

Content

Agile MCDA Modelling

XMCDA meets D⁴

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7th Decision Deck Workshop
Dauphine, 6 October 2010

1. The D4 Rubis project
2. Use cases of XMCDA in D4
3. Granularity of the MCDA models
4. UMCDA-ML customization
5. New horizons for XMCDA development

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1. The D⁴ Rubis project

leopold-loewenheim.u... x

leopold-loewenheim.uni.lu/cawa/list/index.do

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mainDoc addEditAlternatives addEditCriteria addEditPerformanceTable tuningCriteria compareAlternatives computeOutrankingRelation viewRubisSolut

Distributed Web Application Designer (D⁴)

Version cawa July 2010 RB-UL

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User: raymond

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The screenshot shows the KarmicSoft IDE interface. On the left, a tree view shows the project structure with 'D4 Rubis project' highlighted. A callout bubble points to this tree with the text 'D4 Rubis project'. In the center, the 'Overview' tab shows application details for 'rubis'. A callout bubble points to the 'Name' field with the text 'Rubis applications'. On the right, the 'Applications' table lists several applications, and a callout bubble points to the 'demo_1' entry with the text 'Application users'. Below that, the 'Participations' table shows users and their roles, with a callout bubble pointing to the 'Role' column and the text 'User role'.

The screenshot shows a web application interface. At the top, there is a login form with a text input containing 'raymond' and a 'Login' button. A callout bubble points to the login form with the text 'User raymond Connects to D4'. Below the login form is a 'Create an account' section with fields for 'Login', 'First name', 'Last name', 'Email', and 'Password', and a 'Register' button.

The screenshot shows the KarmicSoft IDE interface. The 'Applications' list on the left includes 'Rubis best choice demo application', 'Choosing a best office site', 'Test application of Rubis best choice...', 'EBPA'04', and 'Dx4'. A callout bubble points to the 'Test application of Rubis best choice...' entry with the text 'Starting the D4 Selected application'. Another callout bubble points to the 'Run' button with the text 'User selects his application'.

The screenshot shows a web application interface titled 'D4 MCDA Web APPLICATION'. It displays a table with the following content:

tabs	Content
addEditAlternatives	Edit the set of potential decision alternatives
addEditCriteria	Edit the family of performance criteria
addEditPerformanceTable	Add and edit the evaluations of the alternatives on each criterion
tuningCriteria	Add and edit the preference discrimination thresholds
computeOutrankingRelation	Compute a bipolar valued outranking digraph with a Condorcet robustness index, visualize the Condorcet outranking graph and submit the problem to the RUBIS Solver
viewRubisSolution	Retrieve the complete best choice recommendation

A callout bubble points to the table with the text 'main steps of the decision aid process'. At the bottom, there is a reference: '* R. Bisdorff, P. Meyer and M. Roubens (2008). RUBIS: a bipolar-valued outranking method for the choice problem. 4OR, A Quarterly Journal of Operations Research, Springer-Verlag, Volume 6 Number 2 pp. 143-165. (Online) Electronic Version: 10.1007/s10288-007-0045-5 (downloadable preliminary version PDF file 271.5Kb)'.

a. Edit the set of potential alternatives

The screenshot shows the 'addEditAlternatives' page. It features a table with the following data:

order	name	description	active	fullName
1	a	demo decision action 1	<input checked="" type="checkbox"/>	action 1
2	b	demo decision action 2	<input checked="" type="checkbox"/>	action 2
3	c	demo decision action 3	<input checked="" type="checkbox"/>	action 3
4	d	demo decision action 4	<input checked="" type="checkbox"/>	action 4

An orange callout bubble labeled 'Grid fragment' points to the table. The page footer shows 'Page 1 of 1' and 'User: raymond'.

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b. Edit the family of criteria

The screenshot shows the 'addEditCriteria' page. It features a table with the following data:

name	description	active	significance	scaleMinimum	scaleMaximum	preferenceDirection
g01	ordinal criterion 1	<input checked="" type="checkbox"/>	1	0	6	max
g02	ordinal criterion 2	<input checked="" type="checkbox"/>	1	0	6	max
g03	ordinal criterion 3	<input checked="" type="checkbox"/>	1	0	6	max

An orange callout bubble labeled 'Grid fragment' points to the table. The page footer shows 'Page 1 of 1' and 'User: raymond'.

