Agile MCDA Modelling

XMCDA meets D^4

R. Bisdorff & M. Zamfiroiu

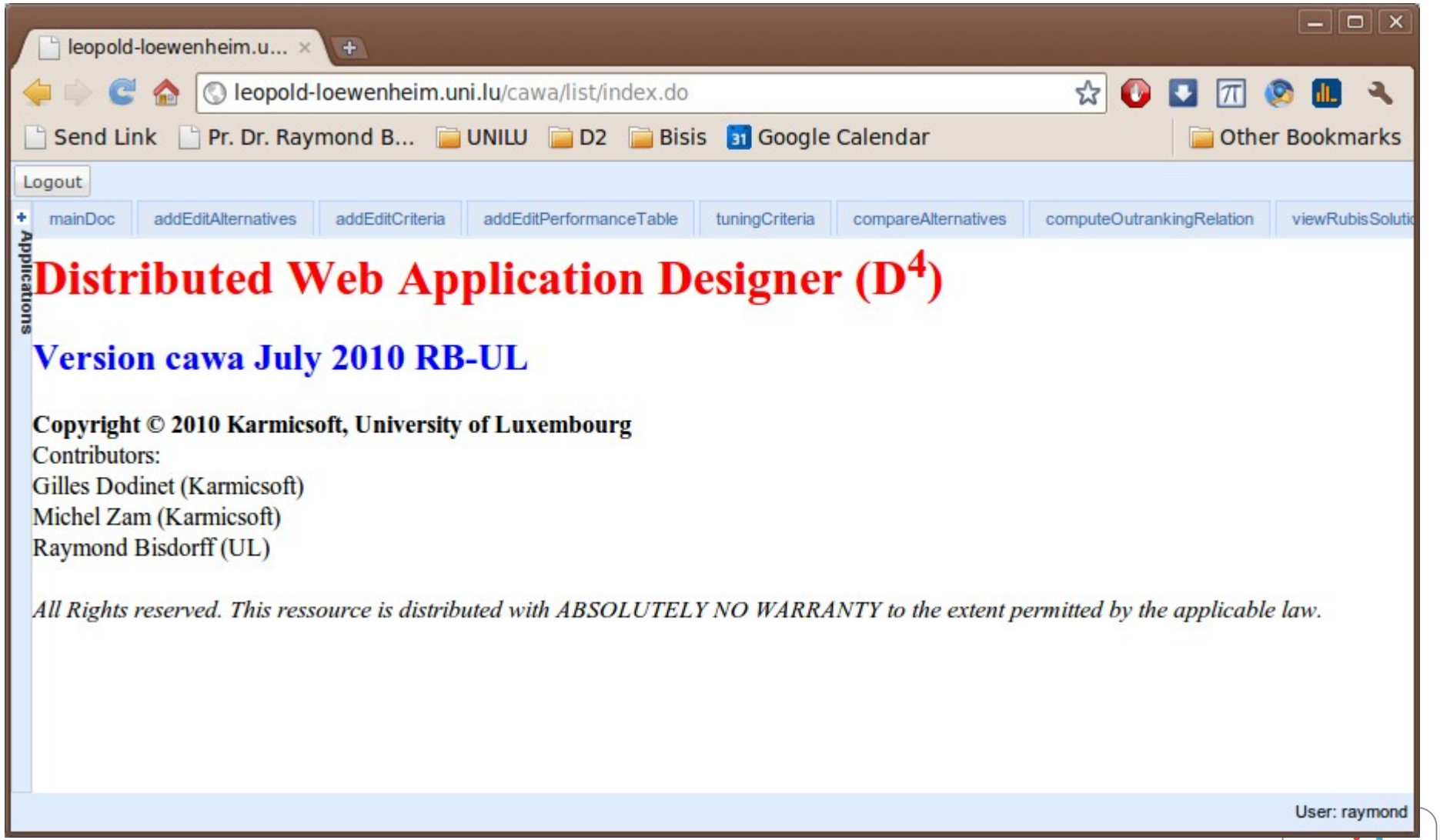
Manchester, April 15, 2011

Cost Action IC0206 Algorithmic Decision Theory

Content

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

1. The D^4 Rubis project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D2
Bisis
Google Calendar
Other Bookmarks
Logout
mainDoc
addEditAlternatives
addEditCriteria
addEditPerformanceTable
tuningCriteria
compareAlternatives
computeOutrankingRelation
Applications
Distributed Web Application Designer (D4)
Version cawa July 2010 RB-UL
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Contributors:
Gilles Dodinet (Karmicsoft)
Michel Zam (Karmicsoft)
Raymond Bisdorff (UL)
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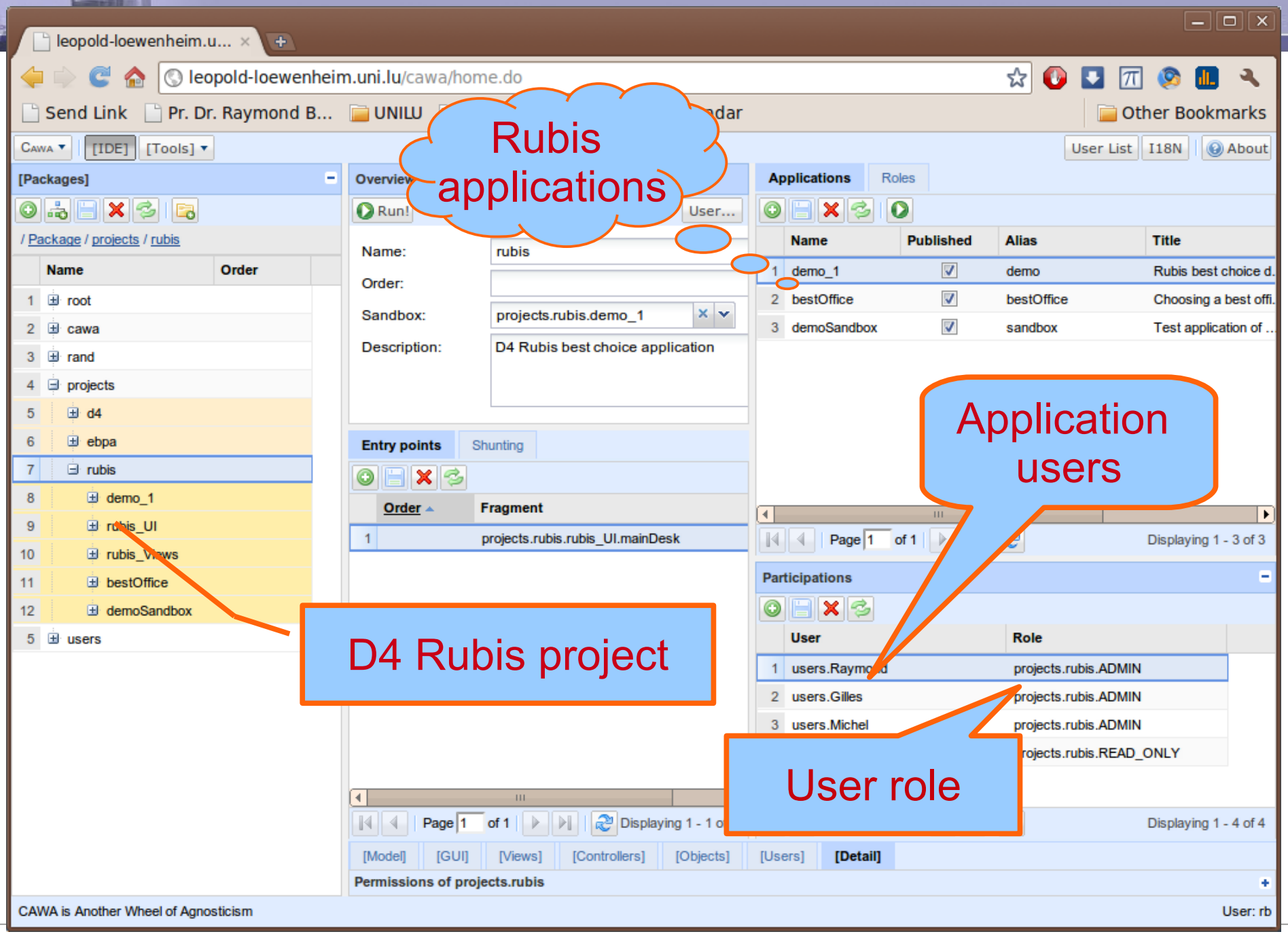
User: raymond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Other Bookmarks
Cawa
[IDE]
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User List
I18N
About
Rubis applications
[Packages]
/ Package / projects / rubis
Name
Order
root
cawa
rand
projects
d4
ebpa
rubis
demo_1
rubis_UI
rubis_Views
bestOffice
demoSandbox
users
Overview
Run!
User...
Name:
rubis
Order:
Sandbox:
projects.rubis.demo_1
Description:
D4 Rubis best choice application
Entry points
Shunting
Order
Fragment
projects.rubis.rubis_UI.mainDesk
Applications
Roles
Name
Published
Alias
Title
demo_1
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demoSandbox
sandbox
Test application of ..
Page 1 of 1
Displaying 1 - 3 of 3
Application users
Participations
User
Role
users.Raymond
projects.rubis.ADMIN
users.Gilles
projects.rubis.ADMIN
users.Michel
projects.rubis.ADMIN
projects.rubis.READ_ONLY
D4 Rubis project
User role
Displaying 1 - 4 of 4
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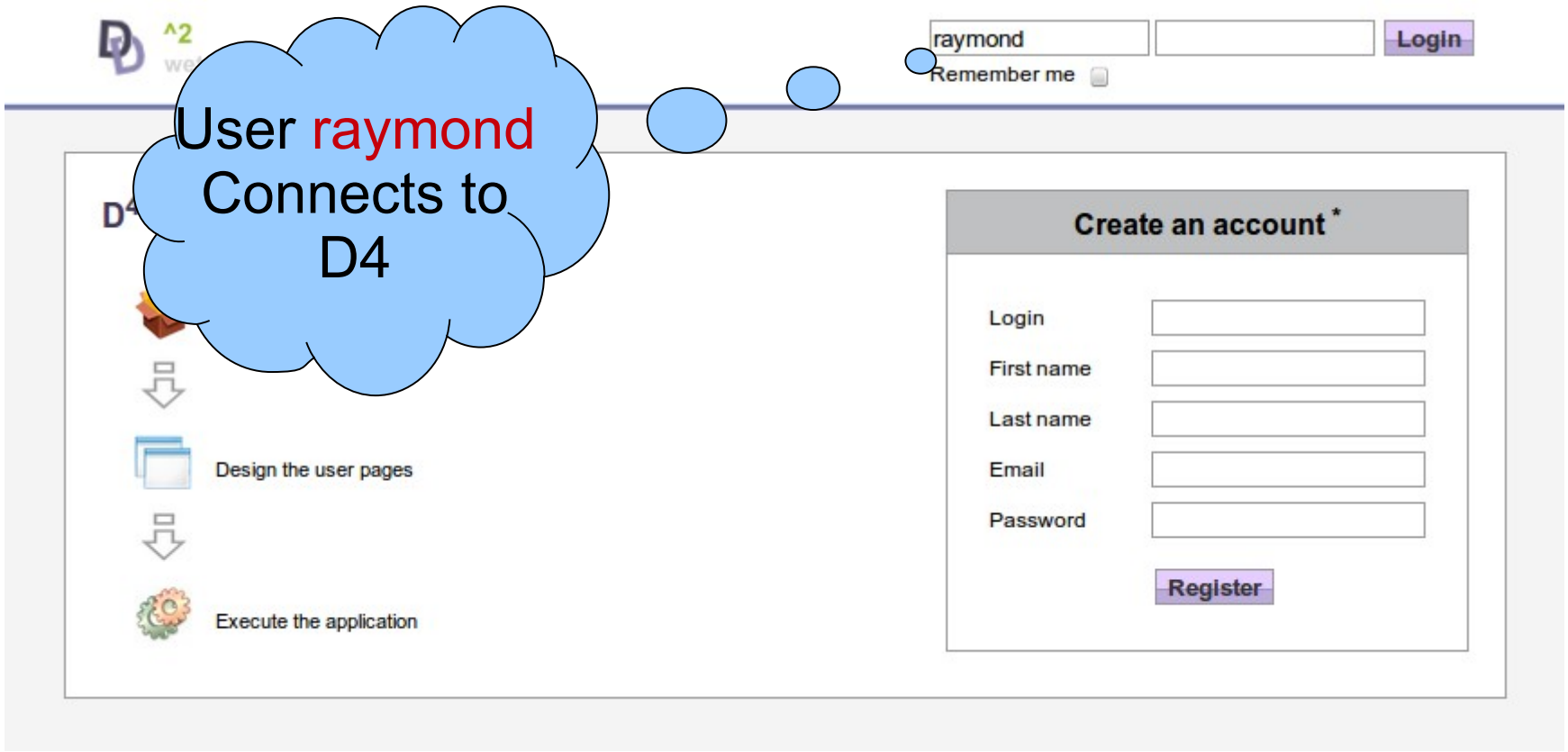
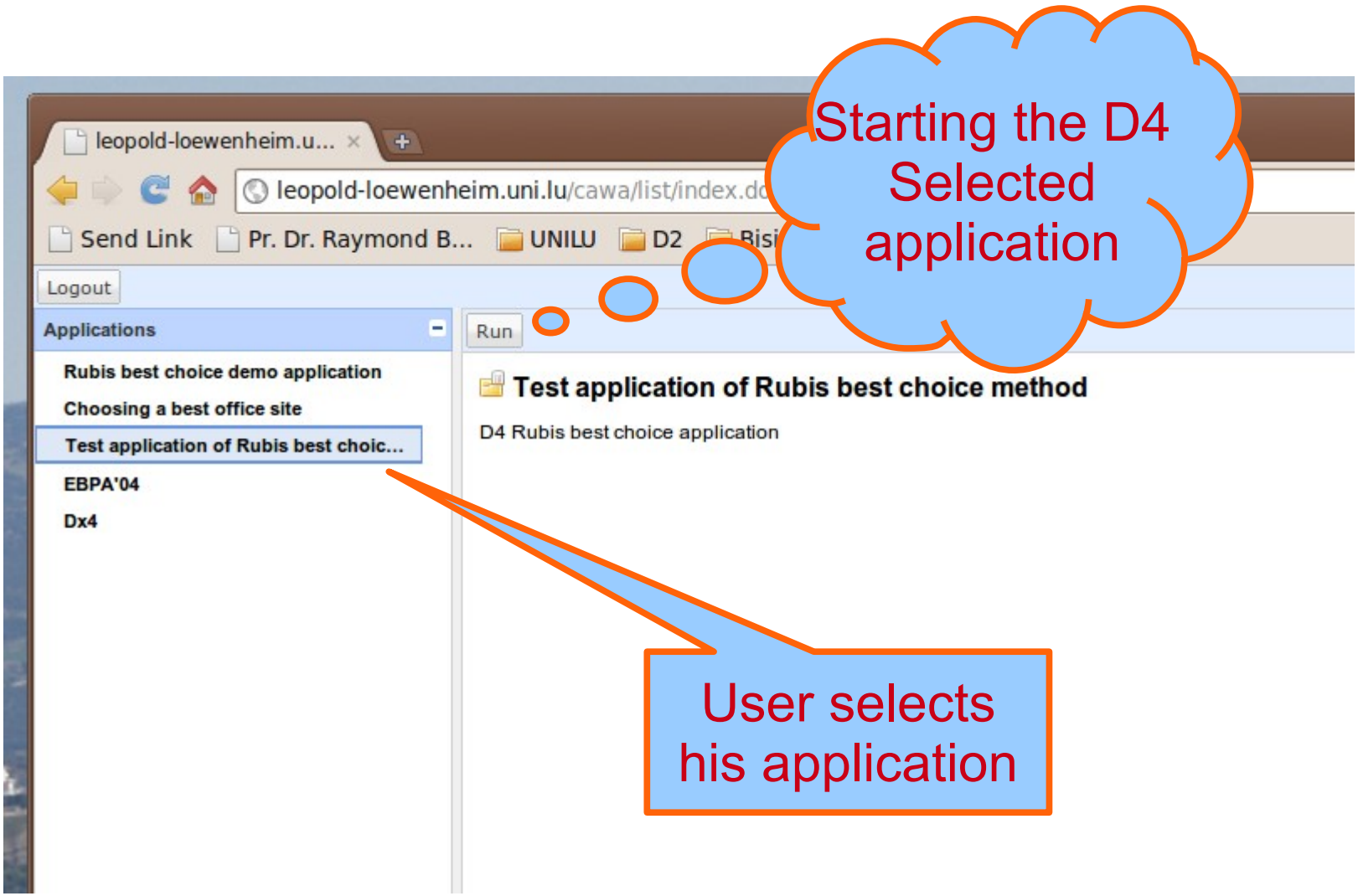
[Objects]
[Users]
[Detail]
Permissions of projects.rubis
CAWA is Another Wheel of Agnosticism
User: rb


