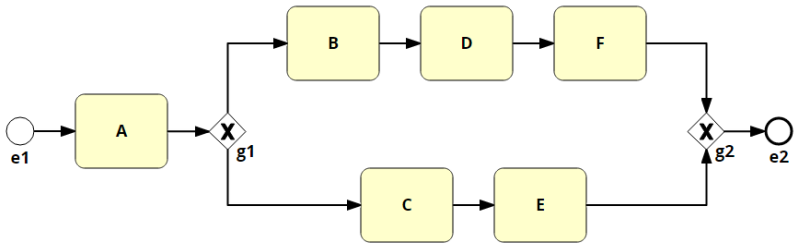
Mapping between BPMN to BPEL

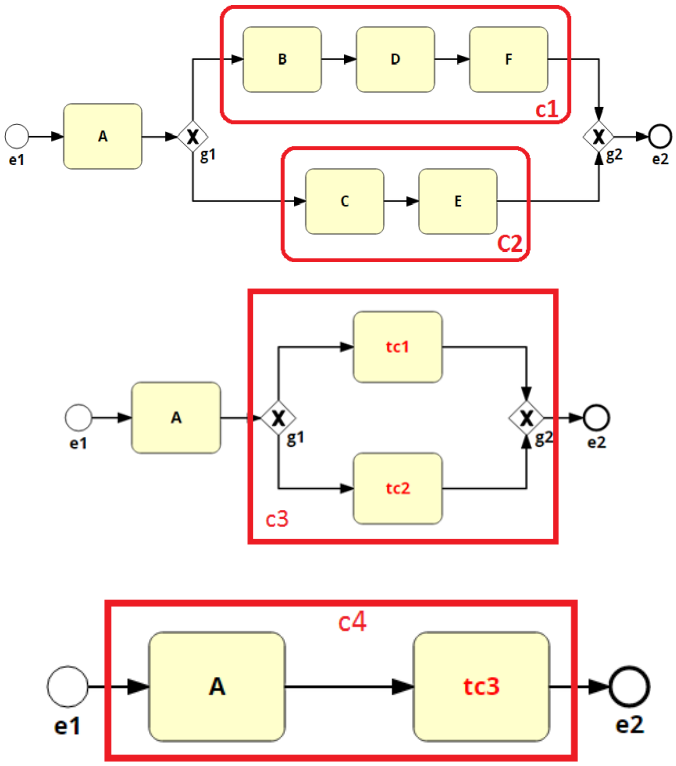
Mapping

It is composed of 2 steps: (1) component folding, and (2) gateway mappings.

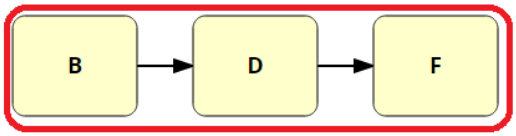
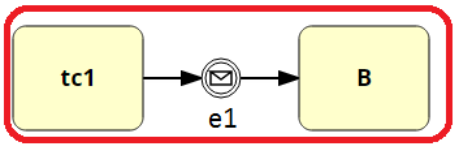
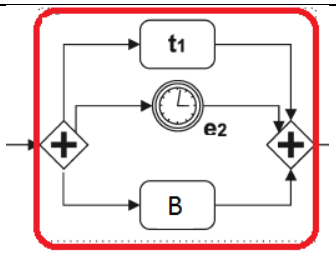
1) Component Folding

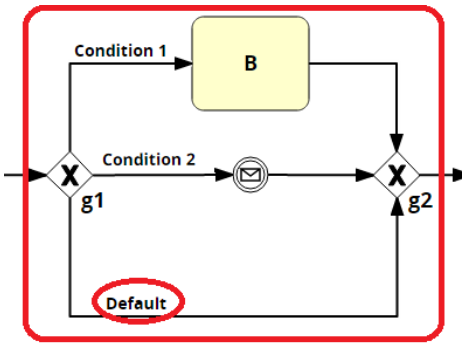


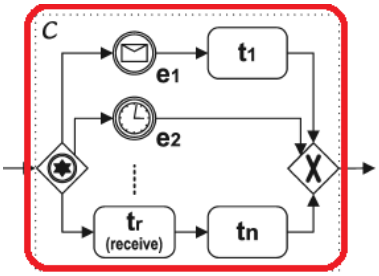
Step 1:

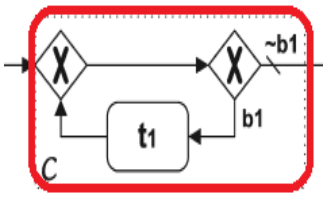
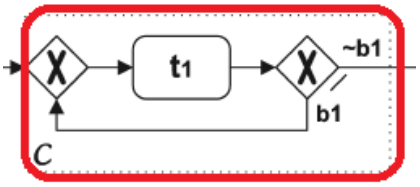
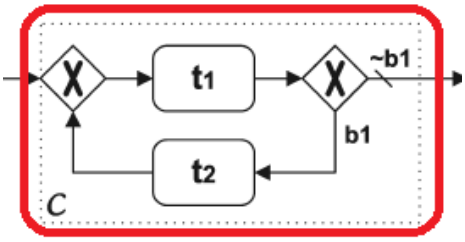


