



Dr. Falk Langhammer | Living Pages Research GmbH

Software harder than Hardware!?

Failures of object-oriented and promises of organic programming

Agenda

- What is complex?
- Hands-on (35 min)
- Philosophy
- Acknowledgements



Complexity emerges from Simplicity

Complexity emerges from Simplicity

- in nature
- in non-planned economies
- in software engineering
→*no complexity yet!*



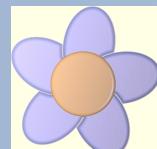
*True complexity is difficult to understand
but easy to achieve by self-organization.
„Allow the parts of your system to self-evolve“*

Hands-On

1,2,3 Ercatons!

- We need new stuff:
 - Simpler than objects, yet more powerful
 - Really like **true objects** in the real world
 - Really unified superset of **object + document**
 - True objects exist w/o programmers...
 - Outperforms current web frameworks :)

Call them ***ercatons***



Live Demo Session

- Problem:
 - Software for election with electronic voting
 - Web interface
- The session will grow a solution as far as time permits
- Questions highly appreciated

after demo

~elect/artless/census

```
<?xml version="1.0" encoding="UTF-8"?>
<ballot xmlns:erc="http://ercato.com/xmlns/ErcatoCore">

<erc:id>~elect/artless/census</erc:id>

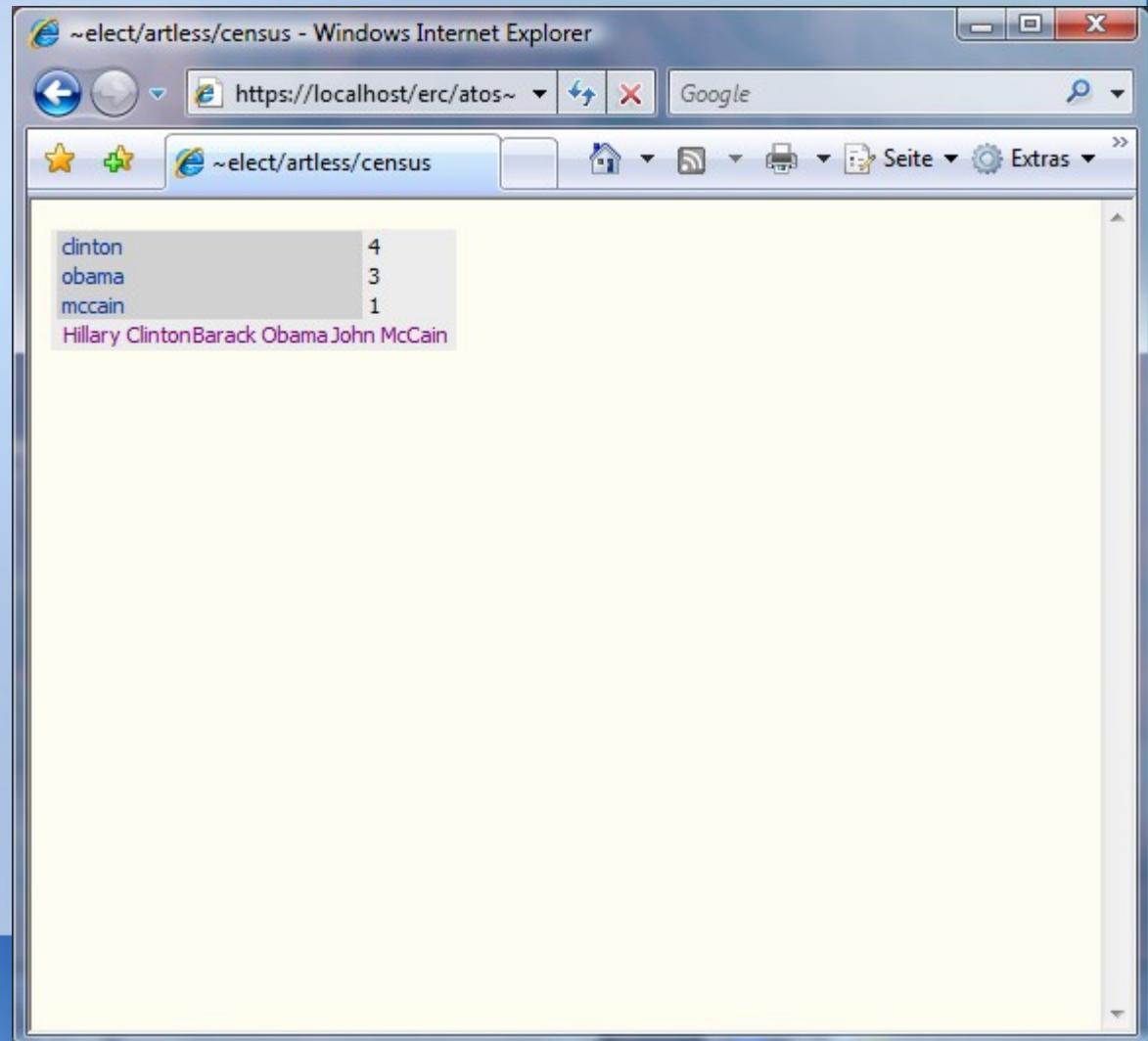
<vote>
  <clinton> 0 </clinton>
  <obama>    0 </obama>
  <mccain>   0 </mccain>
</vote>

<erc:action name="Hillary Clinton"> /bin/increment
  <erc:arg name="xpath"> //vote/clinton </erc:arg> </erc:action>

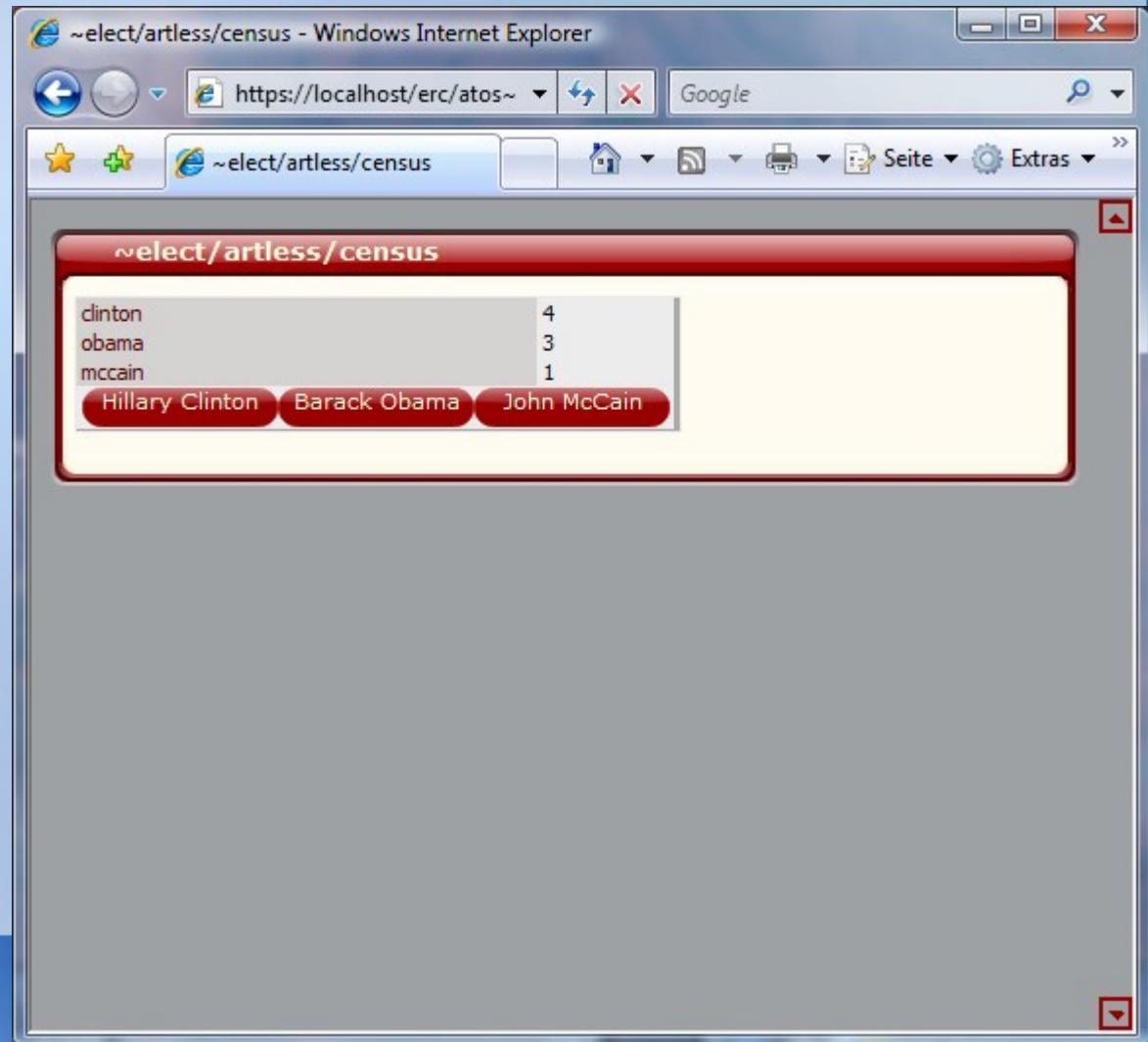
<erc:action name="Barack Obama">      /bin/increment
  <erc:arg name="xpath"> //vote/obama   </erc:arg> </erc:action>

<erc:action name="John McCain">        /bin/increment
  <erc:arg name="xpath"> //vote/mccain </erc:arg> </erc:action>
</ballot>
```