User raymond Connects to D4
raymond
Login
Remember me
Create an account *
Login
First name
Last name
Email
Password
Register
Design the user pages
Execute the application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leopold-loewenheim.uni.lu/cawa/list/index.do
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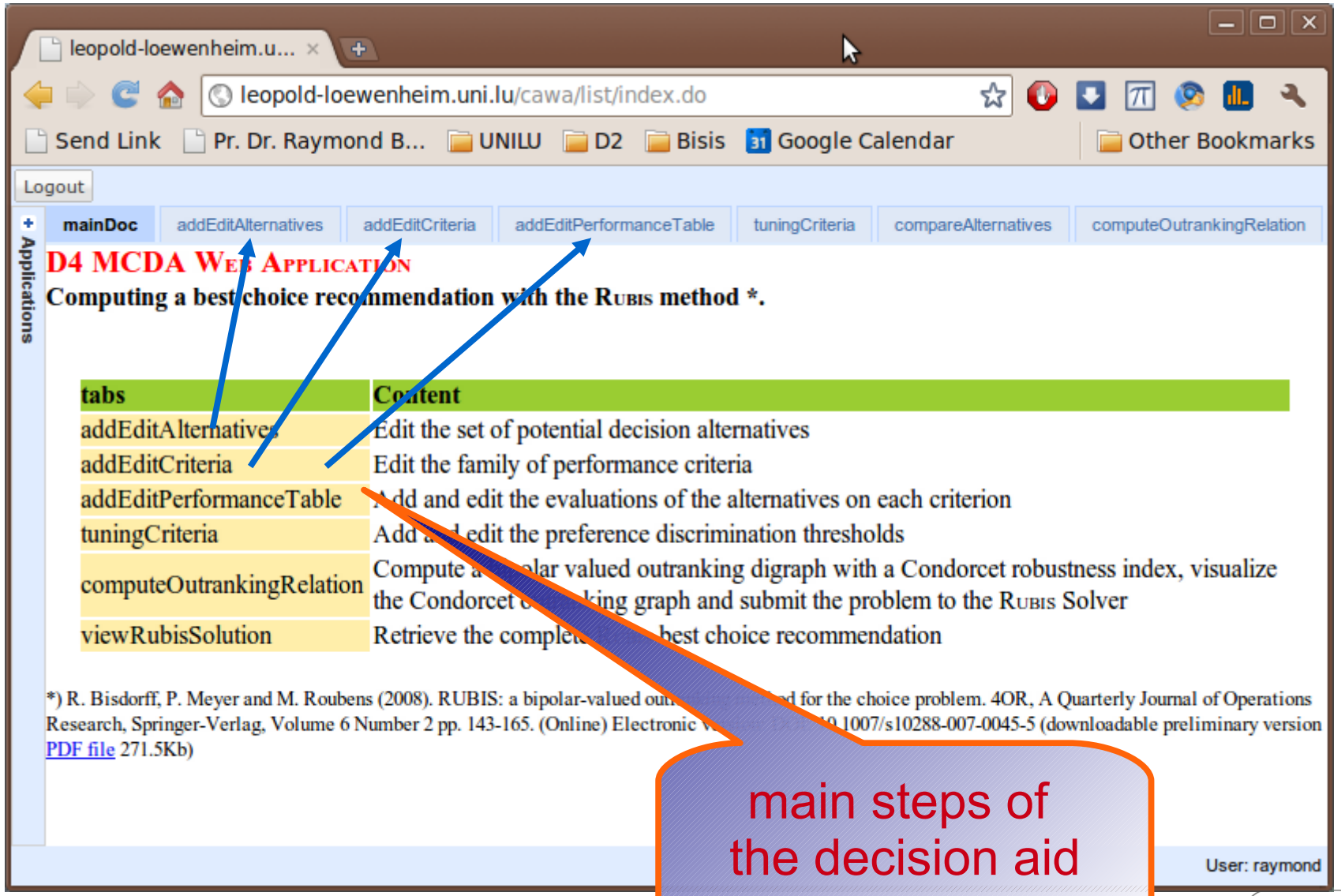
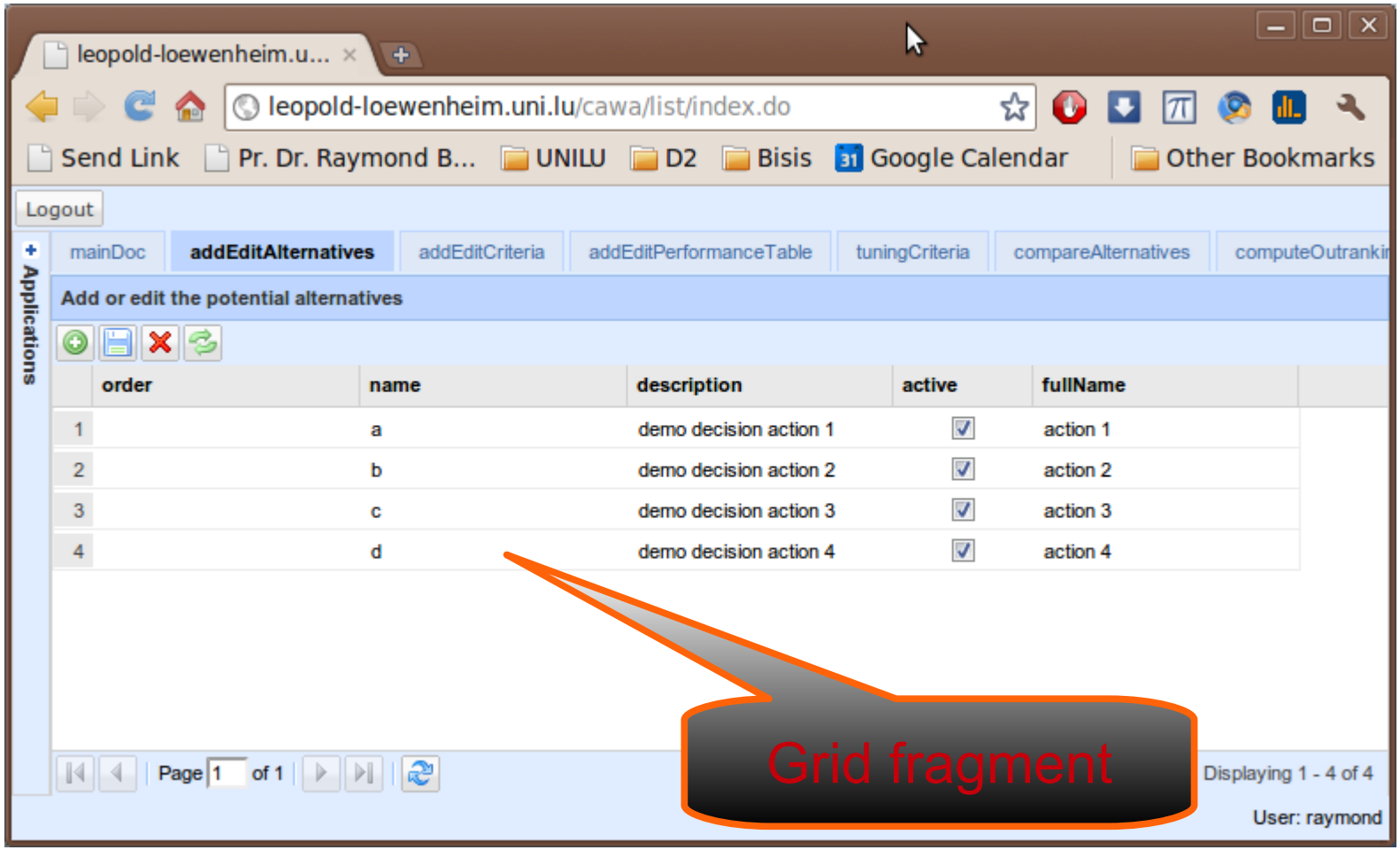
D2
Logout
Applications
Rubis best choice demo application
Choosing a best office site
Test application of Rubis best choic...
EBPA'04
Dx4
Run
Test application of Rubis best choice method
D4 Rubis best choice application
Starting the D4 Selected application
User selects his application

