

ISGC 2011 & OGF 31 Conference report

Anar Manafov, GSI



<http://event.twgrid.org/isgc2011/index.html>

Program

e-Science Application Workshop

Asia@home Hackfest

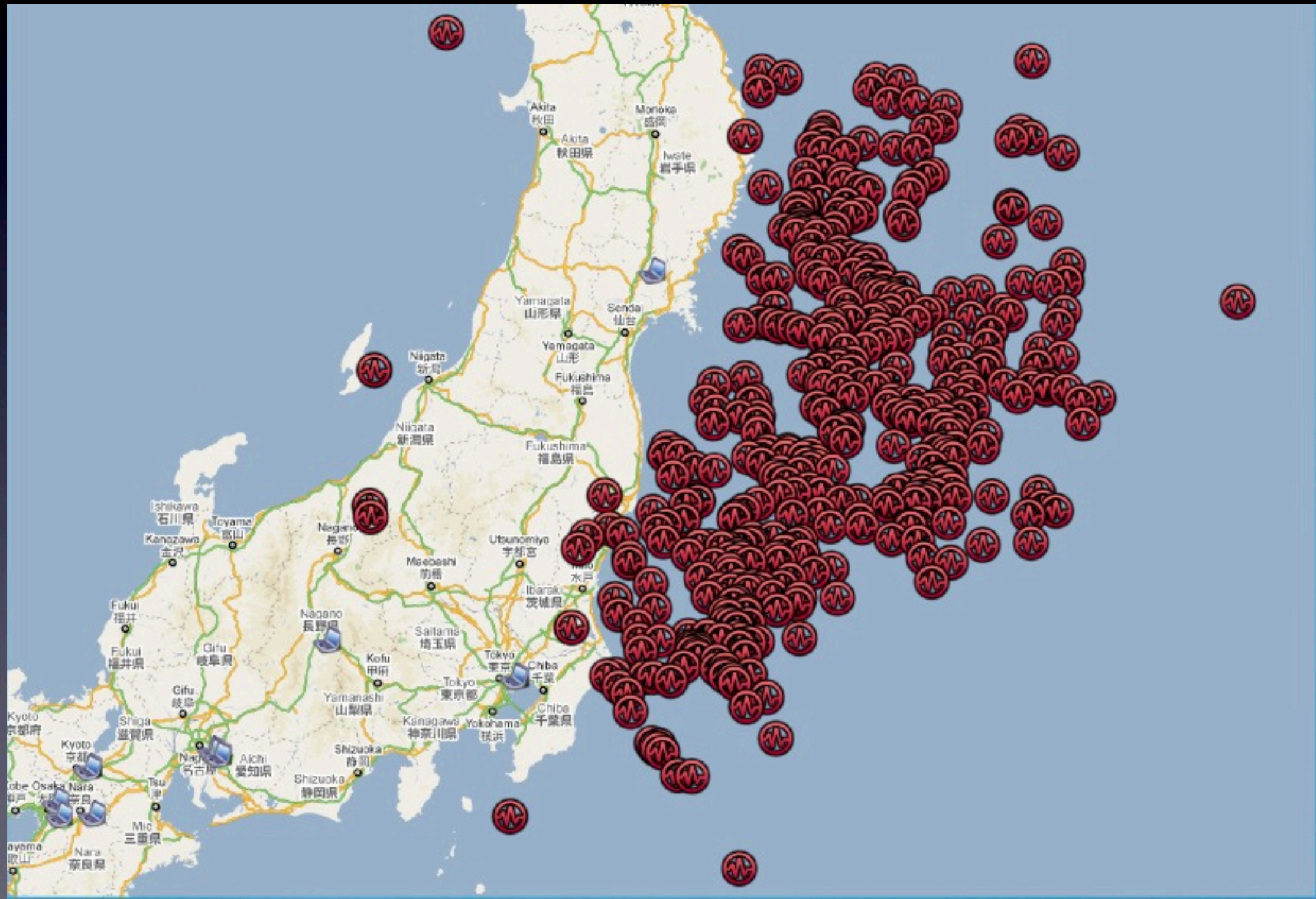
IDGF (Desktop Grid)

OGF

ISGC

Japan 03/10-14/2011

(each circle at least M4 quake)