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c. Edit the performances of the actions on the criteria

The screenshot shows the 'addEditPerformanceTable' page. It has two side-by-side tables:

id	name
1	g01
2	g02
3	g03

id	name	value
1	a_g01	6

An orange callout bubble labeled 'Filtered performance' points to the second table. The page footer shows 'Page 1 of 1' and 'User: raymond'.

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The screenshot shows the KarmicSoft IDE interface. The main window displays a project structure with a tree view of files and folders. A callout bubble labeled 'Declarative definition of the tabs' points to the project structure. Another callout bubble labeled 'declarative definition of filtering conditions' points to a table in the right-hand pane:

Na...	Type	Source
1	r1	cawa.ui.relations.masterdetail
2	r2	cawa.ui.relations.masterdetail

The page footer shows 'Page 1 of 1' and 'User: rb'.

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View the entire performance table

use D4 Python scripting

crit	wght	g(x)	g(y)	diff	ind	wp	p	concord	wv	polarisation
g01	1.00	6.00	2.00	+4.00	1.0	None	2.0	+1.00		
g02	1.00	2.00	6.00	-4.00	1.0	None	None	-1.00		
g03	1.00	4.00	0.00	+4.00	1.0	None	None	+1.00		

showPerformanceTable

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d. Tuning the preference discrimination

declarative definition of thresholds

id	significance	description
1	1	ordinal criterion 1
2	1	ordinal criterion 2
3	1	ordinal criterion 3

name	description	type	value	intercept	slope
1	th_g01_pref	preference discrimination threshold	pref	2	0
2	th_g01_ind	constant indifference discrimination	ind	1	

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Pairwise Comparison
Comparing actions : (a,c)

crit	wght	g(x)	g(y)	diff	ind	wp	p	concord	wv	polarisation
g01	1.00	6.00	2.00	+4.00	1.0	None	2.0	+1.00		
g02	1.00	2.00	6.00	-4.00	1.0	None	None	-1.00		
g03	1.00	4.00	0.00	+4.00	1.0	None	None	+1.00		

Valuation in range: -3.00 to +3.00; global concordance: +1.00

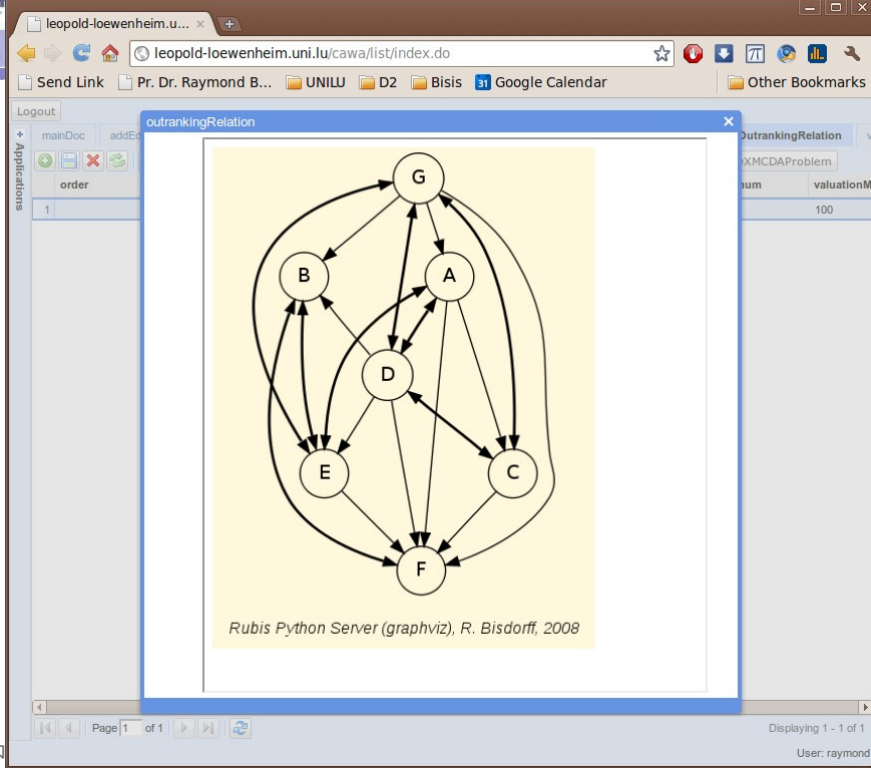
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e. Computing the bipolar valued outranking digraph