~elect/artless/census



~elect/artless/census



~elect/artless/ballot

```
<?xml version="1.0" encoding="UTF-8"?>
<ballot xmlns:erc="http://ercato.com/xmlns/ErcatoCore">
  <erc:id>~elect/artless/ballot</erc:id>
  <paper><erc:id-ref expand="fill-in">~elect/artless/ballot.html</erc:id-ref></paper>
  <name>Wiesbaden</name>
  <voter>Easter Bunny</voter>
  <vote>
    <clinton/>
    <obama/>
    <mccain/>
  </vote>

  <erc:action name="vote">
    <erc:arg name="ballot">this</erc:arg>
    <erc:arg name="clinton"/><erc:arg name="obama"/><erc:arg name="mccain"/>
    <erc:native lang="Java">
      <erc:class>org.ercato.samples.elect.Ballot</erc:class>
      <erc:archive>~elect/lib/elect.jar;/lib/erxlib.jar</erc:archive>
      <erc:method>vote</erc:method>
      <erc:parameter name="ballot" type="ercaton"/>
      <erc:parameter name="clinton" type="boolean"/>
      <erc:parameter name="obama" type="boolean"/>
      <erc:parameter name="mccain" type="boolean"/>
      <erc:returns type="reference"/>
    </erc:native>
  </erc:action>
  <erc:target name="fill-in" content-type="text/xhtml; charset=UTF-8">
    ~elect/artless/fill-in.xsl </erc:target>
  <erc:target name="view" depends-on="fill-in" content-type="text/xhtml; charset=UTF-8">
    /builtin/default.xsl </erc:target>
  </ballot>
```

