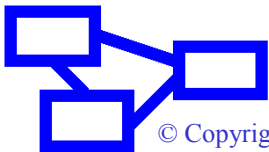


# Business Process Mapping using the BPMN 2.0 Modelling Notation

**Tutorial**



# Contents

- ◆ **BPMN and Business Process Diagrams (BPD)**
- ◆ **Private Processes**
- ◆ **Start and End Events**
- ◆ **Activities and Sequence Flows**
- ◆ **Exclusive Gateways**
- ◆ **Intermediate Events**
- ◆ **Public Processes, Pools and Lanes**
- ◆ **Message Flows**
- ◆ **Collaboration Processes**
- ◆ **Sub-processes**
- ◆ **Parallel Gateways**
- ◆ **Process Steps as Tasks**
- ◆ **Human versus System Pools**
- ◆ **Choreographies, Conversations and BPEL**

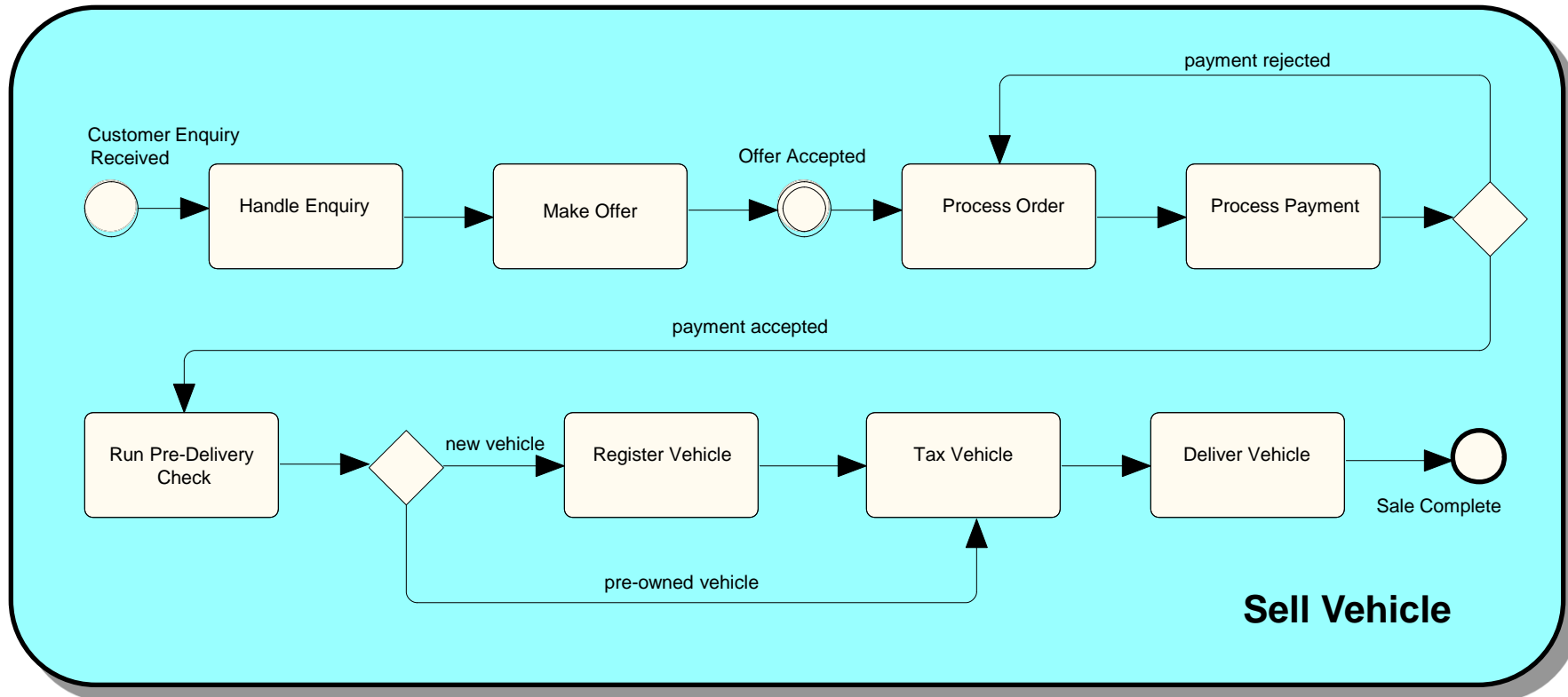


# The Business Process Model and Notation

- ◆ Syntax only
- ◆ Process independent
- ◆ Tool independent
- ◆ Developed by the OMG
- ◆ Also responsible for
  - ◆ UML
  - ◆ SysML
- ◆ Version 1.0 - May 2004 - adopted 6/2/06
- ◆ Version 1.1 - Feb 2008
- ◆ Version 2.0 - Jan 2011 - current



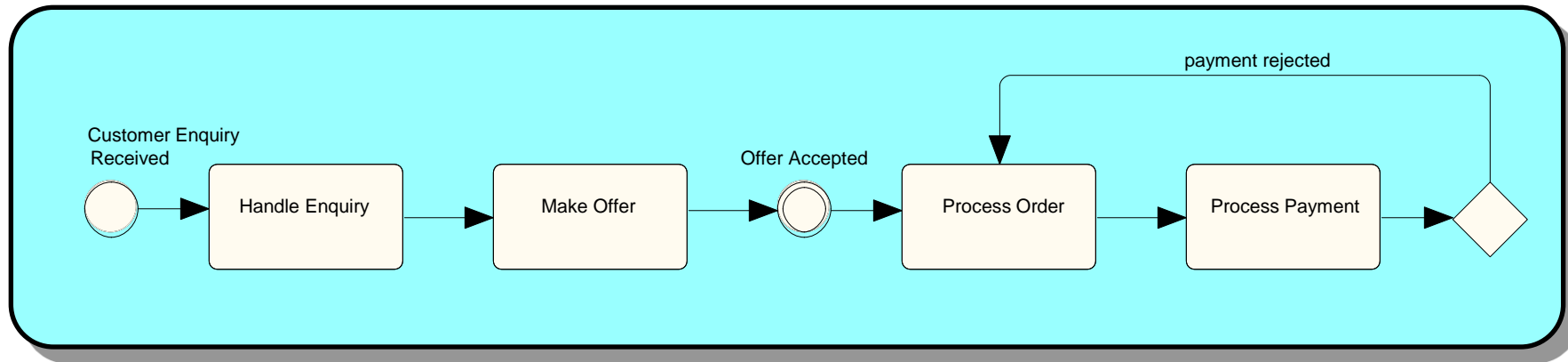
# Business Process Diagram (BPD)



