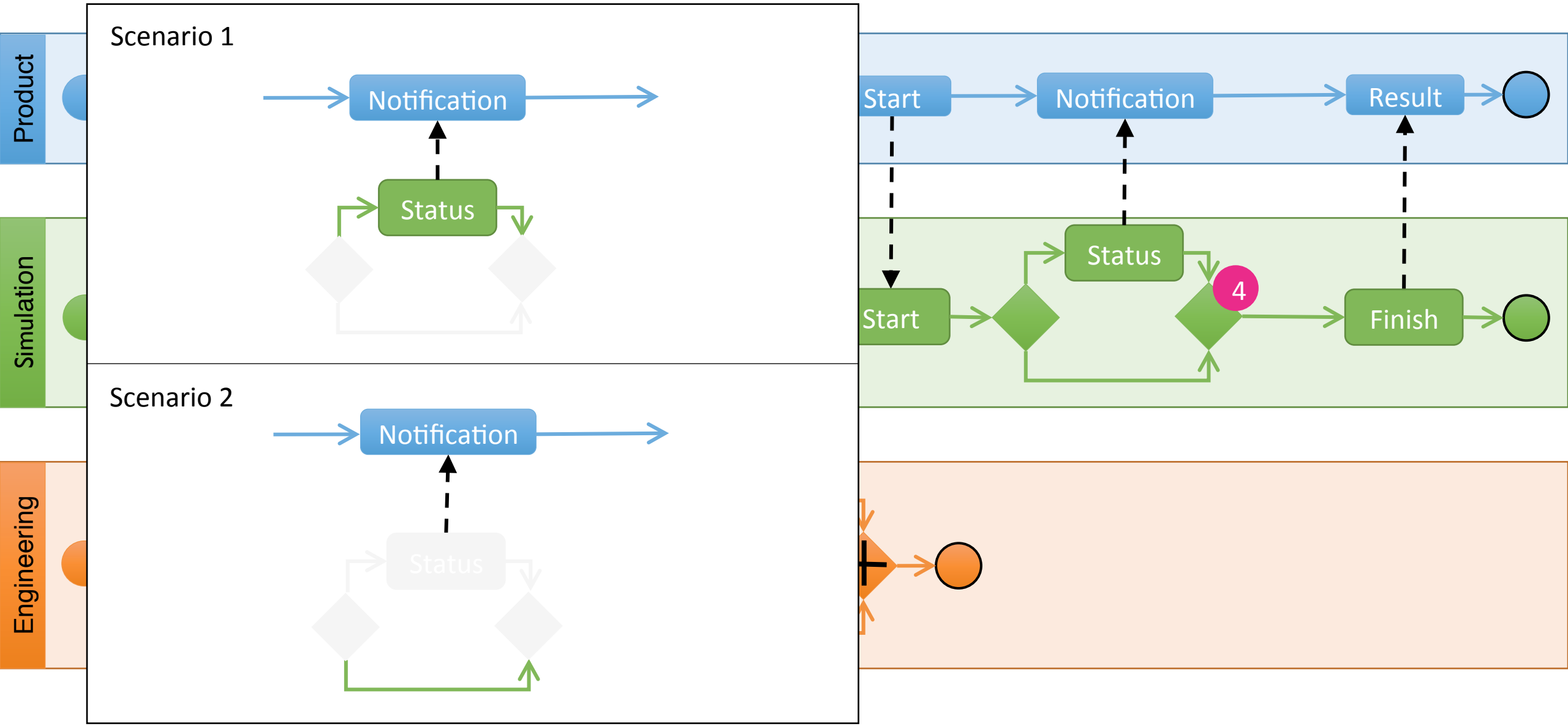


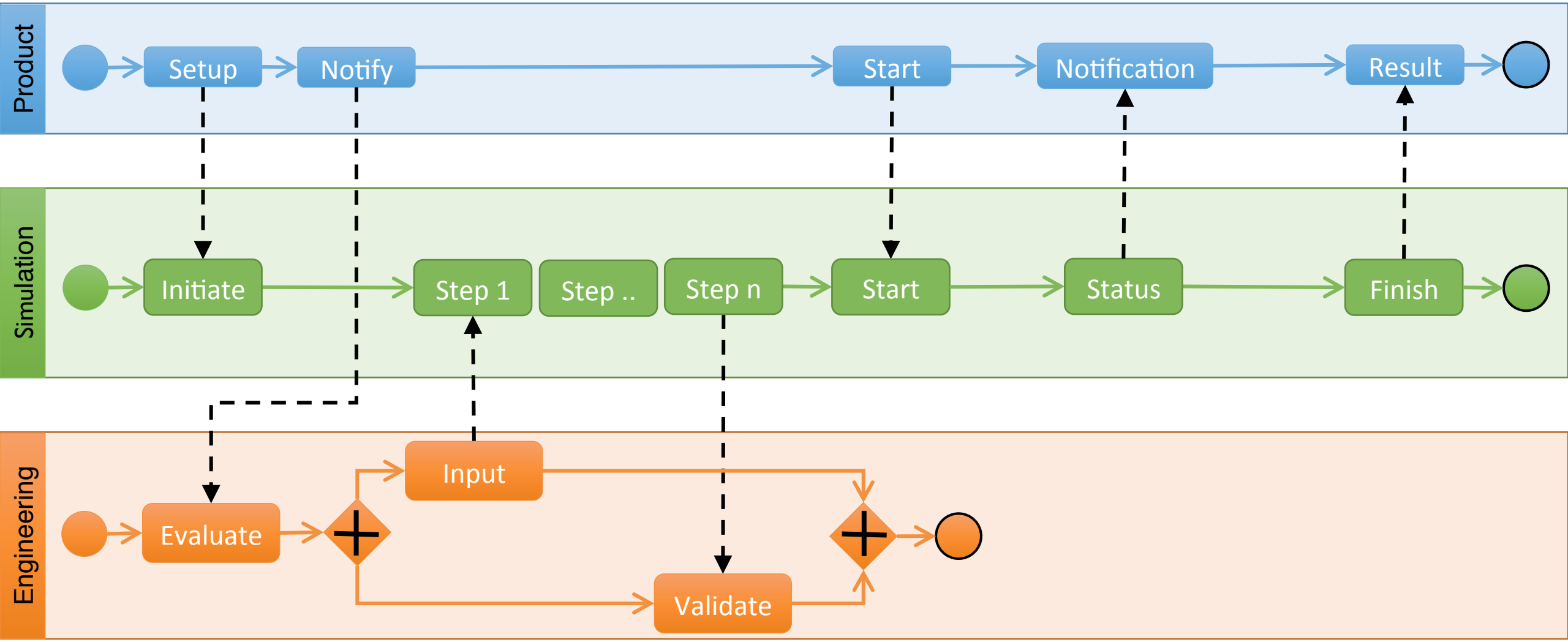
Exception 4


Product
Setup
Notify
Start
Notification
Result
Simulation
Initiate
Step 1
Step ..
Step n
Start
Status
4
Finish
Engineering
