Case Management Model and Notation - CMMN

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Case Management and Case Modeling

- Any individual Case may be resolved in a completely ad-hoc manner

- But as experience grows in resolving similar Cases over time, *a set of common practices* can be defined for Cases.

- This becomes the practice of Case Management.

- Case management requires modeling which can express the essential flexibility that human Case workers require for
  - run-time planning for the selection of Tasks for a Case,
  - run-time ordering of the sequence in which the Tasks are executed
  - ad-hoc collaboration with other knowledge workers on the Tasks
Ad hoc Processes in BPMN

- Adhoc (sub)processes – marked with a tilde (~) - are a way to represent cases in BPMN.

- There is no specific ordering or obvious decisions. The activities in an ad hoc process can occur:
  - in any order
  - In any frequency

- Typically, the activities in an ad hoc process involve human performers to make decisions as to what activities to perform, at which time and how many times.

- It is possible, however, to use occasional sequence flow between some activities, but sequence flow does not imply that there are explicit start and end events.
Example of an Ad hoc Process

Write a Book Chapter

Research Notes → Write Text

Write/Edit Text

Chapter Text [draft]

Include Graphics in Text

Graphics [completed]

Generate Graphics

Research the Topic

Topic

Organize References

References

Finalize Chapter

Chapter [completed]
OMG defined a Modeling Standard for Case Modeling

Case Management Model and Notation (CMMN)

In January 2013 OMG published the first beta version

http://www.omg.org/spec/CMMN/1.0/Beta1/PDF/

It is referenced in this presentation as (CMMN Beta 1)

CMMN is specialized notation to model cases. It is independent from BPMN
**Design Time vs Run Time = Modeling vs Planning**

- A Case has two distinct phases: design-time and run-time
  - During the **design-time** phase, **business analysts** engage in modeling, which includes defining
    - Tasks that are always part of pre-defined segments in the Case model, and
    - “discretionary” Tasks that are available to the Case worker, to be applied in addition, to his/her discretion.
  - In the **run-time** phase, **Case workers** execute the plan, particularly by
    - performing Tasks as planned,
    - adding discretionary Tasks to the Case plan instance in run-time.

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<table>
<thead>
<tr>
<th>Design-time phase</th>
<th>Run-time phase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Modeling</strong></td>
<td><strong>Plan</strong></td>
</tr>
<tr>
<td><img src="#" alt="Plan Items" /></td>
<td><img src="#" alt="A" /></td>
</tr>
<tr>
<td><img src="#" alt="Discretionary Items" /></td>
<td><img src="#" alt="B" /></td>
</tr>
<tr>
<td><img src="#" alt="C" /></td>
<td><img src="#" alt="D" /></td>
</tr>
<tr>
<td><img src="#" alt="C" /></td>
<td><img src="#" alt="D" /></td>
</tr>
</tbody>
</table>

A case worker can add one or more instances of C and/or D to the plan.

This is the plan to be executed.

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(CMMN Beta1, p. 14f)
A Case Model in CMMN

- A Case consists of a **case Plan Model**, a **Case File Model**, and a set of **case Roles**

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(CMMN Beta1, p. 23)
Metamodel of the Case and its Associated Classes

- Case is a top-level concept that combines all elements that constitute a Case model
Information Model representing Case Files

- The information model of a Case comprises of classes for the management of the information (data) aspects of a Case.
- All information, or references to information, that is required as context for managing a Case, is defined by a Case File.
- A Case File consists of Case File Items.
- A Case File Item is depicted by a “Document” shape.
- A Case File Item may represent a piece of information of any nature, ranging from unstructured to structured, and from simple to complex.
- A Case File Item can be anything from a folder or document, an entire folder hierarchy referring or containing other Case File Items or simply an XML document.
Case Plan Models

- The complete behavior model of a Case is captured in a case Plan Model.

- For a particular Case model, a case Plan model comprises:
  - all elements that represent the initial plan of the case, and
  - all elements that support the further evolution of the plan through run-time planning by case workers.

- There are four types of Plan Items:
  - **Tasks**
  - **Plan Fragments / Stages**
  - **Event Listeners**
  - **Milestones**
Example of a Case Plan Model

- A case Plan Model is depicted using a “Folder” shape.
- The name of the Case can be enclosed into the upper left rectangle.
- The various elements of a case Plan Model are depicted within the boundary of the case Plan Model shape.
- The diagram shows an example of a case Plan Model.

(CMMN Beta1, p. 54)
A Task is a unit of work. There are three types of tasks:

- **Human Task** - a Task that is performed by a Case worker, they can be
  - Blocking: Task is waiting until the work associated with the Task is completed
  - Non-Blocking: the Task is not waiting for the work to complete and completes immediately, upon instantiation.

- **Process Task** - can be used in the Case to call a Business Process

- **Case Tasks** - can be used to call another Case

Task Items are depicted by rectangle shape with rounded corners (cf. tasks/activities in BPMN),

- Non-Blocking Human Task
- Blocking Human Task
- Process Task
- CaseTask

(CMMN Beta1, p.57ff)
**Discretionary Tasks**

- Tasks are always part of pre-defined segments in the Case model.
- In addition to tasks there are Discretionary Tasks which are available to the Case worker, to be applied in addition, to his/her discretion.
- A discretionary Task is depicted by a rectangle shape with dashed lines and rounded corners.
- Any task type can be discretionary.

(CMMN Beta1, p. 58f)
**Event Listeners**

- An event is something that “happens” during the course of a Case. CMMN predefines many events, and their causes:
  - Anything that can happen to information in the CaseFile.
  - Anything that can happen to Stages, Tasks and Milestones.

- Event Listeners are used to model events that do not happen to plan items.