org.ercato.samples.elect.Ballot

```
package org.ercato.samples.elect;

import com.ercato.core.*;
import com.ercato.lib.dom.DOM;
import javax.xml.transform.TransformerException;
import com.sun.org.apache.xpath.internal.XPathAPI;

public class Ballot implements Action {
    protected RuntimeSupport rt;
    public void setRuntime (RuntimeSupport runtime) { rt = runtime; }

    public ErcatonReference vote (ErcatonObject ballot,
        boolean clinton, boolean obama, boolean mccain) throws TransformerException {

        DOM.setTextX (ballot, "//vote/clinton", clinton ? "1" : "0");
        DOM.setTextX (ballot, "//vote/obama", obama ? "1" : "0");
        DOM.setTextX (ballot, "//vote/mccain", mccain ? "1" : "0");

        DOM.removeX (ballot, "//voter");
        DOM.remove (XPathAPI.selectSingleNode (ballot.getDOM (),
            "//erc:action[@name='vote']"));

        ballot.touch ();
        return new ErcatonReference (ballot);
    }
}
```

~elect/artless/ballot

(after voting)

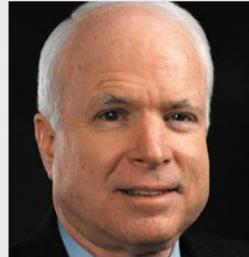
Wiesbaden - Windows Internet Explorer
https://localhost/erc/atos~ Google

Wiesbaden

Ballot Paper

Elections for President 2008

Electoral Constituency:
Wiesbaden

<input type="checkbox"/>	 Hillary Diane Clinton (Independent)
<input checked="" type="checkbox"/>	 Barack Hussein Obama, Jr. (Democratic Party)
<input type="checkbox"/>	 John Sidney McCain III (Republican Party)

name Wiesbaden
clinton 0
obama 1
mccain 0

Dr. Falk

~elect/ constituency/ captain

~falk/elect/constituency/captain - Windows Internet Explorer
https://localhost/erc/a

~falk/elect/constituency/captain

Edit Precinct Captain | Create User (login permitted to vote)

Elections for President 2008

Precinct Captain

Electoral Constituency
Precinct Captain name

Wiesbaden
FalkLanghammer

My Ballot delivery service

You may fetch your copy of the ballot paper
by entering the ballot PIN you have gotten by mail
and press the "My Ballot" button.
You should vote as soon as you got the ballot paper.
The vote is anonymous.

My Ballot

Registry of voters - link -
Ballot Box - link -

~elect/ supervisor

Ercato Demo - Windows Internet Explorer
<https://localhost/erc/atos~demo/start> Google

Falk Langhammer [logout](#)

• Ercato Demo •

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/Elections/Supervisors

<< | >> | [Edit Query](#) | [Delete Query](#) | [Save As](#) | [Share](#) | [Query](#) | [tmp]

in die Zwischenablage alle markieren

Name (>)	street	zipcode	city

[+] name:
a b c d e f g h i j k l m n o p q r s t u v w x y z *
distinct 1 - 1 max:
100

Elections for President 2008 Supervised by Bill Cosby

Elections for President 2008 Supervised by Bill Cosby

[Edit Election Supervisor](#) | [Create User \(Constituency Captain\)](#) | [Create My Constituency](#)

Elections for President 2008

The Election Supervisor

Election Supervisor name: [Elections for President 2008 Supervised by Bill Cosby](#)

powered by ercations

~falk/elect/constituency/captain

Ercato Demo - Windows Internet Explorer
https://localhost/erc/atos~demo/start Google Falk Langhammer logout

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/Elections/Precinct Captains << | >> | Edit Query | Delete Query | Save As | Share | Query | [tmp]

in die Zwischenablage alle markieren Name (>) street zipcode city

[+] name: a b c d e f g h i j k l m n o p q r s t u v w x y z * distinct 1 - 1 max: 100 Ok

Wiesbaden

~falk/elect/constituency/captain Edit Precinct Captain | Create User (login permitted to vote) |

Elections for President 2008

Precinct Captain

Electoral Constituency: Wiesbaden
Precinct Captain name: FalkLanghammer

My Ballot delivery service

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My Ballot

Registry of voters - link -
Ballot Box - link -

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~falk/elect/ consituency/ voters

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/Elections/Precinct Captains

<< | >> | [Edit Query](#) | [Delete Query](#) | [Save As](#) | [Share](#) | [Query](#) | [tmp]

in die Zwischenablage alle markieren

Name (>)	street	zipcode	city

[+] name:
a b c d e f g h i j k l m n o p q r s t u v w x y z *
distinct 1 - 1 max: 100

Wiesbaden

~falk/elect/constituency/voters

[Edit Registry of Voters](#)