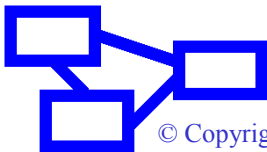
- ◆ Private Process
- ◆ Start and End Events
- ◆ Activities

- ◆ Sequence Flows
- ◆ Exclusive Gateways
- ◆ Intermediate Events

# Private Processes



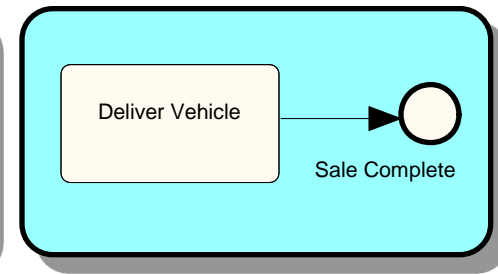
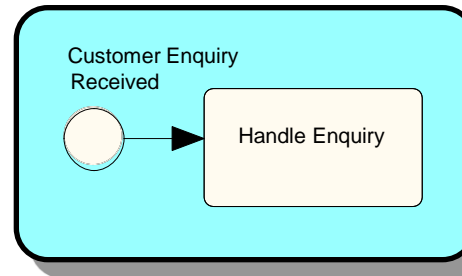
- ◆ **Internal to a specific organisation**
- ◆ **Does not show explicit interaction with external entities**
- ◆ **Non-executable**
  - Modelled for the purpose of documenting process behaviour at a modeller-defined level of detail
- ◆ **Executable**
  - Modelled for the purpose of being executed in business process management or other system



# Start and End Events

## ◆ An event is instantaneous

- Mostly a status phrase e.g.
- “Customer Enquiry Received”
- “Sale Complete”
- Maybe a command e.g.
- “Start Process”
- Often associated with the arrival or sending of information

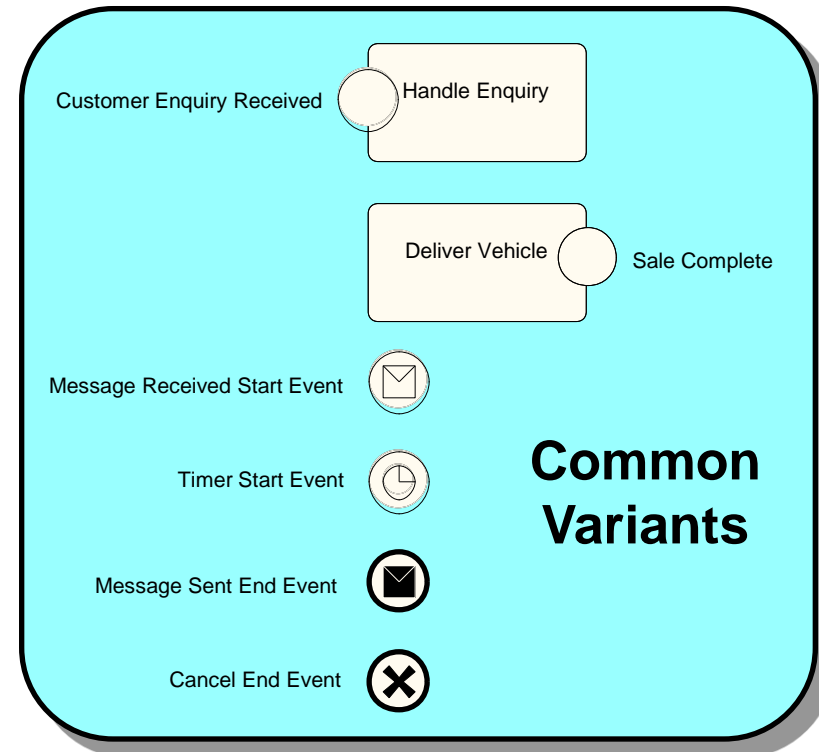


## ◆ Start Event

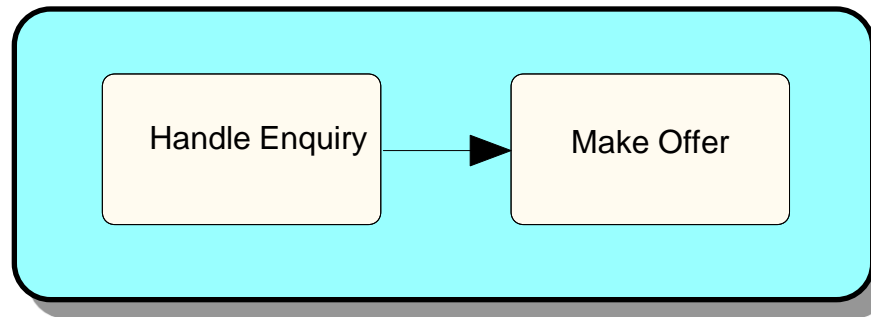
- Indicates where a process will start
- Optional but recommended
- No incoming sequence flows
- May be more than one

## ◆ End Events

- Indicates where a path of a process will end
- No outgoing sequence flows
- Optional but recommended
- May be more than one

