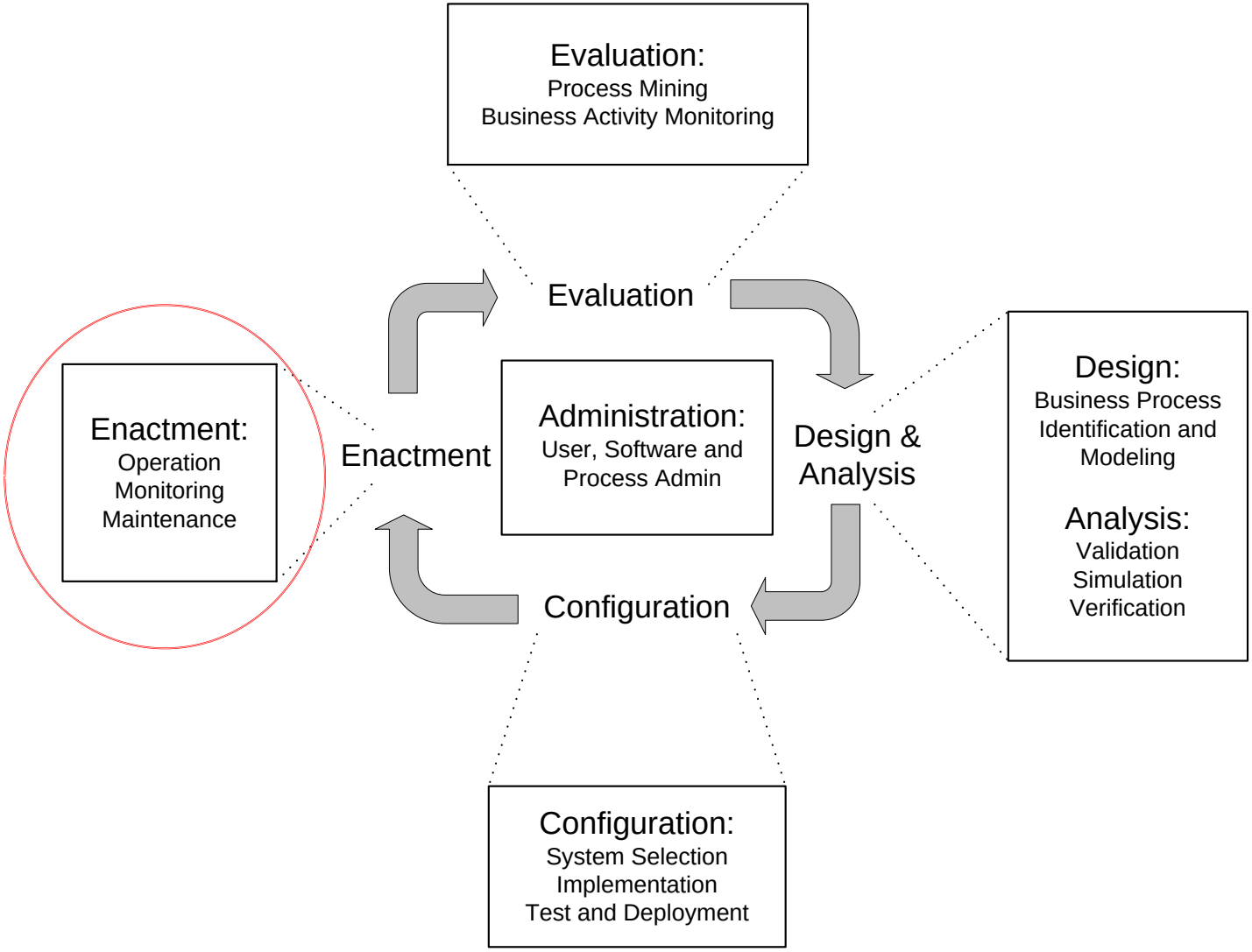
Process Instantiation



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Instantiation of Processes

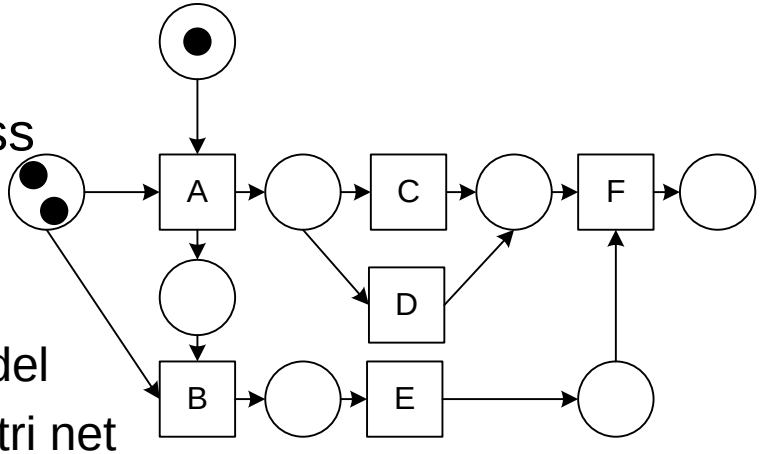
- Process instantiation
  - Central question: When a process instance is created?
  - What rules are to be considered?
- Clear Instantiation semantics is crucial
  - To allow a clear interpretation of the model
  - Specifically: To know when a process should be started
- Hint
  - The adoption of structural soundness is abandoned here