Input
Evaluate
Validate

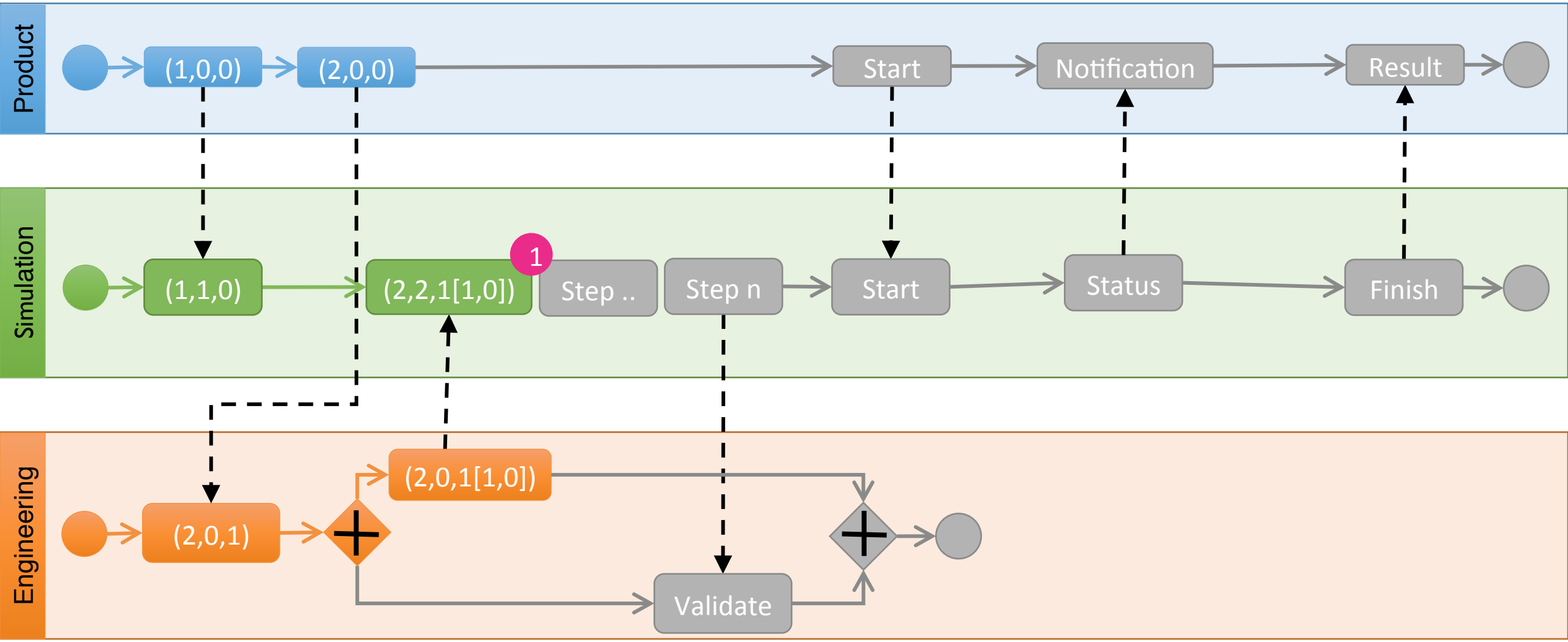
Exception 4


Scenario 1
Notification
Status
Scenario 2
Notification
Status
Product
Simulation
Engineering
Start
Notification
Result
Status
4
Start
Finish