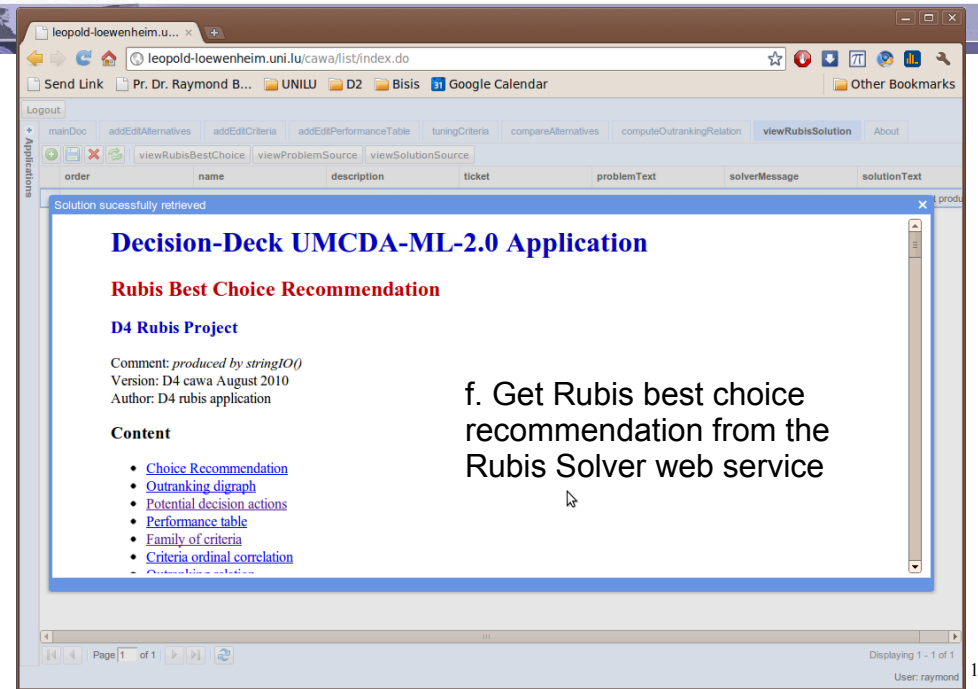
Relation	a	b	c	d
a	0.00	3.00	0.00	-1.00
b	-3.00	0.00	0.00	-1.00
c	-1.00	-1.00	0.00	0.00
d	0.00	0.00	-1.00	0.00

Valuation domain: from -3 to 3.

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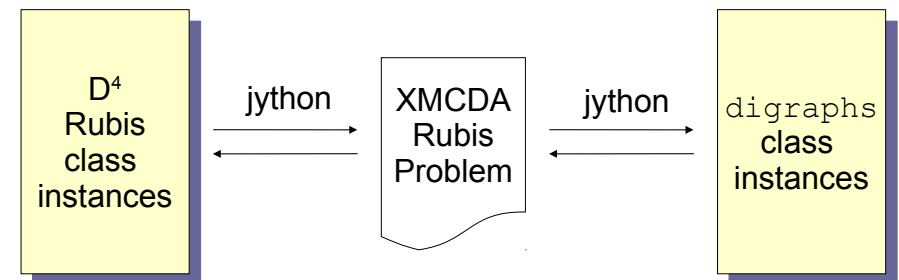
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2. Use cases of XMCDA in D⁴

a. Interfacing D⁴ and digraphs class instances



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Example: showing the pairwise comparison table

class operation

The class instance has a pointer to an XMCDAs encoded instance of a complete Rubis PerformanceTableau

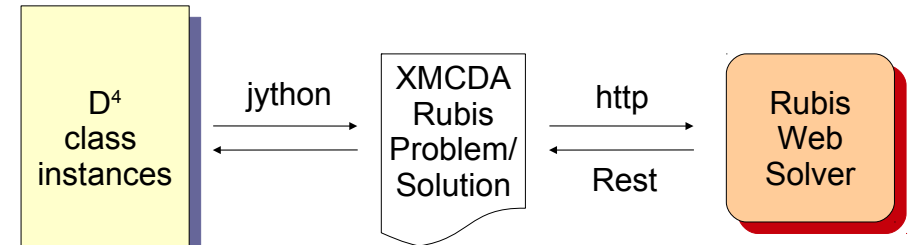
D4 class definition

```

1 import digraphs
2 # this is the current selected outranking situation
3 print this.name
4 if this.initial.name != this.terminal.name:
5     t = digraphs.XMCDAsPerformanceTableau(stringInput=this.digraph.performanceTableau)
6     if this.digraph.noVeto:
7         g = digraphs.BipolarOutrankingDigraph(t, hasNoVeto=True)
8     else:
9         g = digraphs.BipolarOutrankingDigraph(t, hasBipolarVeto=True)
10    initialAction = str(this.initial.name)
11    terminalAction = str(this.terminal.name)
12    html = g.showPairwiseComparison(initialAction, terminalAction, isReturningHTML=True)
13    print html
14    return html
15 else:
16    return 'Error: can only compare non identical posters !'