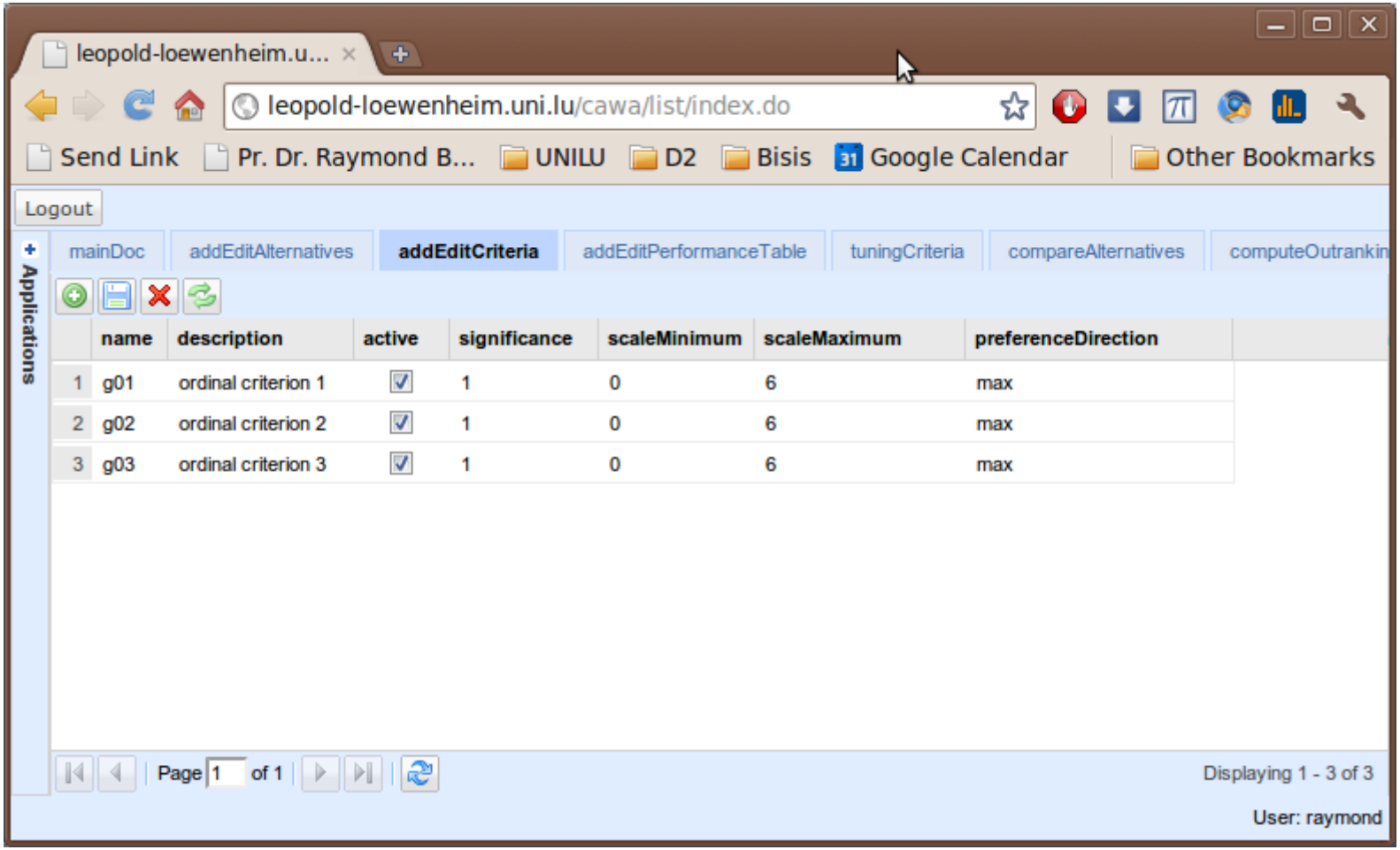


main steps of the decision aid process

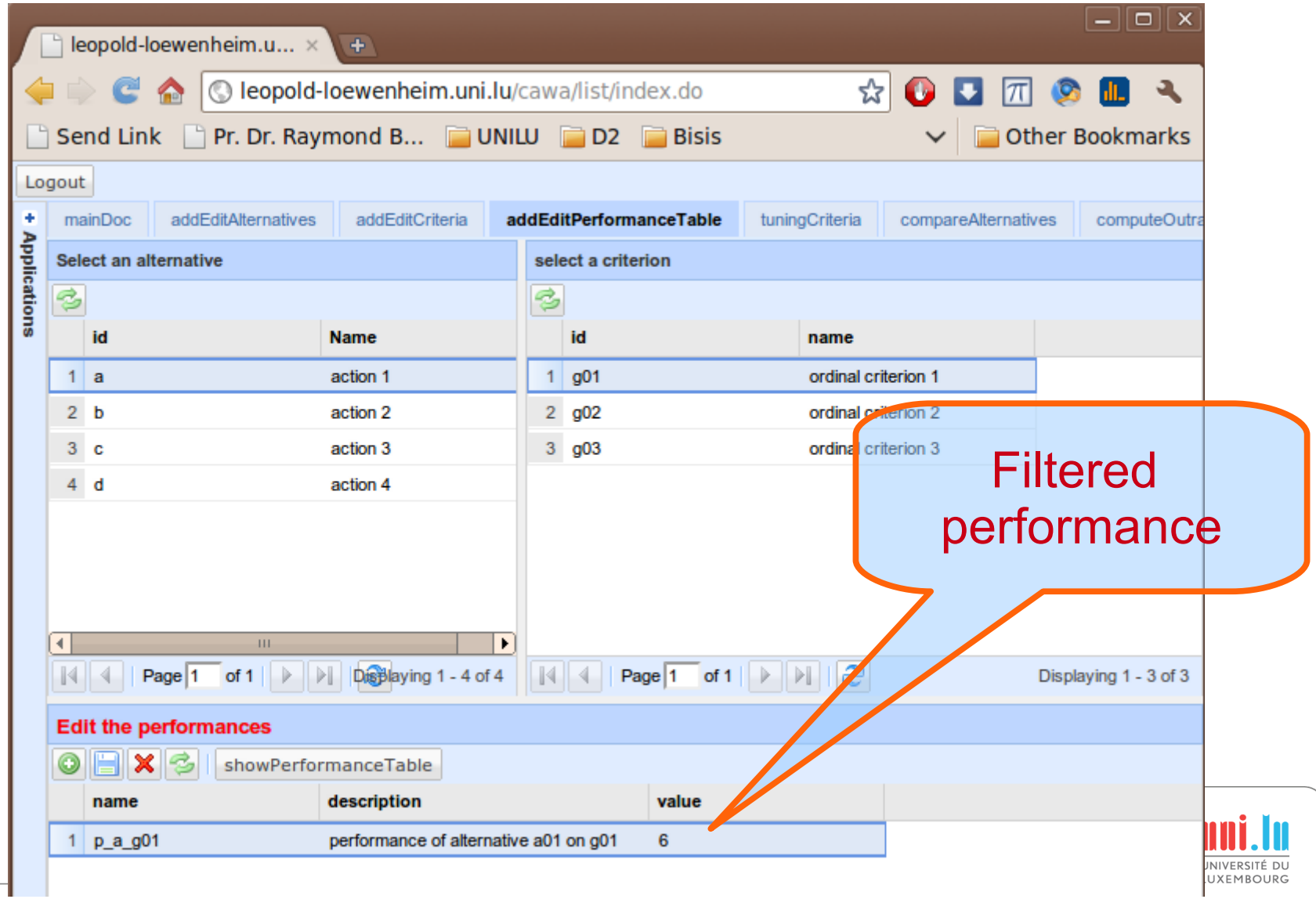
a. Edit the set of potential alternatives

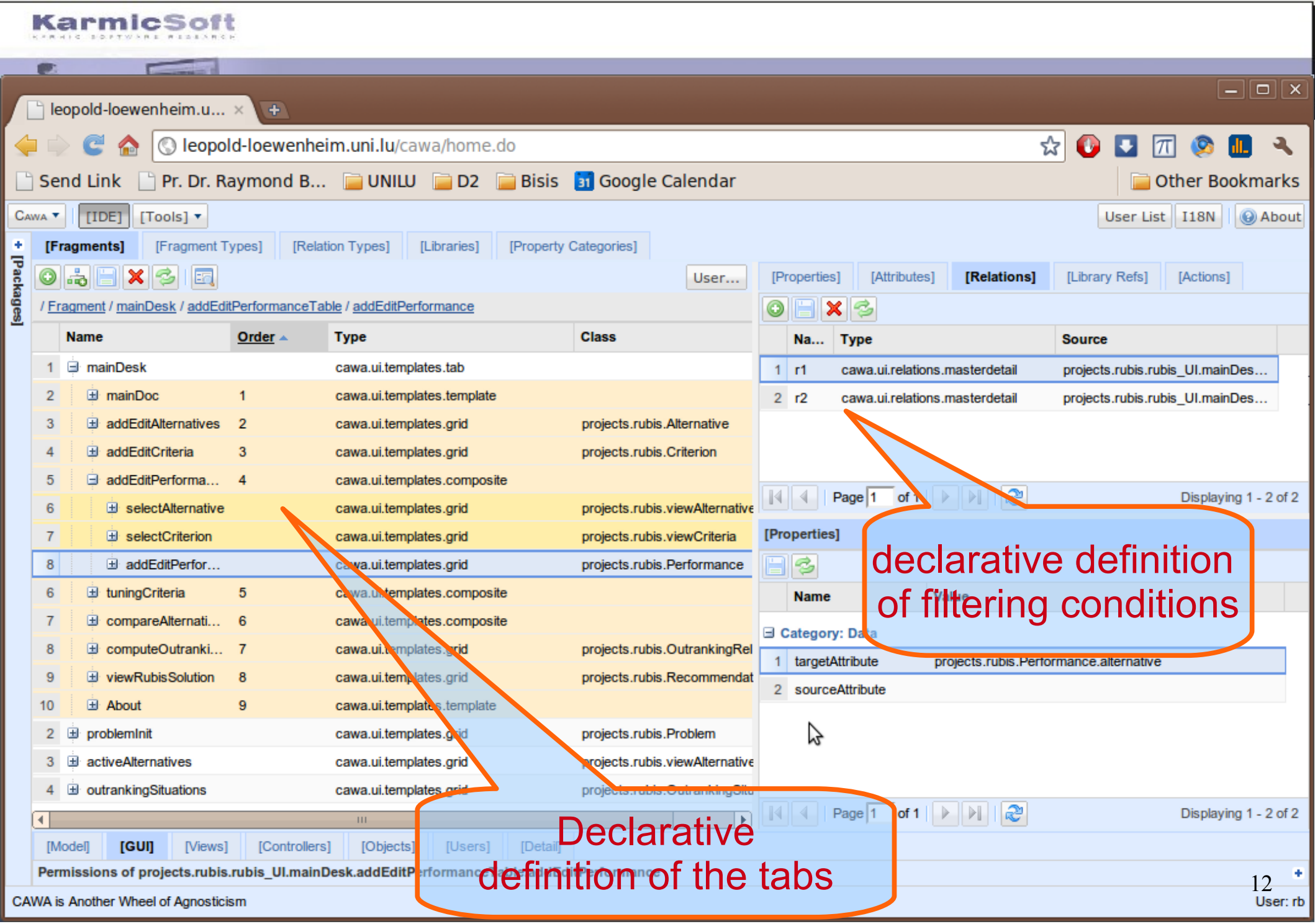


b. Edit the family of criteria



c. Edit the performances of the actions on the criteria

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Cawa
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User List
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About
[Packages]
[Fragments]
[Fragment Types]
[Relation Types]
[Libraries]
[Property Categories]
User...
/ Fragment / mainDesk / addEditPerformanceTable / addEditPerformance
Name
Order
Type
Class
1 mainDesk cawa.ui.templates.tab
2 mainDoc 1 cawa.ui.templates.template
3 addEditAlternatives 2 cawa.ui.templates.grid projects.rubis.Alternative
4 addEditCriteria 3 cawa.ui.templates.grid projects.rubis.Criterion
5 addEditPerforma... 4 cawa.ui.templates.composite
6 selectAlternative cawa.ui.templates.grid projects.rubis.viewAlternative
7 selectCriterion cawa.ui.templates.grid projects.rubis.viewCriteria
8 addEditPerfor... cawa.ui.templates.grid projects.rubis.Performance
6 tuningCriteria 5 cawa.ui.templates.composite
7 compareAlternati... 6 cawa.ui.templates.composite
8 computeOutranki... 7 cawa.ui.templates.grid projects.rubis.OutrankingRel
9 viewRubisSolution 8 cawa.ui.templates.grid projects.rubis.Recommendat
10 About 9 cawa.ui.templates.template
2 problemInit cawa.ui.templates.grid projects.rubis.Problem
3 activeAlternatives cawa.ui.templates.grid projects.rubis.viewAlternative
4 outrankingSituations cawa.ui.templates.grid
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[Attributes]
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[Actions]
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Type
Source
1 r1 cawa.ui.relations.masterdetail projects.rubis.rubis_UI.mainDes...
2 r2 cawa.ui.relations.masterdetail projects.rubis.rubis_UI.mainDes...
Page 1 of 1
Displaying 1 - 2 of 2
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Name
Value
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2 sourceAttribute
Page 1 of 1
Displaying 1 - 2 of 2
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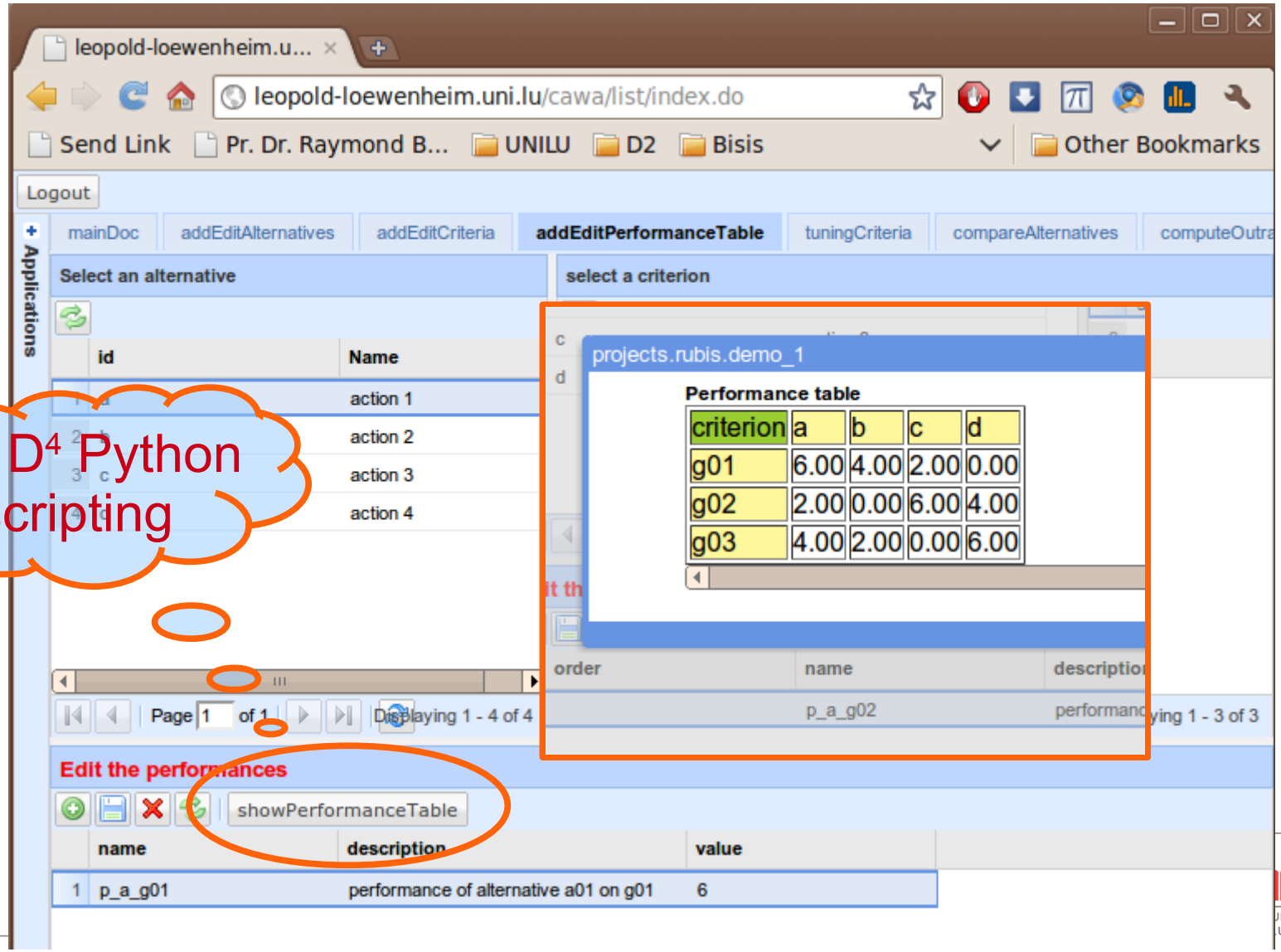
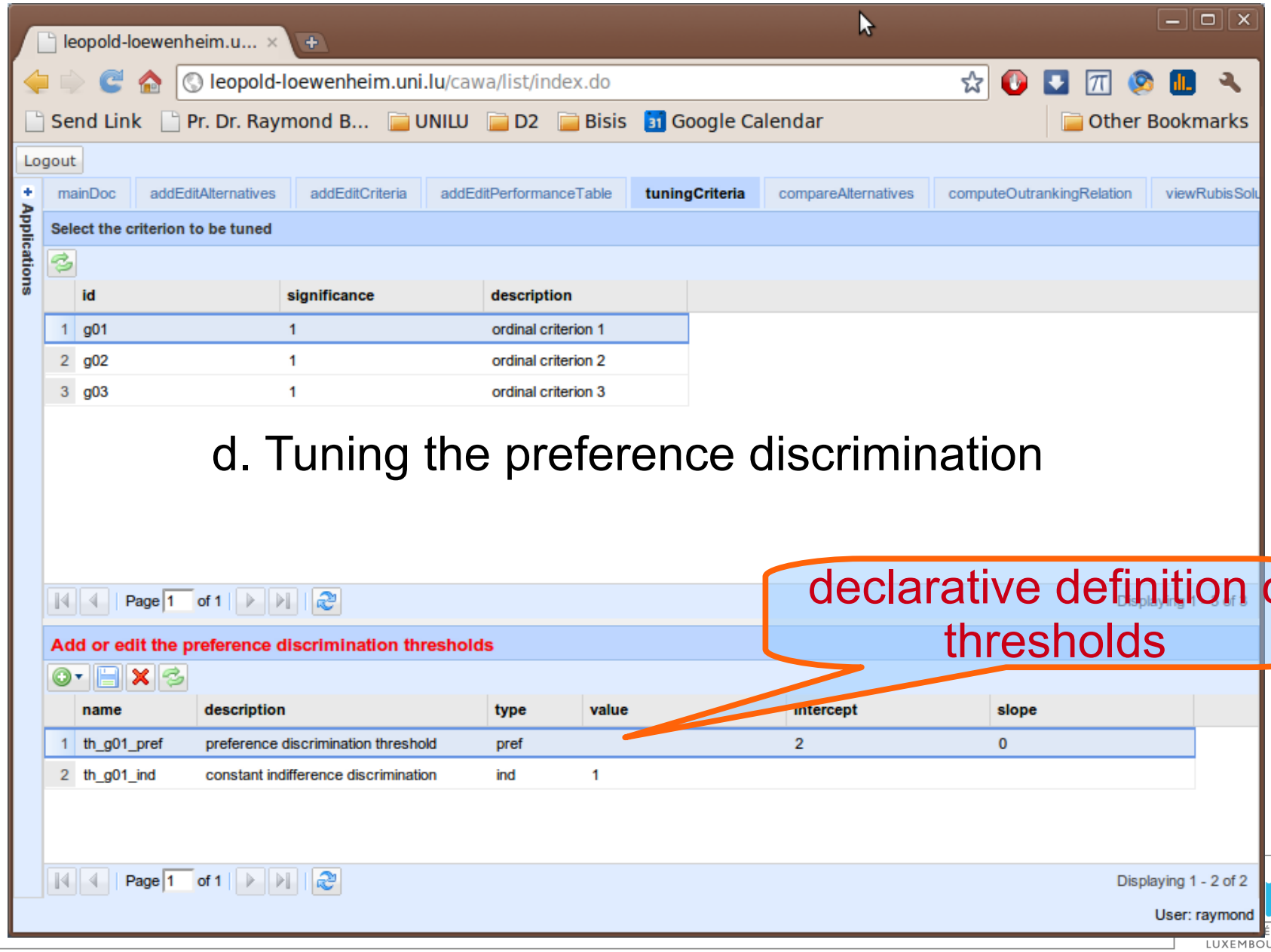
[Controllers]
[Objects]
[Users]
[Detail]
Permissions of projects.rubis.rubis_UI.mainDesk.addEditPerformance
CAWA is Another Wheel of Agnosticism
User: rb
declarative definition of filtering conditions
Declarative definition of the tabs