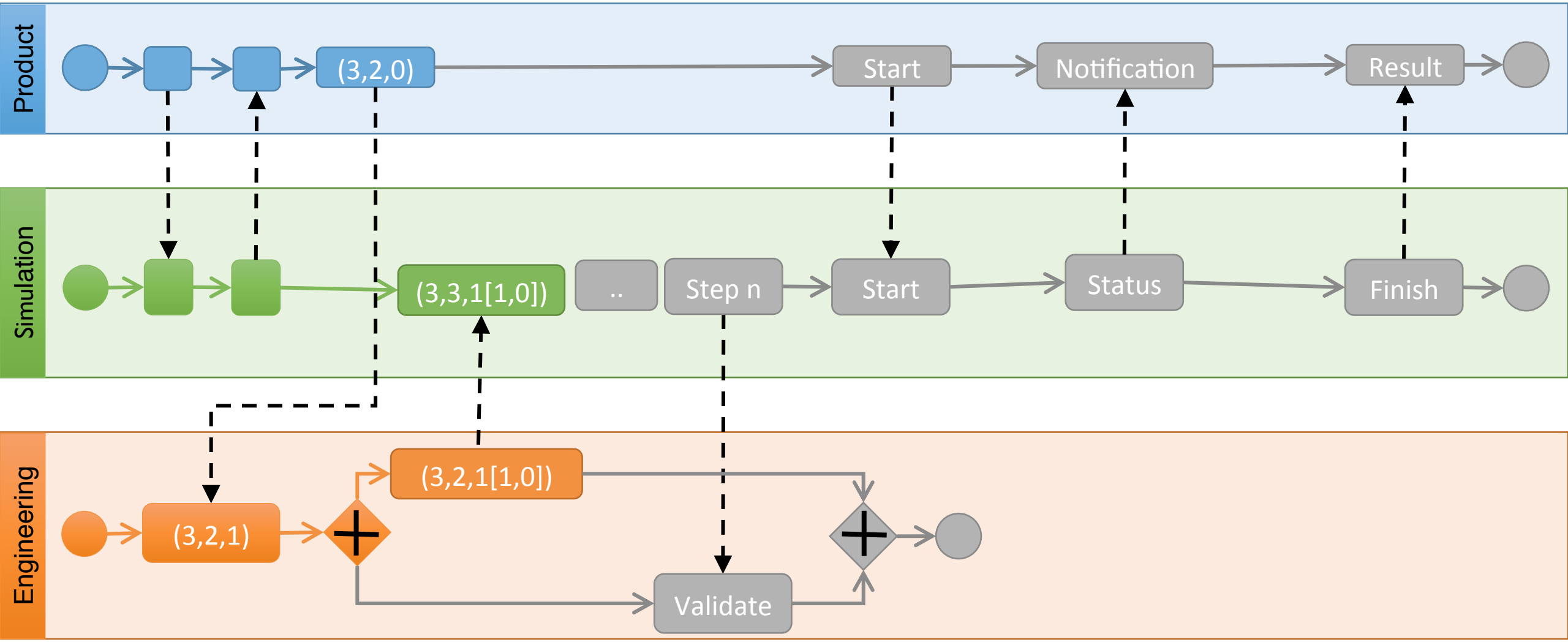
Possible solution for Exception 4



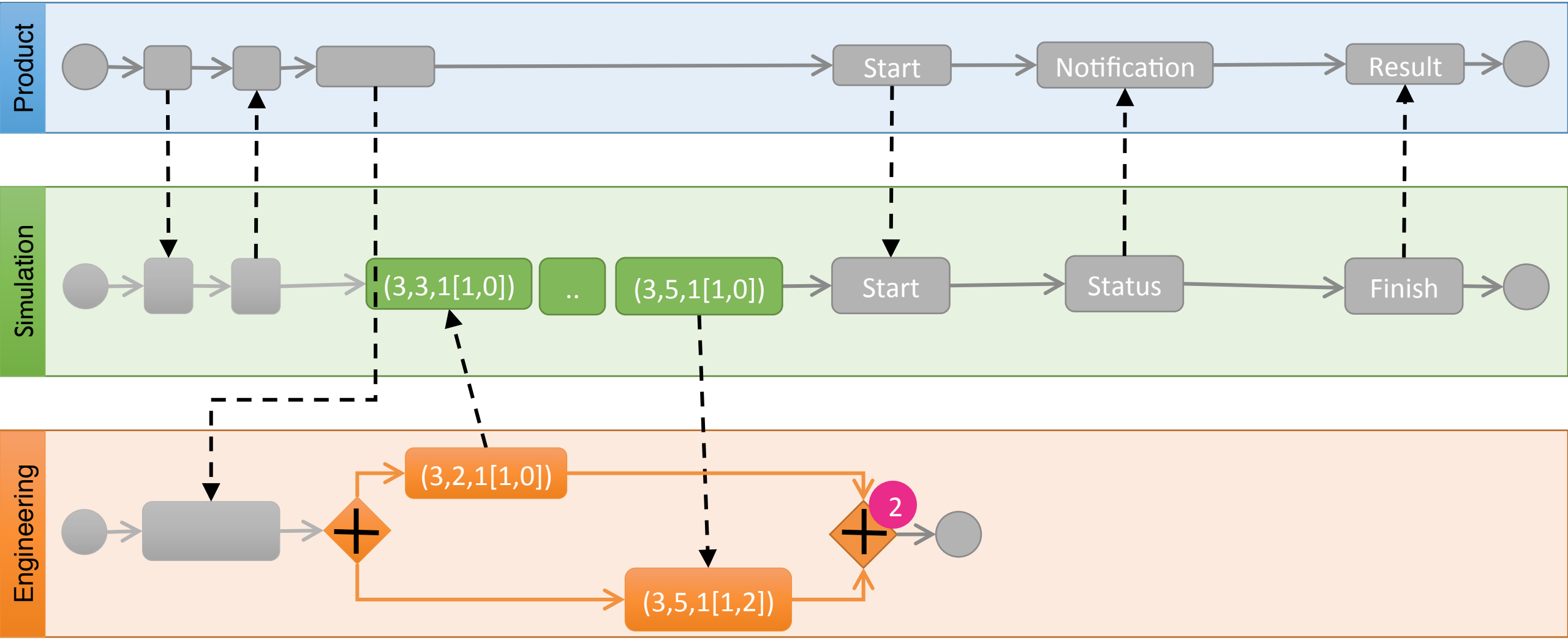
Exception ❶ : message order



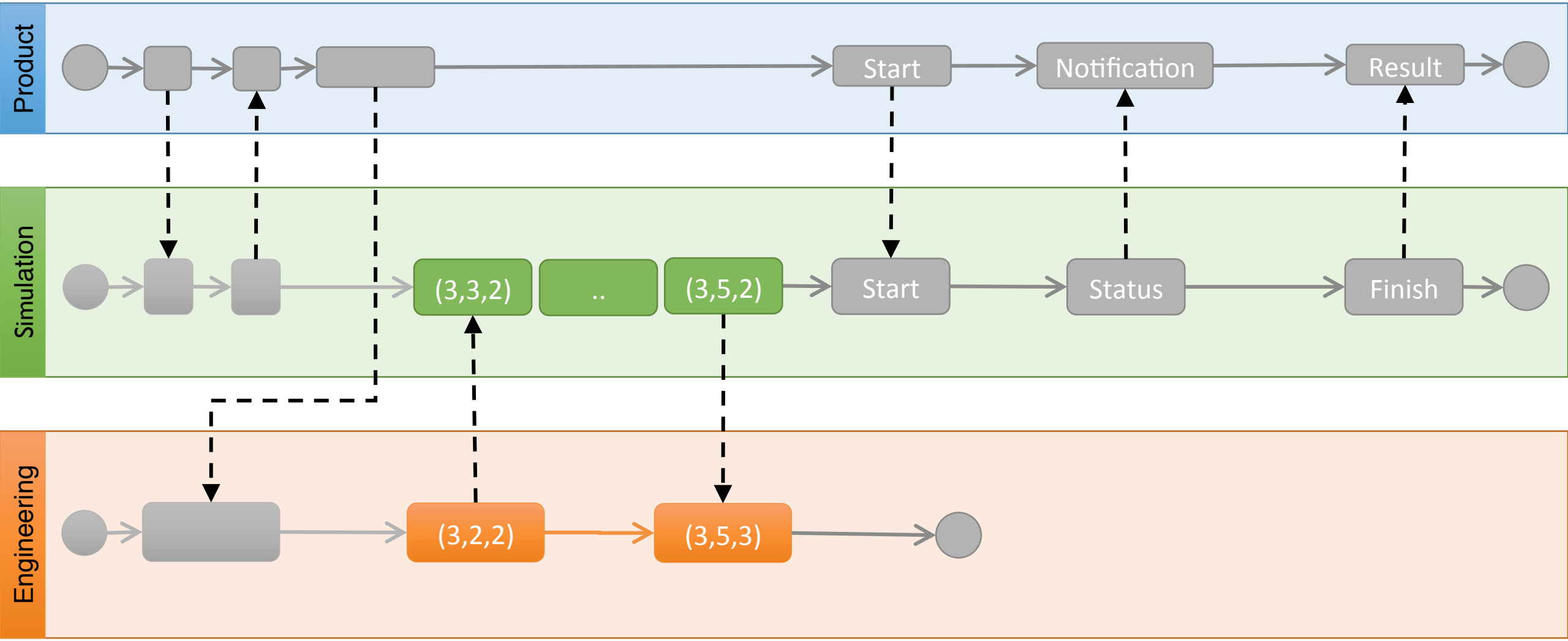
