BPMN: Modelling Tools

- Many open/closed source and commercial tools
  - Modelling/authoring tools
  - Simulation/Automation tools

- Modelling/authoring tools- examples :
  - ADONIS (Community)
  - BPMN.io
  - ARIS Express
  - Bitrix24
  - ConceptDraw- for drawing only.

- Modelling + Simulation/Automation
  - Bonita
  - Bizagi
  - Germain APM
  - Camunda

Identifying Processes
(known in BPMN as Activities, Sub Processes and Tasks)

- Processes should be named
  - ***verb phrase + noun phrase***
  - ***<u>DO</u> something <u>TO</u> something (the "do to" rule)***

  e.g. Place Order, Examine Patient, Write Prescription to the patient

- Top level processes (activities):
  - Guideline of mutual dependency.
  - Guideline of initiation and outcome linkage.
  - Guideline of user concurrency.
  - Guideline of meaningfulness.

  Any level processes (sub-processes) and tasks
  - Guideline of unit of work.
  - Guideline of conciseness of specification.
  - Guideline of transaction steps.

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Identifying Processes –Top Level Processes (Activities)
Guideline of mutual dependency

- If you conclude that Process A is always performed when Process B is performed, and that the only time Process A is performed is when Process B is performed then these processes should be **combined in to one** process.
  - Example: Whenever the Process Create Customer is performed, the process Check Credit Rating is performed and the only time that Check Credit Rating is performed is when Create Customer is performed. Therefore, combine these processes

Identifying Processes –Top Level Processes (Activities)
Guideline of initiation and outcome linkage

- if you conclude that whenever Process A is invoked *under certain circumstances* it will always result in initiating Process B (and/or outputs) and when Process A is invoked *under different circumstances* it always invokes Process C (and/or outputs) then it is *likely* that Process A has 2 or more processes combined in it and **should be split out**.
  - Example: When Create Customer is invoked for a normal customer then the business rule is that the next process is always Place Order. When Create Customer is invoked for a customer who is also a company employee, then the business rule is that next process is always Authorise Employee Customer. In this case it is likely that Create Customer has another process in it (Create Employee Customer) that in turn would include Authorise Employee Customer under the rule of mutual dependency.

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Identifying Processes –Top Level Processes (Activities)
Guideline of user concurrency

- If a process needs 2 or more different Job Roles in order to execute then it is highly likely **there are 2 or more different processes in it** [unless there is a business rule that says this process must be executed by these job roles at the same time].
  - Example: Suppose a company allows its employees to be customers of that company's services, but to prevent fraud more stringent checks are made for so-called Employee Customers. If the process Authorise Employee Customer needs authorisation by Employee Line Manager role and Sales & Marketing Director role then consider having 2 processes because without doing this once the Employee Line Manager role has authorised the Employee Customer the process will wait until the Sales & Marketing Manager has also authorised it!

Identifying Processes –Top Level Processes (Activities)
Guideline of meaningfulness

- If Process A does not produce any meaningful outcome or output (to the Business) then consider **merging** with the preceding or following process. Which process to merge with should be assessed using the other guidelines.
  - Example: the process Record Customer Date Of Birth does not produce a meaningful outcome and can be combined under the guideline of mutual dependency with Create Customer

Process for Modelling Processes

1. Identify starting events – always verify in scope
    1. Operational events that trigger processes
    2. Data maintenance events (almost always reference data)
    3. Reporting events to monitor business performance
2. For each starting event
    1. Assign the event to an originating Pool (and lane if possible)
    2. Define the “happy path” top level process response
        1. For each process step
            1. Assign the lane
            2. Define other normal exit paths
            3. Define other exceptional exit paths
3. For each top level process
    1. Decompose if and as required
    2. Balance

Exercise-6: Scenario

On 8 Nov, after arriving at the Clinic, the patient was directed to the Receptionist to check and confirm his appointment.

The Receptionist recorded the patient's arrival on the appointment schedule and notifies the staff that the Patient has arrived.

A Nurse, or Aid, escorts the Patient to an examination room.

Patient vitals (weight, blood pressure, temperature) are measured and recorded on the patient chart.

A Doctor, or Physician's Assistant ,examines the Patient and records the information related to
the purpose of the Patient's visit (diagnosis, medical procedures performed, etc.) on the Patient's chart.

On check out, Adam goes to the receptionist. The receptionist does the following:

If the Patient visit is covered by insurance, the Patient provides or verifies their insurance information and their records are updated with any new or revised insurance information.