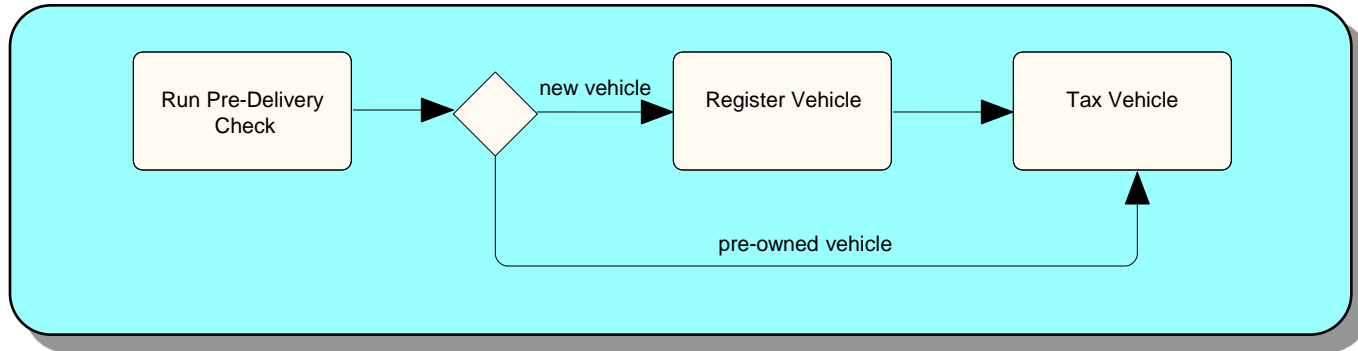


# Activities and Sequence Flows

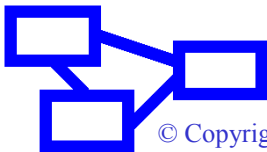


- ◆ An activity is work that is performed within a business process
- ◆ A sequence flow shows the order in which activities will be performed in a business process
- ◆ It defines the end of one activity and the beginning of the next
- ◆ No activity occurs on the sequence flow
- ◆ Think of a sequence flow as the thread of activity
- ◆ A sequence flow is normally only named if it is the outgoing flow from a gateway
- ◆ Use an event or a conditional sequence flow to qualify it

# Exclusive Gateways



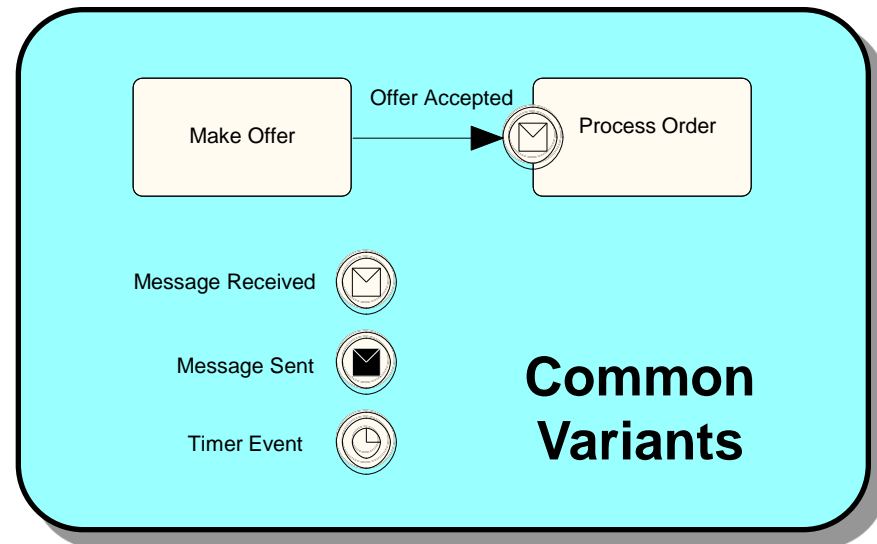
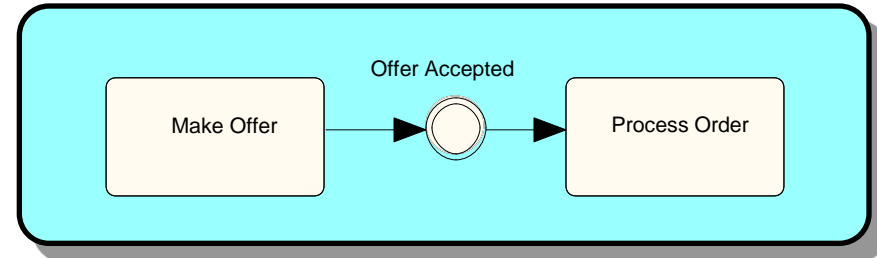
- ◆ Gateways control the flow of the thread of activity
  - 1-N sequence flow in (‘merging’ of flows)
  - 1-N sequence flow out (‘switching’ of flows)
  - Can be named with a question
  - Can occur sequentially
- ◆ No work is done in a gateway
- ◆ A simple gateway is exclusive by default
- ◆ An exclusive gateway has non-overlapping conditions defined for each possible exit
- ◆ Think of it as switching the flow
- ◆ If no condition is met the thread is held up