Possible solution for Exception 1



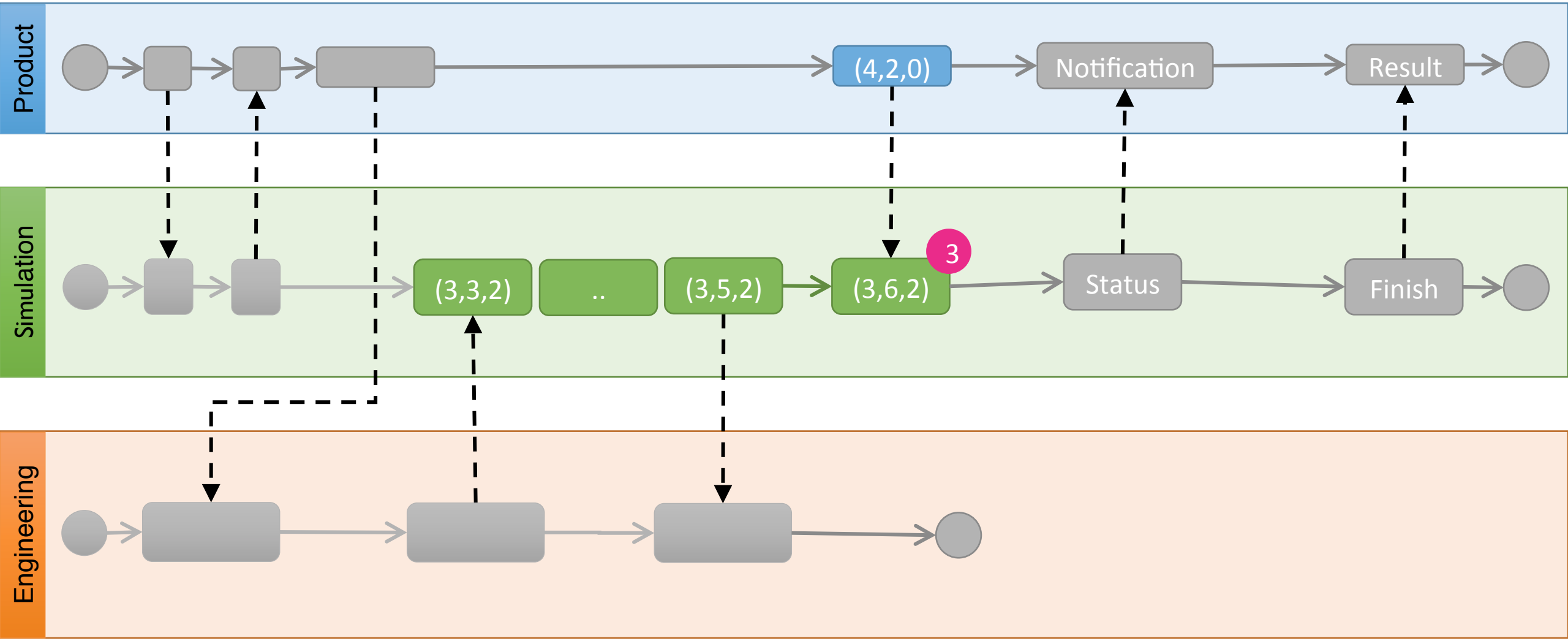
Exception ❷ : parallel order



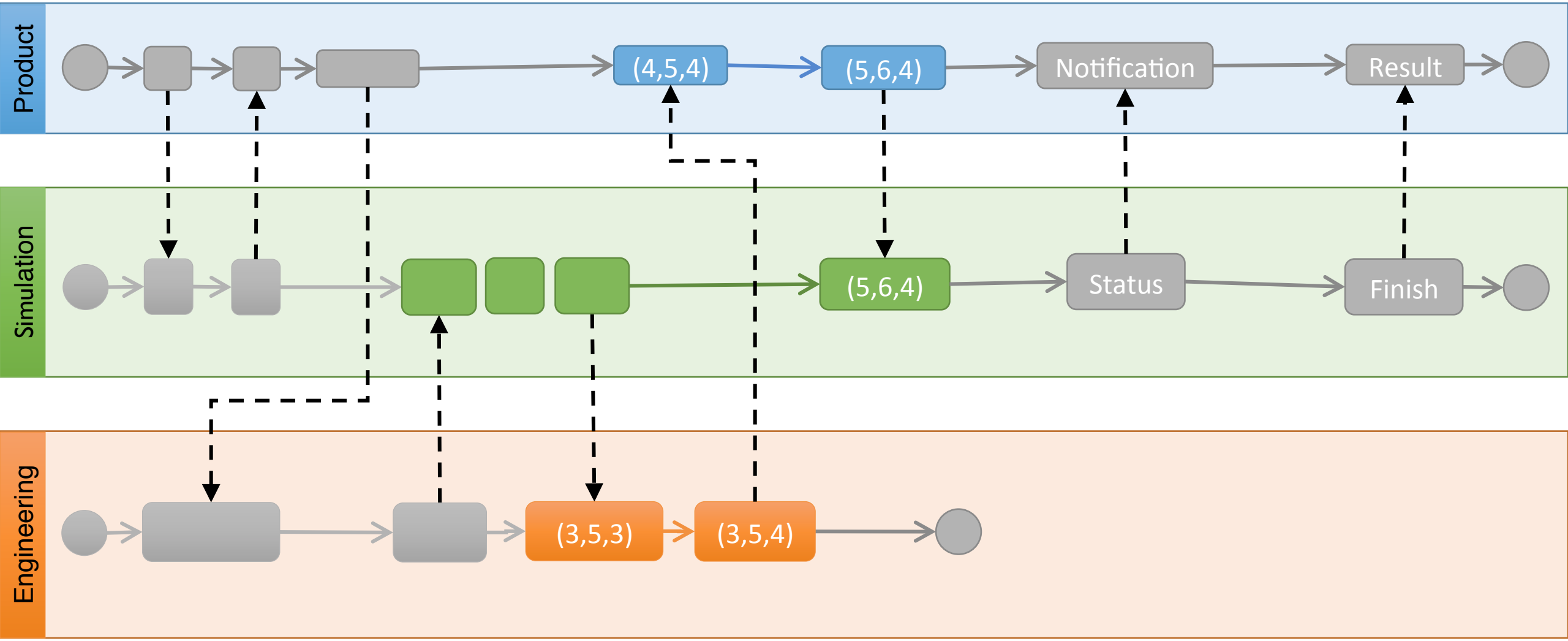
Possible solution for Exception ❷



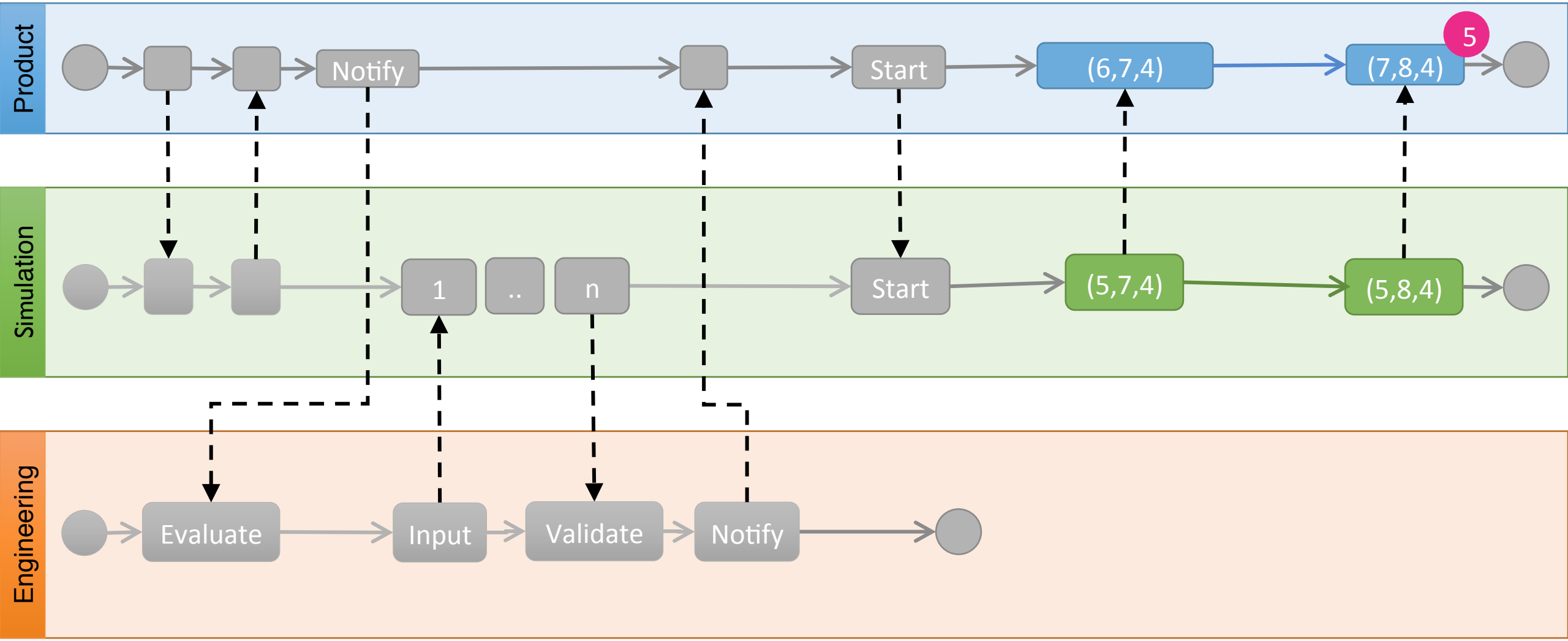
