

The D⁴ Platform

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Agenda

I. D⁴ Overview

- Key mechanisms to **build** and **evolve** MCDA methods

I. EBPA example

- Step by step illustration : EBPA 2004

I. Conclusion

- Progression and feedback

MCDA Software Challenges

- Today's mainstream web technologies
 - JEE: Java, JSP, HTML/JS, RIA, Spring, JPA, SQL, DMBS ...
are robust but the implementation is difficult, slow and expensive
- Decision Deck community deserves more
 - Implementing, experimenting and evolving new MCDA methods should be easy, fast and cheap
- D⁴ value proposition
 - An abstraction layer to JEE robust web technologies
 - An interactive designer to **build** and **evolve** MCDA methods

D⁴ = Distributed Designer for Decision Deck

- Distributed platform
 - Browser only, RIA IDE, hosted @uni.lu
- Design (build and evolve) MCDA applications
 - OO concepts : classes, attributes, operations (py)
 - RIA GUI : component (grids, forms, graphs ...)
- Manage MCDA data
 - Persistent shared objects
- Made for MCDA researchers, experts
 - no dev skills required

Overview

D4 DESCRIPTION

Create an account *

Login:

First name:

Last name:

Email:

Password:

Distributed IDE everybody in the cloud

- Create the domain model
- Design the user pages
- Execute the application

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Packages, themes & typed components, with properties

[Classes]

Name	Order	Superclass
1 Alternative		root.oosemantics.foundations.Object
2 Evaluation		root.oosemantics.foundations.Object
3 Evaluator		root.oosemantics.foundations.Object
4 SevereEvaluation		d4.Evaluation

[Attributes]

Name	Order	Multiplicity	Static	Type
1 evaluations		*	<input type="checkbox"/>	d4.Evaluation
2 label			<input type="checkbox"/>	root.oosemantics.primitives.String
3 test			<input type="checkbox"/>	root.oosemantics.primitives.Boolean

- Package oriented repository
- Theme oriented designer : design domain & user pages, then run application
- Typed component and property editors

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Design alternatives

Encapsulation

[Instances]

Name	Owner	Path	Type
1 alt1	d4	d4.alt1	tives.String
2 alt2	d4	d4.alt2	tives.Boolean
3 alt3	d4	d4.alt3	
4 alt4	d4	d4.alt4	
5 alt5	d4	d4.alt5	
6 alt6	d4	d4.alt6	
7 alt7	d4	d4.alt7	

```

1 1 - eval.compute()
2
3  return r
4
5
6
7
    
```

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Design evaluations

[Instances]

Name	Owner	Path	Type
1 ev1	d4	d4.ev1	tives.Float
2 ev2	d4	d4.ev2	tives.Text
3 ev3	d4	d4.ev3	
4 se1	d4	d4.se1	

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Design evaluators

[Instances]		[Attributes]			[Operations]			[Instances]		
Name	Superclass	Name	Owner	Path				Name	Owner	Path
1 Alternative		1 rb	d4	d4.rb						ves.String
2 Evaluation		2 vm	d4	d4.vm						
3 Evaluator		3 mp	d4	d4.mp						
4 SevereEvaluation	d4.Evaluation	4 pm	d4	d4.pm						

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Design severe evaluations

Polymorphism

Inheritance

[Instances]		[Attributes]			[Operations]			[Instances]		
Name	Superclass	Name	Owner	Path				Name	Owner	Path
1 Alternative		1 se1	d4	d4.se1						
2 Evaluation										
3 Evaluator										
4 SevereEvaluation	d4.Evaluation									

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Live objects

Instances		[Editor] [Meta] ← Generic GUI		
Name	Class	Name		
1 Alternative	root.oosemanctics.foundations.Class	1 hello		
2 Evaluation	root.oosemanctics.foundations.Class	2 compute		
3 ev1	d4.Evaluation	3 show		
4 alt1	d4.Alternative			
5 alt2	d4.Alternative			
6 alt3	d4.Alternative			