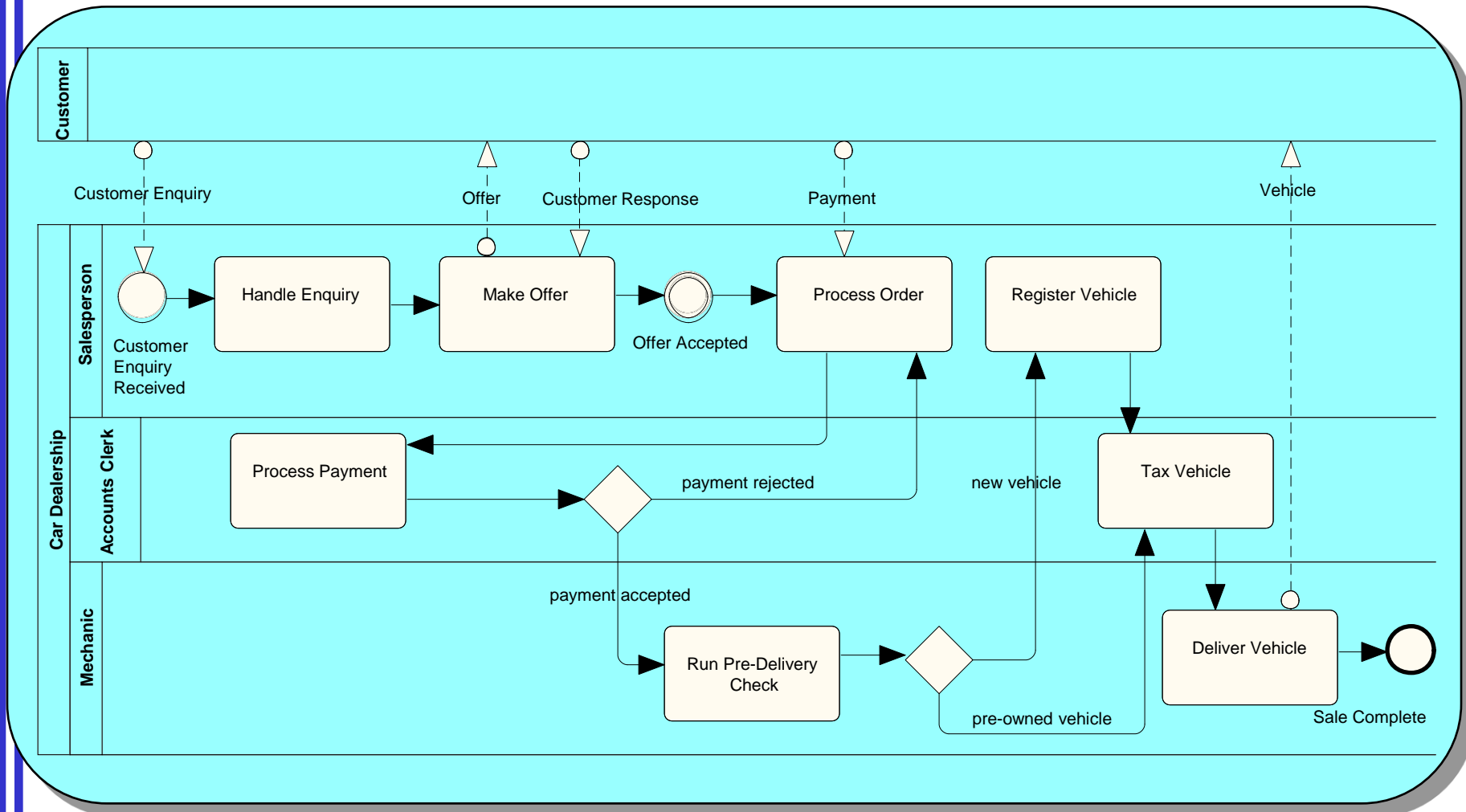


# Intermediate Events

- ◆ Indicate where something happens between the start and end of a process
- ◆ Indicates the termination of the previous activity or the start of the next
- ◆ All events are instantaneous and no work is done
- ◆ May occur as the result of receiving or sending data (message flows)
- ◆ May be 'throw' or 'catch'
- ◆ Activity edge event is catch only