If not covered, the Check-Out station records the services that were provided in the Claims Ledger. The Patient makes their payment/co-payment and their visit is completed. Any payment made is recorded in the Payment Ledger.

Draw a process diagram, for the above scenario [show only flow of activities, no need to show pools, lanes or participants]

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Exercise-7

I own and manage a florist's shop called My Florist.

I want to start emailing reminders to customers when special occasions are due for which they have brought flowers in the past – for example a spouse's birthday.

So when a customer buys flowers, I want the florist to capture the occasion and email address (if possible: there may be no special occasion involved, or they may not wish to tell us what it is, or they may not want to tell us their email address).

Then daily at 9am I want to be able to review what reminders could be sent that day, choose which ones I want to send, write an email and send it.

Draw up a process model to support the above scenario, using pools, lanes and correct BPMN notations.

Executing BPMN: BPEL

How a BPMN model can become executable?

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Executing BPMN: BPEL

- No standard graphical notation for BPEL => vendors have created their own notations, enabling a direct visual representation of BPEL process descriptions (e.g., ORACLE BPEL).
- Other ones have proposed to use BPMN as a graphical front-end to capture BPEL process descriptions. Mapping of BPMN to BPEL has been implemented in a number of tools (e.g. BPMN2BPEL).
- Difficult to generate BPEL code from BPMN models.
- BPEL not a modeling language, although it has been used as such in database research.
- Moreover, there are tools that can execute BP from BPMN 2.0 specifications: Activiti, jBPM5, BizAgi, Roubroo.

BPEL Process definition

- BPEL defines an executable process by specifying
  - Activities and their execution order
  - Partners interacting with the process
  - Data necessary for and resulting from the execution
  - Messages exchanged between the partners
  - Fault handing in case of errors and exceptions
- Example: a simplified structure of a BPEL process

```
1  <process name="..."
2     targetNamespace="http://www..." >
3     ...
4     <partnerLinks> ...
5     <messageExchanges> ...
6     <variables> ...
7     ...
8     <faultHandlers> ...
9     <eventHandlers> ...
10    ...
11    activity
12 </process>
```

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BPEL Process definition

- Basic activities
  - invoke: invoking operations offered by partner Web services
  - receive: waiting for messages from partner Web services
  - reply: for capturing interactions
  - wait: delaying the process execution
  - assign: updating variables
  - throw: signaling faults
  - rethrow: propogating the faults that are not solved
  - empty: doing nothing
  - exit: ending a process immediately

```
1 <invoke name = "..."
2    partnerLink = "..."
3    operation = " ..."
4    inputVariable = "..."
5    outputVariable = "..." />
```

```
1 <receive name = "..."
2    partnerLink = "..."
3    operation = " ..."
4    variable = "..."
5    createInstance = "yes/no"
6    messageExchange = "..." />
```

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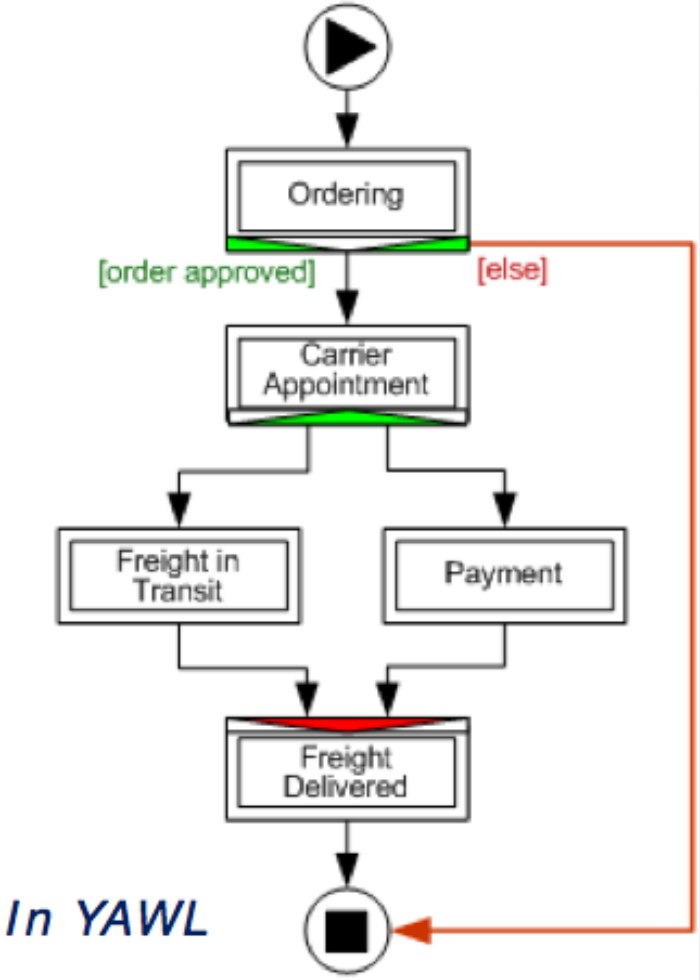
BPEL process definition