```

b. Interfacing D⁴ and the Rubis XMCDAs Solver



class operation

D4 python xmlrpc exchange with the Rubis Solver

D4 class definition

```

1 import sys, xmlrpc
2 host = "http://localhost/cgi-bin/xmlrpc.cgi.py"
3 rubisServer = xmlrpc.ServerProxy(host)
4 #this = weta.core.loader.load('projects.ebpa.data2004.globalOutranking')
5
6 problemText = this.performanceTableau
7 arg = {'problemFile': problemText.encode('ascii', 'xmlcharrefreplace')}
8 #arg = {'problemFile': problemText}
9 answer = rubisServer.submitProblem(arg)
10 print answer['ticket']
11 html = answer['message']
12 if answer['ticket'] != None:
13     Job = weta.core.loader.load('projects.rubis.Recommendation')
14     job = Job()

```

```

<?xml version="1.0" encoding="UTF-8"?>
<!--?xml-stylesheet type="text/xsl" href="xmcdas2Rubis.xsl"?-->
<xmcdas:XMCDAs xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.decision-deck.org/2009/XMCDAs-2.0 http://www.decision-deck.org/xmcdas_downloads/XMCDAs-2.0.xsd" xmlns:xmcdas="http://www.decision-deck.org/2009/XMCDAs-2.0" instanceID="void">
  <projectReference id="d4_rubis_temp" name="d4_rubis_temp.xml"/>
  <!--D4 Rubis Project-->
  <author>D4 rubis application</author>
  <version>D4 cawa August 2010</version>
  <comment>produced by stringIO</comment>
  <!--projectReference-->
  <methodParameters id="Rubis" name="Rubis best choice method" mdaConcept="methodData">
    <description>
      <subTitle>Method parameters</subTitle>
      <version>1.0</version>
      <description>
        <parameters>
          <parameter name="varian">
            <value>
              <label>Rubis</label>
              <value>
                <parameter name="valuationType">
                  <value>
                    <label>bipolar</label>
                    <value>
                      <parameter>

```

UMCDAML perspectives

Learning from the D4 experience

Motivation

- D4 ?
 - Power-User design tool for MCDA problems
 - No deployment cycle : app online from the beginning
 - Fast : new class in minutes
 - Flexible : refactoring with instant impact to data
- Example

I. SprintOne : build task grid

1. Define task objects

The screenshot shows a class browser with a 'Task' class. The 'Attributes' tab is active, showing a table with one attribute:

Name	Type
Done	root.oosemantics.primitives.Boolean

1. Preview task grid

The screenshot shows a 'Tasks (and iterations)' window with a table of tasks. A red box highlights the table content:

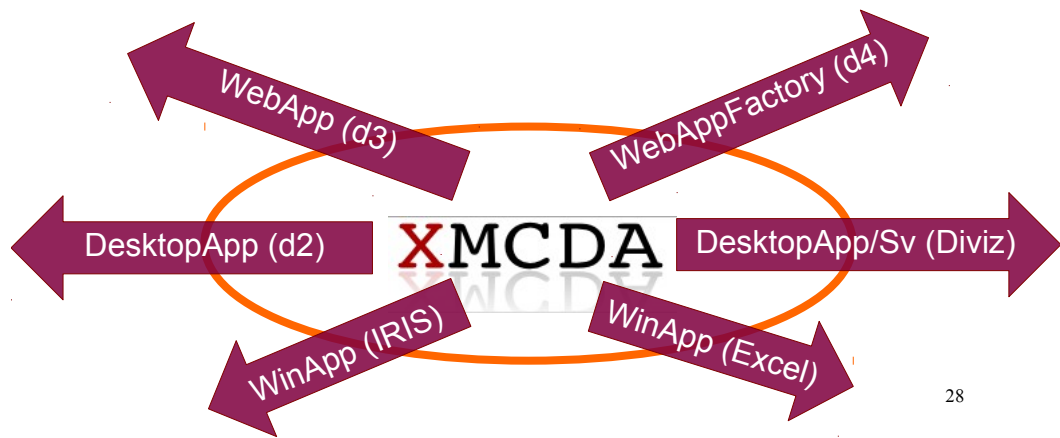
order	name	description	Done
1	task2	preview task grid	<input type="checkbox"/>
2	task1	define Task objects	<input checked="" type="checkbox"/>
1	task5	define iterations	<input checked="" type="checkbox"/>
2	task6	group tasks by it...	<input checked="" type="checkbox"/>
3	SprintFour	iterations as tasks	<input type="checkbox"/>