Exception ❸ : message order



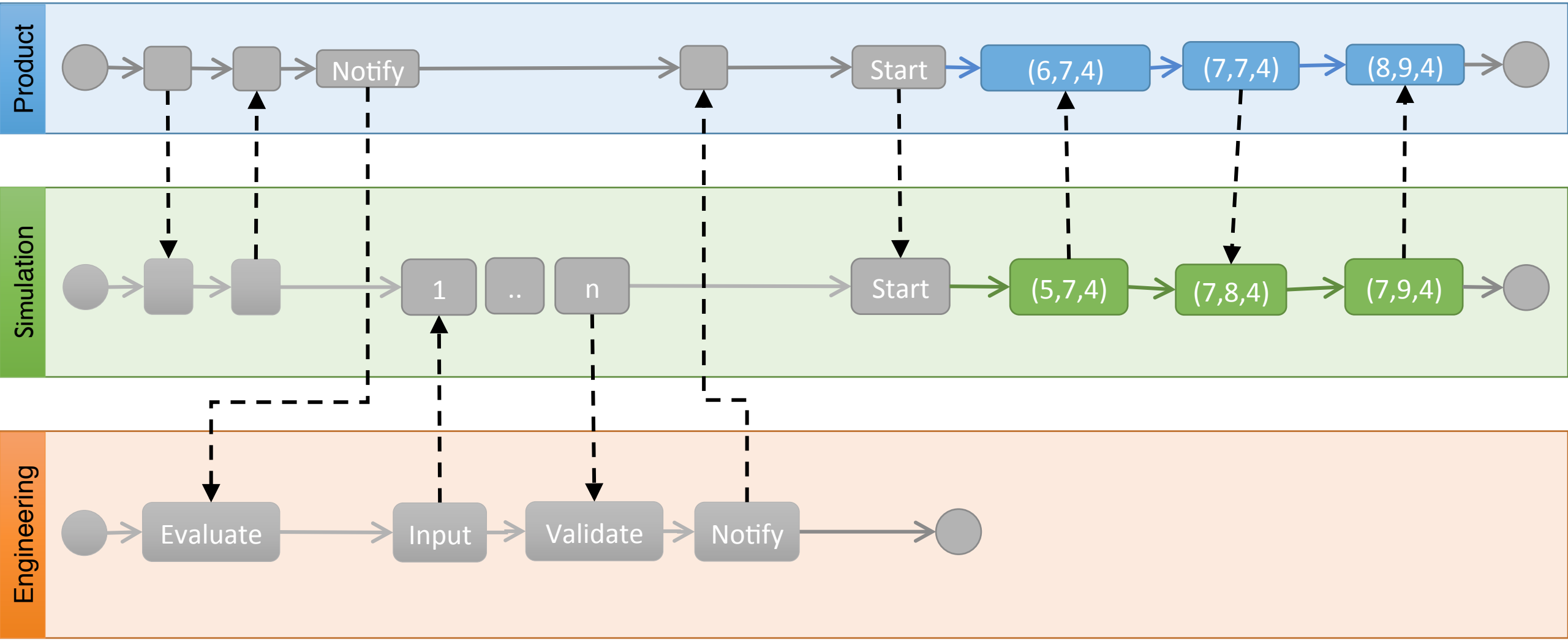
Possible solution for Exception ❸



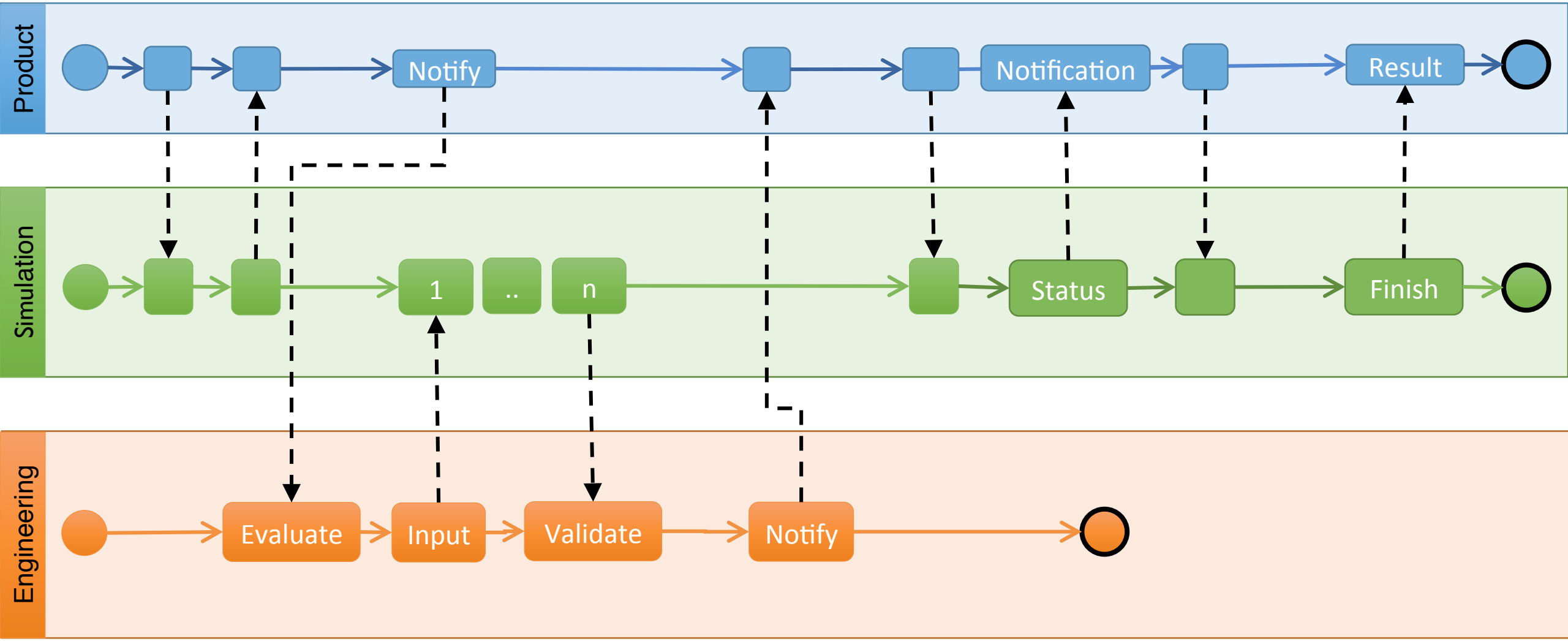
Exception 5