- Structured activities
  - sequence: activities being executed sequentially
  - flow: activities being executed in parallel
  - if: capturing conditional routing
  - while: structured looping
    - Condition is evaluated at the beginning of each iteration
  - repeatUntil: structured looping
    - Condition is evaluated at the end of each iteration
  - forEach: executing multiple instances
  - of an activity with synchronisation
  - scope: grouping activities into blocks

```
1  <scope name="..." >
2     <variables> ...
3     <partnerLinks> ...
4     <messageExchanges>...
5     ....
6     <eventHanlders>...
7     <faultHandlers>...
8     <compensationHanlders>...
9     ...
10    activity
11 </scope>
```

BPEL process definition




```
1  <sequence>
2     <scope name = "Ordering"> ..... </scope>
3     <if>
4        <condition>
5           $POApprovalResult = "approved"
6        </condition>
7        <sequence name ="continue">
8           <scope name = "CarrierAppointment"> ..... </scope>
9              <flow>
10                <scope name = "FreightInTransit"> ..... </scope>
11                <scope name = "Payment"> ..... </scope>
12             </flow>
13          <scope name = "FreightDelivered"> ..... </scope>
14       </sequence>
15       <else>
16          <exit />
17       </else>
18    </if>
19 </sequence>
```

In BPEL

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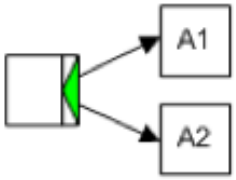
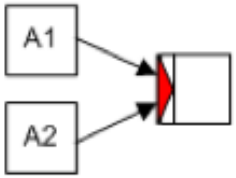
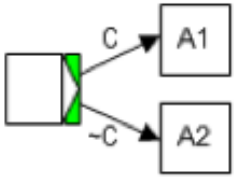
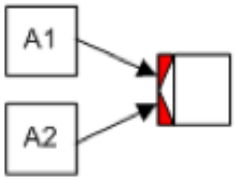
BPEL Control Patterns (Example)

No.	Pattern	YAWL	BPEL
1	Sequence		<sequence> activity A1 activity A2 </sequence>
2	Parallel Split		<flow> activity A1 activity A2 </flow>
3	Synchronization		
4	Exclusive Choice		<if> <condition>C</condition> activity A1 <else> activity A2 </else> </if>
5	Simple Merge		