2) Getways and mapping rules

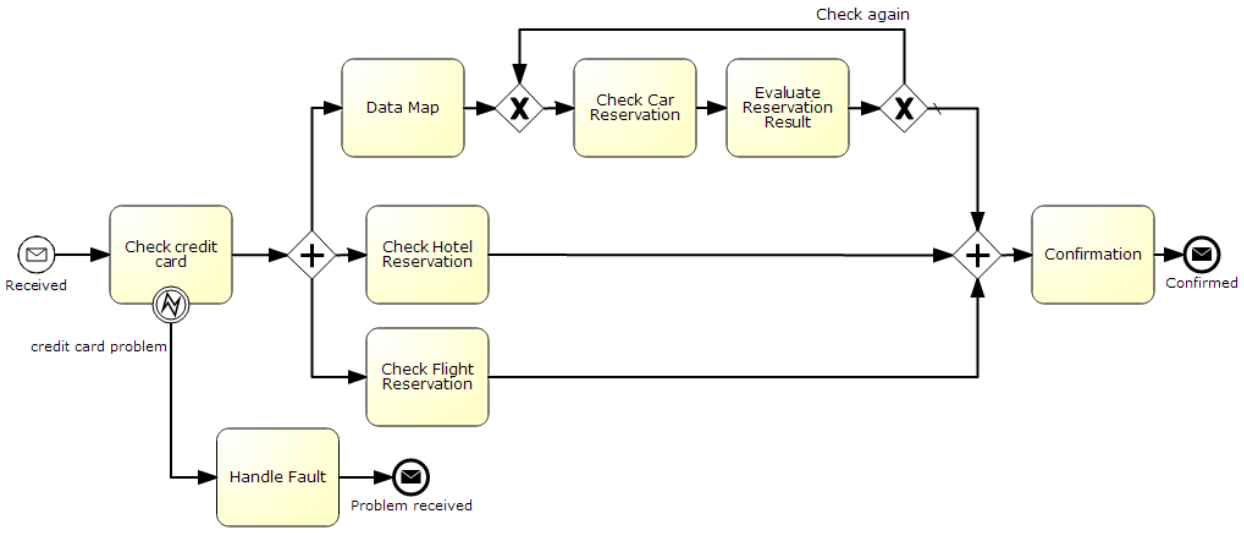
Sequence Pattern 	**<sequence>** <**invoke** name=”B” /> <invoke name=”D” /> <invoke name=”F” /> **</ sequence >**
Sequence Pattern 	**<sequence>** Mapping tc1 <**receive** name=”e1” /> <invoke name=”B”> **</ sequence >**
Flow Pattern 	**<flow>** Mapping t1 <wait name=”e2”/> <invoke name=”B” /> **</flow>**

Switch Pattern
 
	<**switch**>
	  <**case condition** =”condition1”>
	  <invoke name=”B” />
	  </case>
	  <**case condition**=”condition2”>
	  <receive name=”e2” />
	  </case>
	  <otherwise>
	  <empty/>
	  </otherwise>
	</switch>

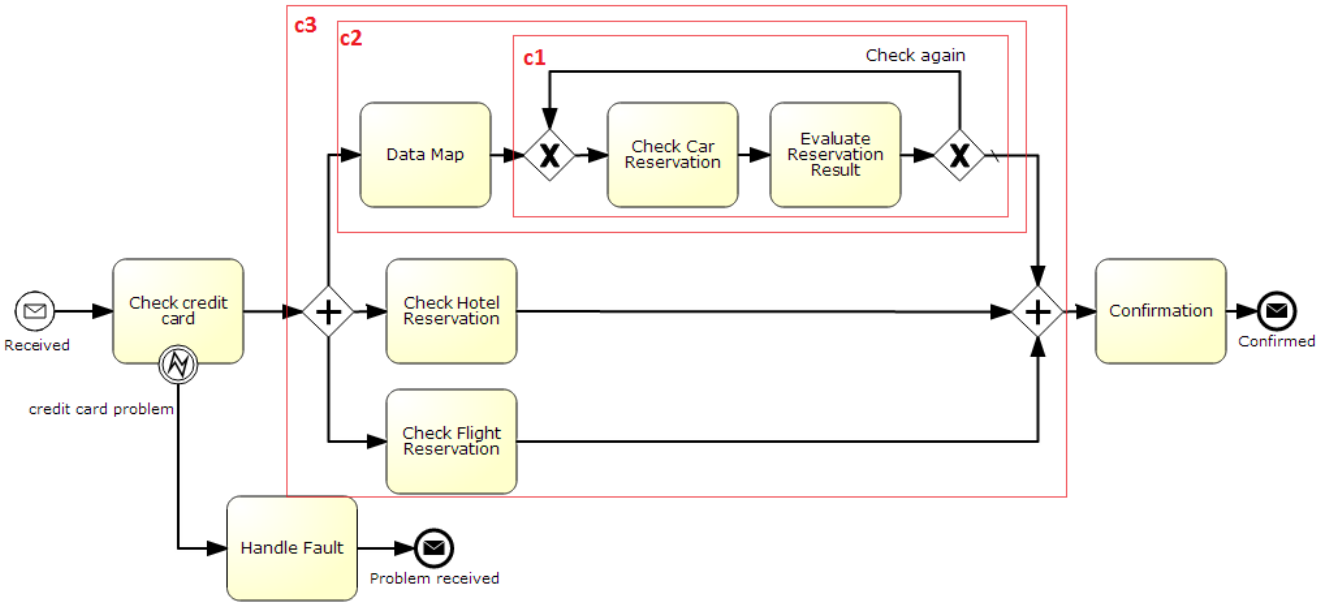
Pick Pattern
 
	<**pick**>
	  <**onMessage** name=”e1”>
	  Mapping t1
	  </onMessage>
	  <**onAlarm** name=”e2”>
	  <empty/>
	  </onAlarm>
	  …….
	  < **onMessage** name =“tr”>
	  Mapping tn
	  </ onMessage>
	</pick>