Electoral Constituency	Voters	Wiesbaden					
		Name	Street	Zip Code	PIN	Ballot paper	Voted?
H. Abate		Klagenfurter Ring 1a		65187 lqhkdg			
Dr. Falk Langhammer		Unter der Brücke 1a		65187 fx1o0n	X		
Dr. Dipl.-Chem. Ahmed Abdel Hamid		Drususstr. 47		65187 s42h5u			
Alexander Abdel Hamid		Drususstr. 47		65187 kygb0d			
Dr. M. Yousri Abdel-Aziz		Schenkendorfstr. 7		65187 vjcn5c			
Sevan Abedian		Platanenstr. 7		65187 m3fy7k			
Gudrun Chr. Abels		Eichendorffstr. 7		65187 cih05j			
Larissa Aberle		Klopstockstr. 42		65187 87urky			
A. Abrahams u. Patschke		Klagenfurter Ring 40		65187 u5c0r			
Abshagen's Corporate Experience GmbH		Gutenbergplatz 3		65187 cdmvwe			
Friedrich Abstein		Niederwaldstr. 12		65187 qappy7			
Nicola Accettura		Niederwaldstr. 8		65187 up31m6			
Thomas Achab		Niederwaldstr. 8		65187 t171ul			
Matthias Achilles u. Borchers Hille		Scheffelstr. 5		65187 yziuth			
Ch. Acker		Wiesenstr. 4		65187 u7uxro			
Gerhard Ackermann		An der Kupferlache		65187 9wo4nc			
Heinz Ackermann		Konrad-Adenauer-Ring 40		65187 ooqkh3			

~elect/idx/ ballotbox-query

Ercato Demo - Windows Internet Explorer
<https://localhost/erc/atos~demo/start> Google

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Ballot Box Counting

<< | >> | [Edit Query](#) | [Delete Query](#) | [Save As](#) | [Share](#) | [Query](#) |

	in die Zwischenablage alle markieren	[tmp]	
Electoral Constituency (<)	Hillary Diane Clinton	Barack Hussein Obama, Jr.	John Sidney McCain III
Wiesbaden			
[+]	name: a b c d e f g h i j k l m n o p q r s t u v w x y z *	distinct 1 - 6 max: 100	Ok
<input type="checkbox"/> Wiesbaden	0	0	1
<input checked="" type="checkbox"/> Wiesbaden	0	1	0

[~falk/elect/constituency/captain](#)
[Edit Precinct Captain](#) | [Create User \(login permitted to vote\)](#) |

Elections for President 2008

Precinct Captain

Electoral Constituency: Wiesbaden
Precinct Captain name: FalkLanghammer

My Ballot delivery service

You may fetch your copy of the ballot paper by entering the ballot PIN you have gotten by mail and press the "My Ballot" button.
You should vote as soon as you got the ballot paper.
The vote is anonymous.

[My Ballot](#)

Registry of voters: [- link -](#)
Ballot Box: [- link -](#)

~falk/elect/ ballot/ hTkN3q

End of live demo

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<https://localhost/erc/atos~demo/start> Google

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Ballot Box Counting

<< | >> | [Edit Query](#) | [Delete Query](#) | [Save As](#) | [Share](#) | [Query](#) | [tmp]

Electoral Constituency (<)	Hillary Diane Clinton	Barack Hussein Obama, Jr.	John Sidney McCain III
Wiesbaden			

[+] name: a b c d e f g h i j k l m n o p q r s t u v w x y z * distinct 1 - 6 max: 100 Ok

Wiesbaden	0	0	1
Wiesbaden	0	1	0

Wiesbaden

Ballot Paper

Elections for President 2008

Electoral Constituency:
Wiesbaden

 Hillary Diane Clinton (Independent)



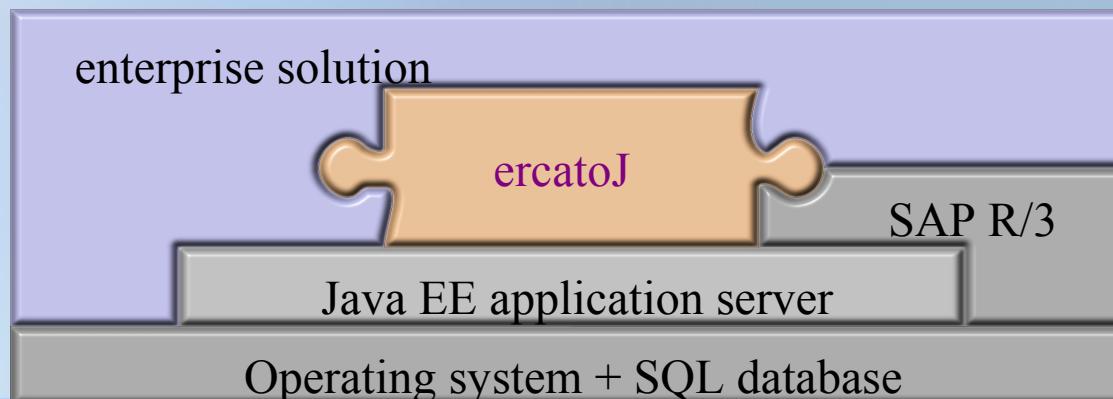


powered by ercations

The ercato engine *ercatoJ*

1/3

- Ercatons become EJBs at runtime
- GUI (Web 2.0) and persistence is automagic
- Languages: Java, XSLT, JavaScript (pending)
- XML tree algebra for OO principles
- SOA, shell, XA, joins, security, versioning, ...