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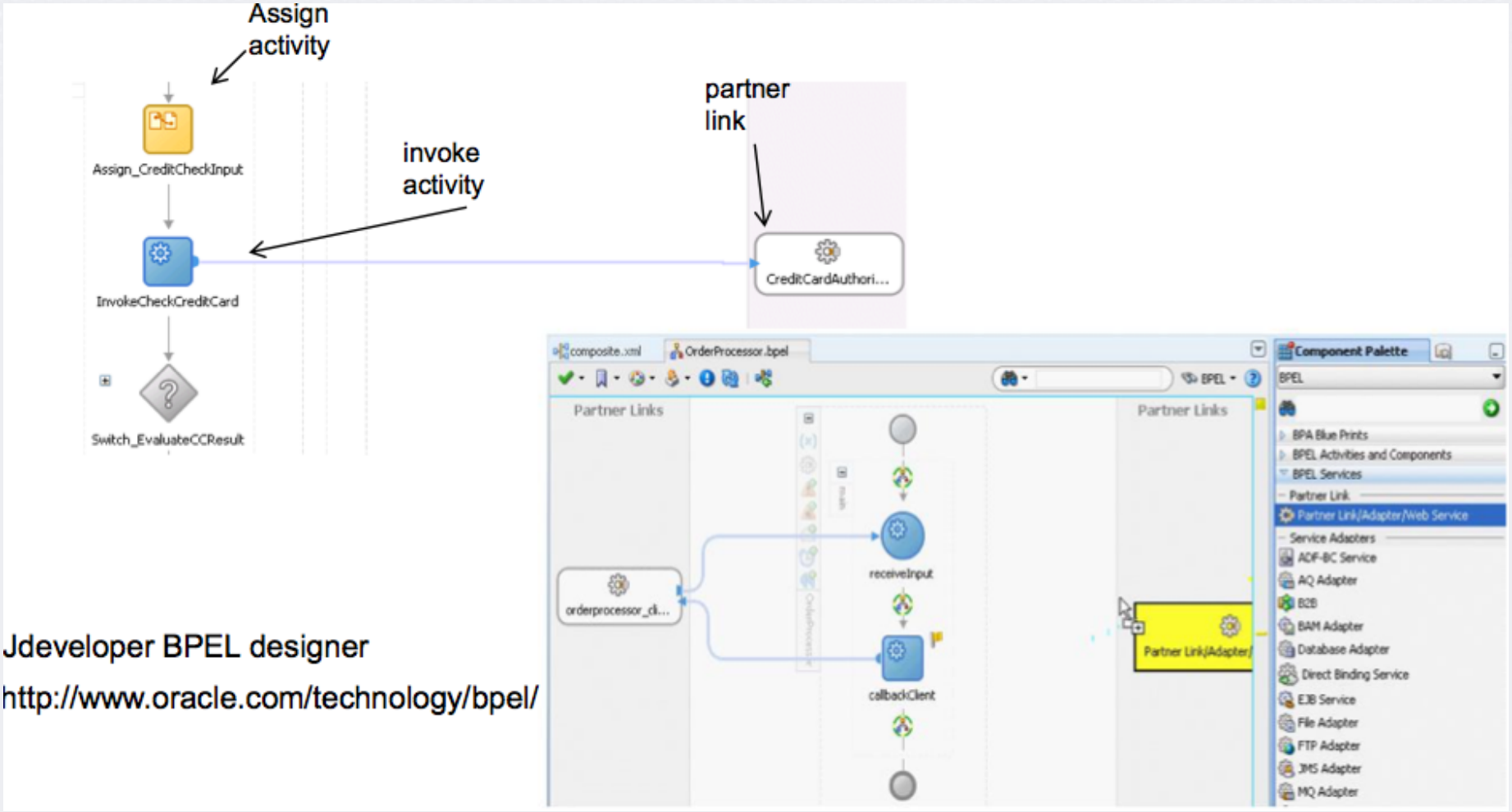
BPEL Tools



Jdeveloper BPEL designer

http://www.oracle.com/technology/bpel/

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Pattern Control Evaluation: support across models

1 – BPMN 2 – UML AD 3 – BPEL

		1	2	3			1	2	3
Branching					**Multiple Instances**				
1	Sequence	+	+	+	12	MI without Synchronization	+	+	+
2	Parallel Split	+	+	+	13	MI with a priori Design Time Knlg	+	+	+
6	Multiple Choice	+	+	+	14	MI with a priori Runtime Knlg	+	+	-
4	Exclusive Choice	+	+	+	15	MI without a priori Runtime Knlg	-	-	-
16	Deferred Choice	+	+	+	34	Static Partial Join for MI	+/-	-	-
42	Thread Split	+	+	+/-	35	Cancelling Partial Join for MI	+/-	-	-
Synchronisation					36	Dynamic Partial Join for MI	-	-	-
3	Synchronization	+	+	+	**Concurrency**				
33	Generalised AND-Join	+	-	-	40	Interleaved Routing	+/-	-	+
30	Structured Partial Join	+/-	+/-	-	17	Interleaved Parallel Routing	+/-	-	+/-
31	Blocking Partial Join	+/-	+/-	-	39	Critical Section	-	-	+
32	Cancelling Partial Join	+/-	+	-	18	Milestone	-	-	-
9	Structured Discriminator	+/-	+	-	**Trigger**				
28	Blocking Discriminator	+/-	+/-	-	23	Transient Trigger	-	+	-
29	Cancelling Discriminator	+	+	-	24	Persistent Trigger	+	+	+
7	Str. Synchronizing Merge	+/-	-	+	**Cancellation & Completion**				
37	Local Synchronizing Merge	-	+/-	+	19	Cancel Activity	+	+	+
38	General Synchronizing Merge	-	-	-	20	Cancel Case	+	+	+
5	Simple Merge	+	+	+	25	Cancel Region	+/-	+	-
8	Multiple Merge	+	+	-	26	Cancel MI Activity	+	+	-
41	Thread Merge	+	+	+/-	27	Complete MI Activity	-	-	-
Repetition					**Termination**				
10	Arbitrary Cycles	+	+	-	11	Implicit Termination	+	+	+
21	Structured Loop	+	+	+	43	Explicit Termination	+	+	-
22	Recursion	-	-	-					

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Thanks!

Any questions?

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