name	val	comment
1 ev1	1000	
2 ev2	409.5	
3 ev3	600.5	
4 se1	1500.5	best

← Customized GUI

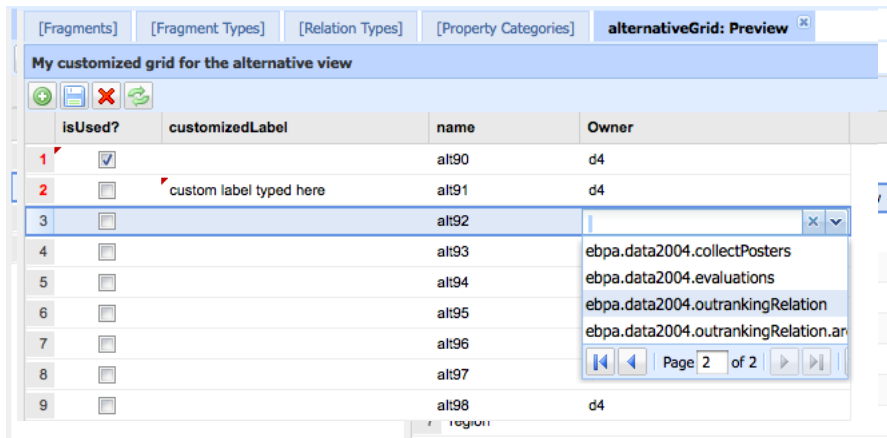
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Views : virtual classes

Virtual Classes				[Expression] [Attributes] [Preview]	
Name	Target	Inherit	Uniform	Name	Attribute
1 alternativeView	d4.Alternative	<input type="checkbox"/>	<input type="checkbox"/>	1 customizedLabel	d4.Alternative.label
2 evaluationView	d4.Evaluation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	2 name	root.oosemanctics.foundations.Object.name
				3 isUsed?	3 d4.Alternative.ignored

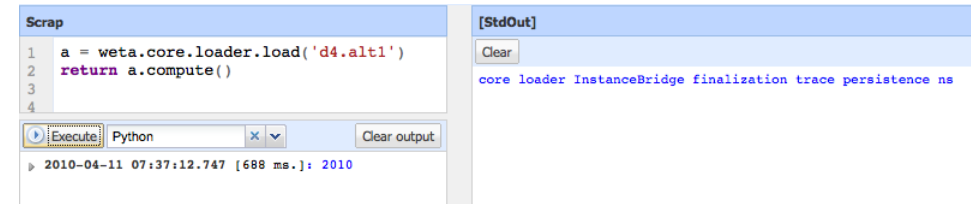
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GUI components



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Scripting API, available in console



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Monitoring the shared resources

[Hibernate] [Memory]					
com.karmicsoft.weta.model.Atom.components	1397	2133	1363	0	0
com.karmicsoft.weta.model.Atom.instances	0	0	0	6	6
com.karmicsoft.weta.model.Atom.references	0	0	0	6	6
com.karmicsoft.weta.model.auth.User.roles	0	0	0	0	0
2nd level cache statistics					
Regionname	Puts	Hits	Misses	Elements in memory	Size in memory (bytes)
com.karmicsoft.mydraft.webapp.model.i18n.I18NKey	0	0	0	0	0
com.karmicsoft.mydraft.webapp.model.i18n.I18NLang	0	0	0	0	0
com.karmicsoft.mydraft.webapp.model.i18n.I18NProperty	0	0	0	0	0
com.karmicsoft.weta.model.Atom	30790	36035	925	3203	4823112
com.karmicsoft.weta.model.Atom.components	18627	7061	2133	1363	1571496
com.karmicsoft.weta.model.Atom.instances	0	0	0	6	6402
com.karmicsoft.weta.model.Atom.references	0	0	0	6	6408
org.hibernate.cache.StandardQueryCache	1348	1401	1348	177	410040
org.hibernate.cache.UpdateTimestampsCache	0	0	0	1	369
					6817827

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Key mechanisms

- Data structure and behaviour
 - Classes, with attributes and operations (py)
 - Inheritance, virtual classes (views)
 - Data presentation and evolution
 - Updatable GUI components : grids, ...
 - Build and evolve your MCDA prototype
 - using RIA designers : click, give names and choose values
 - in minutes, using a browser only and an internet connection
- ➔ **easy, fast and cheap**

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EURO 2004 Best Poster Award

II. EBPA Example

Illustration

MCDA application concerning a best choice decision problem

Real decision aid case:
EURO XX Rhodes, July 2004

Size: 5 judges, 13 competing posters evaluated on 4 preference dimensions of ordinal significance

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EURO 2004 Best Poster Award

Decision making process:

Configuration: choice of the jury and the preference dimensions

Collecting the competing posters

Evaluating the posters

Modelling a pairwise “at least as good as” relation

Construct a best choice recommendation via an Rubis Web Service under XMCD A-2.0.0

Robustness analysis

EBPA package and classes

Cawa [IDE] [Tools]		
[Packages] [Classes] [Diagram]		
/ Package / ebpa		
Name	Order	Superclass
1 root		
2 d4		
3 cawa		
4 ebpa		
5 data2004		
6 configuration	10	
7 collectPosters	20	
8 evaluations	30	
9 outrankingRelat	40	
10 arcs		

Name	Order	Superclass
1 Conference	10	root.oosemantics-foundations.Object
2 JuryMember	20	root.oosemantics-foundations.Object
3 ViewPoint	30	root.oosemantics-foundations.Object
4 Poster	40	root.oosemantics-foundations.Object
5 Evaluation	50	root.oosemantics-foundations.Object
6 DiscriminationThreshold	60	root.oosemantics-foundations.Object
7 ValuationDomain	70	root.oosemantics-foundations.Object
8 Arc	80	root.oosemantics-foundations.Object
9 OutrankingRelation	90	root.oosemantics-foundations.Object
10 RubisServerJob	100	root.oosemantics-foundations.Object

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D4 snapshot: ebpa.configuration

[Packages]			Instances		
/ Package / ebpa / data2004 / configuration					
Name	Order		Name	Order	Class
1 root			1 EURO XX Rhodes		ebpa.Conference
2 d4			2 j1		ebpa.JuryMember
3 cawa			3 j2		ebpa.JuryMember
4 ebpa			4 j3		ebpa.JuryMember
5 data2004			5 j4		ebpa.JuryMember
6 configuration	10		6 j5		ebpa.JuryMember
7 collectPosters	20		7 sq		ebpa.ViewPoint
8 evaluations	30		8 tp		ebpa.ViewPoint
9 outrankingRelation	40		9 or		ebpa.ViewPoint
10 arcs			10 pq		ebpa.ViewPoint
			11 showJury	5	cawa.ui.Fragment
			12 showCriteria	10	cawa.ui.Fragment

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D4 snapshot: ebpa.showJury

[Packages]			Instances		
/ Package / ebpa / data2004 / configuration					
Name	Order				
1 root					
2 d4					
3 cawa					
4 ebpa					
5 data2004					
6 configuration					
7 collectPosters					

EBPA Jury members						
name	fullName	isChair	isOCMember	isPCMember	Owner	
1 j1	Prof. John Smith	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	ebpa.data2004.configuration	
2 j2	Dr. Hans Hoffmann	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	ebpa.data2004.configuration	
3 j3	Pr. Dr. Igmar Burg	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ebpa.data2004.configuration	
4 j4	Pierre Martin	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ebpa.data2004.configuration	
5 j5	Prof. Jean SaisTout	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	ebpa.data2004.configuration	

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D4 snapshot: ebpa.collectPosters

[Packages]			Instances		
/ Package / ebpa / data2004 / collectPosters					
Name	Order				
1 root					
2 d4					
3 cawa					
4 ebpa					
5 data2004					
6 configuration					
7 collectPosters					

The competing posters				
name	fullName	active	Owner	
1 p1	poster 1	<input checked="" type="checkbox"/>	ebpa.data2004.collectPosters	
2 p2	poster 2	<input checked="" type="checkbox"/>	ebpa.data2004.collectPosters	
3 p3	poster 3	<input checked="" type="checkbox"/>	ebpa.data2004.collectPosters	
4 p4	poster 4	<input checked="" type="checkbox"/>	ebpa.data2004.collectPosters	
5 p5	poster 5	<input checked="" type="checkbox"/>	ebpa.data2004.collectPosters	
6 p6	poster 6	<input checked="" type="checkbox"/>	ebpa.data2004.collectPosters	
7 p7	poster 7	<input checked="" type="checkbox"/>	ebpa.data2004.collectPosters	
8 p8	poster 8	<input checked="" type="checkbox"/>	ebpa.data2004.collectPosters	
9 p9	poster 9	<input checked="" type="checkbox"/>	ebpa.data2004.collectPosters	
10 p10	poster 10	<input checked="" type="checkbox"/>	ebpa.data2004.collectPosters	
11 p11	poster 11	<input checked="" type="checkbox"/>	ebpa.data2004.collectPosters	
12 p12	poster 12	<input checked="" type="checkbox"/>	ebpa.data2004.collectPosters	
13 p13	poster 13	<input checked="" type="checkbox"/>	ebpa.data2004.collectPosters	