High stakes : raise abstraction

Technology vs methodology

Motivation

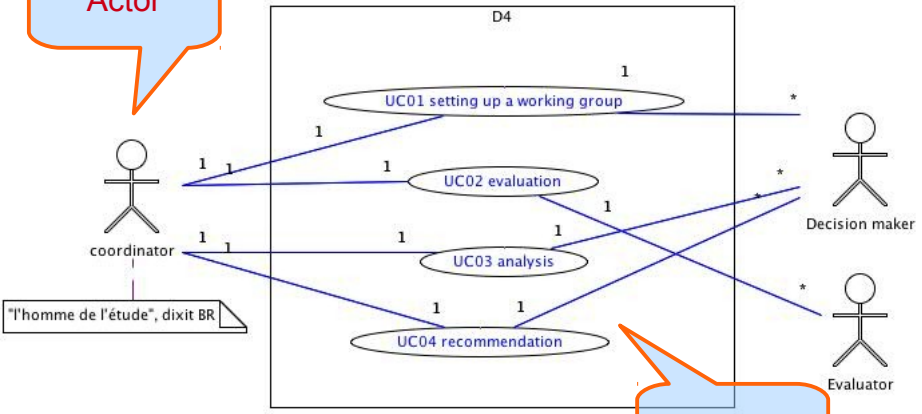
U MCDA ML



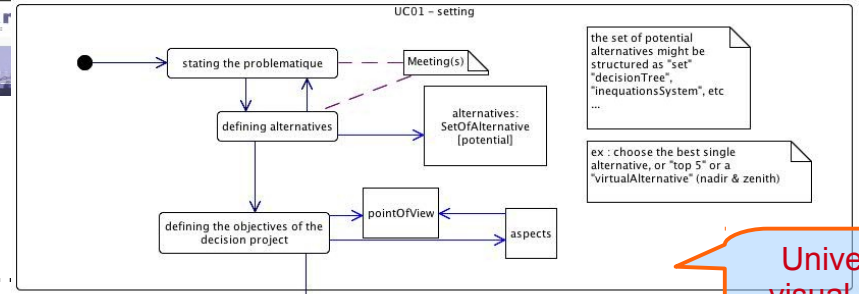
Multi platform, multi language ...