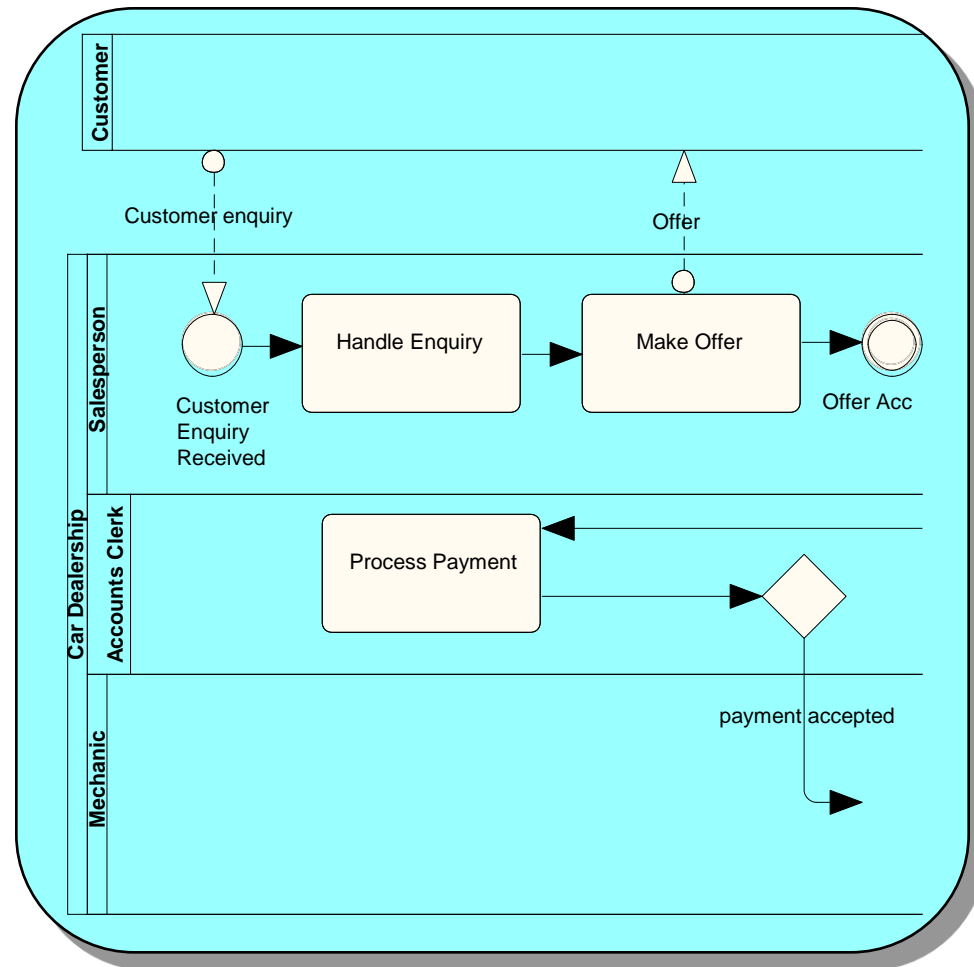
# Public Processes



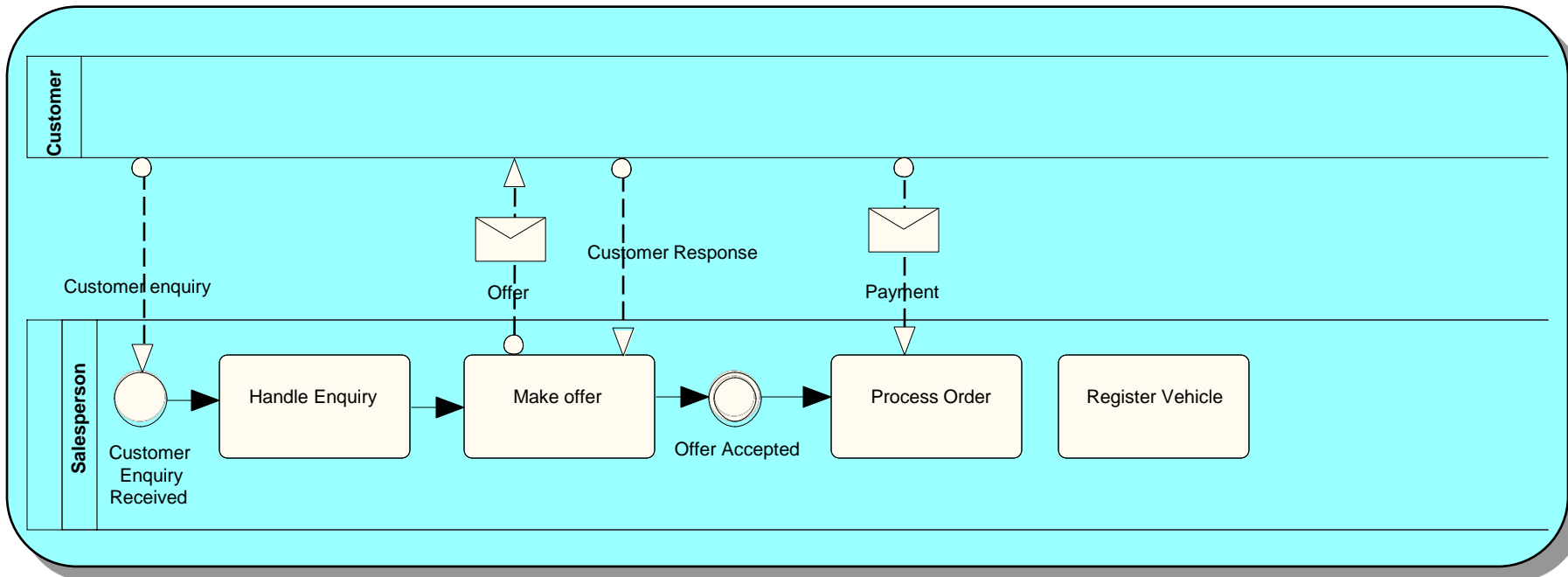
## ◆ Pools, lanes and message flows

# Pools and Lanes

- ◆ Pools represent participants in a collaboration
- ◆ Pools may be empty (black box), or show a process
- ◆ A public process shows external entities as empty pools with messages to and from the pool
- ◆ Lanes may be used to organise activities within a pool
- ◆ The meaning of the lanes is up to the modeller
- ◆ Lanes may be nested e.g. a role within a department
- ◆ The assignment of an activity to a pool or lane indicates the allocation of responsibility