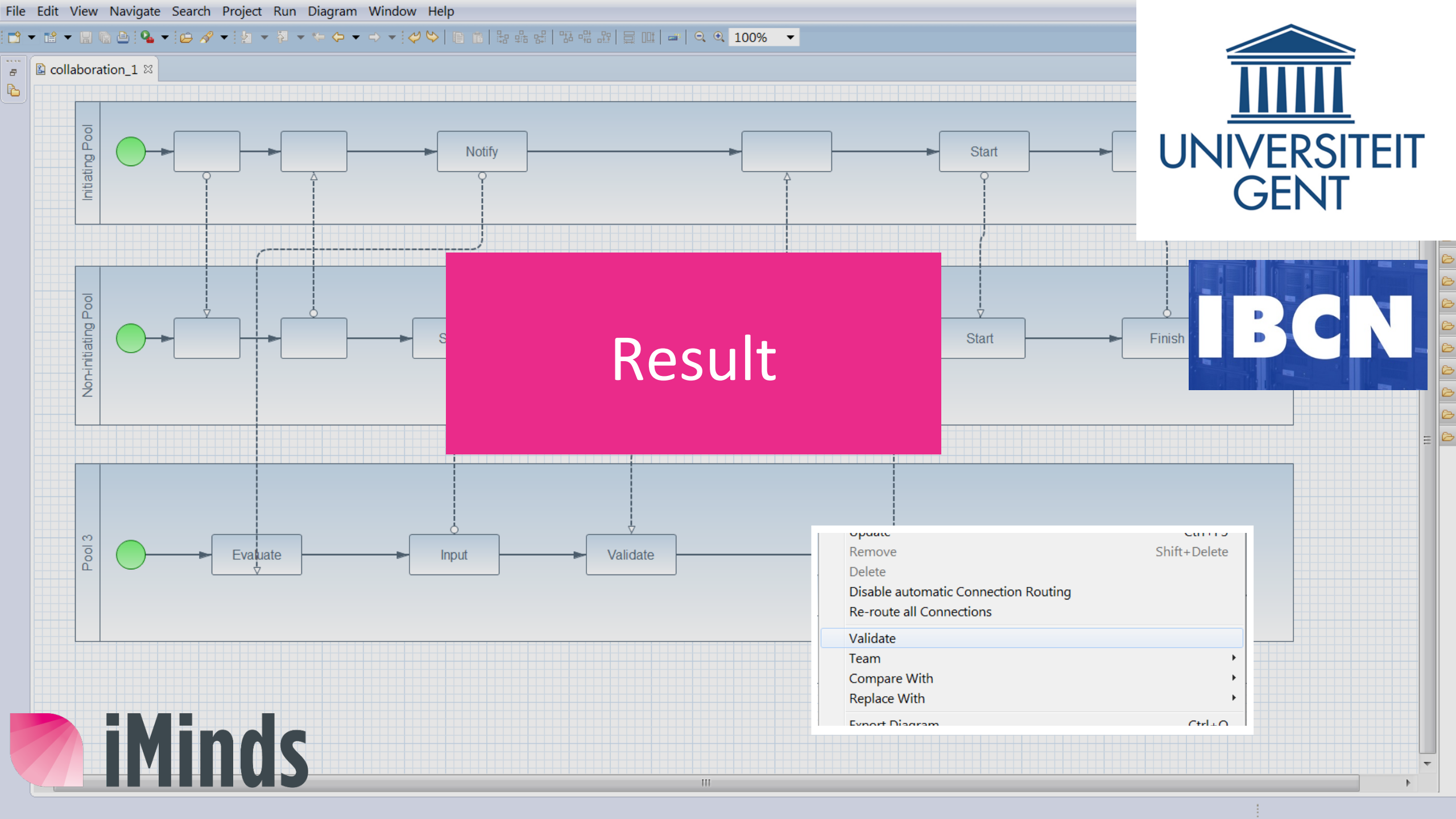

Product
Notify
Start
(6,7,4)
(7,8,4)
5
Simulation
1
..
n
Start
(5,7,4)
(5,8,4)
Engineering
Evaluate
Input
Validate
Notify

Solution for Exception 5



Properly validated BPMN model




File Edit View Navigate Search Project Run Diagram Window Help
100%
collaboration_1
Initiating Pool
Notify
Start
Non-initiating Pool
Start
Finish
Result
Pool 3
Evaluate
Input
Validate
Remove Shift+Delete
Delete
Disable automatic Connection Routing
Re-route all Connections
Validate
Team
Compare With
Replace With
UNIVERSITEIT GENT
IBCN
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