The ercato engine *ercatoJ* engine tags:

2/3

Generic outer elements erc: (allowed everywhere)

id
type
role
base
clone
index
object
action
target
id-ref
trigger
version
catalog
versions
permission
public-for
version-clone
prototype-permission

Generic attributes erc:

(allowed everywhere)
index
add-ref
expanded-id-ref

Generic sub-elements erc: (allowed below generic elements) <too numerous to list>

Generic sub-attributes erc: (allowed below generic elements) <too numerous to list>

Pattern elements e:

(optional, allowed at top-level)
head
structure
behaviour
system

Special elements erc:

(allowed in some ercatons)
<not listed yet>

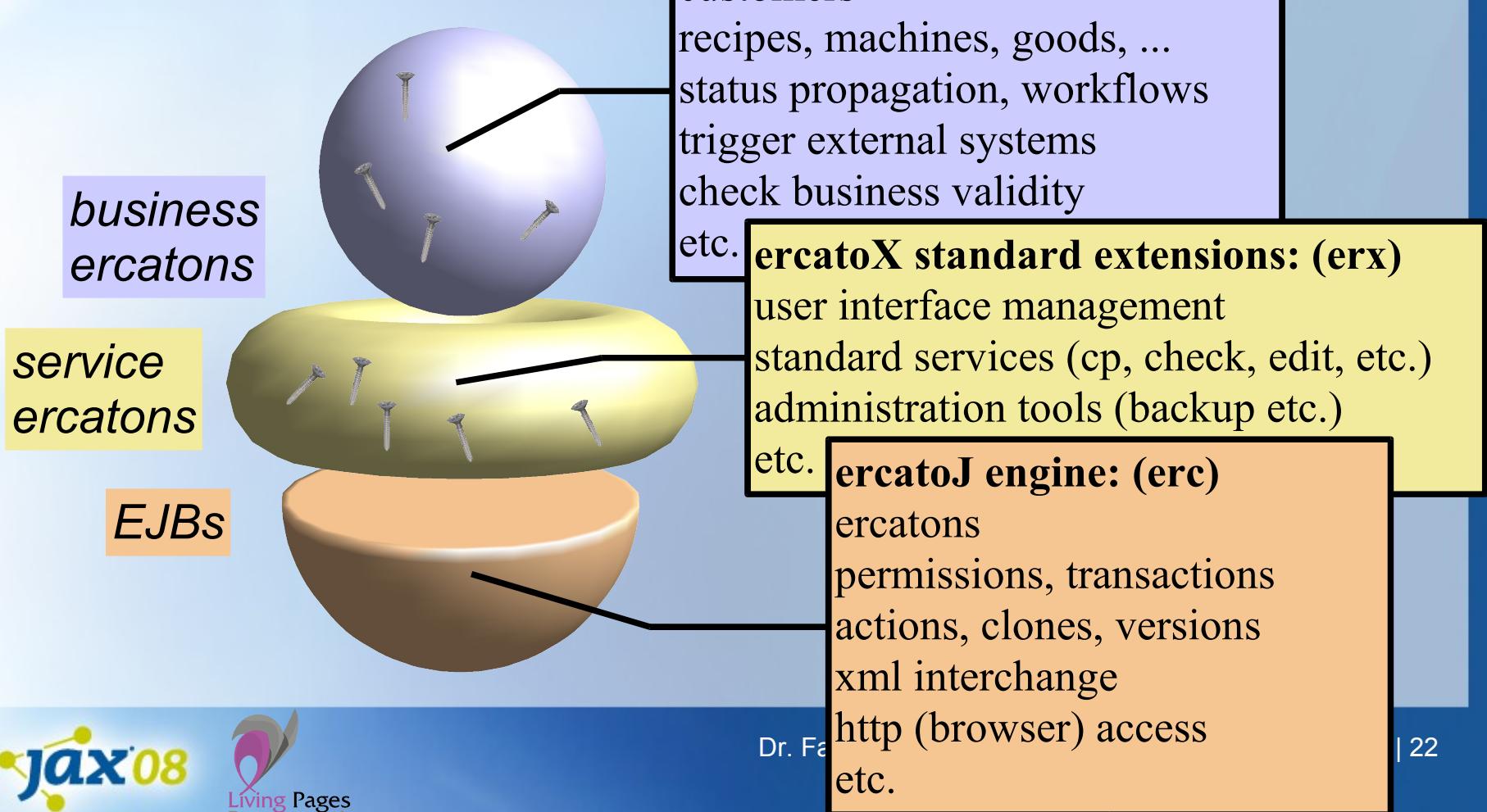
Generic Extension Library outer elements erx: (allowed everywhere) <not listed here>

Generic Extension Library attributes erx: (allowed everywhere) <not listed here>

The ercato engine *ercatoJ*

3/3

layers:



Philosophy

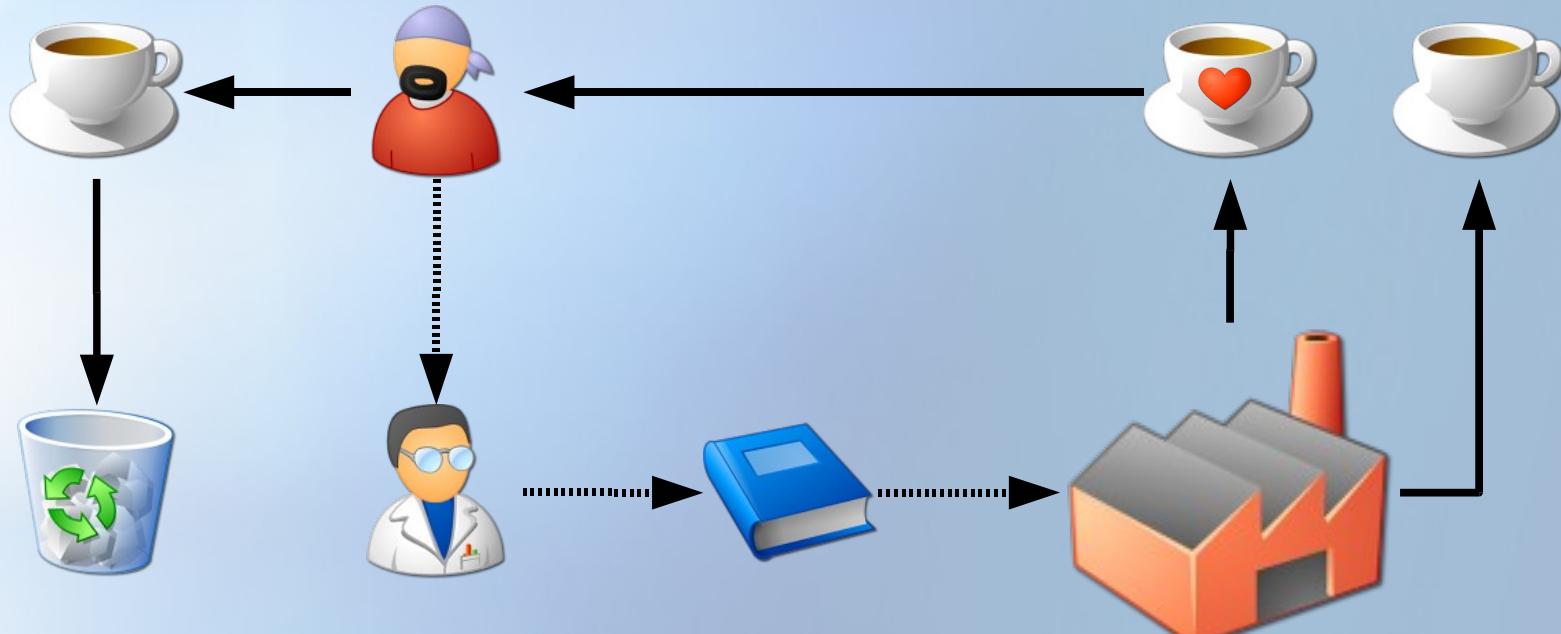
The coffee cup with a heart

- The coffee cup is a true object.
- You may urgently want a heart painted on it.
- How do you  achieve this?



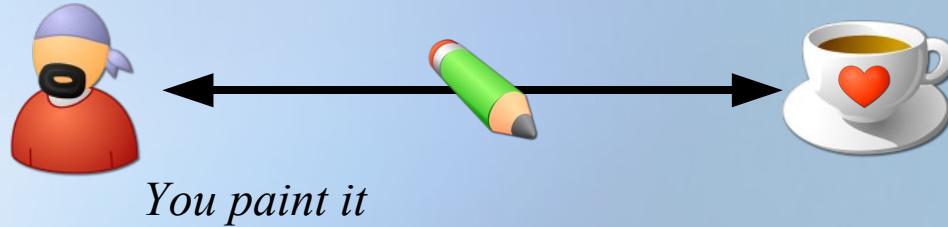
Deep philosophical questions here...

The hard way ...



You request a modification to the cup factory

... and the soft way.



- This is the method recommended by the author ;)
- Although the cup is hardware, it is no problem to apply the soft way!

Object-oriented programming ...

...uses the hard way!

```
class Cup {  
    double amount;  
    void drink (double amount);  
    void refill ();  
}
```

Edit, recompile, deploy, run, get new objects()...

Why?

- Because it used to be fast enough (not anymore!)
- Because alternatives imply overheads
- Because OO alternatives are not available

OO-software *is* harder than hardware!

Organic programming ...

...uses the soft way!

Alter the instance (by edit or another tool/ercaton)

Why?

- *The hard way fails with complex systems (WWW...)*
- *Because an OO alternative now exists: **ercatons***
- *Overheads are now acceptably small*
- *Such systems grow organically to true complexity*

Organic-software **is** soft!

```
<cup>
```

```
<erc:id>~falk/sein/cup</erc:id>
```