Modeling MCDA problems with UML

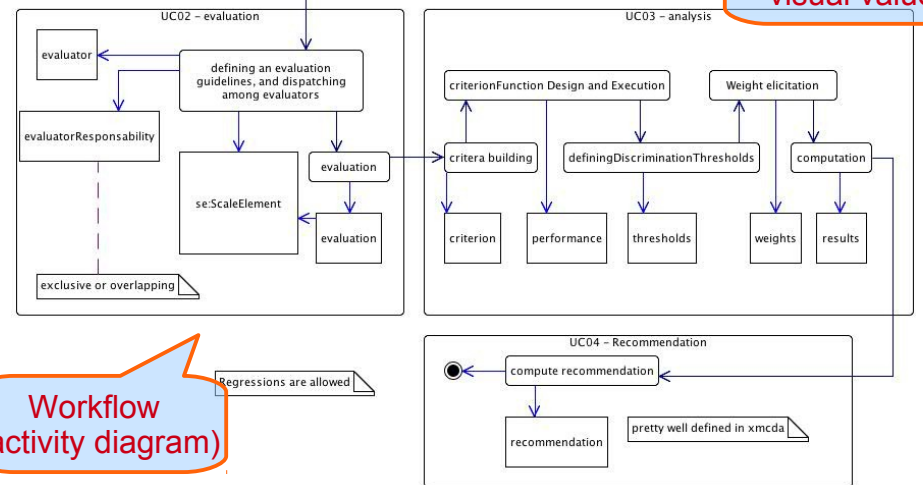
Actor



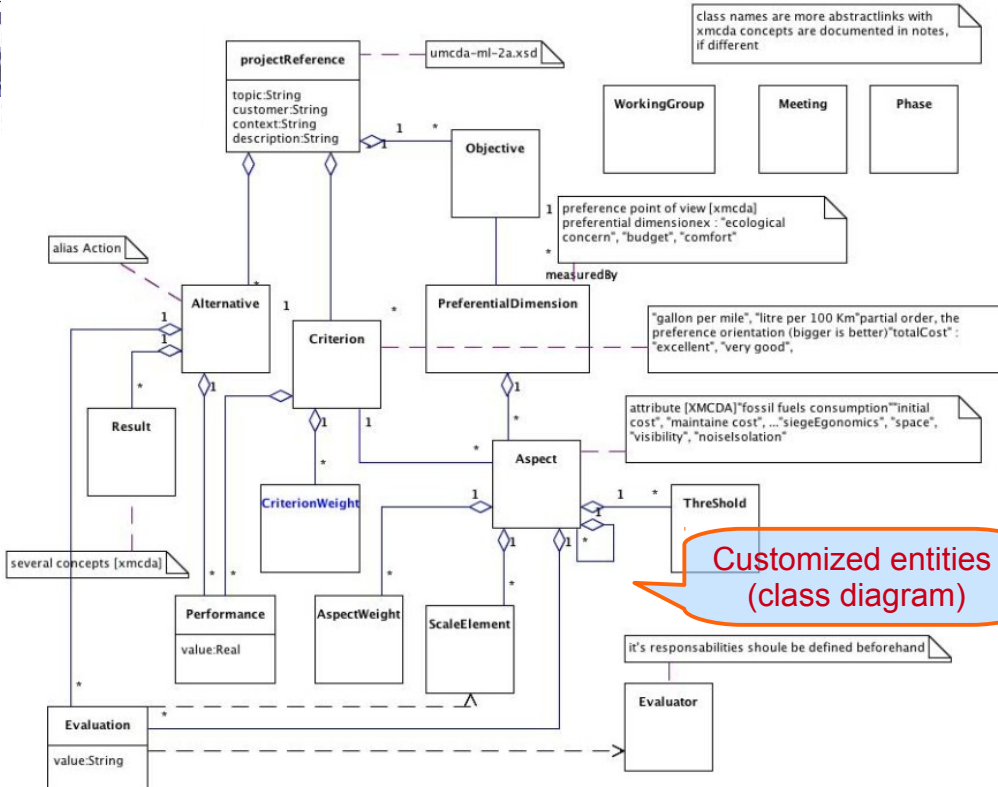
Use Cases



Universal visual value



Workflow (activity diagram)

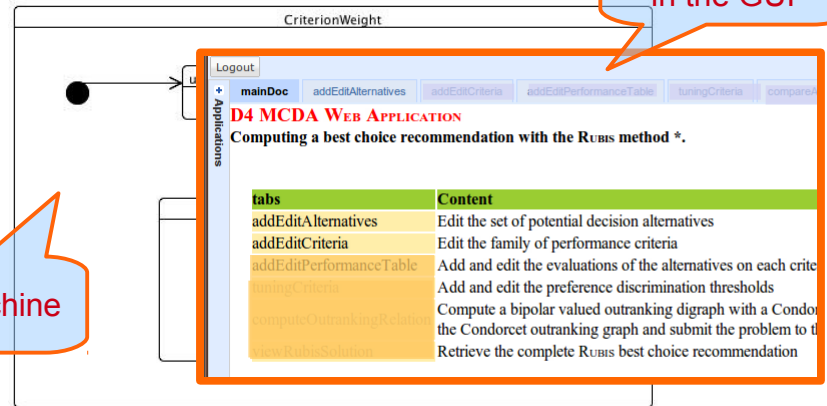


Customized entities (class diagram)