Challenges

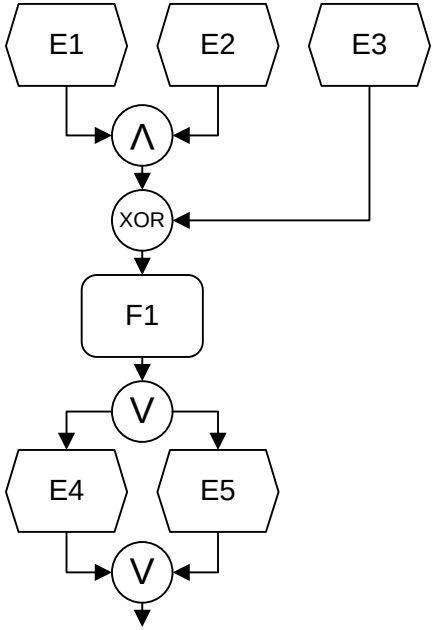
- Observation
  - There may be a variety of initial states for a process model
  - Structural Soundness is not met
- For example, brokers in the finance
  - Seller offers shares for sale to the broker
  - Buyer makes a purchase request for shares through the broker
  - Offers and requests are brought together on the basis of the securities identification number
- Discussion
  - It is not defined, which occurs first.
  - Question here: When the process is instantiated?

Start State

- Start state is initial state of each process instance
- Explicit start state
  - Part of the definition of the process model
  - For example, the initial marking of a Petri net
  - Satisfied for structural soundness

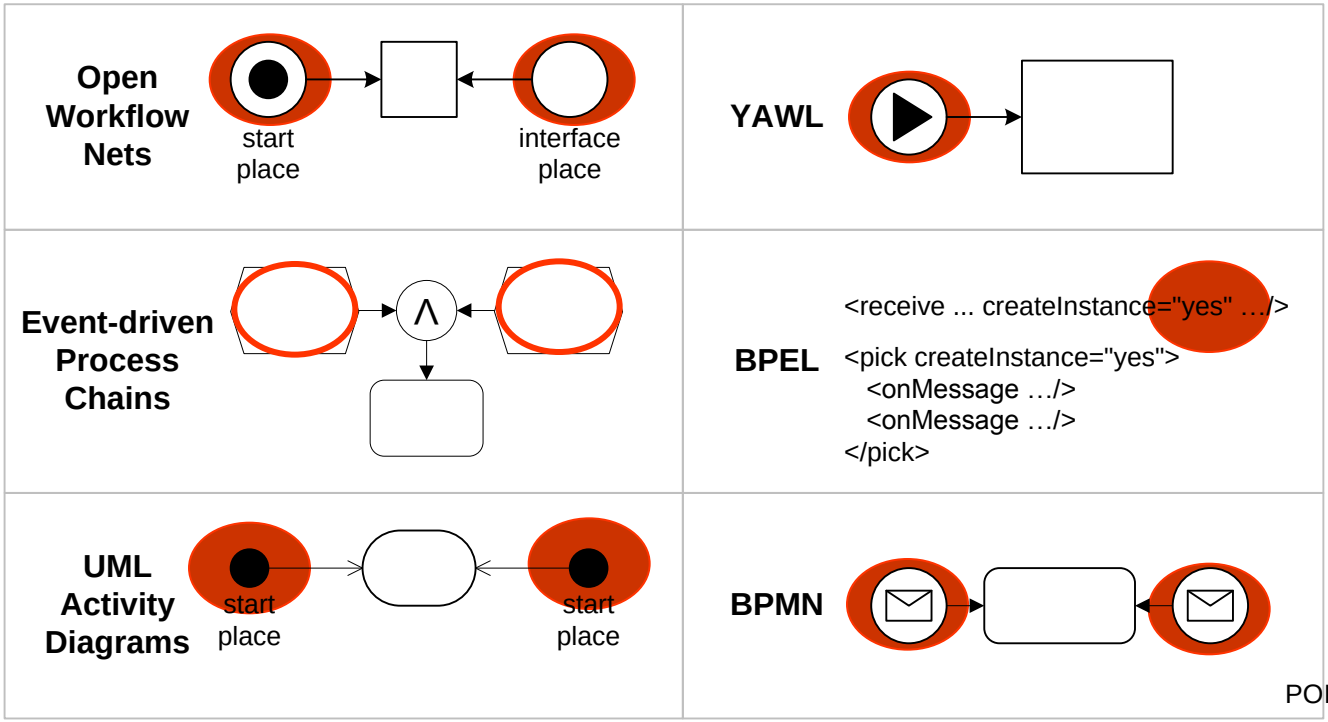


- Implicit start state
  - Is derived from the structure of the process model
  - Process model has entry points
  - These characterize the initial state (s)
  - For example, events with no incoming edges in an EPC



