

# *Virtual EZ Grid*

Project presentation for SWITCH AAA info day

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# *Virtual EZ Grid at glance*

- AAA/Switch funding
- Partners: UniGE, USI, UniNE, HES-SO (4 sites)
- Start/end dates : February 2009 - July 2010
- Budget : 550 kCHF
- Web Site: [http://www.xtremwebch.net/Projects/Virtual\\_EZ\\_Grid](http://www.xtremwebch.net/Projects/Virtual_EZ_Grid)

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# *Virtual EZ Grid* : Objectives

- **Infrastructure** : Construct a desktop grid infrastructure with more than 1000 PCs.
- **Reliability & security**: Implement a reliable platform by using virtual environments to support secure computing and remote check-pointing.
- **Economic model**: Provide a resource-credit system.
- **Applications**: Evaluate the project in a real world setting with two medical applications: *NeuroWeb* and *MedGift*.

# *Virtual EZ Grid* : Components

**EZ-GRID:** A supervisor for virtual machines (VM's), responsible for suspending and waking up the VM on demand.

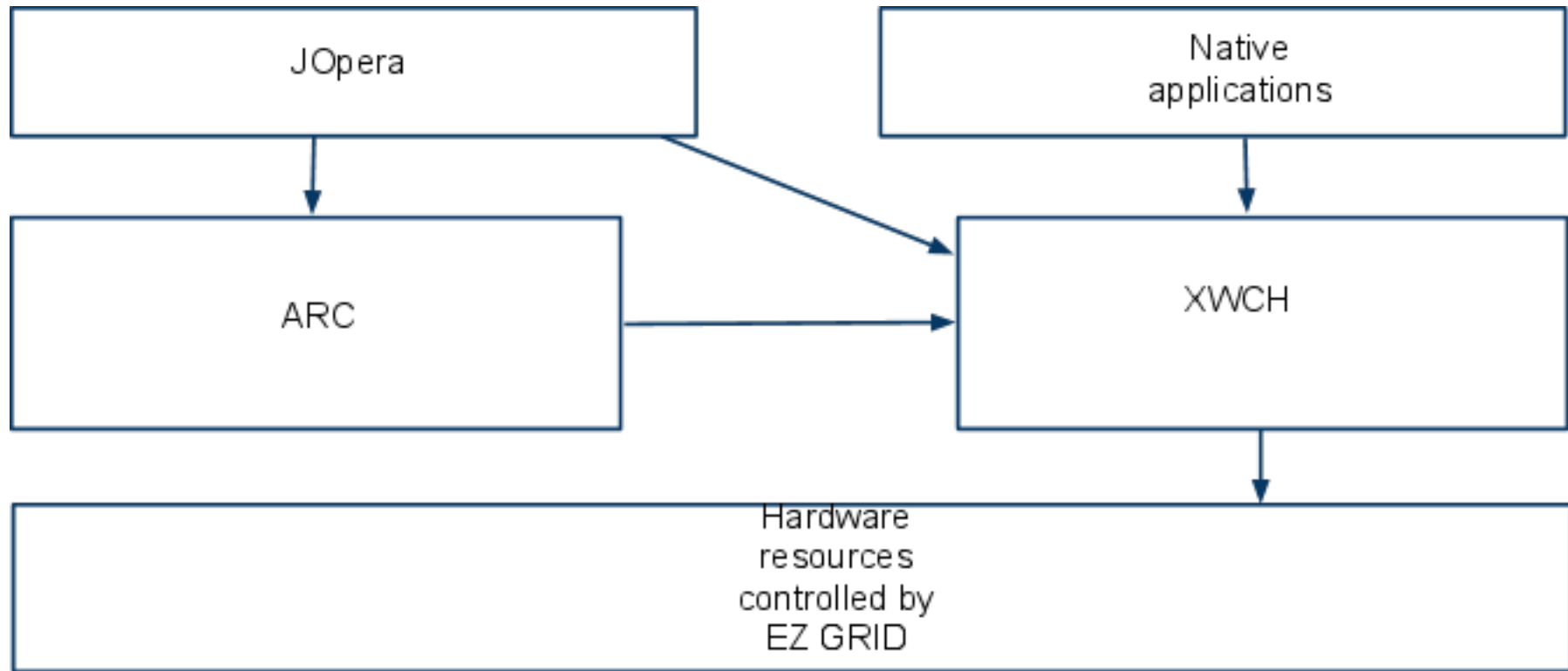
**XtremWeb-CH:** *www.xtremwebch.net* (XWCH) is a volunteer computing system developed at [hepia](http://hepia).