Object's lifecycle : workflow regulator

Can be reflected in the GUI

StateMachine



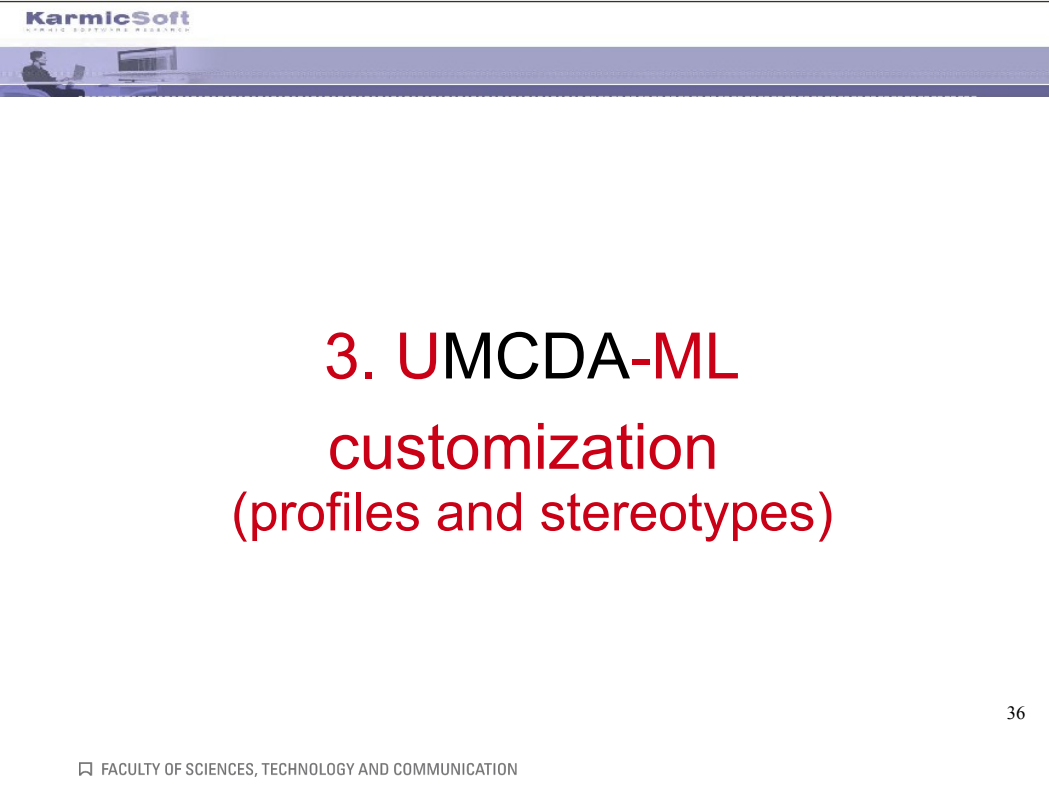
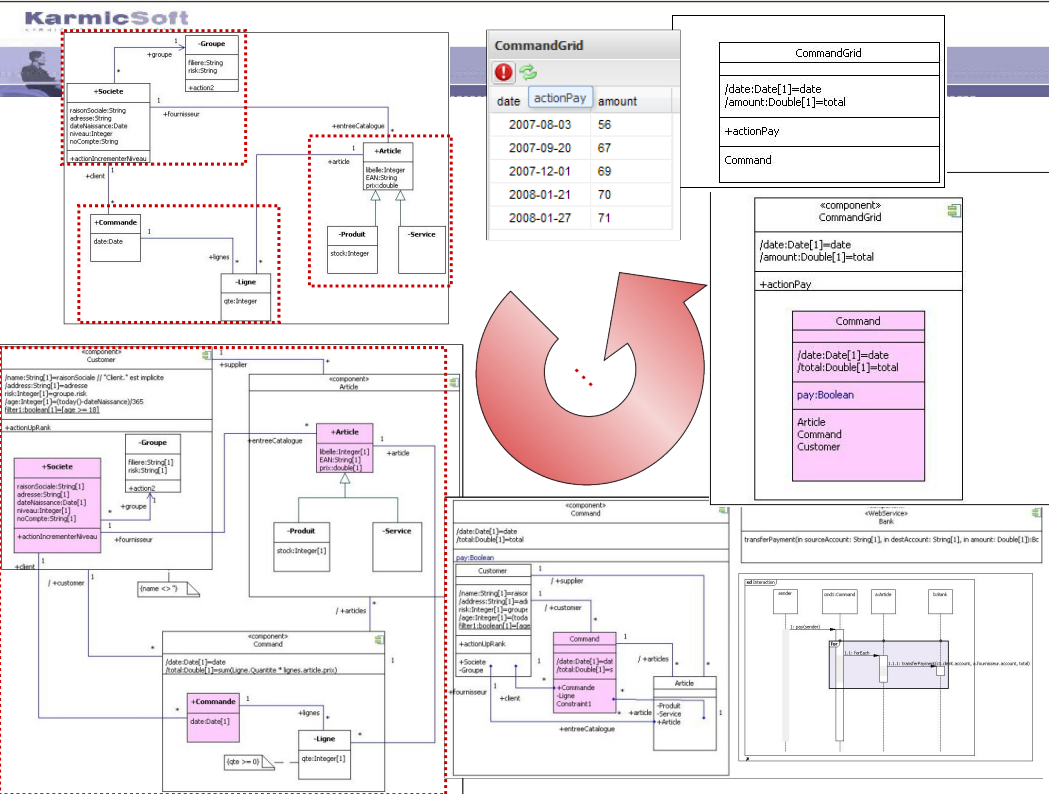
UML granularity concepts