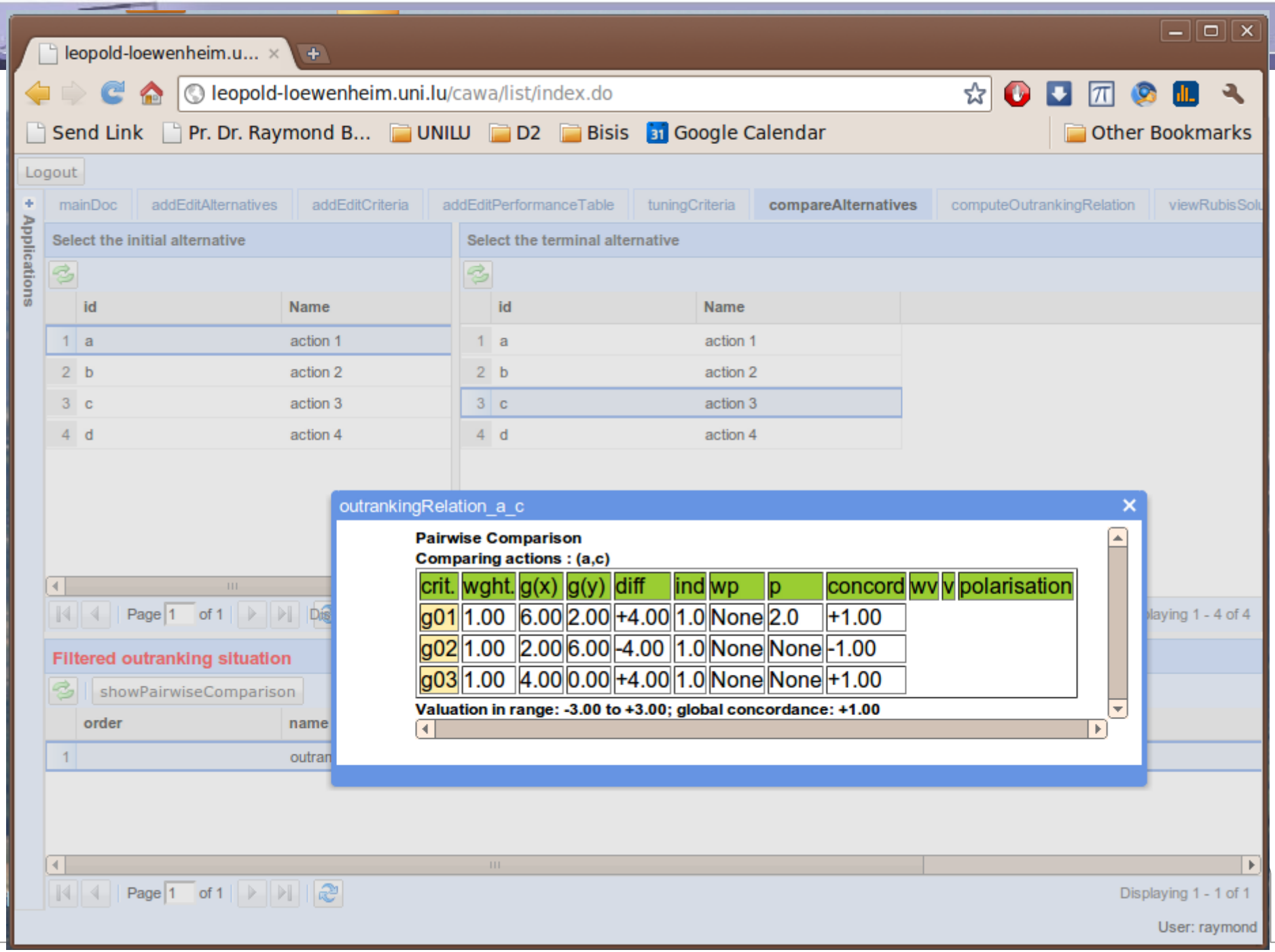
View the entire performance table





d. Tuning the preference discrimination

declarative definition of thresholds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Logout
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mainDoc
addEditAlternatives
addEditCriteria
addEditPerformanceTable
tuningCriteria
compareAlternatives
computeOutrankingRelation
viewRubisSolu
Select the initial alternative
Select the terminal alternative
id
Name
1 a action 1
2 b action 2
3 c action 3
4 d action 4
Page 1 of 1
Displaying 1 - 4 of 4
Filtered outranking situation
showPairwiseComparison
order
name
1 outran
Page 1 of 1
Displaying 1 - 1 of 1
User: raymond
outrankingRelation_a_c
Pairwise Comparison
Comparing actions : (a,c)
crit. wght. g(x) g(y) diff ind wp p concord wv v 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

e. Computing the bipolar valued outranking digraph

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+ Applications

computeValuedRelation | computeCondorcetRobustness | showCondorcetGraph | submitProblem | showXMCDAProblem

	name	description	performanceTableau	valuationMinimum	valuationMaximum	noVeto	problem
1	outrankingRelation	Demo version (RB)	D4 rubis application D4 ca...	-3	3		

outrankingRelation

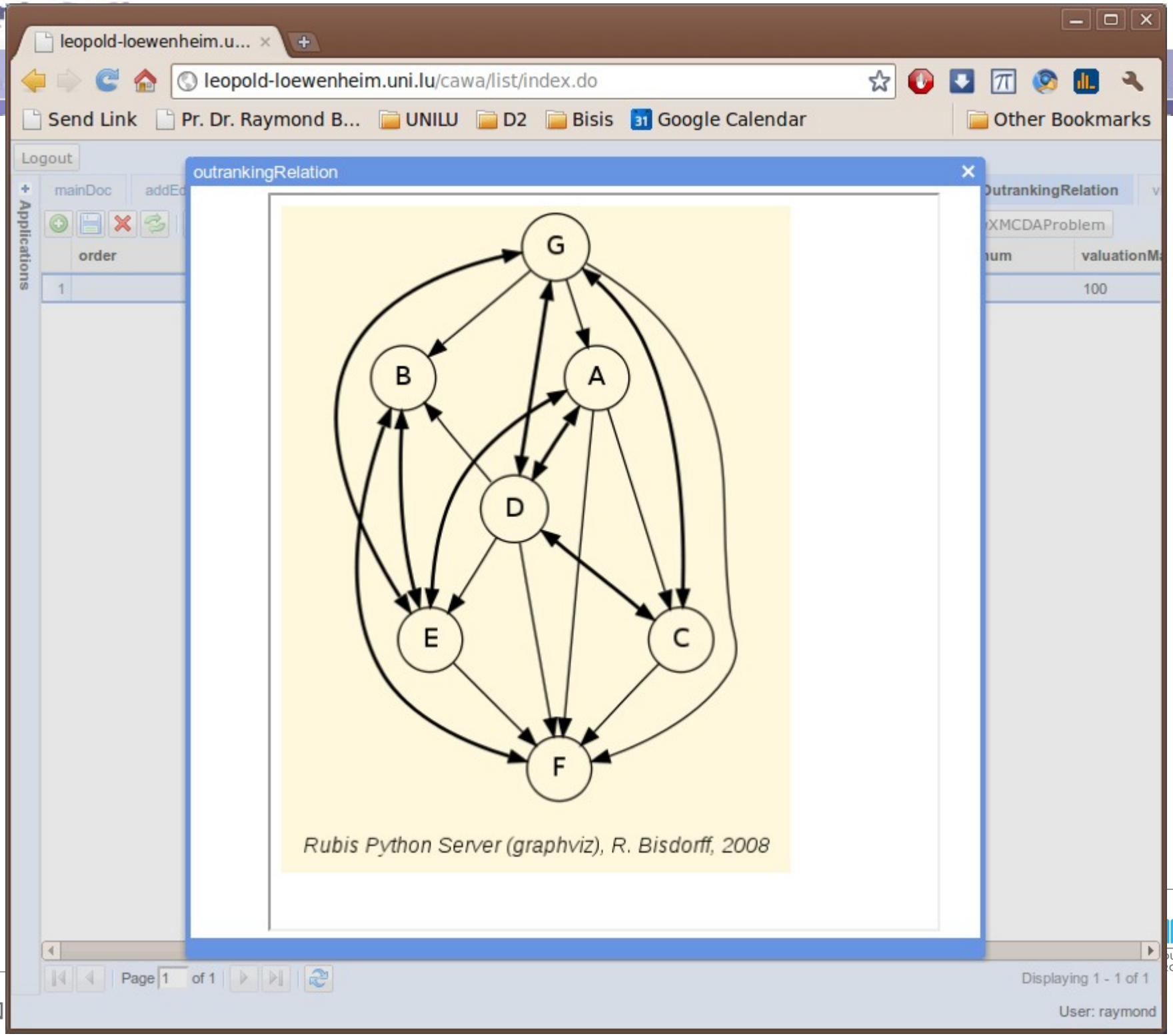
problemDemo_1: Bipolar-valued adjacency table of outrankingRelation

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 .