**ARC:** *www.nordugrid.org/middleware* Advanced Resource Connector, a grid middleware.

**JOpera:** *www.jopera.org* is an open source grid workflow management system that can execute tasks on several platforms.

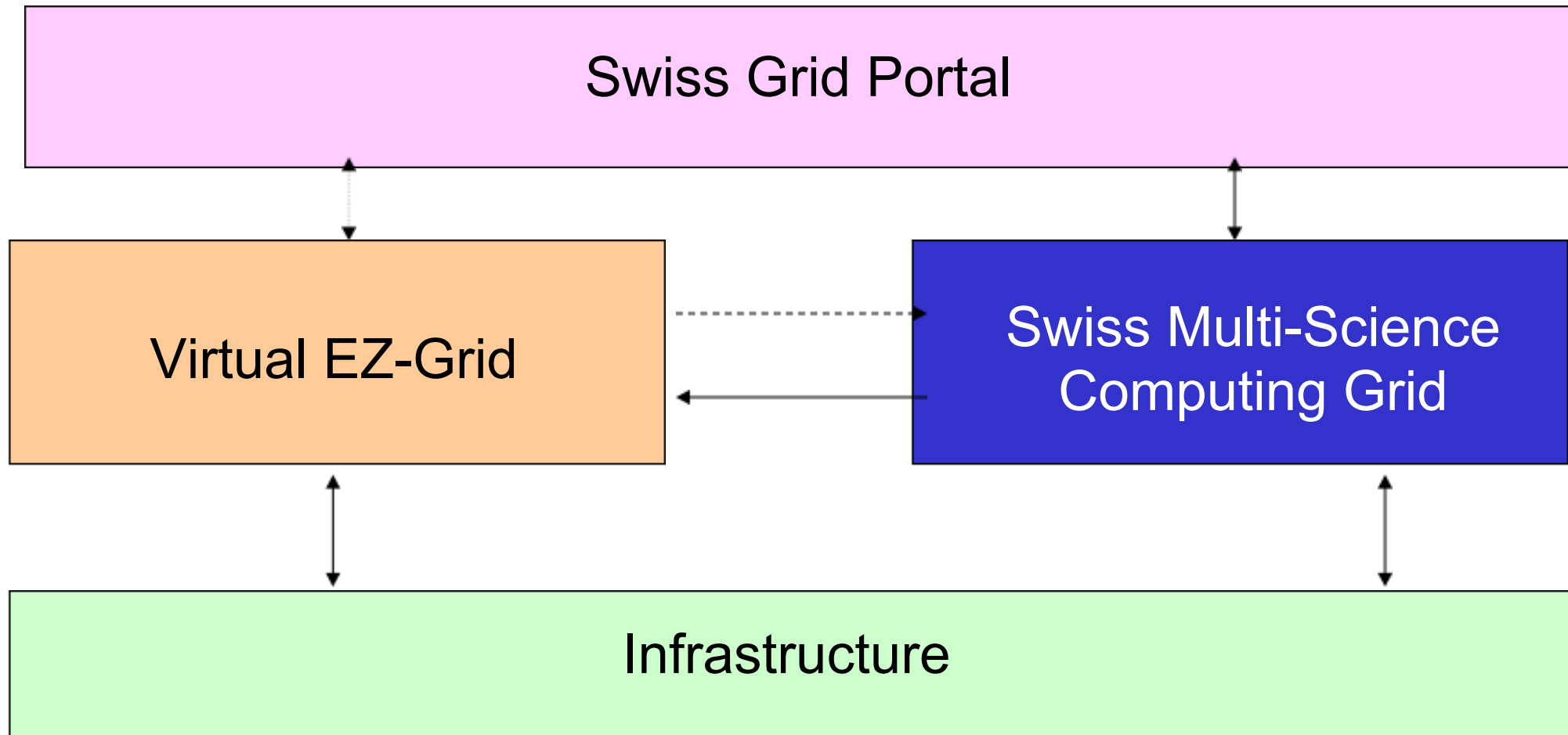
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# Virtual EZ Grid : Architecture