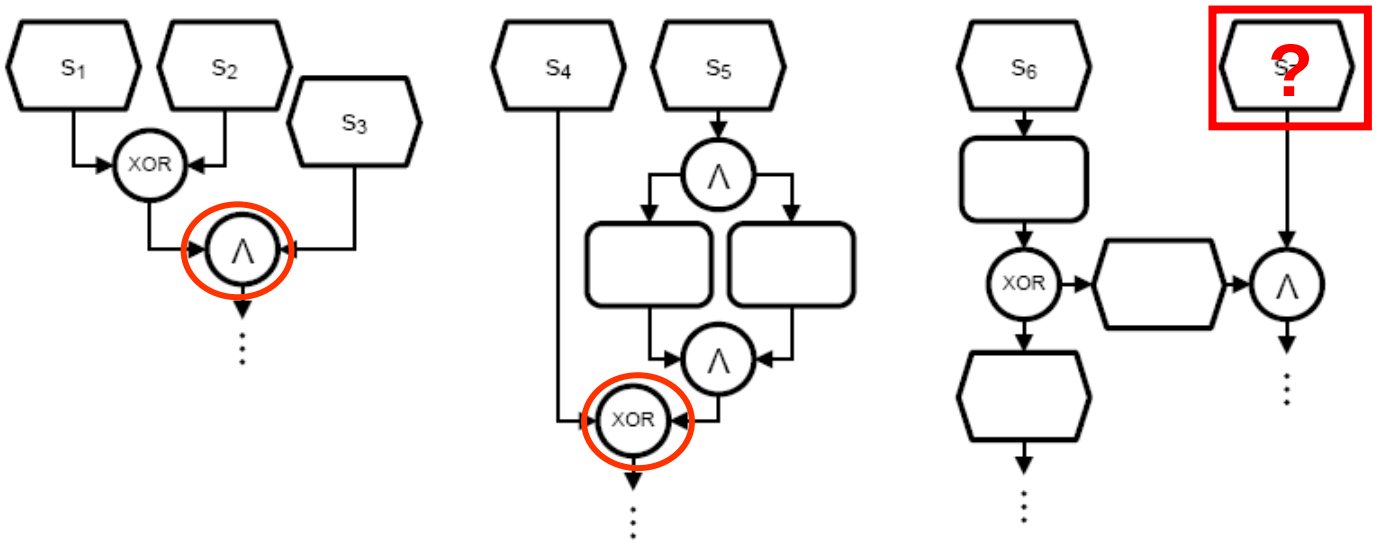
Instantiation Semantics

- Observation
  - Implicit initial states can be expressed in different process languages
  - Semantics of the language describes instantiation semantics, this is not always unique!