Page 1 of 1 | Displaying 1 - 1 of 1

User: raymond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G
B
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C
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Rubis Python Server (graphviz), R. Bisdorff, 2008
XMCDAProblem
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Page 1 of 1
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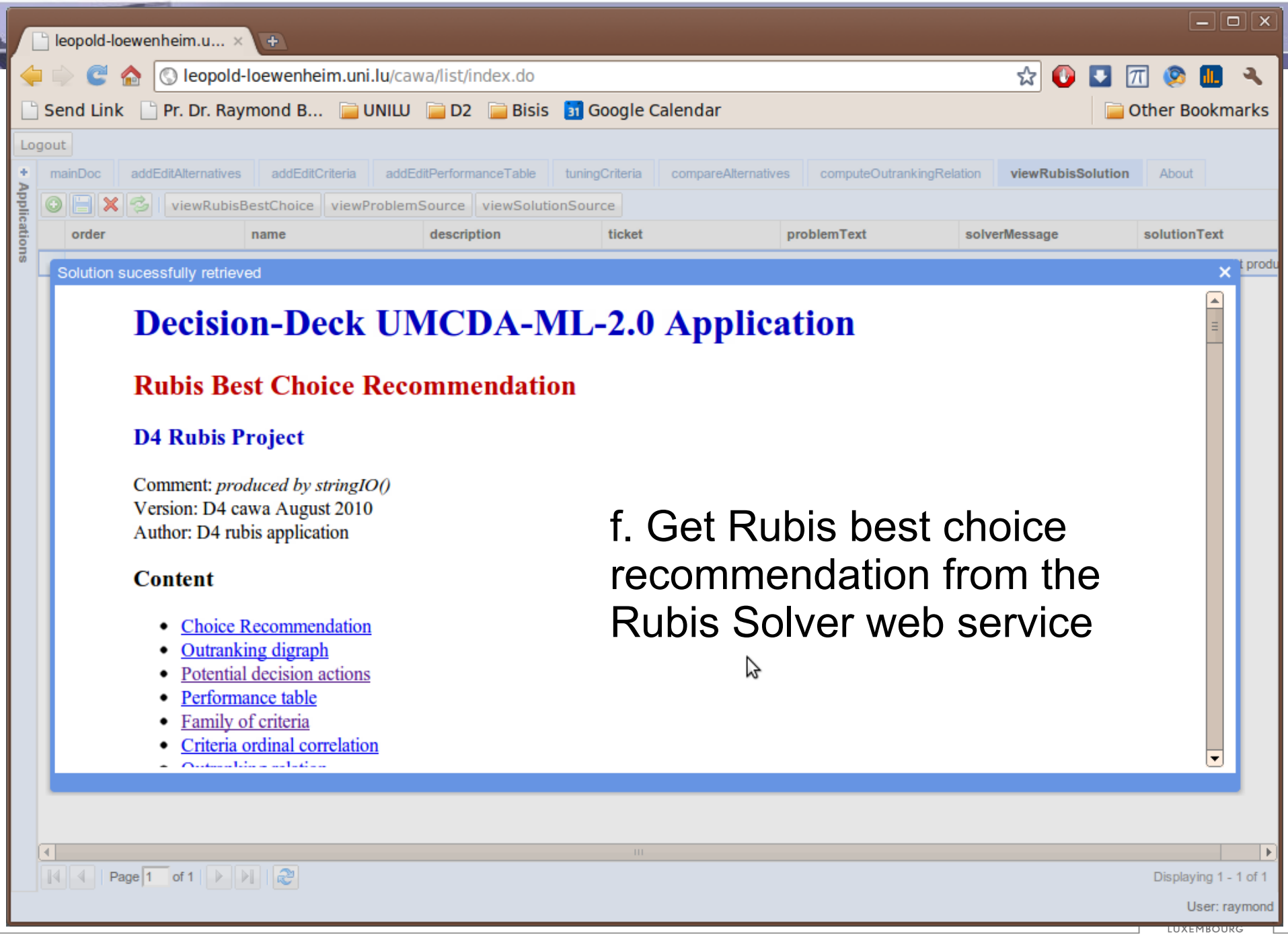
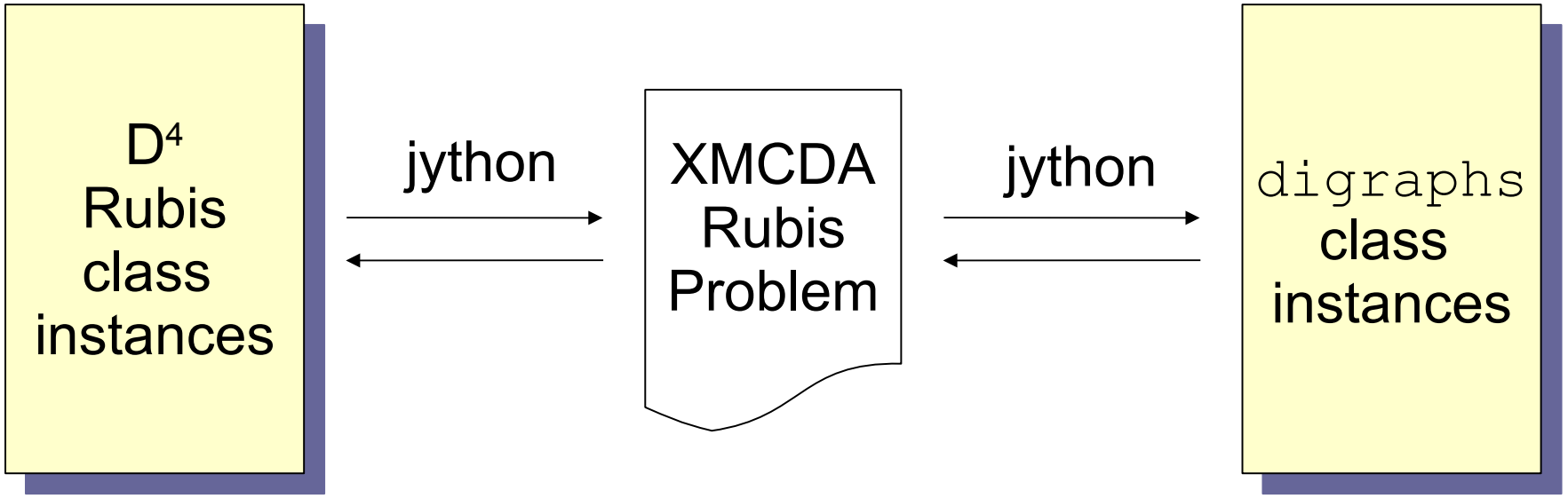


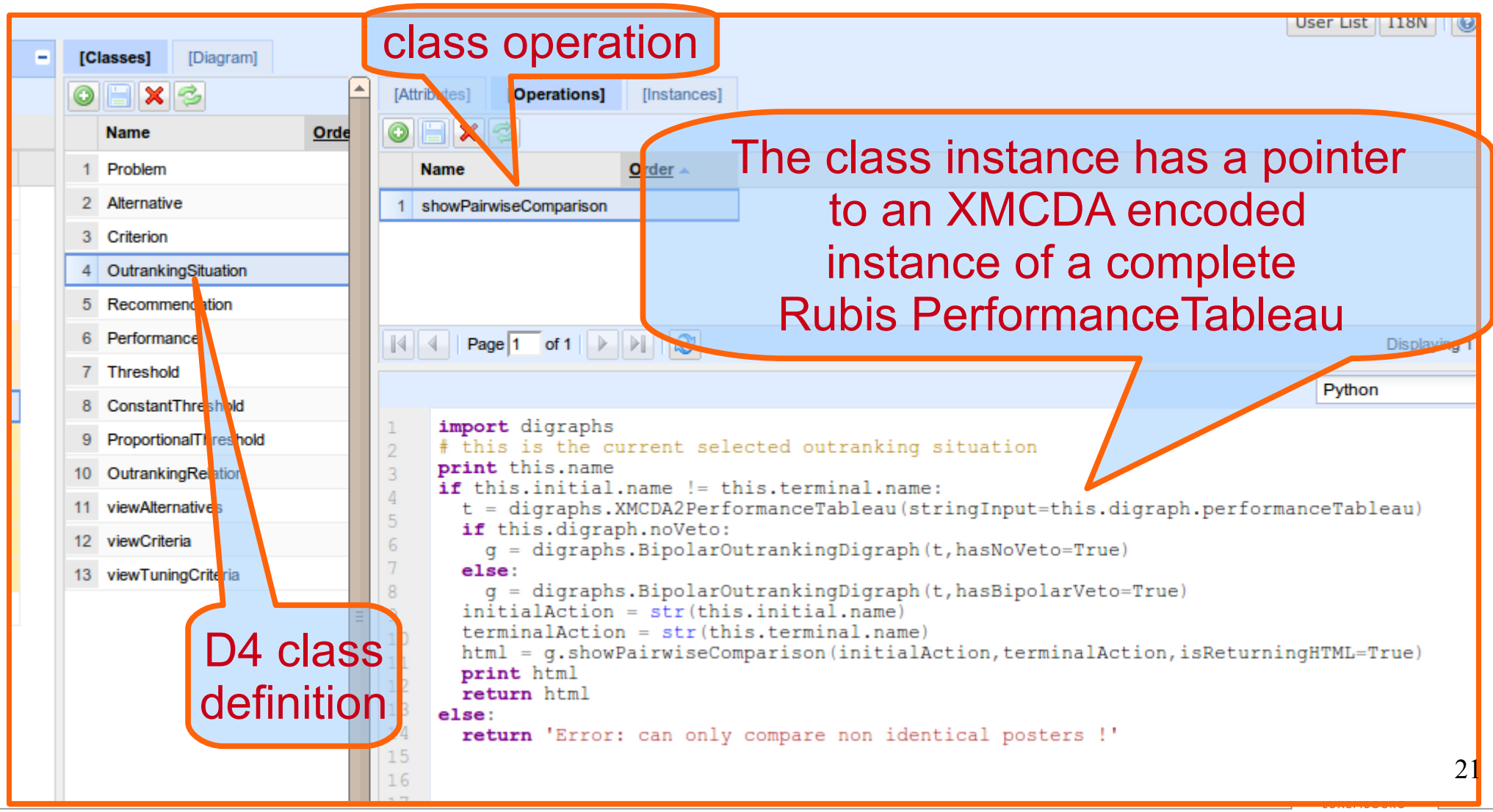
f. Get Rubis best choice recommendation from the Rubis Solver web service

2. Use cases of XMCDA in D⁴

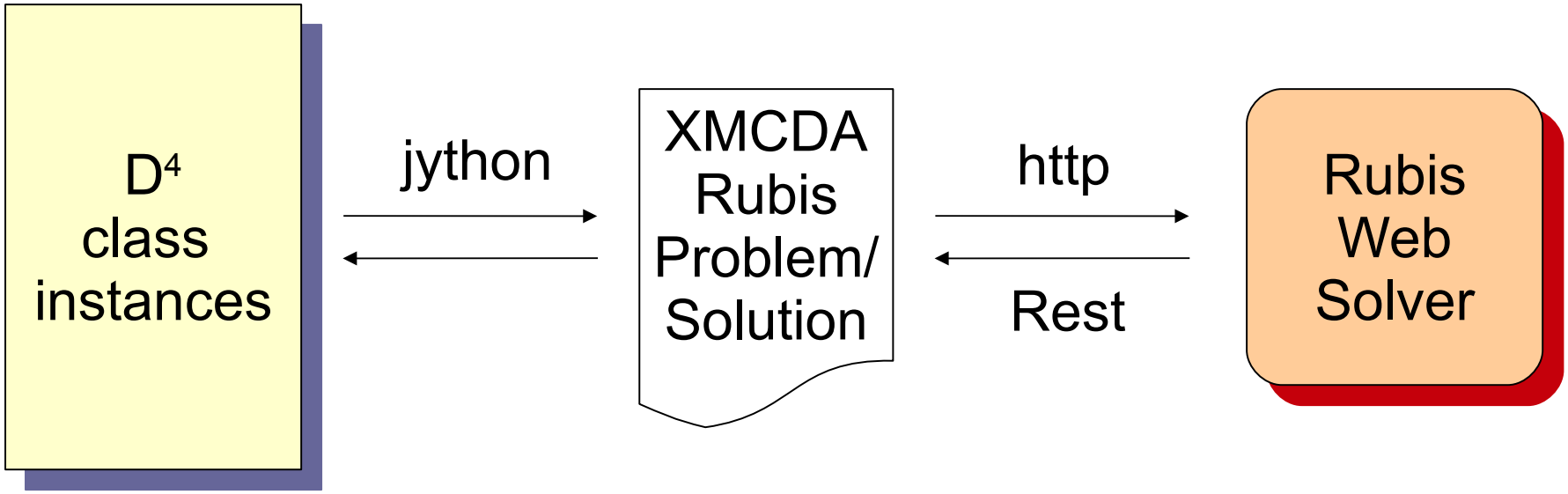
a. Interfacing D⁴ and `digraphs` class instances