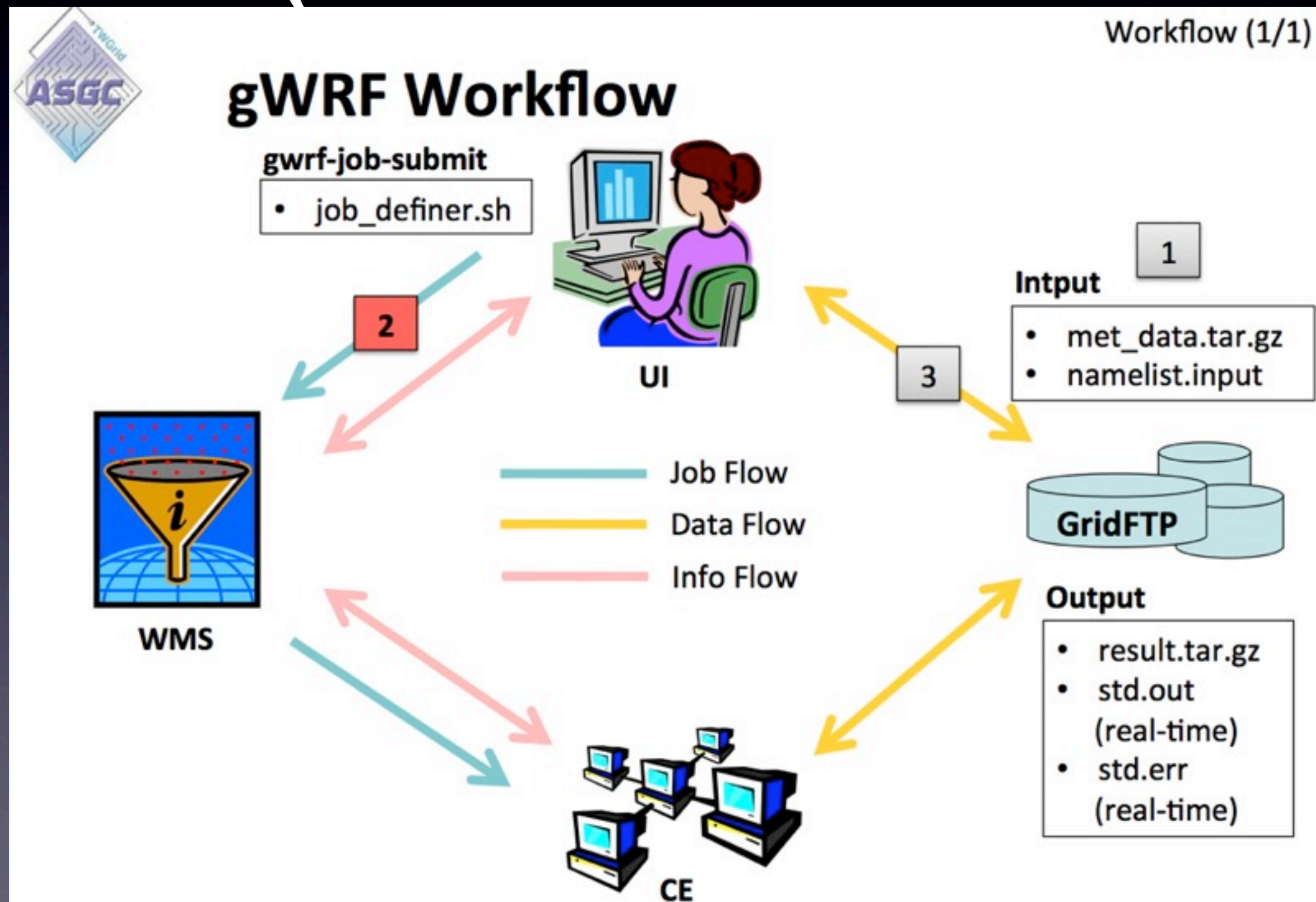


e-Science Application Workshop

- Weather Research and Forecasting (WRF).
- Computational Seismology.
- Natural Disaster Mitigation - Typhoon prediction.

Main message: all these applications and analysis
models utilizes Grid

e-Science: gLite-based WRF (Live Demo sessions)



Asia@home hackfest

- Earthquake analysis: Near Real-Time Waveforms and ShakeMovie!
- Volunteer computing.
- BOINC - OSS for volunteer computing and grid computing.
- All around earthquake simulation and analysis...