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# *Virtual EZ Grid* :Connections with other projects



# *Virtual EZ-Grid: Project content and achievements*

- Infrastructure
- Applications
- Grid
- The economic model

# *Virtual EZ Grid: The infrastructure*

Distribution of PC's in the project (curr. max 557):

HES-SO ca. 300 (Windows, native)

UNIGE ca. 170 (Virtual Machines, Linux), to be ca. 1000  
at nights by late January

UNINE ca. 30

USI ca. 20

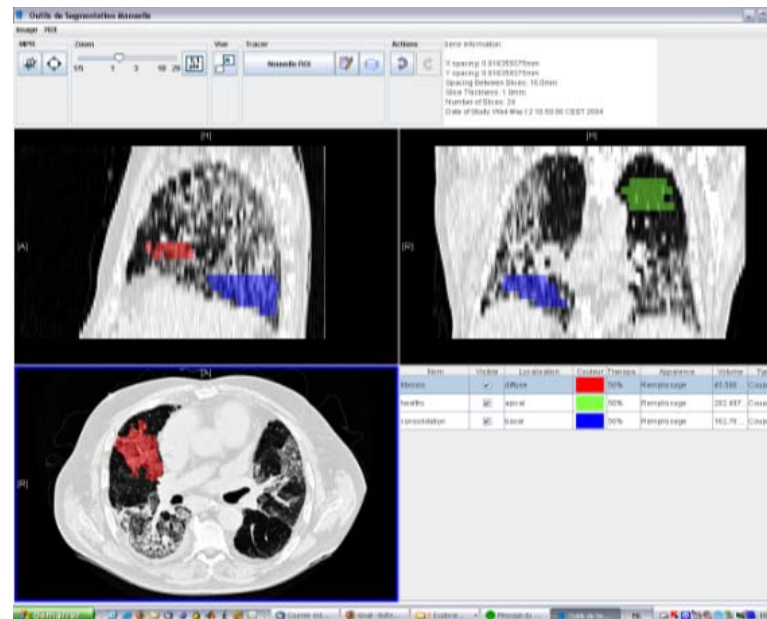
others ca. 10

# Virtual EZ Grid : Applications

- *NeuroWeb* : build neuronal maps extracted from brain measurements



- *MedGift* : medical image analysis and retrieval



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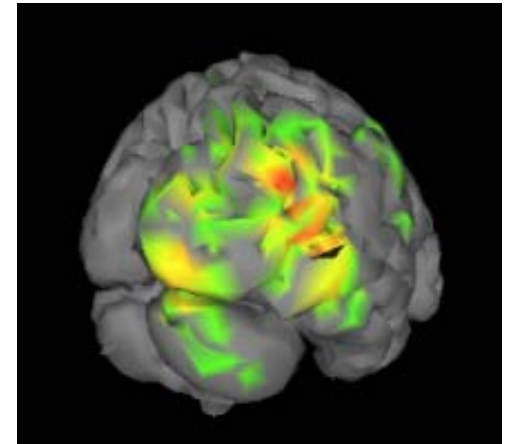
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et d'architecture de Genève

# Applications: NeuroWeb

## Objective

- Reconstruction of the electromagnetic brain map
- Which neuron is responsible of what?
  - Epileptic crisis
  - Parkinson
  - Alzheimer
  - Etc.