<table>
<tr>
<td>While Pattern
 
</td>
<td><u><while condition= “b1”></u>
Mapping(t1)
</while></td>
</tr>
<tr>
<td>Repeat Pattern
 
</td>
<td><sequence name= “tc” >
Mapping (t1)
<u><while condition= “b1”></u>
Mapping(t1)
</while>
</sequence></td>
</tr>
<tr>
<td>Repeat +While Pattern
 
</td>
<td><sequence name= “tc” >
Mapping (t1)
<u><while condition= “b1”></u>
<sequence>
Mapping(t2)
Mapping(t1)
</sequence>
</while>
</sequence></td>
</tr>
</table>

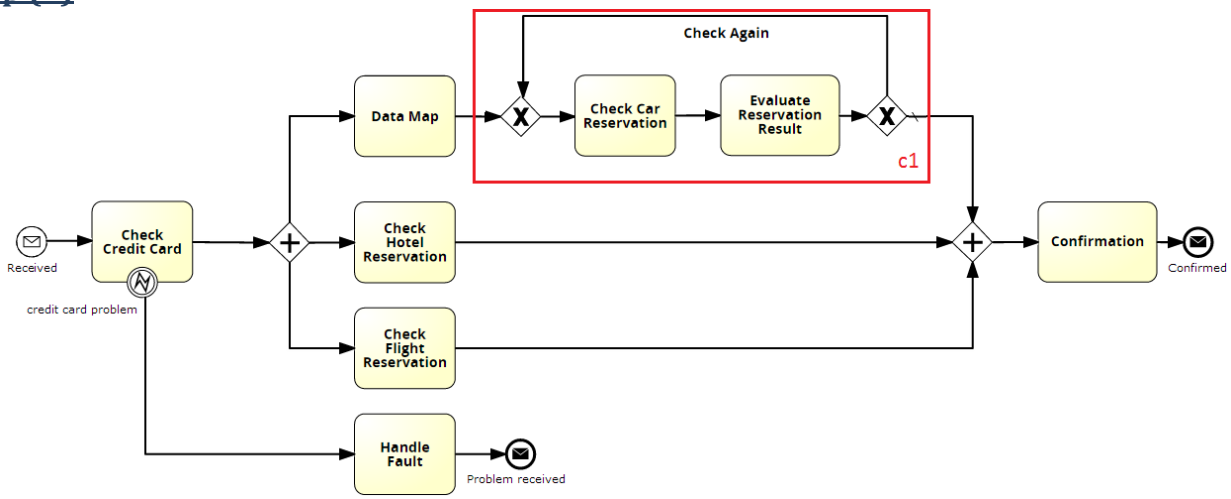
BPMN to BPEL Example1:



Solution:



Step (1)



<!—Mapping c1-->

<sequence name="t_c^1">

<invoke name= “Check Car Reservation”/>

<invoke name= “Evaluate Reservation Result”/>

<while condition = “Check again”>

<sequence>

<invoke name= “Check Car Reservation”/>

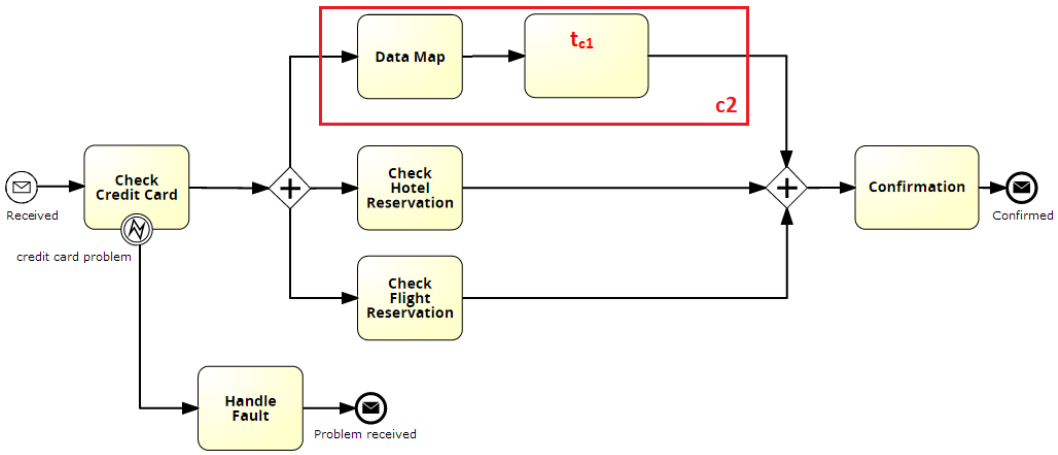
<invoke name= “Evaluate Reservation Result”/>

</sequence>

</while>

</sequence>

Step (2)