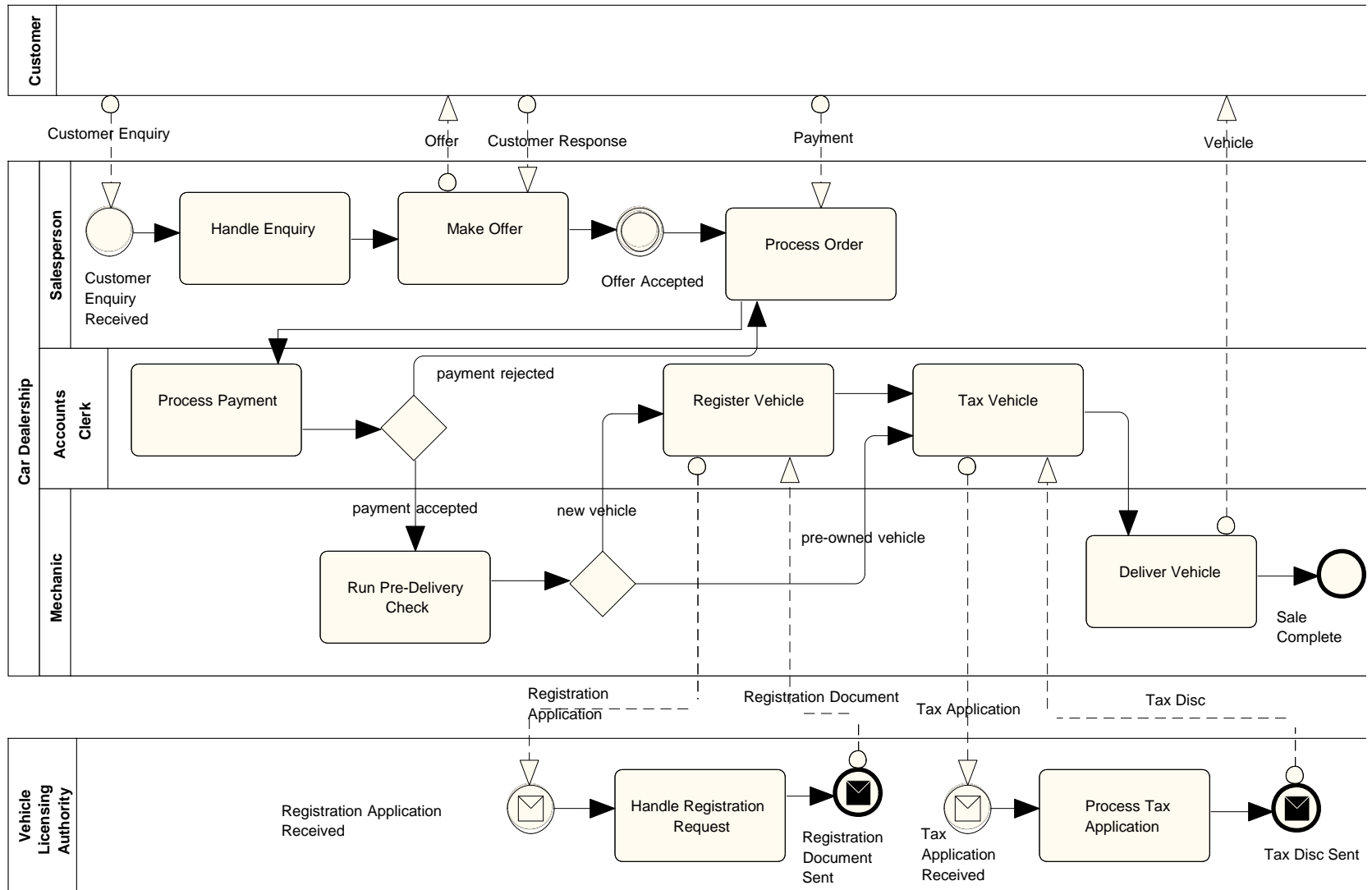


# Message Flows

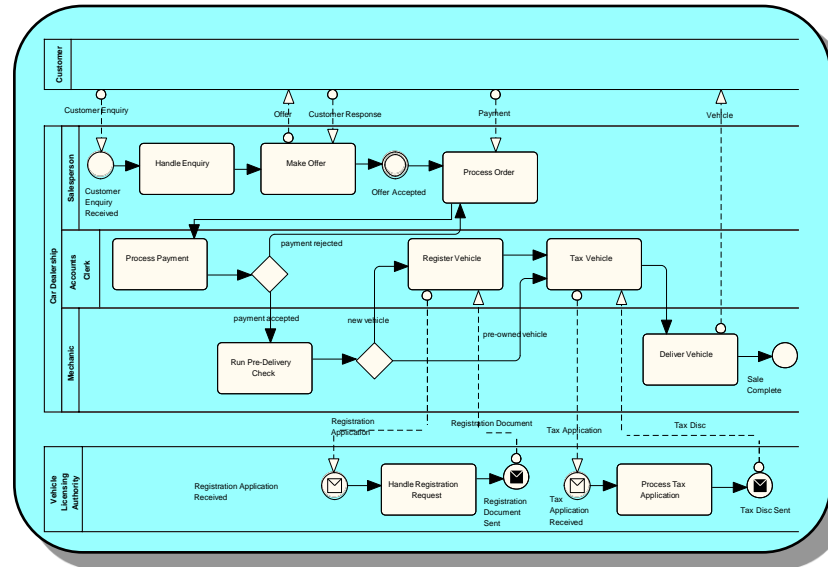


- ◆ are used to show the flow of messages between two participants in a collaboration
- ◆ must connect two separate pools and not two objects within the same pool
- ◆ connect either to the pool boundary or to flow objects within the pool
- ◆ may have an attached message

# Collaboration Process

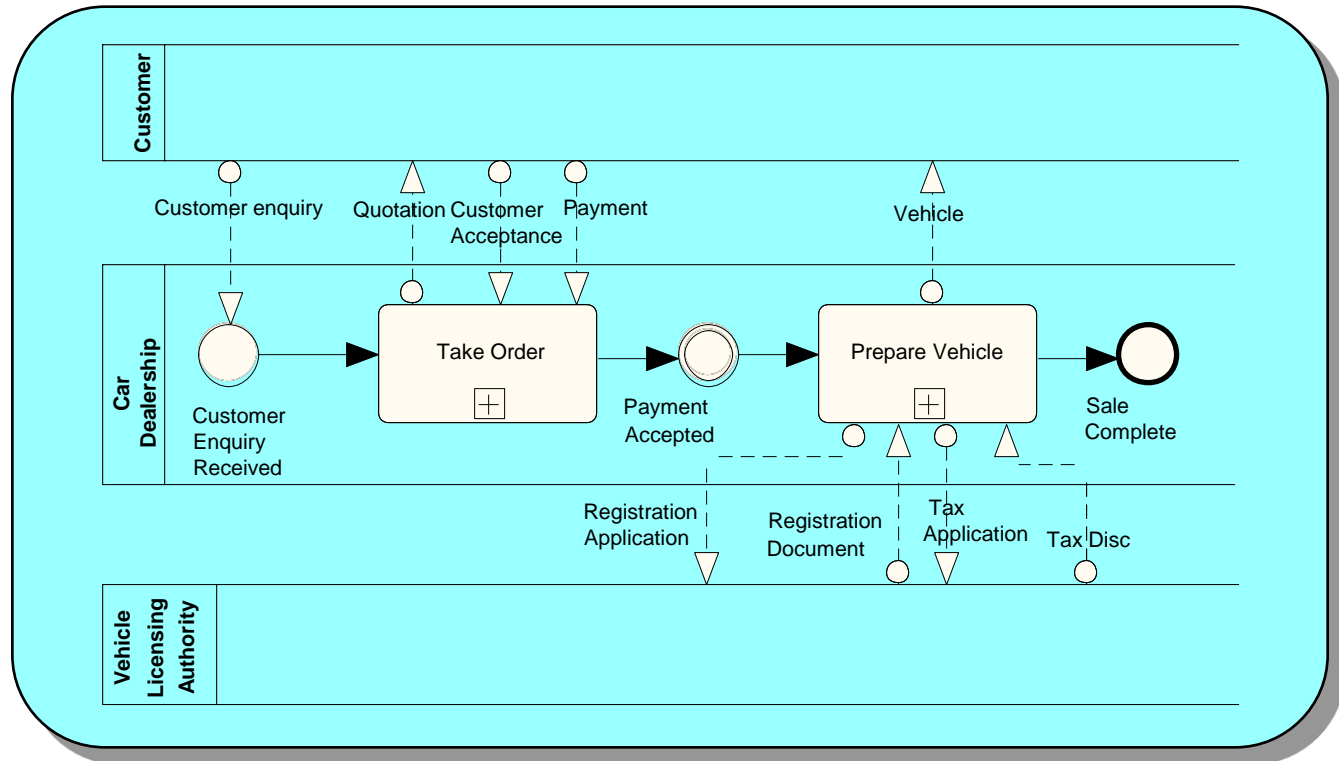


# Collaboration Process



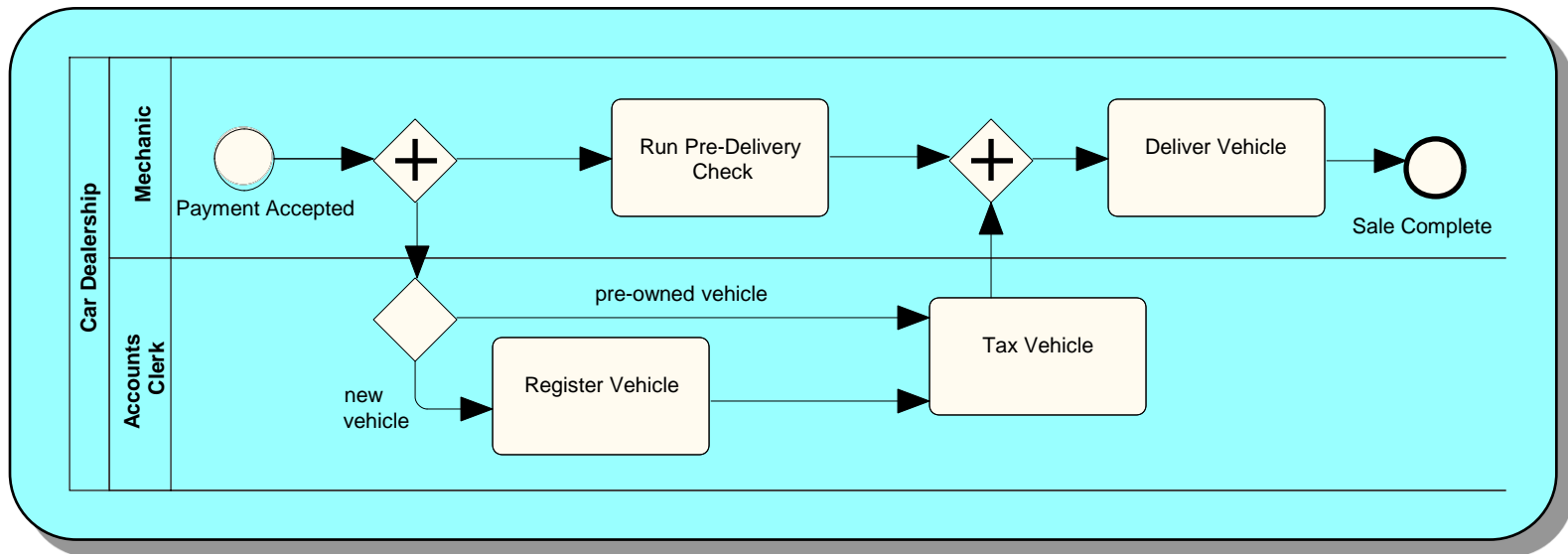
- ◆ Shows the internal processes of more than one participant (pool) in the collaboration.
- ◆ The participants can be different organisations or different departments within the same organisation
- ◆ Message flows can cross the pool boundary to attach to the appropriate activity or event in another pool
- ◆ Start and end events for each pool