## Why?

- To avoid invasive surgeries

NeuroWeb is a plugin of NeoBrain/BrainStorm

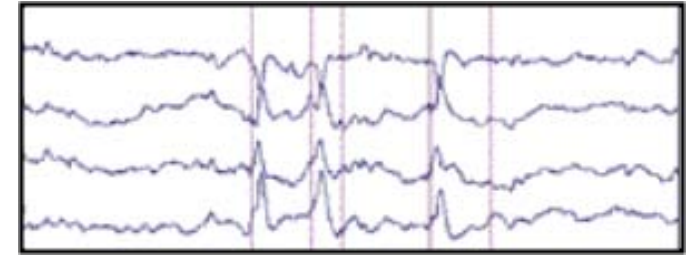
<http://www.hesso.ch/modules/projets/projet.asp?ID=482>

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# Applications: NeuroWeb

## MEG scanner

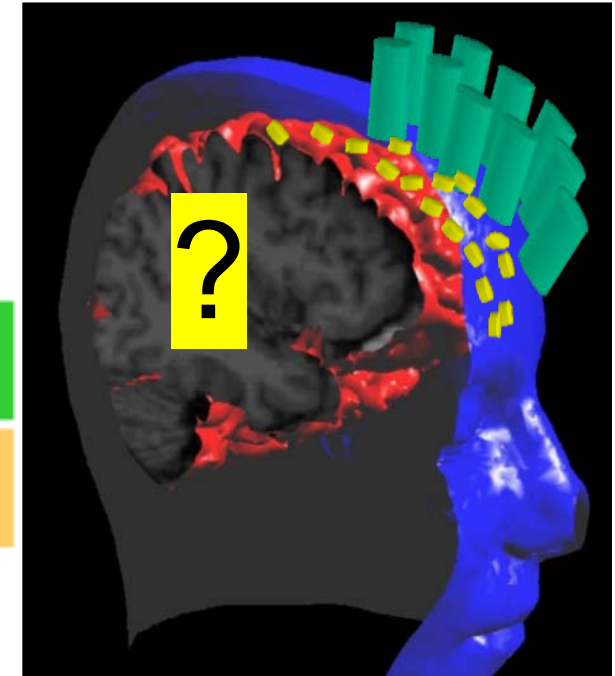
Magneto-EncephaloGraphy (MEG) scanner:  
provides temporal information (functional data)



**# Sensors = 256**  
**dt = 1 millisecond**

**# of sensors: 256**

**# of neurons: 60'000**



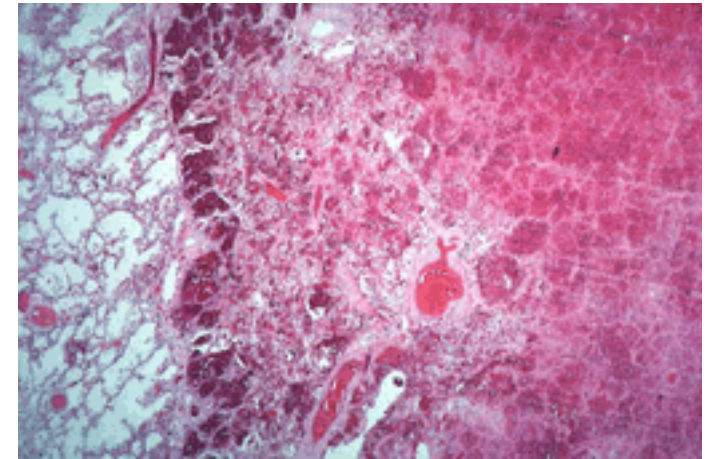
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# Applications: MedGIFT

Finding image features from a large collection of images for Content Based Image Retrieval



The GIFT (GNU Image Finding Tool) system can extract features from a single image quite fast.

But hospitals produce large amounts of images per day (HUG radiology: 70 000/day in 2007).

We use a sample collection of 50 000+ anonymized images. Feature extraction a single CPU: ca 14 hours. With Virtual EZ-Grid: ca 4 hours.