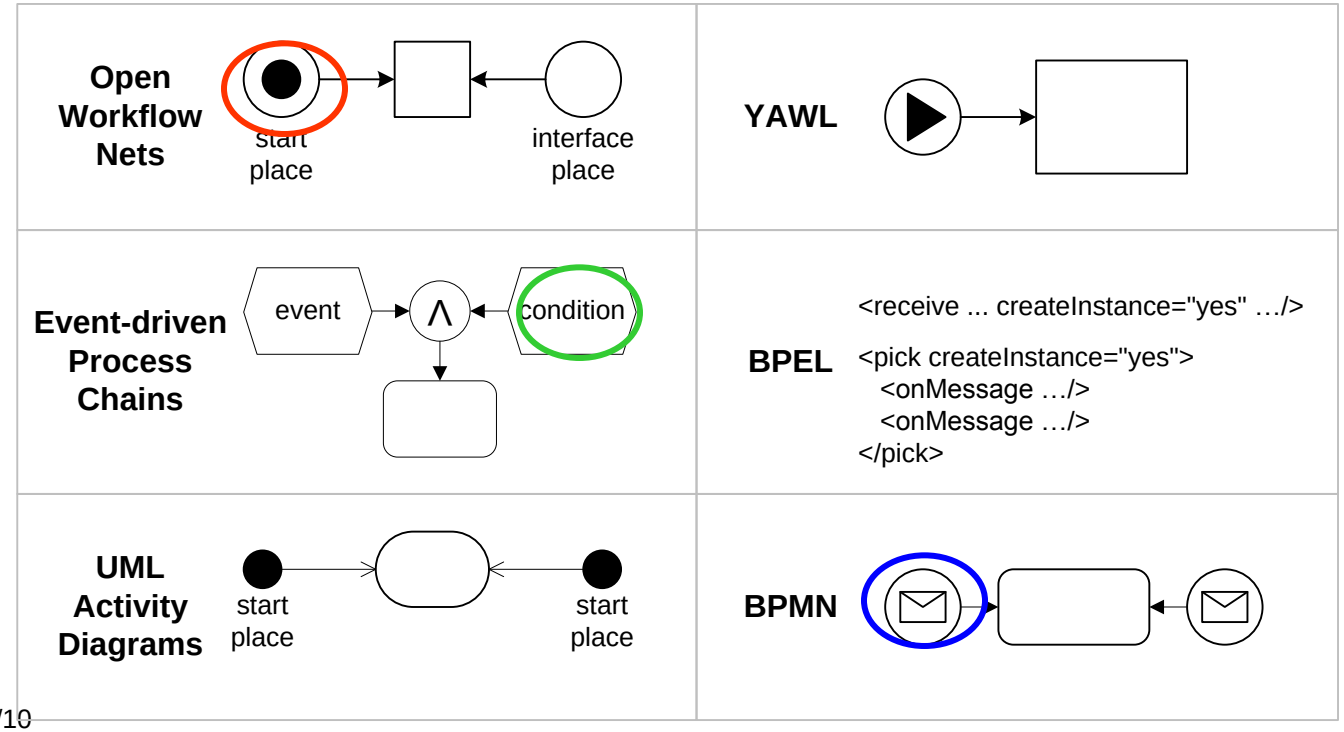
Deriving the initial state

- Start-Join
  - Join nodes, so all paths from entry points to endpoints contain that node
- Observation
  - If there are several start-joins, we pick the first
    - I.e., there is path to each other start-join
  - Based on the minimal start-join, valid starting states can be identified



Types of Entry Points

- Start-Place: will be always activated because it is part of the definition
- Start-Condition: will be activated when condition is true
- Start-Event: will be activated when event occurs



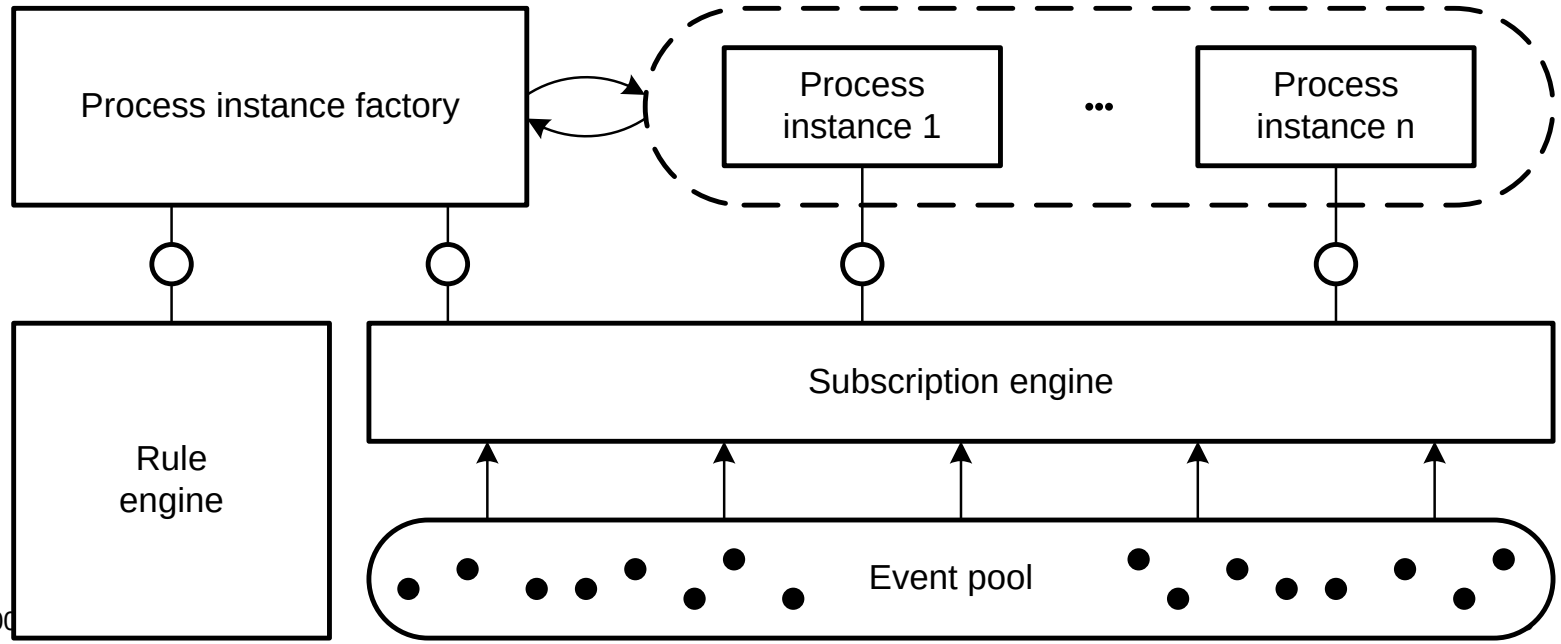
Start-Condition vs. Start-Event

- Distinction between event and condition is sometimes not part of the modeling language

- For example, entry points in EPCs
  - No start-places
  - But can be interpreted as a condition or event
    - "Invoice received" vs. "Invoice is complete“
  - Differentiation by linguistic analysis (active or passive use of the verb)

Technical View on Start Events

- If instantiation includes start events
  - Acceptance of an event-processing infrastructure
  - Instance Creation by Process Instance Factory
- Subscription
  - *Process Instance Factory subscribes for start events*
  - Process instances subscribe for process-related events