<!—Mapping c2-->

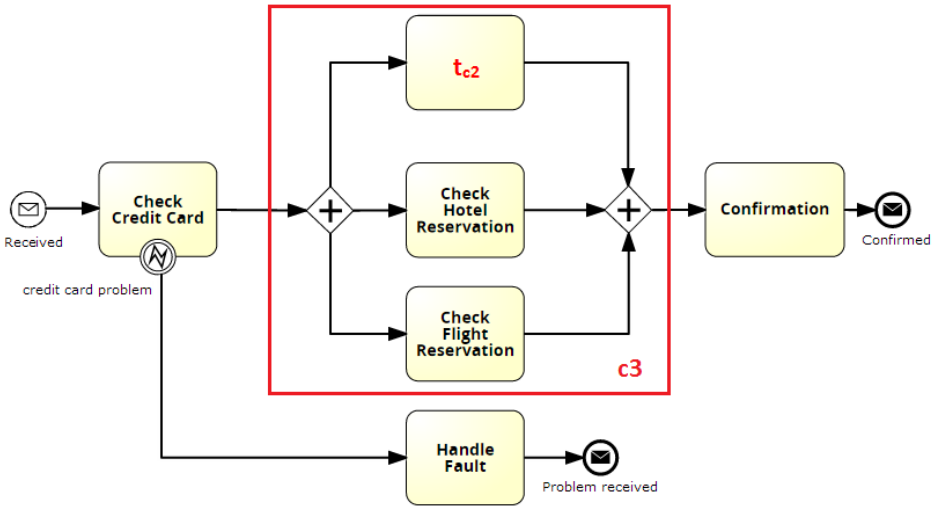
<sequence name="t_c^2">

<invoke name= “Data Map”/>

Mapping (C1)

</sequence>

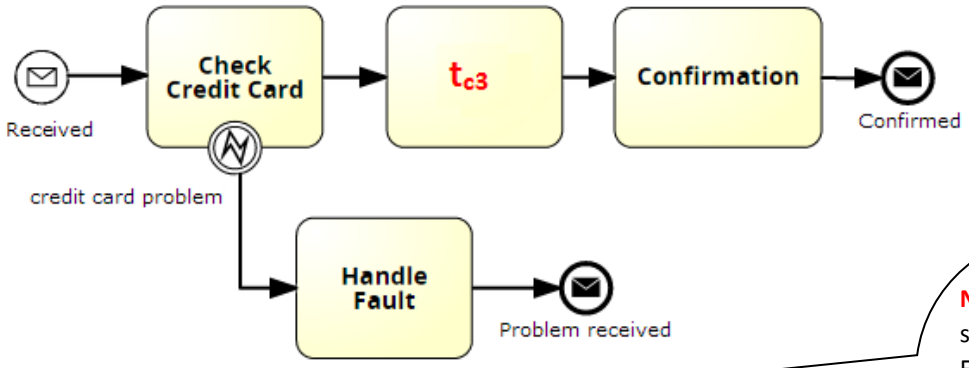
Step (3)



<!—Mapping c3-->
<flow name="t_c^3">
Mapping (c2)
<invoke name= "Check Hotel Reservation"/>
<invoke name= "Check Flight Reservation"/>
</flow>

Step (4)

<!—Mapping Exception-->
<faultHandlers>
<catch faultName="exception" faultVariable= "Credit card problem">
<sequence>
<invoke name= "Handle Fault"/>
< reply name= "Problem received"/>
</sequence>
</catch>
</faultHandlers>



<!—Mapping the rest-->

<scope name="t_c^4">

<faultHandlers>

<catch faultName="exception" name= "Credit card problem">

<sequence>

<invoke name= "Handle Fault"/>

<reply name= "Problem received"/>

</sequence>

</catch>

</faultHandlers>

</scope>

<receive name= "Received" create_instance="yes"/>

<sequence>

<invoke name="Check Credit Card"/>

Mapping (c3)

<invoke name="Confirmation"/>

<reply name= "Confirmed"/>

</sequence>

Note: The scope surrounding the FaultHandler is optional (all the examples)

<!—The whole Mapping -->

<process>

<scope name="t_c^4">

<faultHandlers>

<catch faultName="exception" name= "Credit card problem">

<sequence>

<invoke name= "Handle Fault"/>

<reply name= "Problem received"/>

</sequence>

</catch>

</faultHandlers>

</scope>

<receive name= "Received" create_instance="yes"/>

<sequence>

<invoke name="Check Credit Card"/>

<flow name="t_c^3">

<sequence name="t_c^2">

<invoke name= "Data Map"/>

<sequence name="t_c^1">

<invoke name= "Check Car Reservation"/>

<invoke name= "Evaluate Reservation Result"/>

<while condition = "Check again">

<sequence>

<invoke name= "Check Car Reservation"/>

<invoke name= "Evaluate Reservation Result"/>

</sequence>

</while>

</sequence>

</sequence>

<invoke name= "Check Hotel Reservation"/>

<invoke name= "Check Flight Reservation"/>

</flow>

<invoke name="Confirmation"/>

<reply name= "Confirmed"/>

</ sequence >

</process>

Fault handler

Mapping (c2)