# Process with Sub-Processes



- ◆ ‘Take Order’ and ‘Prepare Vehicle’ are collapsed sub-processes
- ◆ A collapsed sub-process can be “opened up” to show a lower-level process either as a separate process diagram, or on the parent process diagram
- ◆ The events starting and ending the parent activities should be consistent with the child diagrams

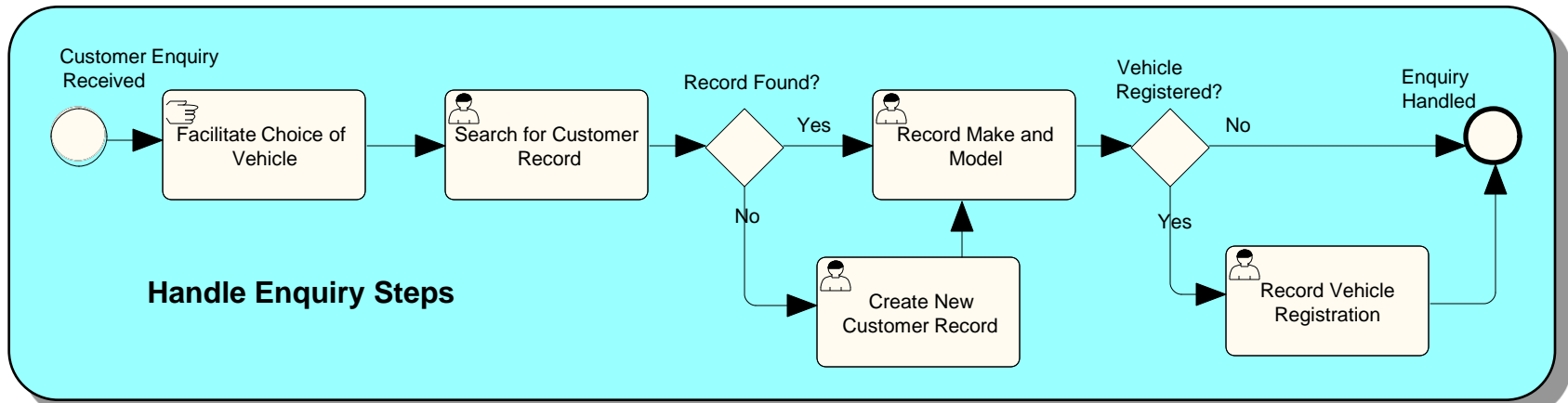
# Concurrency: Parallel Gateway



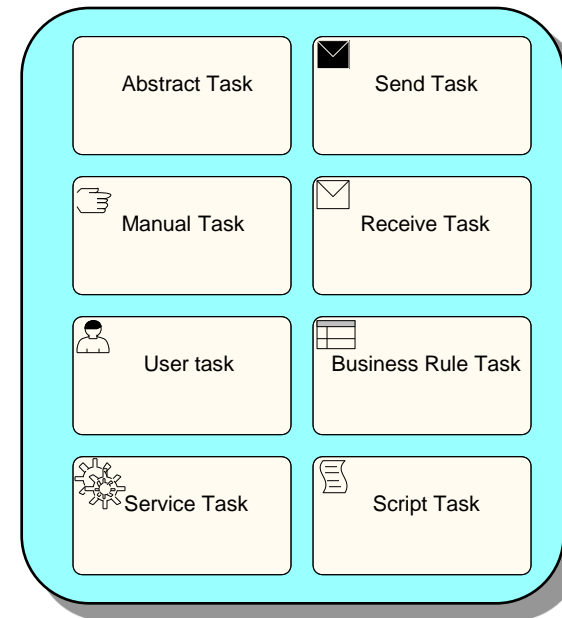
- ◆ Splits thread (token) into parallel paths
- ◆ Following activities all start immediately
- ◆ Each prior state must be complete at the merging gateway for the thread to continue
- ◆ Re-sync the threads with a parallel gateway before leaving the diagram