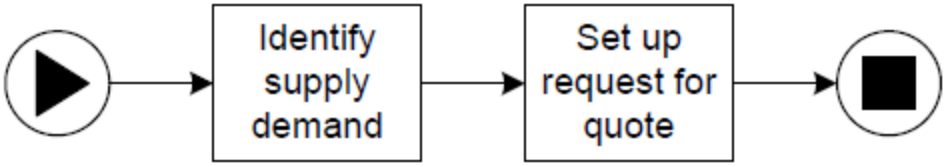


CASU Framework

- CASU Framework answers the questions
  - What are the possibilities of instantiation?
  - How those are supported by process modeling languages?
- **Creation (C):**
  When is an instance created?
- **Activation (A):**
  Which entry points are activated immediately after instantiation?
- **Subscription (S):**
  For which non-activated start events are subscriptions created?
- **Un-subscription (U):**
  How long are subscriptions kept?

CASU: Creation

- C-1 Ignorance
  - Not start condition, no sta
  - The process environment instantiation
  - In the example, it is not clear under which conditions the supply demand is identified

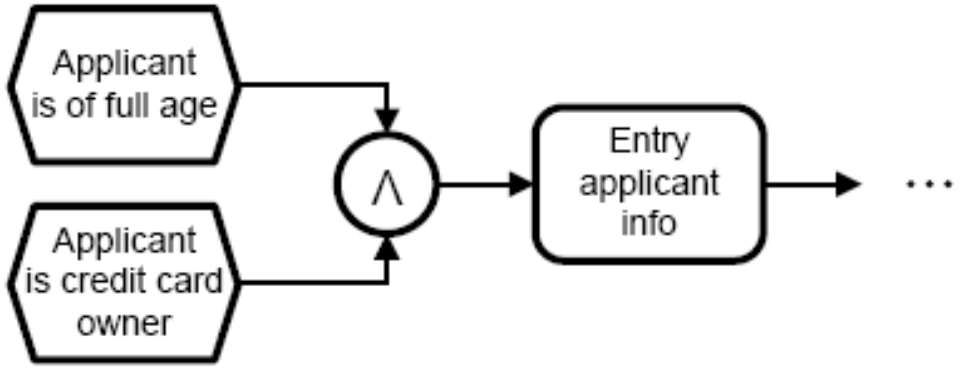


- C-2 Single Condition Filter

- C-3 Multi Condition Filter
- C-4 Single Event Trigger
- C-5 Multi Event Trigger

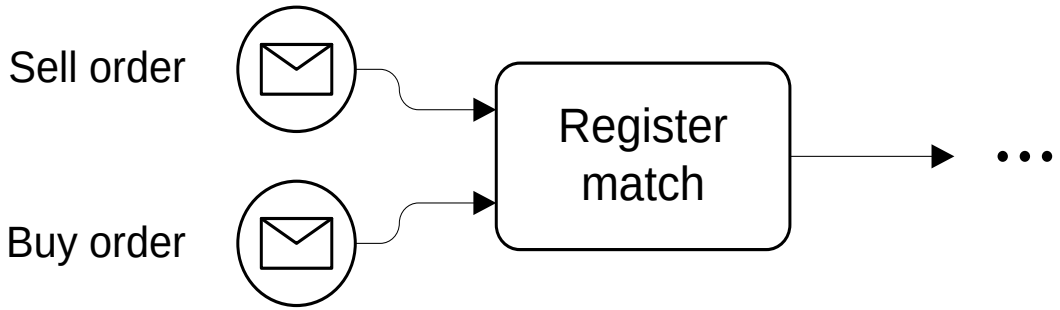
CASU: Creation

- C-1 Ignorance
- C-2 Single Condition Filter
- C-3 Multi Condition Filter
  - Creation by means of conditions (analog C-2)
  - Several start-conditions for the instantiation
  - A complex combination of conditions is possible
- C-4 Single Event Trigger
- C-5 Multi Event Trigger