3. Granularity of the MCDA models

- Model
 - Static : package*, class*, component*
 - Dynamic : usecase, activity*, state*, operation*
- Metamodel solution
 - (*) : Composite design pattern
 - XMI : **X**ML **M**odel **I**nterchange

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3. UMCDA-ML customization (profiles and stereotypes)

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UML Profile

CriteriaBuilding
 << McdaProcess >>

Buildin
 StateMachine

• Profile

- provides a generic extension mechanism for customizing UML models for specific domains and platforms.
- define new concepts (meta) called << stereotypes >> more than types, less than metatypes
- model remain compliant with the standard
- finally, the standard can evolve and integrate the stereotype as an official new concept

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3. New horizons for XMCD A ?

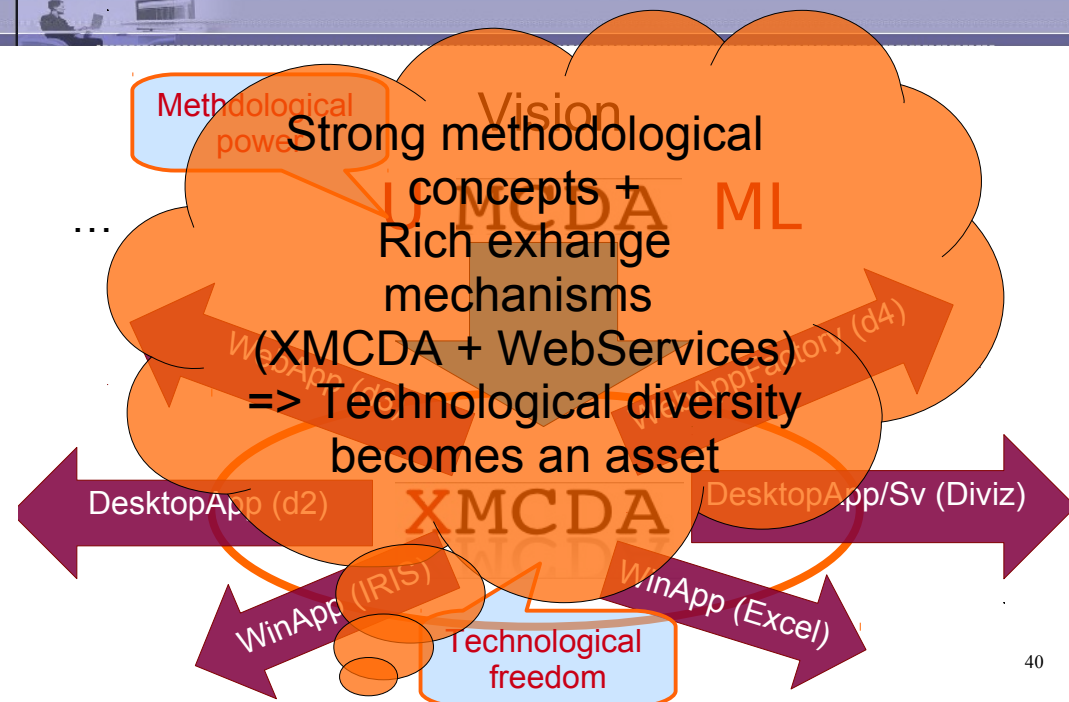
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XMCD A

- UML-like profiles and stereotypes
 - Requires tools for diagrams and generation
 - <<problem>>, <<package>>,
 - <<phase>>, <<workflow>>
- Types aggregates : java-like generics
 - Using Spring parsing features
 - Set<Alternative>, List<Evaluator> ...
 - Matrix<Alternative, Evaluator>, Vector<Criteria> ...

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Q&A