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# The XWCH platform

## XTREMWEB-CH

Home Applications Administration My account Logout

Account: marco niinimaki

293 worker(s) alive

Current applications ⏪ ⏩ Page 1 / 2 View all Refresh

Application	progress	workers in use	workers allocated
<a href="#">images19000 (11-01-2010 12:53:18)</a>	0 / 1	0	1
<a href="#">images18000 (11-01-2010 12:50:10)</a>	0 / 1	0	0
<a href="#">images17000 (11-01-2010 12:43:17)</a>	0 / 1	0	0
<a href="#">images16000 (11-01-2010 12:00:42)</a>	0 / 1	0	0
<a href="#">images15000 (11-01-2010 11:53:32)</a>	0 / 1	0	3
<a href="#">images14000 (11-01-2010 11:50:27)</a>	0 / 1	0	0
<a href="#">images13000 (11-01-2010 11:47:11)</a>	0 / 1	0	0
<a href="#">images11000 (11-01-2010 11:37:02)</a>	0 / 1	0	3
<a href="#">images9000 (11-01-2010 11:26:36)</a>	0 / 1	0	4
<a href="#">images8000 (11-01-2010 11:23:08)</a>	0 / 1	0	0
<a href="#">images7000 (11-01-2010 11:16:08)</a>	0 / 1	0	0
<a href="#">images6000 (11-01-2010 11:09:42)</a>	1 / 1	1	1

..with aai enabled access..



SWITCH > aai  
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Login

Login for non-AAI users

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# Grid: Running ARC jobs in XWCH

Grid Monitor

2010-01-11 CET 12:58:19

Processes: ■ Grid ■ Local

Country	Site	CPUs	Load (processes: Grid+local)
World	arctest	3	8+2
<b>TOTAL</b>	<b>1 sites</b>	<b>3</b>	<b>0 + 2</b>

Resource Details for arctest.hesge.ch - Mozilla Firefox

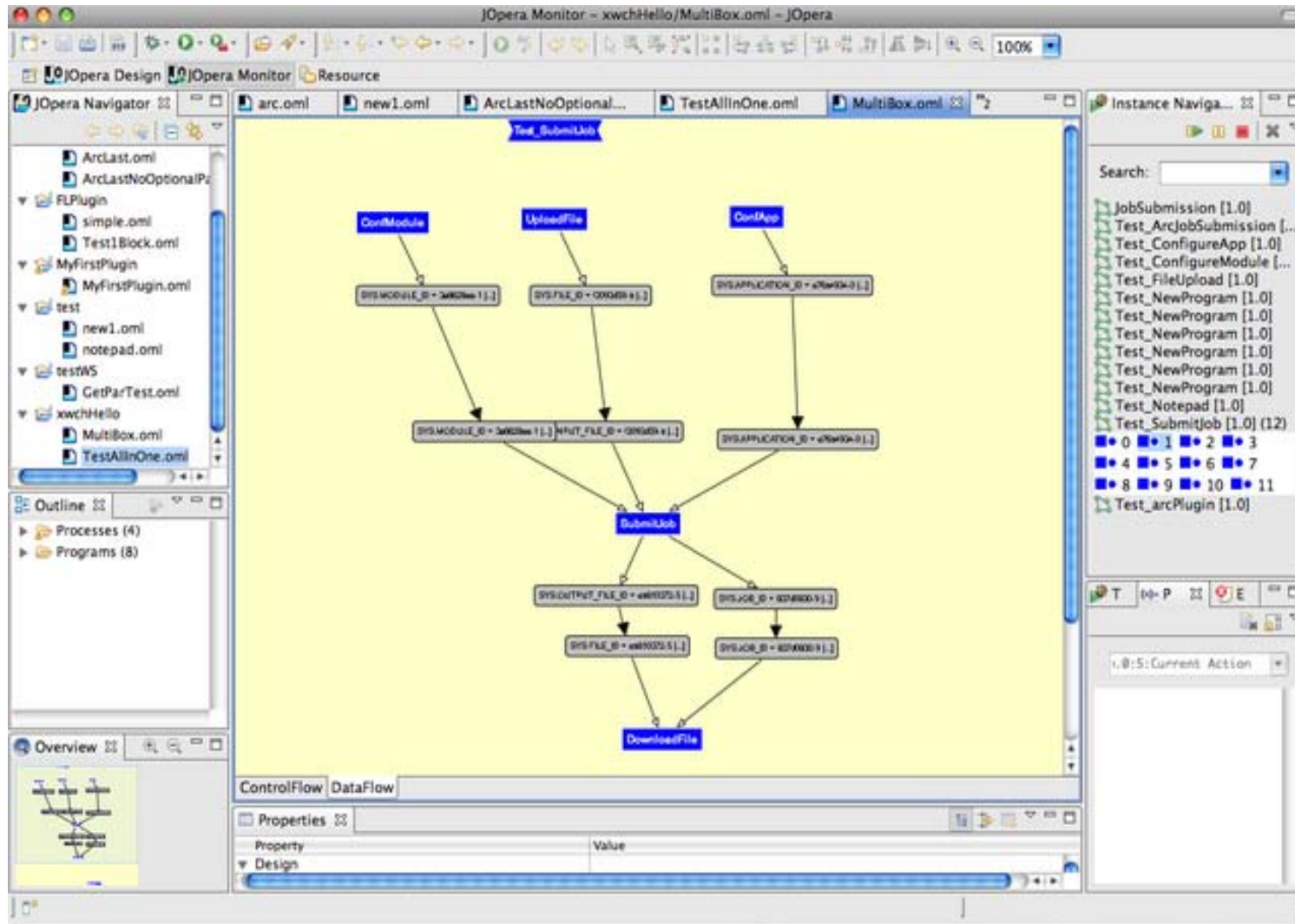
http://arctest.hesge.ch/gridmonitor/clusdes.php?host=arctest.hesge