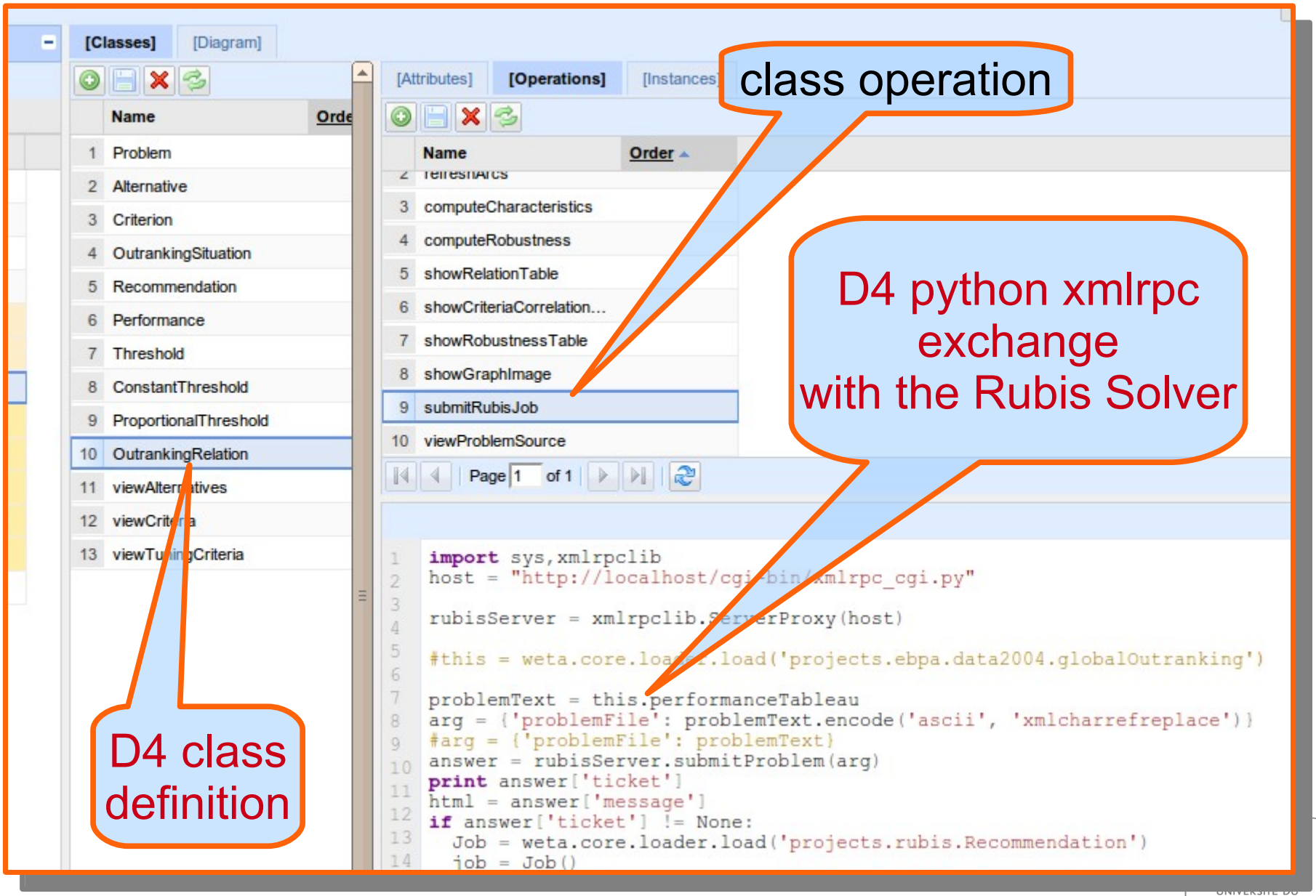


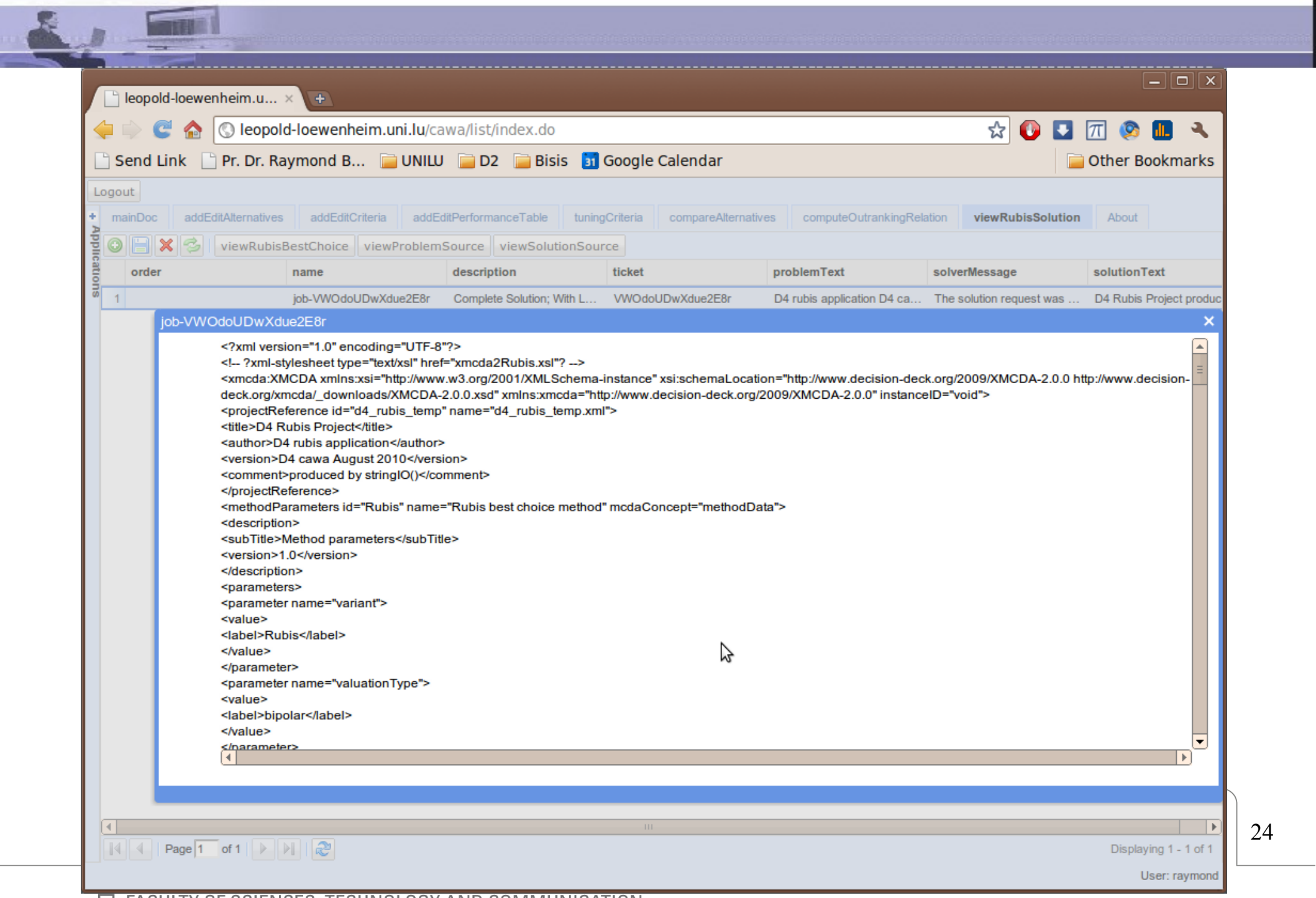
Example: showing the pairwise comparison table



b. Interfacing D⁴ and the Rubis XMCDA Solver




[Classes]
[Diagram]
Name
Order
1 Problem
2 Alternative
3 Criterion
4 OutrankingSituation
5 Recommendation
6 Performance
7 Threshold
8 ConstantThreshold
9 ProportionalThreshold
10 OutrankingRelation
11 viewAlternatives
12 viewCriteria
13 viewTuningCriteria
[Attributes]
[Operations]
[Instances]
Name
Order
3 computeCharacteristics
4 computeRobustness
5 showRelationTable
6 showCriteriaCorrelation...
7 showRobustnessTable
8 showGraphImage
9 submitRubisJob
10 viewProblemSource
Page 1 of 1
import sys,xmlrpclib
host = "http://localhost/cgi-bin/xmlrpc_cgi.py"
rubisServer = xmlrpclib.ServerProxy(host)
#this = weta.core.loader.load('projects.ebpa.data2004.globalOutranking')
problemText = this.performanceTableau
arg = {'problemFile': problemText.encode('ascii', 'xmlcharrefreplace')}
#arg = {'problemFile': problemText}
answer = rubisServer.submitProblem(arg)
print answer['ticket']
html = answer['message']
if answer['ticket'] != None:
Job = weta.core.loader.load('projects.rubis.Recommendation')
job = Job()
class operation
D4 python xmlrpc exchange with the Rubis Solver
D4 class definition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Applications
viewRubisBestChoice
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order
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description
ticket
problemText
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solutionText
1
job-VWOdoUDwXdue2E8r
Complete Solution; With L...
VWOdoUDwXdue2E8r
D4 rubis application D4 ca...
The solution request was ...
D4 Rubis Project produc
job-VWOdoUDwXdue2E8r
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<author>D4 rubis application</author>
<version>D4 cawa August 2010</version>
<comment>produced by stringIO()</comment>
</projectReference>
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Page 1 of 1
Displaying 1 - 1 of 1
User: raymond

UMCDAML perspectives

Learning from the D4 experience

Motivation

- D4 ?
  - Power-User design tool for MCDA problems
  - No deployment cycle : app online from the begining
  - Fast : new class in minutes
  - Flexible : refactoring with instant impact to data
- Only enrolling you ?
  - Technological war ?

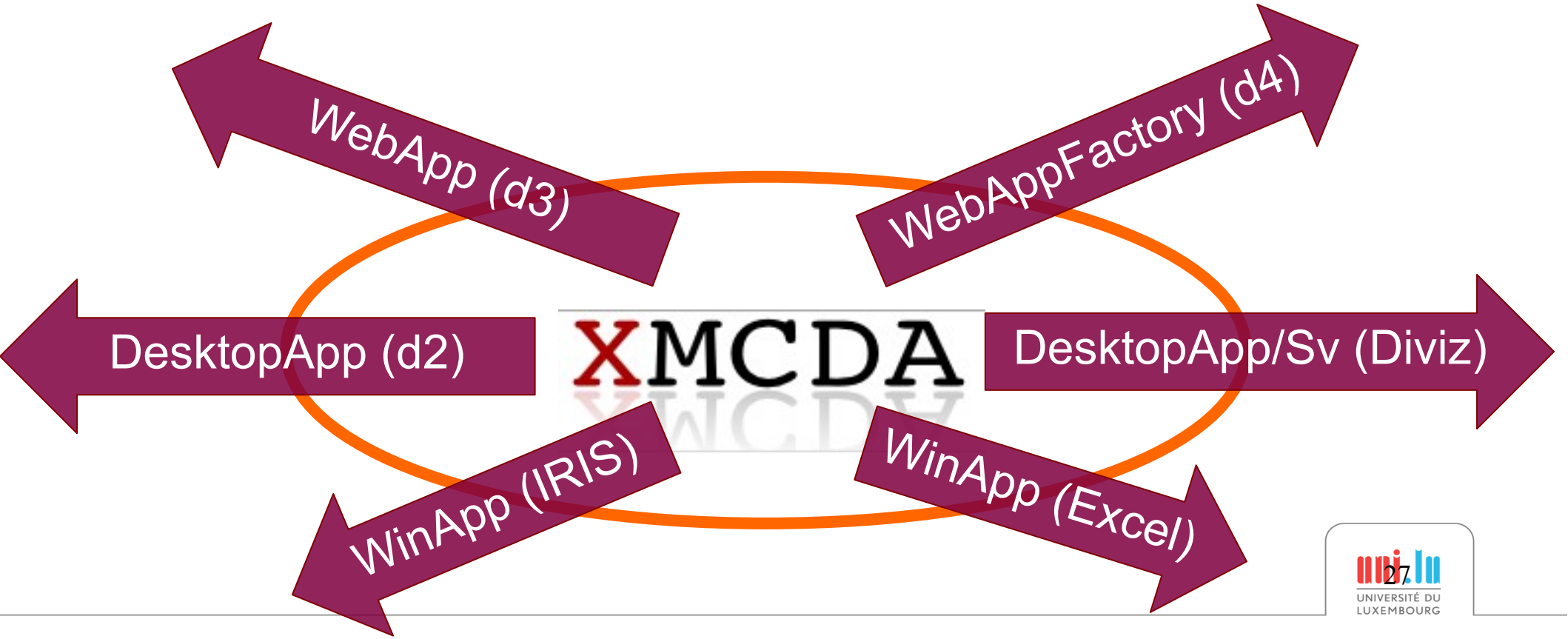
High stakes : raise abstraction

Motivation

Technology vs methodology

...