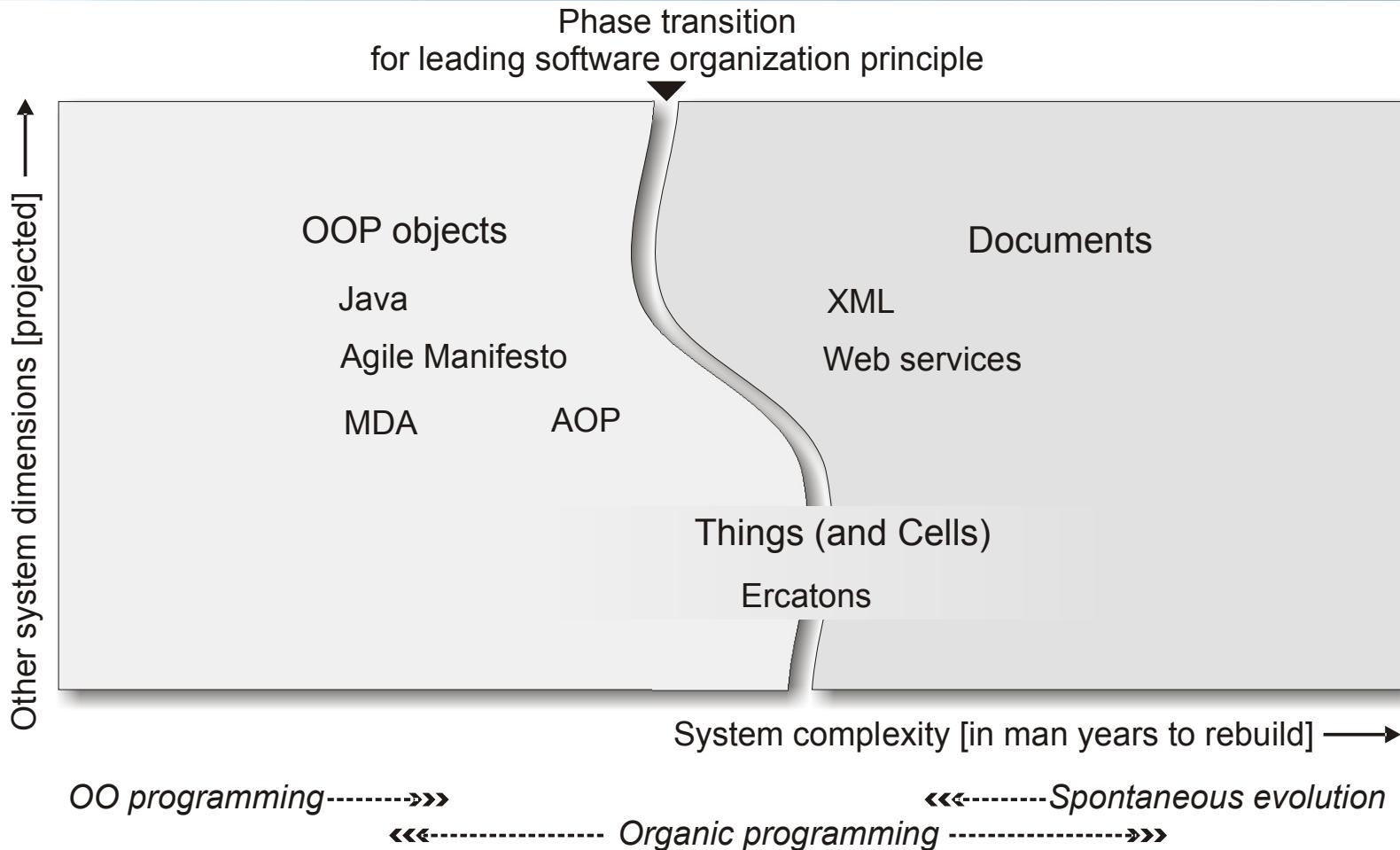
```
<amount>237.6</amount>
```

```
<erc:action name="drink"/>
```

```
<erc:action name="refill"/>
```

```
</cup>
```

Phase transition in SW-engineering



Manifesto of Organic Programming

The exception is the rule.

- §1 *Our world is rich and complex*
rather than well-structured and simple.
- §2 *Software must cover irregular, changing patterns*
rather than regular patterns.
- §3 *A software system is an organic being*
rather than a set of mathematical algorithms.
- §4 *Software components are an integral part of our rich world*
rather than entities at some meta level.
- §5 *Complex software emerges when evolving from small to large*
rather than from concrete to abstract.

Acknowledgements

Scientific acknowledgements

- Scientific publications (ACM, LNCS)
- Reviewed talks
(OOPSLA (USA), Net.ObjectDays, Schloß Dagstuhl)
- Founding Member
of Organic
Computing Initiative
- Diploma thesis
(Munich, Hamburg)
- Private communications
(e.g. D.Ungar, creator of Self)



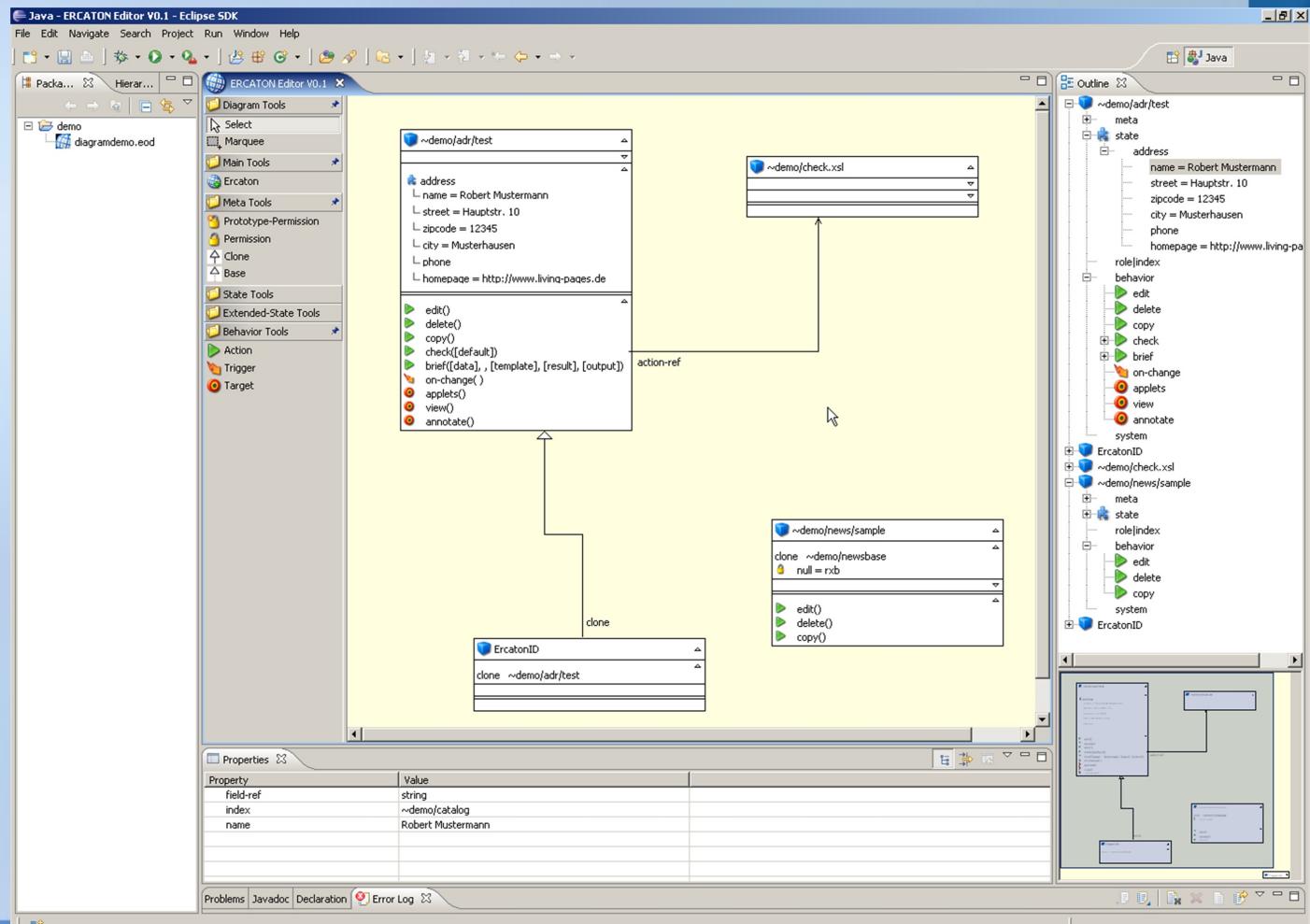
*“Maybe someday all
large-scale objects
will be Ercatonical.”*