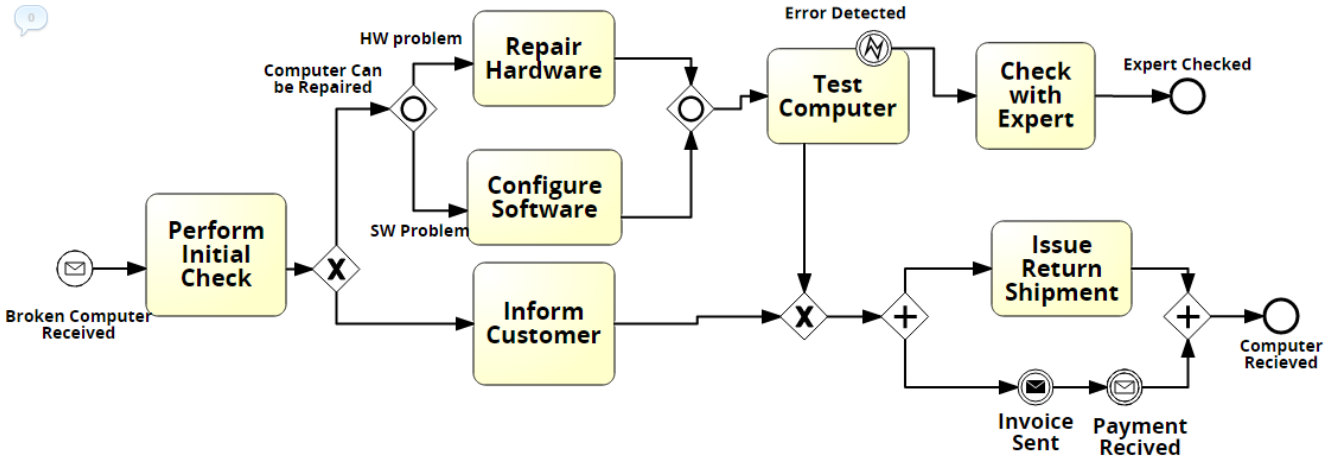
Mapping (c3)

Mapping (c1)

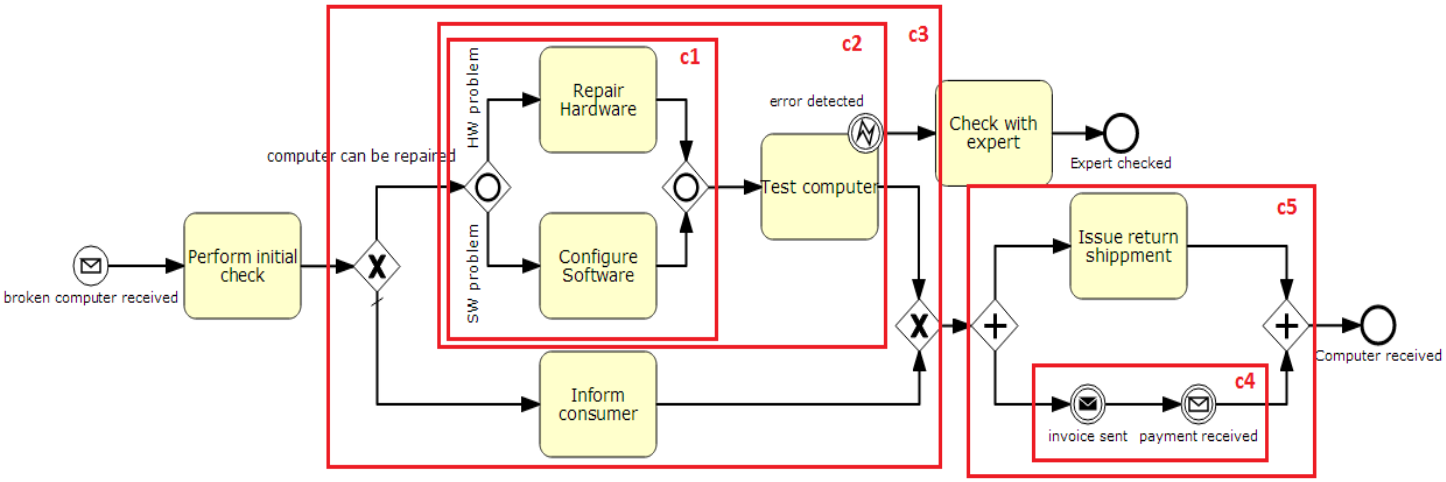
BPMN to BPEL Example2:

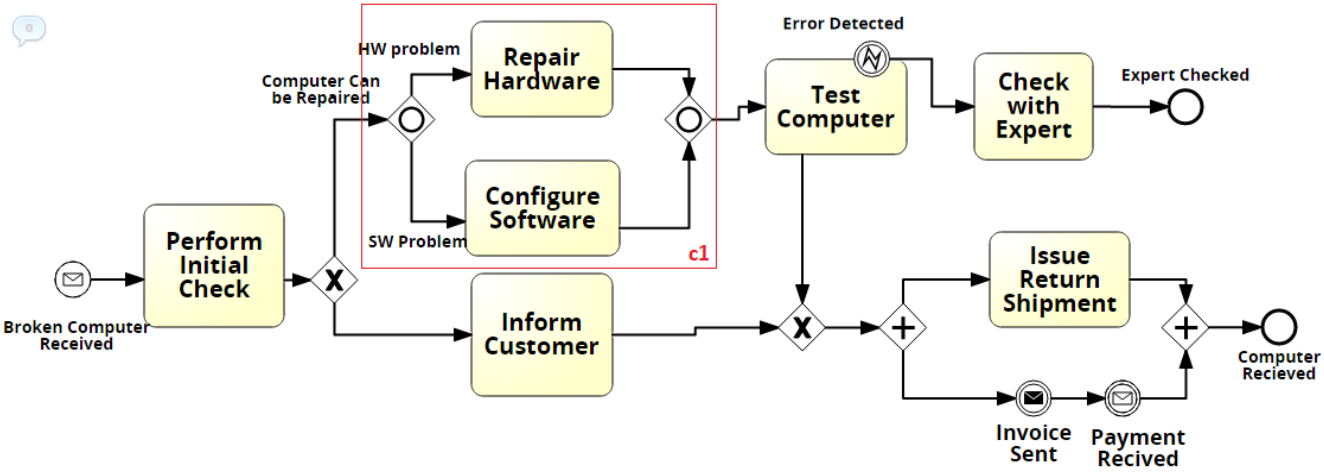
Computer Repair

Visualize this business process using BPMN.