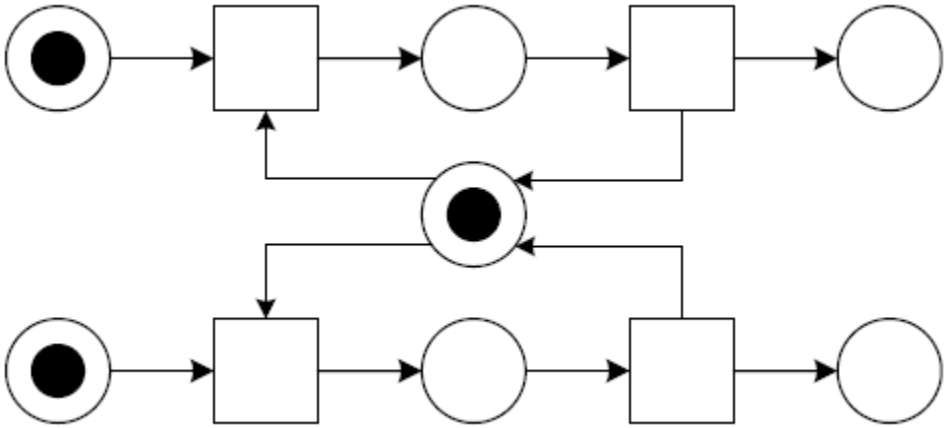
CASU: Creation

- C-1 Ignorance
- C-2 Single Condition Filter
- C-3 Multi Condition Filter
- C-4 Single Event Trigger
  - A Police process model describes that citizens can file charges via a website, triggering instantiation by submitting the web form.
- C-5 Multi Event Trigger
  - Creation by means of events (analog C-4), which are consumed at the start
  - Multiple start events are required
  - If all of the necessary events are present, instantiation succeeds



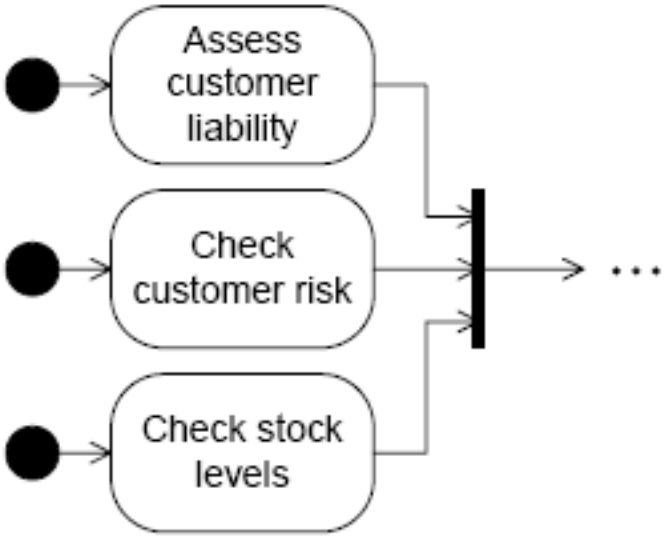
CASU: Activation

- A-1 Initial State
  - Explicit definition of the initial state of a process instance
  - For example, a Petri net system
- A-2 All Start Places
- A-3 True Conditions
- A-4 Occurred Events
- A-5 Occurred Events and Conditions



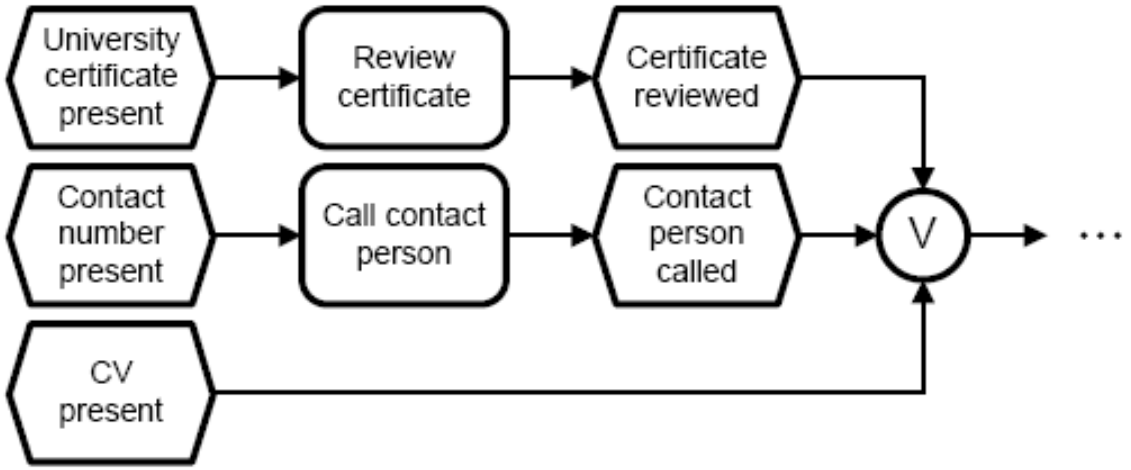
CASU: Activation

- A-1 Initial State
- A-2 All Start Places
  - Initial state is determined by start places
  - Each is activated during the process instantiation
- A-3 True Conditions
- A-4 Occurred Events
- A-5 Occurred Events and Conditions