Attribute	Value
Distinguished name	nordugrid-cluster-name=
objectClass	Mds nordugrid-cluster
Front-end domain name	arctest.hesge.ch
Cluster alias	arctest
Comment	This cluster is specially d
Owner	hepia
Postal code	ch-1200
Certificate issuer	/C=CH/ST=Geneve/L=Ge
Certificate issuer's hash	99d54258
Trusted certificate issuers	<pre>/C=FR/O=CNRS/CN=CNRS2-Proje /DC=org/DC=ugrid/CN=UGRID C /C=BR/O=ICPEDU/O=UFF BrGrid Certification Authority /C=DE/O=DFN-Verein/OU=DFN-P</pre>
Contact string	gsiftp://arctest.hesge.ch:
E-mail contact	xtremwebch@eig.ch
LRMS type	xwch
LRMS version	1
LRMS details	single job per processor
Architecture	i686
Operating system	Fedora 11-Desktop editio
Benchmark	SPECFP2000 @ 333
Homogeneous cluster	TRUE
CPU type (slowest)	Intel(R) Pentium(R) 4 CPU
Memory (MB, smallest)	512
Node IP connectivity	outbound
CPUs, total	3
CPUs, occupied	2
CPU:machines	3cpu:1

Zurich: Mon 12:53 Done

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# Grid: Running JOpera jobs in XWCH



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# *The economic model*

Nabil Abdennadher, Aarti Agrawal, Emmanuel Fragniere and Francesco Moresino: Services Pricing: A Shared Grid Case Study, *IEEE International Conference on Service Operations, Logistics and Informatics*, July 2009, Chicago.

The first model based on job priorities.

# Summary



## Virtual EZ Grid

# Summary and future work I

The project is productive and on schedule.

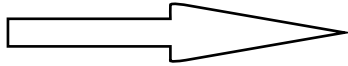
Virtual EZ-Grid has laid the foundation for a system that combines:

- non-intrusive virtual machine based computing (EZ-GRID)
  - volunteer computing (XWCH)
  - Grid and workflows (ARC, JOpera)
  - an economic model that can be used to give credit to resource providers, debit resource users
- ..and it is being tested with 2 medical applications.

# Summary and future work II

The follow-up project will be application driven.

Planned applications:  
data mining



cancer research

machine translation

[your favourite  
application here]

```
select
  {[Measures].[closing price]} on columns,
  {[company].[Allcompanysectors]} on rows
from [stockmarket]
```

Semantic query checking for cube stockmarket ontology  
http://wiki.hip.fi/xml/ontology/stockmarket.rdf SUSPECT: measure closing price depends on dimension company

process MDX query

Results:

	[Measures].[closing price]
[company.company].[Allcompanysectors]	595,513,446

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# XtremWeb-CH