- An EventListener is depicted by a double line circle shape

- Event Listeners are specialized to
  - Timer Event Listener
  - User Event Listener

(CMMN Beta1, p. 28f, 60f)
**Sentries - Entry and Exit Criterion**

- Plan Items may have associated Sentries.
- Sentries define the criteria according to which the Plan Items are enabled (or entered) and terminated (or exited).
- A Sentry “watches out” for important situations to occur which influence the further proceedings of a Case.

- A Sentry used as an entry criterion is depicted by a shallow “Diamond”
- A Sentry used as an exit criterion it is depicted by a solid “Diamond”
Sentry

- A Sentry is a combination of an event and/or a condition.
  - An On-Part specifies the event that serves as trigger.
  - The If-Part specifies a condition, as expression that evaluates over the Case File.

- When the event is received, the condition might be applied to evaluate whether the event has effect or not.
  - If all On-Parts of a Sentry have occurred, and its If-Part (if existent) evaluates to “true”, the Sentry is “satisfied”.

- A Sentry that is satisfied triggers the Plan Item that refers to it:
  - When the Sentry is referenced by one of the Plan Item’s entry Criteria: a Task or Stage will be enabled, and a Milestone will be achieved.
  - When the Sentry is referenced by one of the Plan Item’s exit Criteria: a Task or Stage will be terminated (exited).

(CMMN Beta1, p. 33)
Sentries and Rules

- An Sentry and the task correspond to an ECA (Event-Condition-Action) rule.

- Sentries may take one of the following forms:
  1. An event part and a condition part in the form `on <event> if <condition>`
  2. An event part in the form `on <event>`
  3. Just a condition part 1) in the form `if <condition>`

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1) There is a contradiction in the CMMN specification: According to page 32 a condition can occur without On-Part (i.e. without event) while on page 33 at least one On-Part is required

(CMMN Beta1, p. 32)
**Connectors**

- Connectors can be used to visualize dependencies between Plan Items
  - One such depicted dependency is the On-Part of a Sentry
  - The other type of dependency is between a Human Task and Discretionary Items in its Planning Table (see later)

- The shape of the connector object is a dotted line.

(CMMN Beta1, p. 61f)
**Connector Usage**

- Connectors that represent Sentry On-Parts can be used to visualize dependencies between Plan Items.

- The following pictures illustrate situations where Task C can be activated only:
  1. (1) if Task A is complete
  2. (2) if Task A and Task B are complete
  3. (3) if Task A or Task B are complete

(CMMN Beta1, p. 62)
Plan Fragment

- A Plan Fragment is a container of Plan Items and the Sentries

- Simple examples of Plan Fragments are:
  
  ♦ A combination of two Tasks, whereby, the completion of one Task satisfies the Sentry that enables the start of the other (sequence flow)

  ![Sequence Flow Diagram]

  ♦ A combination of an Event Listener and a Task, whereby the occurrence of the event satisfies the Sentry that enables the start of the Task.

  ![Event Listener Diagram]
**Stage**

- Stages are Plan Fragments that can be tracked.
- Stages may be considered “episodes” of a Case. They can be regarded as sub-cases (cf. sub-processes in BPMN).
- A Stage is depicted by a rectangle shape with angled corners and a marker in the form of a “+” or “-” sign in a small box at its bottom center (“+” or “-” designate expanded or collapsed stages).

(CMMN Beta1, p. 55, 57)
Milestones

- A Milestone is a Plan Item Definition that represents an achievable target, defined to enable evaluation of progress of the Case.

- No work is directly associated with a Milestone, but completion of set of tasks or the availability of key deliverables (information in the CaseFile) typically leads to achieving a Milestone.

- A Milestone is depicted by a rectangle shape with half-rounded ends.

- A Milestone may have zero or more entry criteria, which define, when a milestone is reached.
Planning at Run Time

- Users (Case workers) are said to “plan” (at run-time), when they select Discretionary Items

- With planning tables it is possible to make Discretionary Items dynamically applicable for planning
  
  ♦ Applicability Rules are used to specify, whether a Table Item is “applicable” (“eligible”, “available”) for planning, based on conditions that are evaluated over information in the Case File.
  
  ♦ If the condition of the ApplicabilityRule evaluates to “true”, then the TableItem is applicable for planning,
  
  ♦ During planning only Discretionary Items, for which the ApplicabilityRule evaluates to “true”, must be shown to the Case Worker

(CMMN Beta1, p. 43, 87)
Planning Table

- A Planning Table defines the scope of planning.
- Planning Tables can be assigned to a Stage or a Human Task.
  - Stages: The Planning Table can be used to plan instances of Tasks and Stages into that Stage instance.
  - Human Tasks: The Planning Table can be used to plan instances of Tasks and Stages into the Stage that contains the Human Task.
- A Planning Table is depicted by a “Table” shape.
- A Planning Table can have several Table Items (i.e. Discretionary Items). Planning Table and Table Items can have applicability rules.

(CMMN Beta1, p. 39, 64)
Planning Tables

- The maker at the center bottom cell of the Planning Table indicates if the Discretionary Items are visualized (+) or not (-).
  - When a user “expands” a Planning Table, its contained Discretionary Items become visible within the Stage.
  - When the Planning Table of a HumanTask is expanded, its contained Discretionary Items are visualized outside the HumanTask shape.

(CMMN Beta1, p. 64f)
What is the meaning of this model?

Building Permission

Application arrived

Check land-use plan

Check environmental sustainability

Check historical preservation

Publish application

Specify stipulations

Assessment finished

Inform applicant

Application arrived

Check land-use plan

Check environmental sustainability

Check historical preservation

Publish application

Specify stipulations

Assessment finished

Inform applicant