Solution





Step (1)

<!—Mapping c1-->

```
<!—Mapping OR gateway to other known gateways for easier mapping to BPEL--!>
<switch>
        <case condition = “HW problem”>
                <invoke name=”Repair hardware”/>
        </case>
        <case condition = “SW problem”>
                <invoke name=”Configure software”/>
        </case>
        <case condition = “HW problem” and “SW problem”>
                <invoke name=”Repair hardware”/>
                <invoke name=”Configure software”/>
        </case>
</switch>
<!—Mapping OR gateway to other known gateways -- Another way--!>
<flow>
        <switch>
                <case condition = “HW problem”>
                        <invoke name=”Repair hardware”/>
                </case>
                <otherwise>
                        <empty/>
                </otherwise>
        </switch>
        <switch>
                <case condition = “SW problem”>
                        <invoke name=” Configure software”/>
                </case>
                <otherwise>
                        <empty/>
                </otherwise>
        </switch>
</flow>
```

Step (2)

<!—Mapping c2-->

```
<sequence>
        Mapping (c1)
        <invoke name="Test Computer"/>
        <throw faultVariable= “error detected”/>
</ sequence >
```

Step (3)

<!—Mapping c3-->

```
<flow>
        <switch>
                <case condition = “computer can be repaired”>
                        Mapping(c2)
                </case>
                <otherwise>
                        <invoke name= “Inform customer”/>
                </otherwise >
        </switch>
</flow>
```

Step (4)

<!—Mapping c4-->

```
<sequence>
        <reply  name= “Invoice Sent”/>
        <receive name= “Payment received”/>
</sequence>
```

Step (5)

<!—Mapping c5-->

```
<flow>
        <invoke name= “Issue return shipment”/>
        Mapping (c4)
</flow>
```

Step (6)

<!—Mapping Exception-->

```
<FaultHandlers>
        <catch faultName= “exception” faultVariable= “error detected”>
                 <invoke name= “Check with Expert”/>
                <reply name= “Expert Checked”/>
        </catch>
</FaultHandlers>
```

Step (7)

```
<!—Mapping the rest-->
<sequence>
        <receive name=”Broken Computer Received”/>
        <invoke name=”Perform Initial Check”>
        Mapping (c3)
        Mapping (c5)
        <reply name= “computer received”/>
</sequence>
```

Step (8) Process:

```
<process>
        <FaultHandlers>
                <catch faultName= “exception” faultVariable= “error detected”>
                        <invoke name= “Check with Expert”/>
                        <reply name= “Expert Checked”/>
                </catch>
        </FaultHandlers>
        <receive name=”Broken Computer Received”/>
        <sequence>
                <receive name=”Broken Computer Received”/>
                <invoke name= “Perform Initial check”/>
                Mapping(c3)
                Mapping(c5)
                <reply name= “computer received”/>
        </sequence>
</process>
```

Complete Process:

<!—The whole Mapping -->

```
<process>
    <FaultHandlers>
        <catch faultName= “exception” faultVariable= “error detected”>
            <invoke name= “Check with Expert”/>
            <reply name= “Expert Checked”/>
        </catch>
    </FaultHandlers>
    <sequence>
        <receive name=”Broken Computer Received”/>
        <invoke name=”Perform Initial Check”>
        <flow>
            <switch>
                <case condition = “computer can be repaired”>
                    <sequence>
                        <switch>
                            <case condition = “HW problem”>
                                <invoke name=”Repair hardware”/>
                            </case>
                            <case condition = “SW problem”>
                                <invoke name=”Configure software”/>
                            </case>
                            <case condition = “HW problem” and “SW problem”>
                                <invoke name=”Repair hardware”/>
                                <invoke name=”Configure software”/>
                            </case>
                        </switch>
                        <invoke name="Test Computer"/>
                        <throw faultVariable= “error detected”/>
                    </ sequence >
                </case>
                <otherwise>
                    <invoke name= “Inform customer”/>
                </otherwise >
            </switch>
        </flow>
        <flow>
            <invoke name= “Issue return shipment”/>
            <sequence>
                <reply  name= “Invoice Sent”/>
                <receive name= “Payment received”/>
            </sequence>
        </flow>
    </sequence>
</process>
```

Mapping (c3)

Mapping (c2)

Mapping (c1)

Mapping (c5)

Mapping (c4)

BPMN to BPEL Example3:

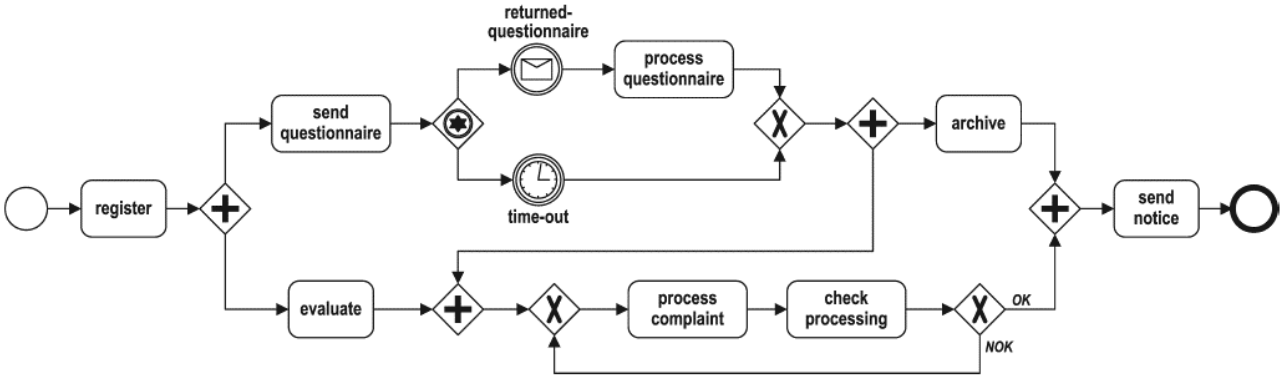
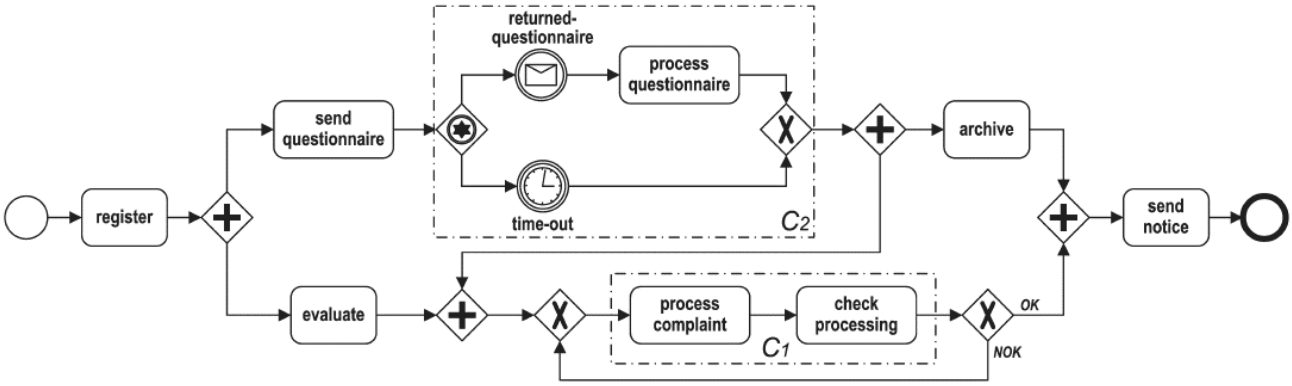


Figure 6. A complaint handling process model.

Solution:

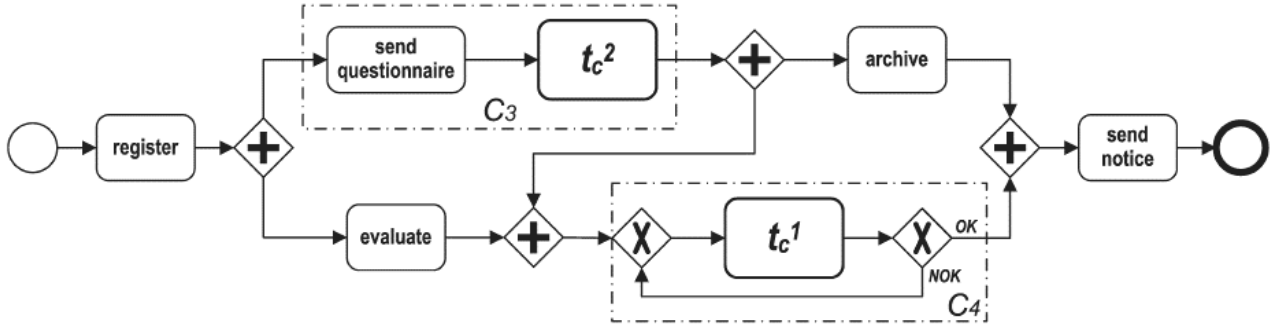
Step (1)




```
<pick name="t_c^2">
   <onMessage name="returned-questionnaire">
      <invoke name="process questionnaire"/>
   </onMessage>
   <onAlarm name="time-out">
      <empty/>
   </onAlarm>
</pick>
```

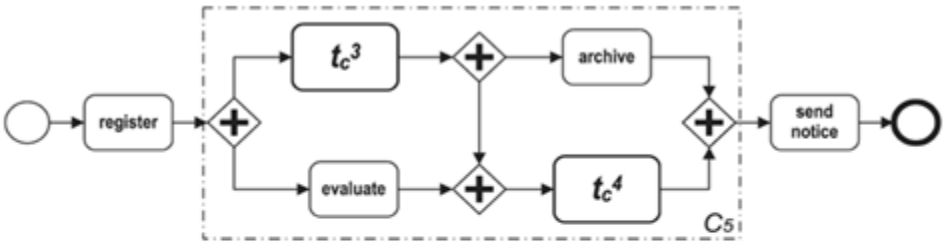
```
<sequence name="t_c^1">
   <invoke name="process complaint"/>
   <invoke name="check processing"/>
</sequence>
```