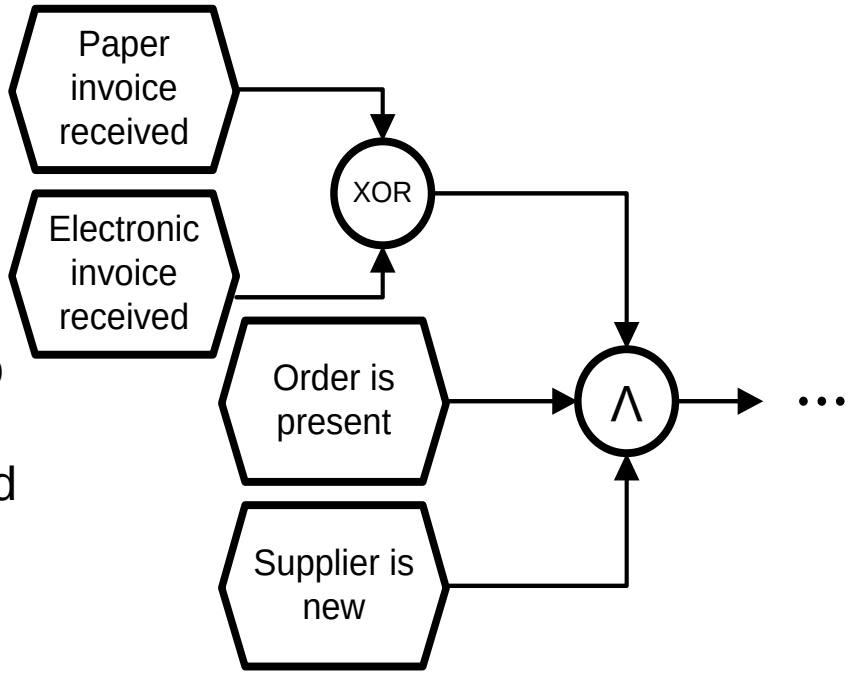
CASU: Activation

- A-1 Initial State
- A-2 All Start Places
- A-3 True Conditions
  - Start conditions are evaluated
  - Insofar true, the process element is activated
  - Logical coupling between activation and instantiation
- A-4 Occurred Events
- A-5 Occurred Events and Conditions



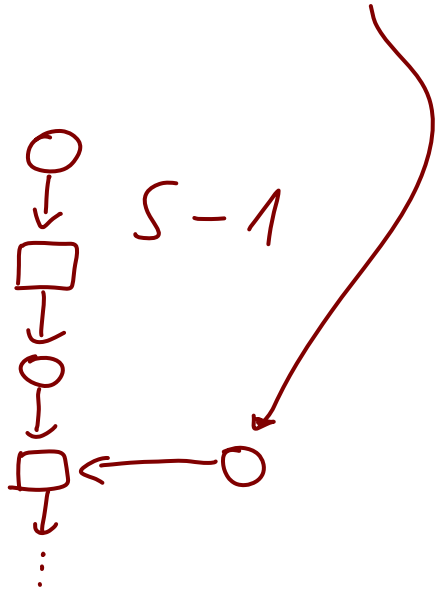
CASU: Activation

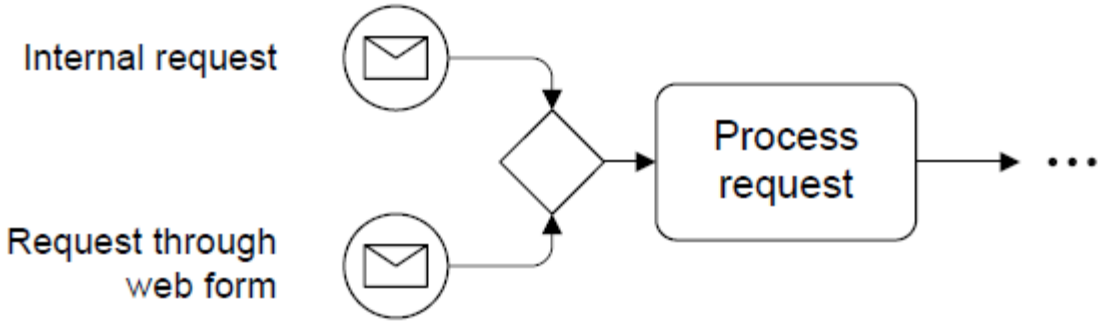
- A-1 Initial State
- A-2 All Start Places
- A-3 True Conditions
- A-4 Occurred Events
- A-5 Occurred Events and Conditions
  - In this case all occurred events map to activated control threads (A-4). Additionally, branches can be activated if start conditions yield true at instantiation time.