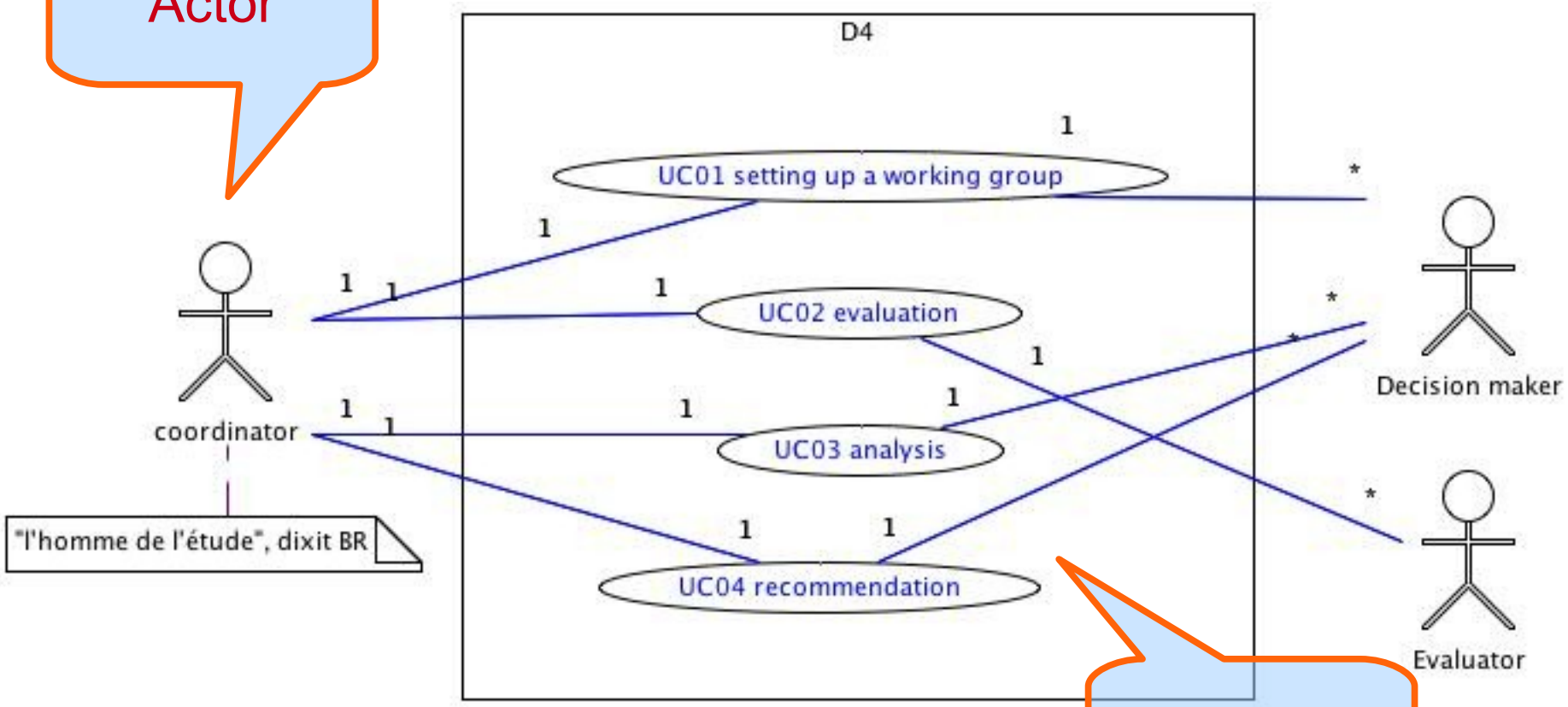
UMCDAML



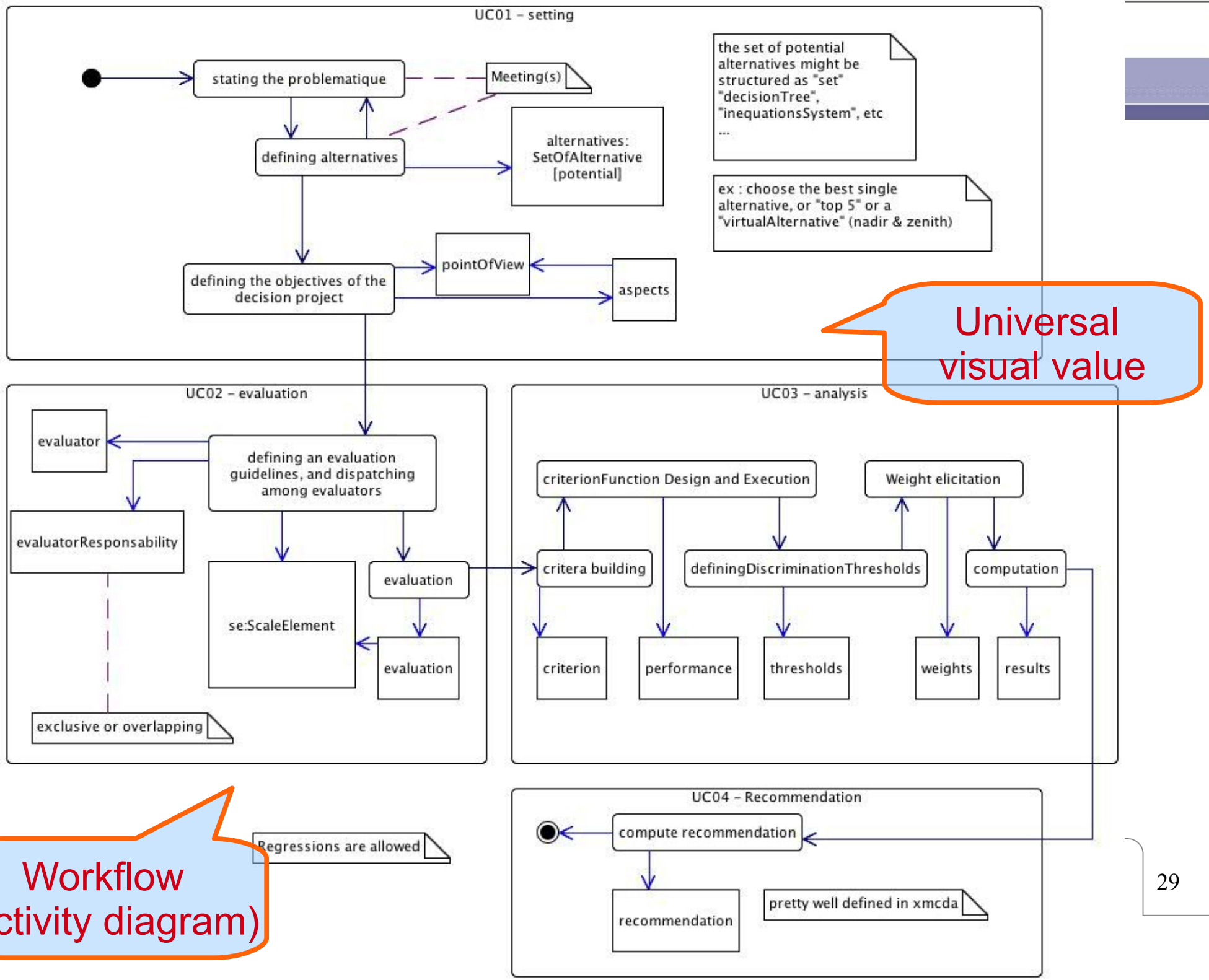
Multi platform, multi language …

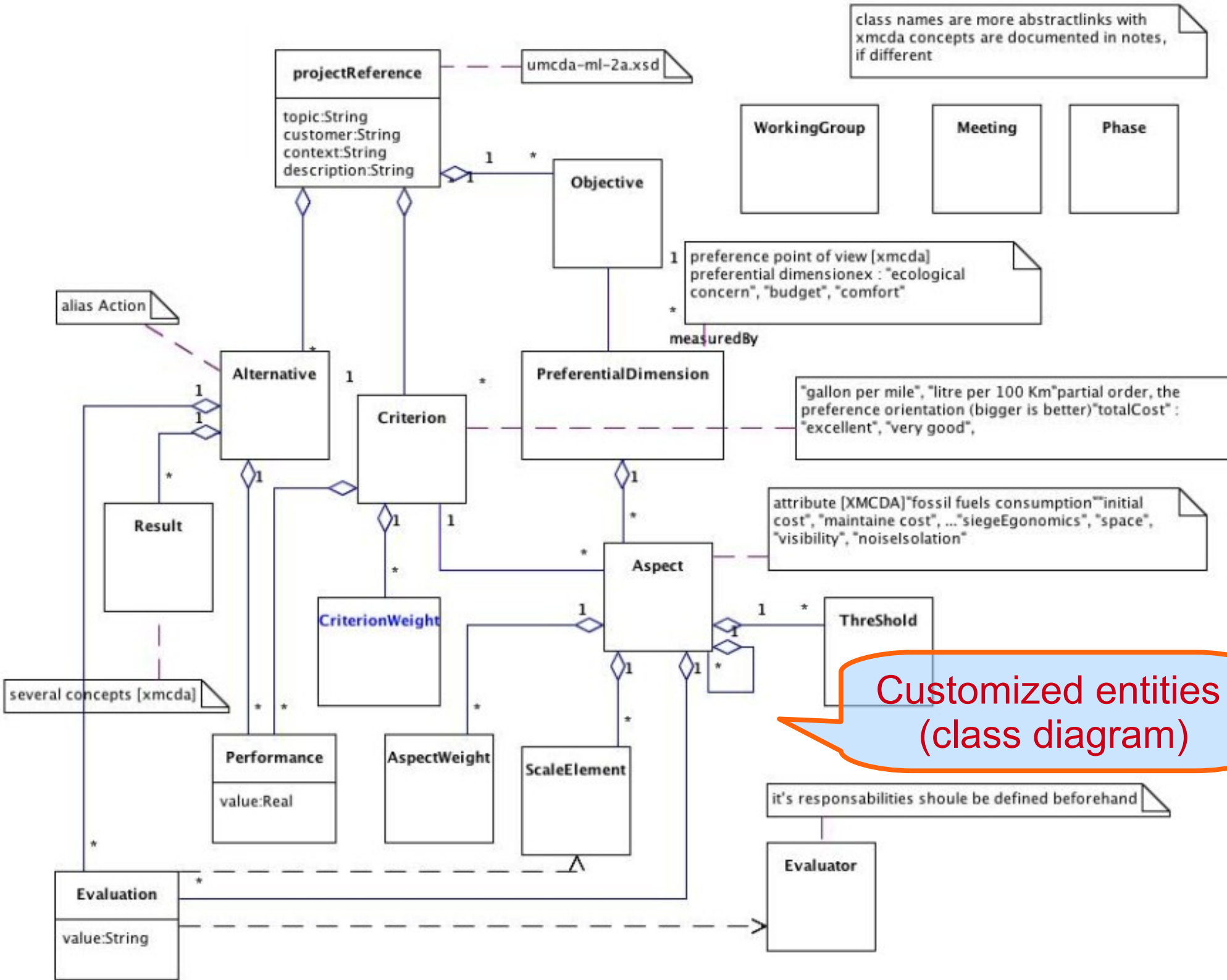
Modeling MCDA problems with UML

Actor



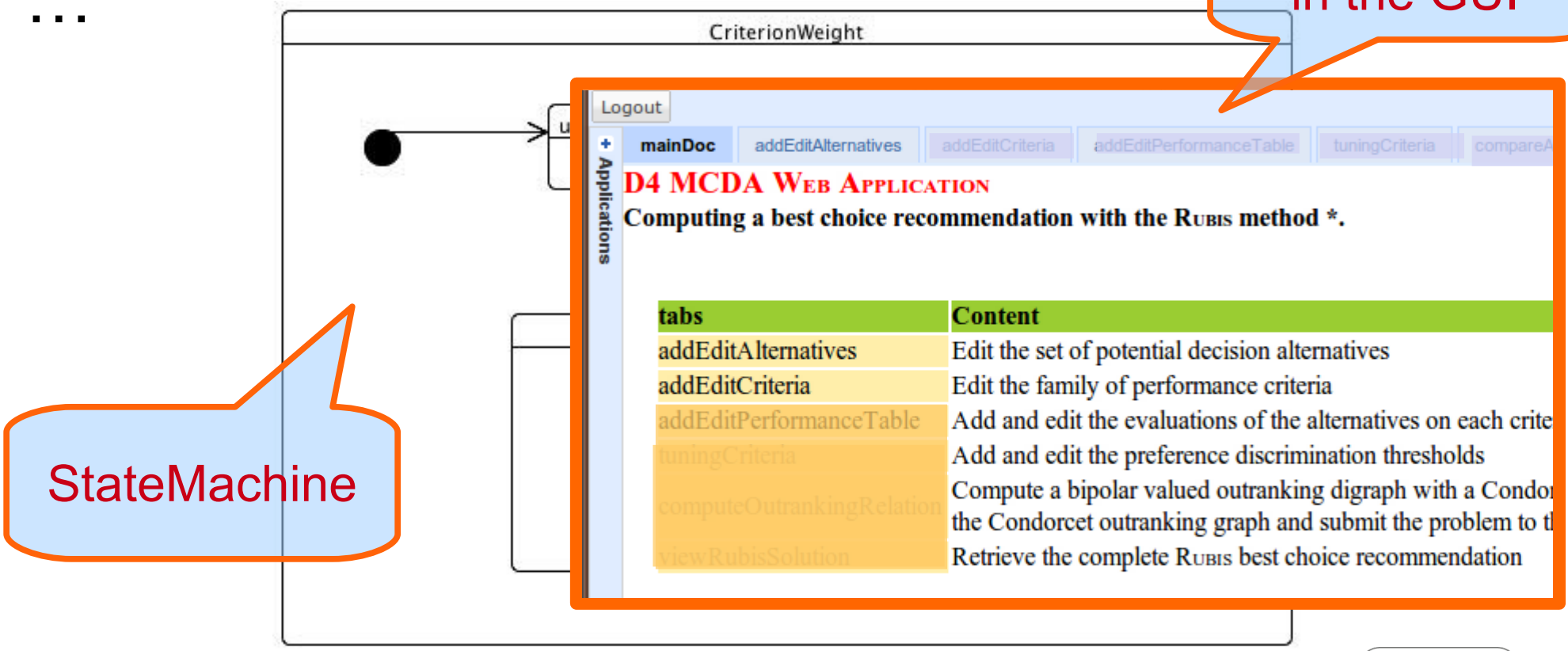
Use Cases


UC01 – setting
stating the problematique
Meeting(s)
defining alternatives
alternatives: SetOfAlternative [potential]
the set of potential alternatives might be structured as "set" "decisionTree", "inequationsSystem", etc ...
ex : choose the best single alternative, or "top 5" or a "virtualAlternative" (nadir & zenith)
defining the objectives of the decision project
pointOfView
aspects
Universal visual value
UC02 – evaluation
evaluator
defining an evaluation guidelines, and dispatching among evaluators
evaluatorResponsability
se:ScaleElement
evaluation
evaluation
exclusive or overlapping
UC03 – analysis
criterionFunction Design and Execution
Weight elicitation
critera building
definingDiscriminationThresholds
computation
criterion
performance
thresholds
weights
results
Regressions are allowed
Workflow (activity diagram)
UC04 – Recommendation
compute recommendation
recommendation
pretty well defined in xmcda


class names are more abstractlinks with xmcda concepts are documented in notes, if different
projectReference
topic:String
customer:String
context:String
description:String
umcda-ml-2a.xsd
WorkingGroup
Meeting
Phase
Objective
preference point of view [xmcda]
preferential dimensionex : "ecological concern", "budget", "comfort"
measuredBy
alias Action
Alternative
Criterion
PreferentialDimension
"gallon per mile", "litre per 100 Km"partial order, the preference orientation (bigger is better)"totalCost" : "excellent", "very good",
Result
attribute [XMCDA]"fossil fuels consumption""initial cost", "maintaine cost", ..."siegeEgonomics", "space", "visibility", "noiselsolation"
Aspect
CriterionWeight
ThreShold
several concepts [xmcda]
Performance
value:Real
AspectWeight
ScaleElement
Customized entities (class diagram)
it's responsabilities shoule be defined beforehand
Evaluator
Evaluation
value:String

Object's lifecycle : workflow regulator

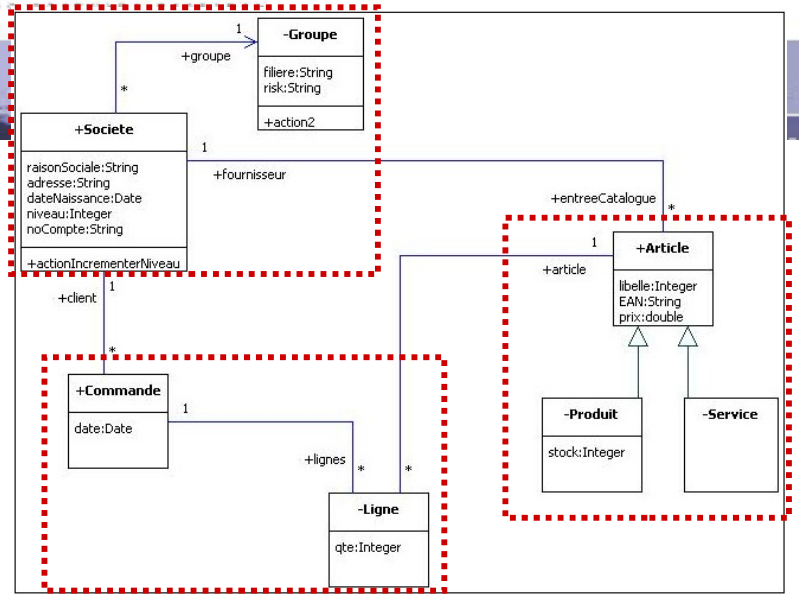
...