Step (2)



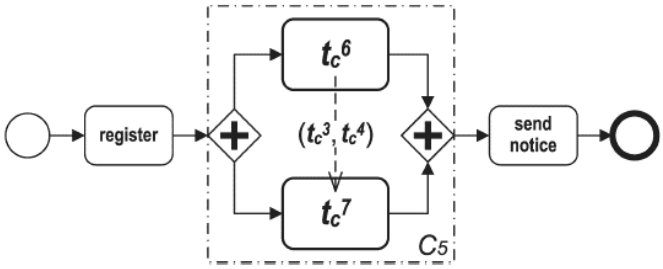

```
<sequence name="t_c^3">
  <source linkName="t3TOt4"/>
  <invoke name="send questionnaire"/>
  <pick name="t_c^2">
    <onMessage name="returned-questionnaire">
      <invoke name="process questionnaire"/>
    </onMessage>
    <onAlarm name="time-out">
      <empty/>
    </onAlarm>
  </pick>
</sequence>
```

```
<sequence name="t_c^4">
  <target linkName="t3TOt4"/>
  <sequence name="t_c^1">
    <invoke name="process complaint"/>
    <invoke name="check processing"/>
  </sequence>
  <while condition="NOK">
    <sequence name="t_c^1">
      <invoke name="process complaint"/>
      <invoke name="check processing"/>
    </sequence>
  </while>
</sequence>
```



- Problem
  - AND synchronization between concurrent activities
  - Component C4 can begin only when evaluate and C3 complete
- Solution
  - Link between these components

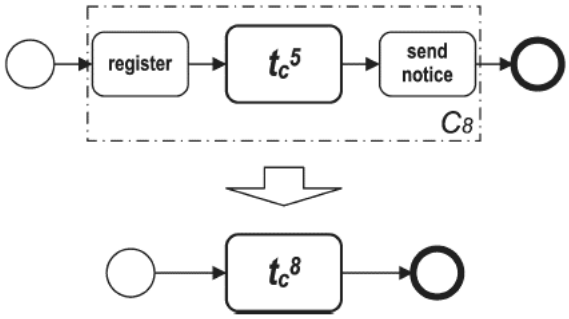
Step (3)




```
<sequence name="t_c^6">
  <sequence name="t_c^3">
    <source linkName="t3TOt4"/>
    <invoke name="send questionnaire"/>
    <pick name="t_c^2">
      <onMessage name="returned-questionnaire">
        <invoke name="process questionnaire"/>
      </onMessage>
      <onAlarm name="time-out">
        <empty/>
      </onAlarm>
    </pick>
  </sequence>
  <invoke name="archive"/>
</sequence>
```

```
<sequence name="t_c^7">
  <invoke name="evaluate"/>
  <sequence name="t_c^4">
    <target linkName="t3TOt4"/>
    <sequence name="t_c^1">
      <invoke name="process complaint"/>
      <invoke name="check processing"/>
    </sequence>
    <while condition="NOK">
      <sequence name="t_c^1">
        <invoke name="process complaint"/>
        <invoke name="check processing"/>
      </sequence>
    </while>
  </sequence>
</sequence>
```

Step (4)



```
<process>
    <links>
      <link name="t3TOt4"/>
    </links>
    <sequence name="t_c^8">
      <invoke name="register"/>
      <flow name="t_c^5">
        <sequence name="t_c^6">
          <sequence name="t_c^3">
            <source linkName="t3TOt4"/>
            <invoke name="send questionnaire"/>
            <pick name="t_c^2">
              <onMessage name="returned-questionnaire">
                <invoke name="process questionnaire"/>
              </onMessage>
              <onAlarm name="time-out">
                <empty/>
              </onAlarm>
            </pick>
          </sequence>
          <invoke name="archive"/>
        </sequence>
        <sequence name="t_c^7">
          <invoke name="evaluate"/>
          <sequence name="t_c^4">
            <target linkName="t3TOt4"/>
            <sequence name="t_c^1">
              <invoke name="process complaint"/>
              <invoke name="check processing"/>
            </sequence>
             <while condition="NOK">
               <sequence name="t_c^1">
                 <invoke name="process complaint"/>
                 <invoke name="check processing"/>
               </sequence>
             </while>
           </sequence>
         </sequence>
       </flow>
       <invoke name="send notice"/>
     </sequence>
  </process>
```

Resources:

1. A tool for translating BPMN models into BPEL processes https://code.google.com/p/bpmn2bpel/
2. Using BPMN to Model a BPEL Process http://www.omg.org/bpmn/Documents/Mapping_BPMN_to_BPEL_Example.pdf
3. Transforming BPMN into BPEL: Why and How http://www.oracle.com/technetwork/articles/dikmans-bpm-101437.html
4. On Visualizing and Modelling BPEL with BPMN http://www.iaas.uni-stuttgart.de/RUS-data/INPROC-2009-27%20-%20On%20Visualizing%20and%20Modelling%20BPEL%20with%20BPMN.pdf
5. From Business Process Models to Process-oriented Software Systems: The BPMN to BPEL Way http://eprints.qut.edu.au/5266/1/5266.pdf