CASU: Subscription

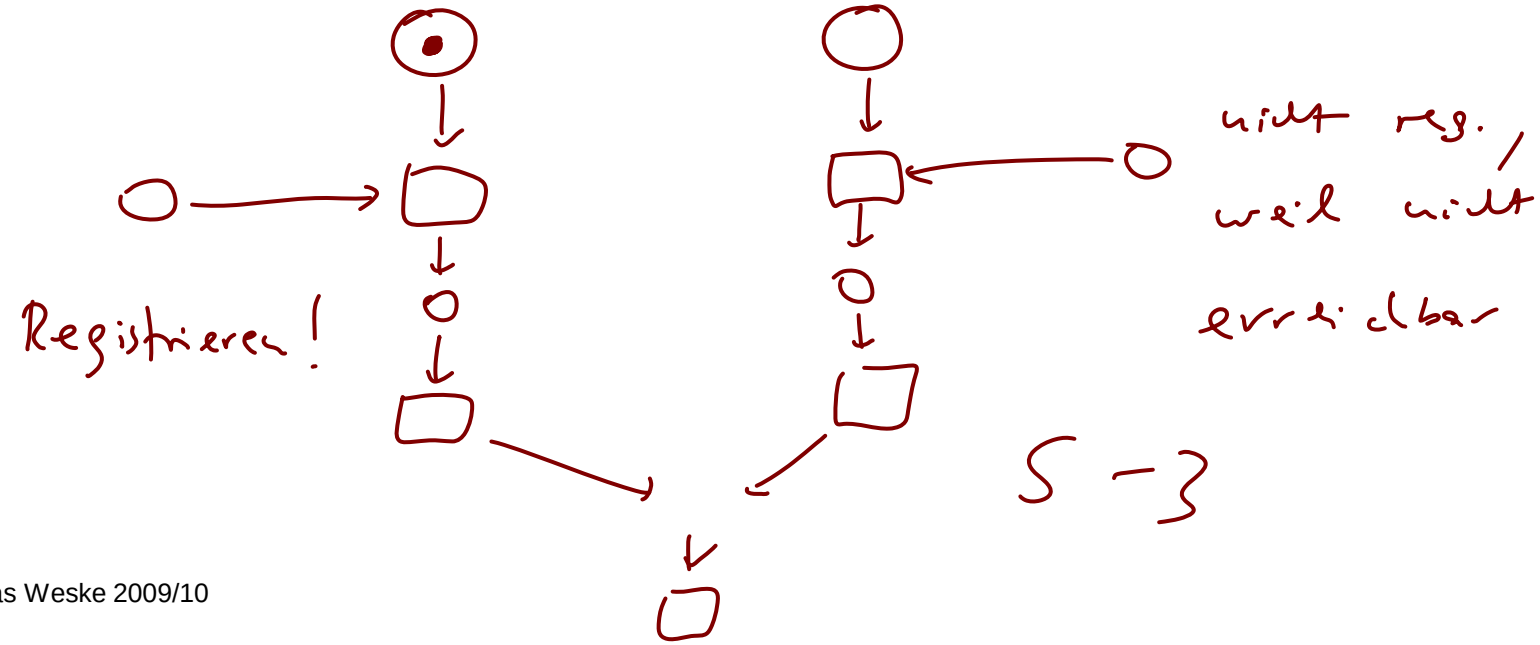
- S-1 All Subscriptions
  - Instance subscribes for all entry points that have not yet occurred (for the corresponding events)
- S-2 No Subscriptions
  - Instance does not subscribe for any of the not occuring entry points
- S-3 Reachable Subscriptions





CASU: Subscription

- S-1 All Subscriptions
- S-2 No Subscriptions
- S-3 Reachable Subscriptions
  - Only those event subscriptions are activated that might be required later to complete the process instance properly.



CASU: Unsubscription

- U-1 Until Consumption
  - All subscriptions for existing entry points are kept
  - The process can not terminate without the occurrence of these events
- U-2 Until Termination
- U-3 Timer-based
- U-4 Event-based
- U-5 Proper Completion

```
<flow>
<sequence><receive name="rcvRFIDNotification" ..
    createInstance="yes">
  <correlations><correlation set="cont"
      initiate="join"/></correlations>
 </receive>..</sequence>
<sequence><receive name="rcvRoutingInfo" .. createInstance="yes">
  <correlations><correlation set="cont"
      initiate="join"/></correlations>
 </receive>..</sequence>
</flow>
```

CASU: Unsubscription

- U-1 Until Consumption
- U-2 Until Termination
  - The subscriptions for entry points to be kept until the process instance terminates
- U-3 Timer-based
- U-4 Event-based
- U-5 Proper Completion

```
<flow>
<receive name="rcvMsg1" .. createInstance="yes" />
<sequence><receive name="rcvMsg2" .. createInstance="yes" />
 .. <exit/>
 </sequence>
</flow>
```

CASU: Unsubscription

- U-1 Until Consumption
- U-2 Until Termination
- U-3 Timer-based
  - After a certain period of time, the registrations for entry points are canceled
- U-4 Event-based
- U-5 Proper Completion

```
<flow>
 <receive name="rcvMsg1" .. createInstance="yes" />
 <pick createInstance="yes">
  <onMessage name="rcvMsg2" .. >
   .. </onMessage>
  <onAlarm name="timeout" .. >
   .. </onAlarm>
 </pick> ..
</flow>
```

CASU: Unsubscription

- U-1 Until Consumption
- U-2 Until Termination
- U-3 Timer-based
- U-4 Event-based
  - After one of several exclusive Start events occurred, the subscriptions for the other entry points are canceled
- U-5 Proper Completion

```
<flow>
 <receive name="rcvInvoice" .. createInstance="yes" />
 <pick createInstance="yes">
  <onMessage name="rcvPaperDeliveryNotification" .. >
  .. </onMessage>
  <onMessage name="rcvElectronicDeliveryNotification" .. >
  .. </onMessage>
 </pick> ..
</flow>
```

CASU: Unsubscription

- U-1 Until Consumption
- U-2 Until Termination
- U-3 Timer-based
- U-4 Event-based
- U-5 Proper Completion
  - Registration is discarded once the process reaches a valid end state without the event