David Ungar
Principal Investigator
Sun Labs, Mountain View



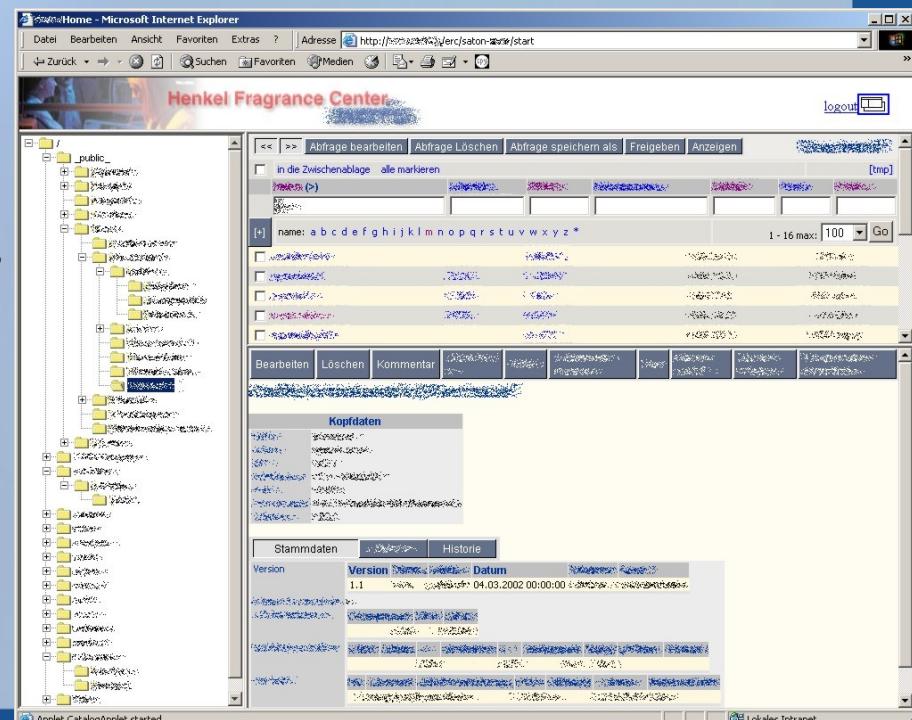
Scientific acknowledgements (example)

OBN
(Organic
Building
Notation *UML*)
Eclipse Plugin
for visual
organic
programming
Diploma thesis
LMU Munich
Erik Ebell



Commercial acknowledgements

- Satisfied customers
(Henkel, Ekato, ASL, KGAL, Docutec ...)
- E.g., backbone of
Henkel perfume factory
(replaced million l.o.c. hostapp)
- Positive consultancy evaluations
(clavis, Virtual Solutions,
sd&m, ESPRiT ...)
- Magazine coverage
(iX, Computerzeitung,
JavaMagazin 2007/01...)



Technological acknowledgements

- XOperator (XML tree algebra) used by NASA and Navy
(ercato engine XML tree algebra that we made open source)
- 99.99% availability proven in the field (limited by maintenance)
- Henkel called it „*best production start ever*“
and „*the system we never hear about – it just grows & works*“
- Ercaton transactional memory as reliable as Oracle database
- Developed many new patterns (firewall, builder, contract ...)
- Once infected, you cannot think differently anymore ;)
(great architectural method)

Open Source 2008

- We will release it into the open source
 - This year 2008!
 - Accepting cooperating members now
 - Many subprojects and a book
- Why?
 - Urged by many, including S&S Verlag
 - We sell expert knowledge better than licenses anyway
 - The impact of the technology has become larger than we can still handle (we're really small!)
- Contact us if you are interested to learn more

falk@living-pages.de

[www.living-pages.de/de/projects/ercato](http://www.living-pages.de/de/de/projects/ercato)

ercato.org (*later this year*)

Thank You