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D4 snapshot: ebpa.outrankingRelation

[Packages]			Instances		
/ Package / ebpa / data2004 / outrankingRelation					
Name	Order		Name	Order	Class
1 root			1 valuationDomain		ebpa.ValuationDomain
2 d4			2 globalOutranking		ebpa.OutrankingRelation
3 cawa			3 arcs		root.oosemantics.foundations.Package
4 ebpa			4 showValuationDomain	10	cawa.ui.Fragment
5 data2004			5 showRelation	20	cawa.ui.Fragment
6 configuration	10		6 showGraphImage	30	cawa.ui.Fragment
7 collectPosters	20		7 showBestChoice	40	cawa.ui.Fragment
8 evaluations	30				
9 outrankingRelation	40				
10 arcs					

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[Classes] **[Diagram]**

Name
1 Conference
2 JuryMember
3 ViewPoint
4 Poster
5 Evaluation
6 DiscriminationThreshold
7 ValuationDomain
8 Arc
9 OutrankingRelation
10 RubisServerJob

[Attributes] **[Operations]** **[Instances]**

Name	Order
1 init2004Arcs	10
2 computeCharacteristics	20
3 submitRubisJob	30
4 computeArcs	40

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```

1 import digraphs
2 from decimal import Decimal
3
4 T = digraphs.PerformanceTableau(isEmpty=True)
5 T.actions = {}
6 for i in range(13):
7     path = 'ebpa.data2004.collectPosters.p%s' % (i+1)
8     poster = weta.core.loader.load(path)
9     T.actions[str(poster.name)] = {'name': 'poster %s' % (i+1)}
10 print T.actions
11
12 sqv = weta.core.loader.load('ebpa.data2004.configuration.sq')
13 tpv = weta.core.loader.load('ebpa.data2004.configuration.tp')
14 orv = weta.core.loader.load('ebpa.data2004.configuration.or')
15 pqv = weta.core.loader.load('ebpa.data2004.configuration.pq')
16 viewPoints = {'sq': sqv, 'tp': tpv, 'or': orv, 'pq': pqv}
17
  
```

[Packages] **[IDE]** **[Tools]**

Name	Order
1 root	
2 d4	
3 cawa	
4 ebpa	
5 data2004	
6 configuration	
7 collectPosters	
8 evaluations	
9 outrankingRelatic	

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[Fragments] **[Fragment Types]** **[Relation Types]** **[Property Categories]** **showRe**

Bipolar valued outranking relation

name	minimum	maximum	median	Owner
1 valuationDomain	-50	50	0	ebpa.data20C

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Valued outranking arcs

name	value	Owner
1 a_p1_p1	0	ebpa.data2004.outrankingRelation.arcs
2 a_p1_p2	8	ebpa.data2004.outrankingRelation.arcs
3 a_p1_p3	-22	ebpa.data2004.outrankingRelation.arcs
4 a_p1_p4	-38	ebpa.data2004.outrankingRelation.arcs
5 a_p1_p5	-8	ebpa.data2004.outrankingRelation.arcs
6 a_p1_p6	18	ebpa.data2004.outrankingRelation.arcs
7 a_p1_p7	-16	ebpa.data2004.outrankingRelation.arcs
8 a_p1_p8	16	ebpa.data2004.outrankingRelation.arcs
9 a_p1_p9	14	ebpa.data2004.outrankingRelation.arcs
10 a_p1_p10	16	ebpa.data2004.outrankingRelation.arcs

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[Model] **[GUI]** **[Views]** **[Objects]**

III. Conclusion

- Progression
 - ✓ Reflective atomic persistency storage system
 - ✓ Molecular strong typed class management
 - % GUI components, more to come
 - % Advanced IDE, more to come : state machines designer
 - Community manager : fine-grained grant management, timemachine remote control
- Next decision deck workshop
 - D⁴ jump start : learn how to build and evolve your MCDA methods in minutes
 - Just bring your browser, no other skills required

*Give man a application (d2) and
you'll feed him for a day*

*Give him a tool (d2)² and
teach him to design an application (d2)
then you'll feed him for a lifetime*

Thanks

Q & A