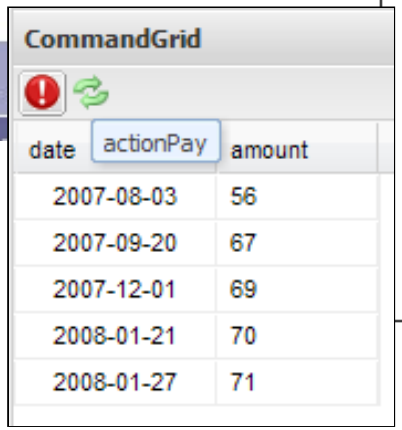


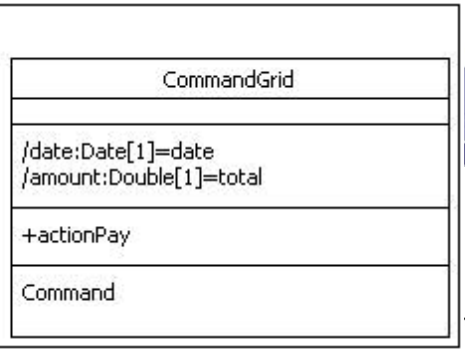
3. Granularity of the MCDA models

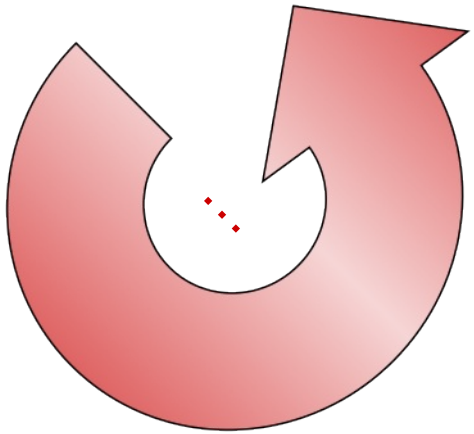
UML granularity concepts

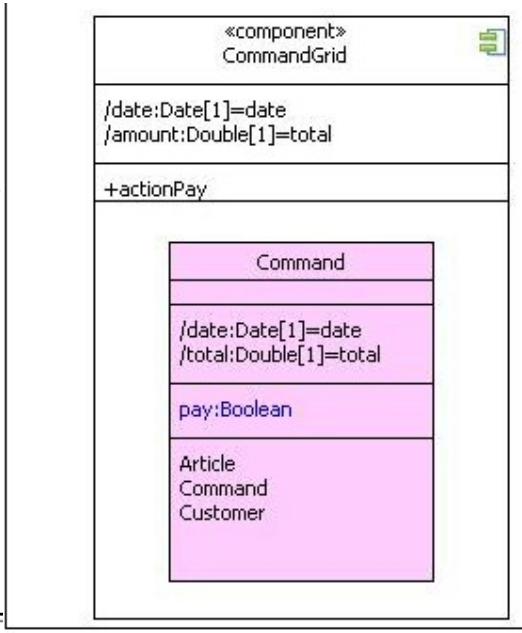
- Model
  - Static : package*, class*, component*
  - Dynamic : usecase, activity*, state*, operation*
- Metamodel solution
  - (*) : Composite design pattern
  - XMI : XML Model Interachange

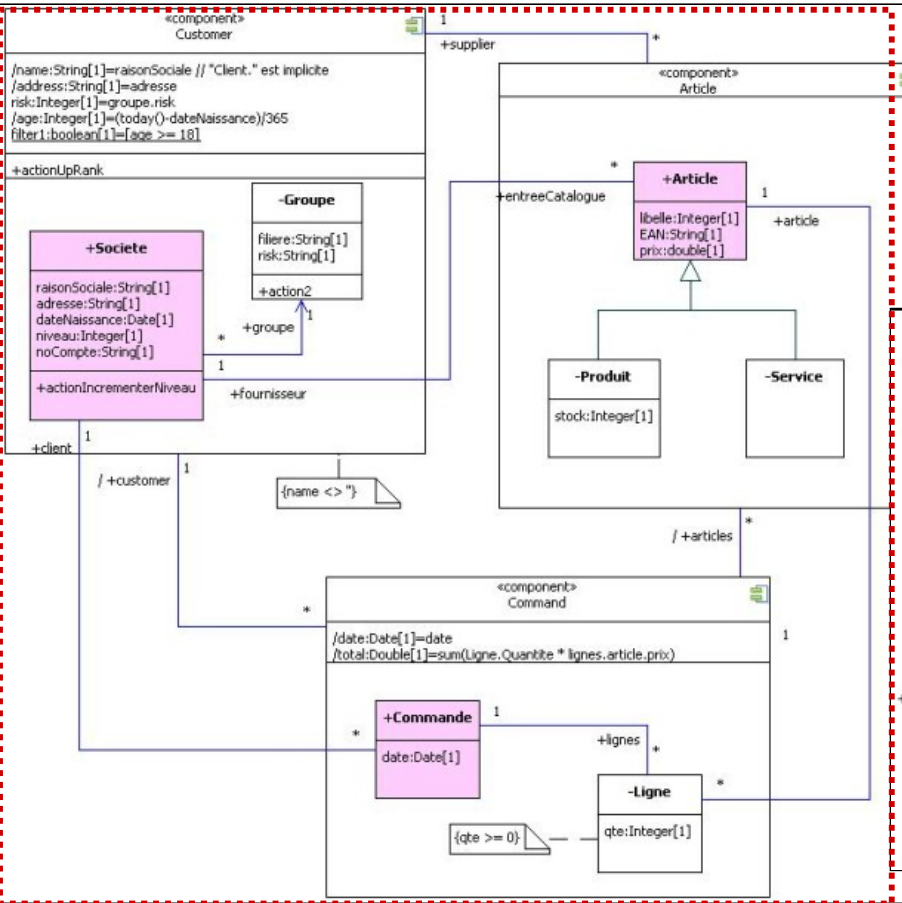

-Groupe
filiere:String
risk:String
+action2
+groupe
1
*
+Societe
raisonSociale:String
adresse:String
dateNaissance:Date
niveau:Integer
noCompte:String
+actionIncrementerNiveau
+fournisseur
+entreeCatalogue
+client
+Article
+article
libelle:Integer
EAN:String
prix:double
+Commande
date:Date
+lignes
-Ligne
qte:Integer
-Produit
stock:Integer
-Service

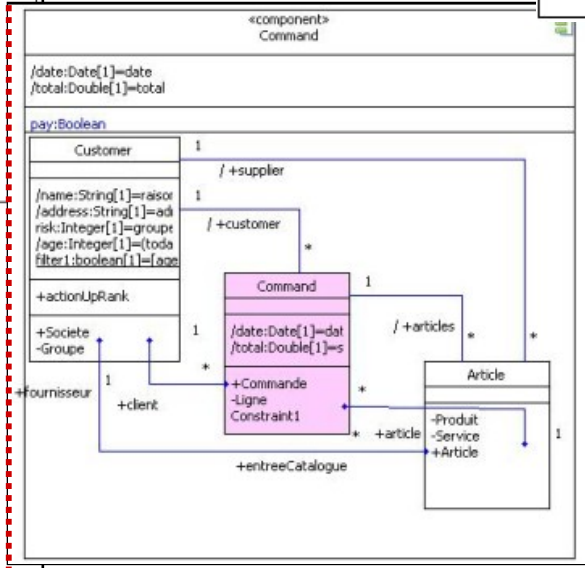

CommandGrid
date
actionPay
amount
2007-08-03
56
2007-09-20
67
2007-12-01
69
2008-01-21
70
2008-01-27
71

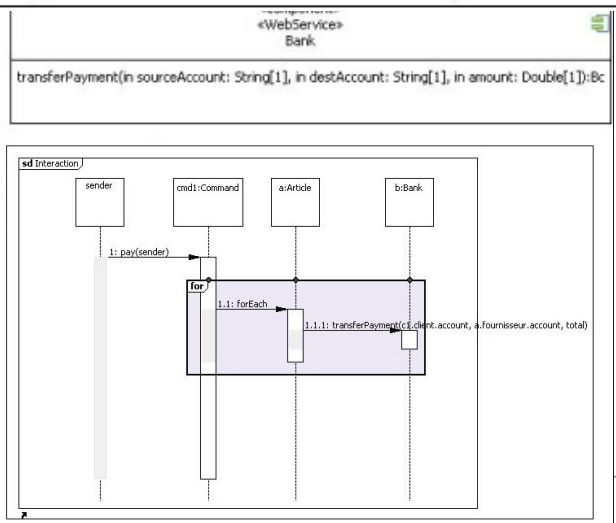

CommandGrid
/date:Date[1]=date
/amount:Double[1]=total
+actionPay
Command




«component»
CommandGrid
/date:Date[1]=date
/amount:Double[1]=total
+actionPay
Command
/date:Date[1]=date
/total:Double[1]=total
pay:Boolean
Article
Command
Customer


«component»
Customer
/name:String[1]=raisonSociale // "Client." est implicite
/address:String[1]=adresse
risk:Integer[1]=groupe.risk
/age:Integer[1]=(today()-dateNaissance)/365
filter1:boolean[1]=[age >= 18]
+actionUpRank
+Societe
raisonSociale:String[1]
adresse:String[1]
dateNaissance:Date[1]
niveau:Integer[1]
noCompte:String[1]
+actionIncrementerNiveau
-Groupe
filiere:String[1]
risk:String[1]
+action2
+groupe
+fournisseur
+client
/ +customer
{name <> ''}
+supplier
«component»
Article
+Article
libelle:Integer[1]
EAN:String[1]
prix:double[1]
+entreeCatalogue
+article
-Produit
stock:Integer[1]
-Service
/ +articles
«component»
Command
/date:Date[1]=date
/total:Double[1]=sum(Ligne.Quantite * lignes.article.prix)
+Commande
date:Date[1]
+lignes
-Ligne
qte:Integer[1]
{qte >= 0}


«component»
Command
/date:Date[1]=date
/total:Double[1]=total
pay:Boolean
Customer
/name:String[1]=raisor
/address:String[1]=adi
risk:Integer[1]=groupe
/age:Integer[1]=(toda
filter1:boolean[1]=[age
+actionUpRank
+Societe
-Groupe
/ +supplier
/ +customer
Command
/date:Date[1]=dat
/total:Double[1]=s
+Commande
-Ligne
Constraint1
/ +articles
Article
-Produit
-Service
+Article
+fournisseur
+client
+article
+entreeCatalogue


«WebService»
Bank
transferPayment(in sourceAccount: String[1], in destAccount: String[1], in amount: Double[1]):Bc
sd Interaction
sender
cmd1:Command
a:Article
b:Bank
1: pay(sender)
for
1.1: forEach
1.1.1: transferPayment(c1.client.account, a.fournisseur.account, total)

3. UMCDA-ML profiles and stereotypes

UML Profile

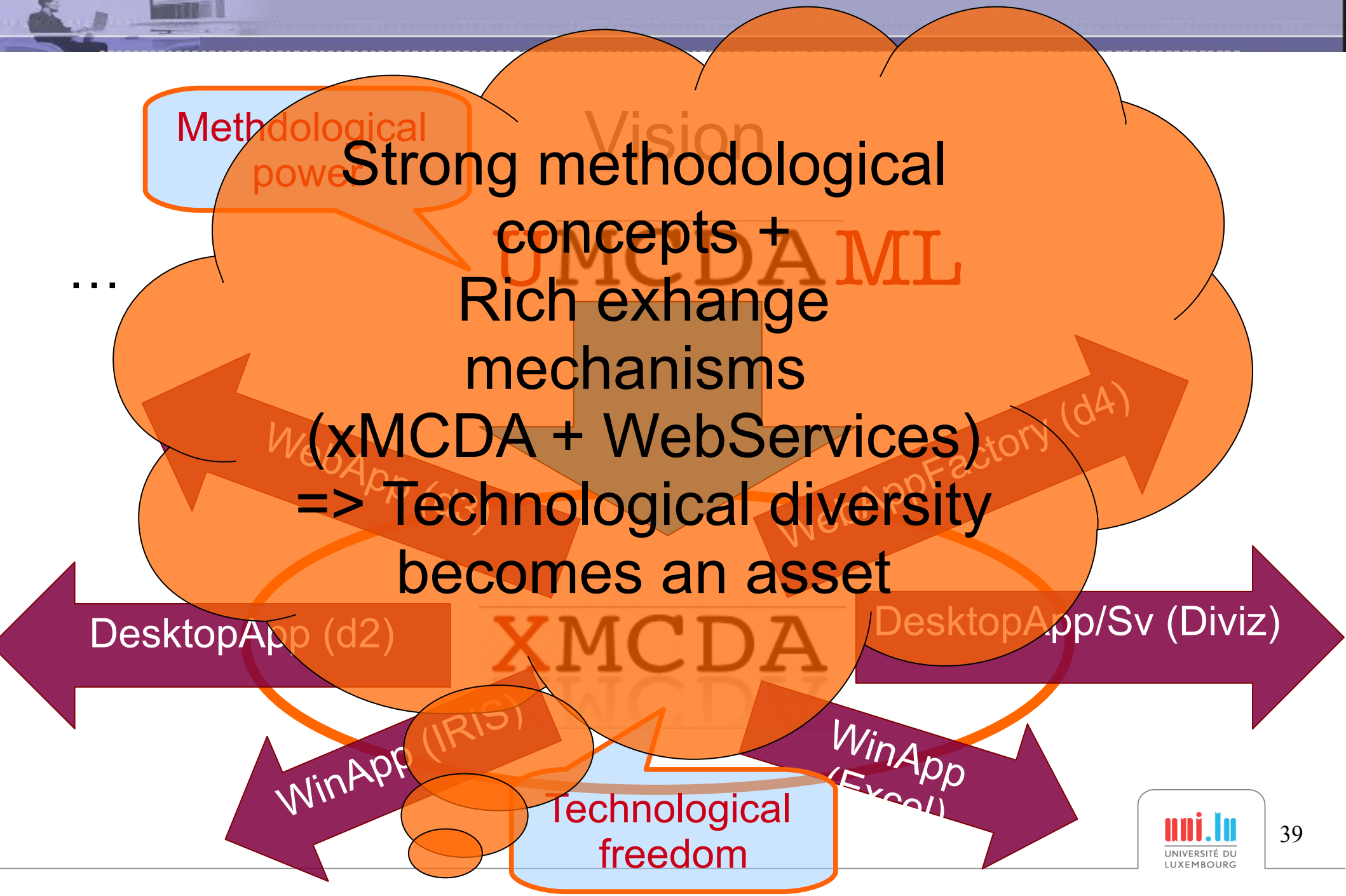
- Profile
  - provides a generic extension mechanism for customizing UML models for particular domains and platforms.
  - define new concepts (meta) called << stereotypes >>

    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

3. New horizons for XMCDA ?

XMCDA

- UML-like profiles and stereotypes
  - Needs a tool for diagrams and generation
  - <<problem>>, <<package>>,
  - <<phase>>, <<workflow>>
- Types aggregates : java-like generics
  - Using Spring parsing features
  - Set<Alternative>, List<Evaluator> …
  - Matrix<Alternative, Evaluator, Critera> …



Strong methodological concepts +
Rich exhange mechanisms
(xMCDA + WebServices)
=> Technological diversity becomes an asset

…

Q&A