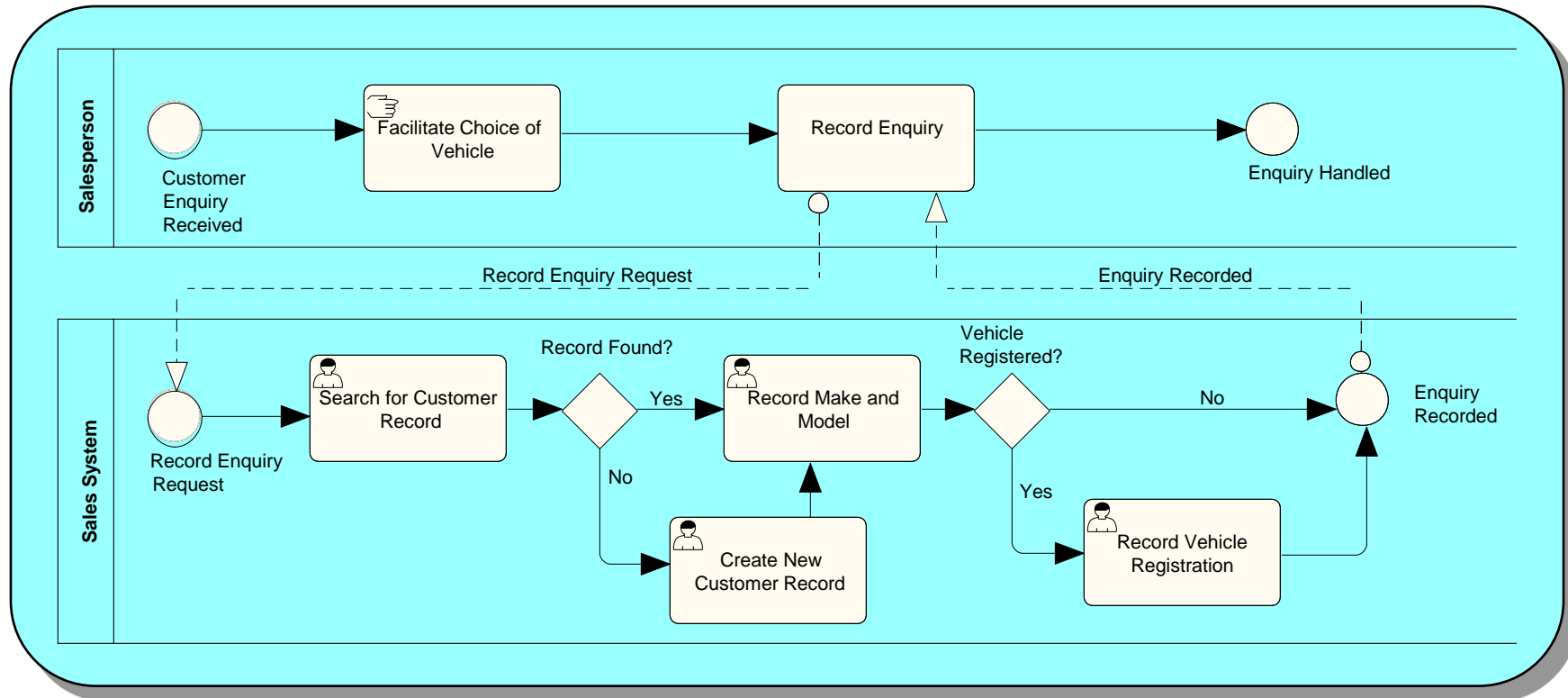
# Process Steps as Tasks



- ◆ **Tasks are activities that do not decompose**
- ◆ **User task is performed by a human with the assistance of an application**
- ◆ **Service task uses a web-service or automated application**
- ◆ **Business rule task provides input to and gets output from a business rules engine**
- ◆ **Script task executed by a business process engine**

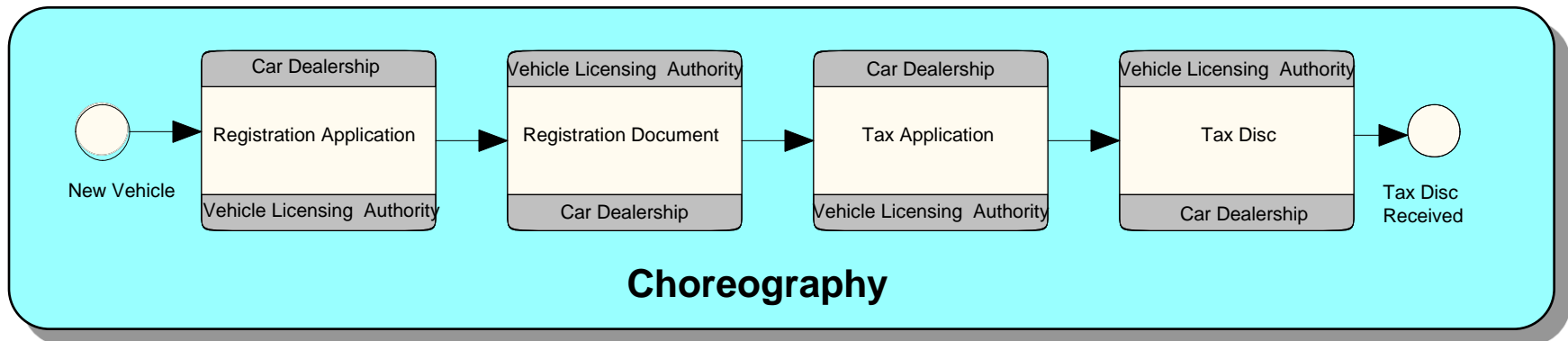


# Human versus System Pools

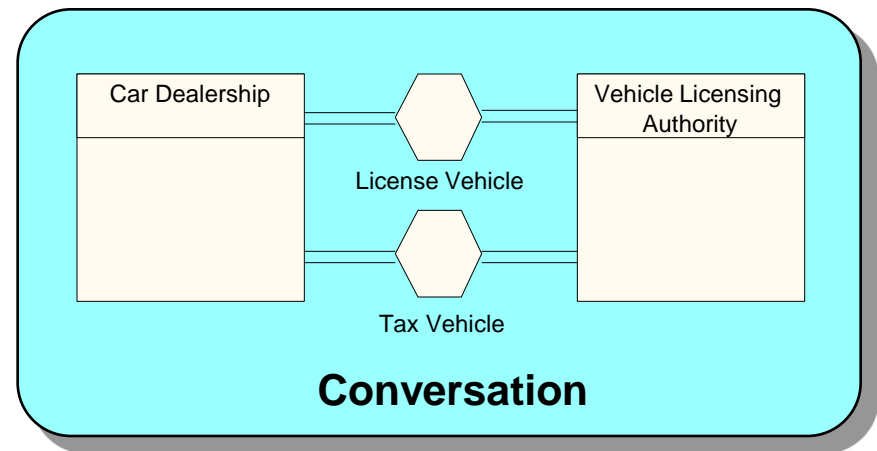


- ◆ Optional grouping of user/automated tasks into a system pool
- ◆ May show data flow between user and system for each step

# Choreographies and Conversations



- ◆ Added in version 2.0
- ◆ Choreography emphasises the messaging between pools in a collaboration process
- ◆ Conversations show collections of choreographies



# Business Process Execution Language (BPEL)

- ◆ Allows the process to be exported as source for Business Process Management system
- ◆ Also WS-BPEL for Web Services
- ◆ Not all BPMN processes will map to BPEL
- ◆ The process must be sound (executable)
  - No deadlocks
  - No lack of synchronisation

```
<wsdl:portType name="[if-name]">  
  <operation name="[op1-name]">  
    <wsdl:input message="[msg1i-name]" />  
    <wsdl:output message="[msg1o-name]" />  
    <wsdl:fault name="[error1a-faultname]"  
      message="[error1a-name]" />  
    ...  
  </operation>  
  ...  
</wsdl:portType>
```