Volunteer computing

- 40 projects
- 500K volunteers
- 800K computers
 - 2.4 cores/computer
 - 65% average availability
- 14 PetaFLOPS
 - would cost \$5 billion/year on Amazon EC2

Volunteer computing

- Volunteer computing offers more/cheaper resources than other paradigms
- BOINC supports many types of HPC jobs
 - parallel
 - large resources requirements
 - VM-based
- Non-technical barriers remain

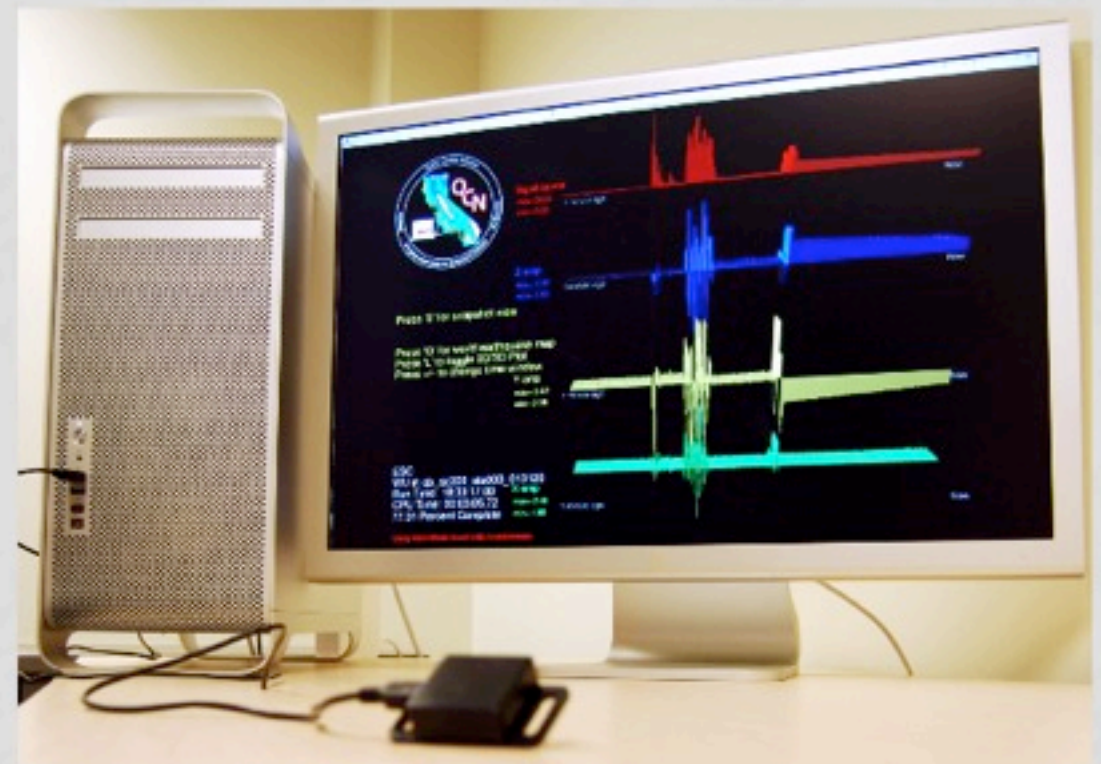
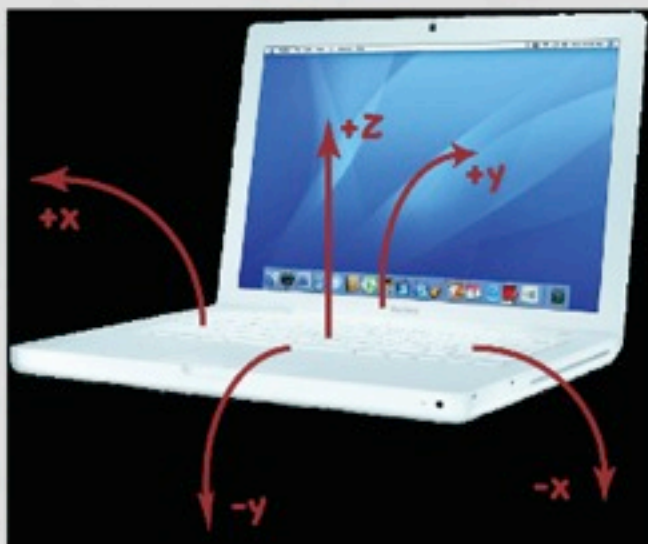
The Quake-Catcher Network

Low cost seismic network that utilizes:

1. MEMS Sensors

We use triaxial MEMS accelerometers internal to laptops or connected to desktops via USB

Benefits: Very low cost sensing
\$0 – laptops
\$30-150 – desktops



USB-connected triaxial
accelerometer

I. INTRODUCTION TO QCN

Low cost seismic network that utilizes:

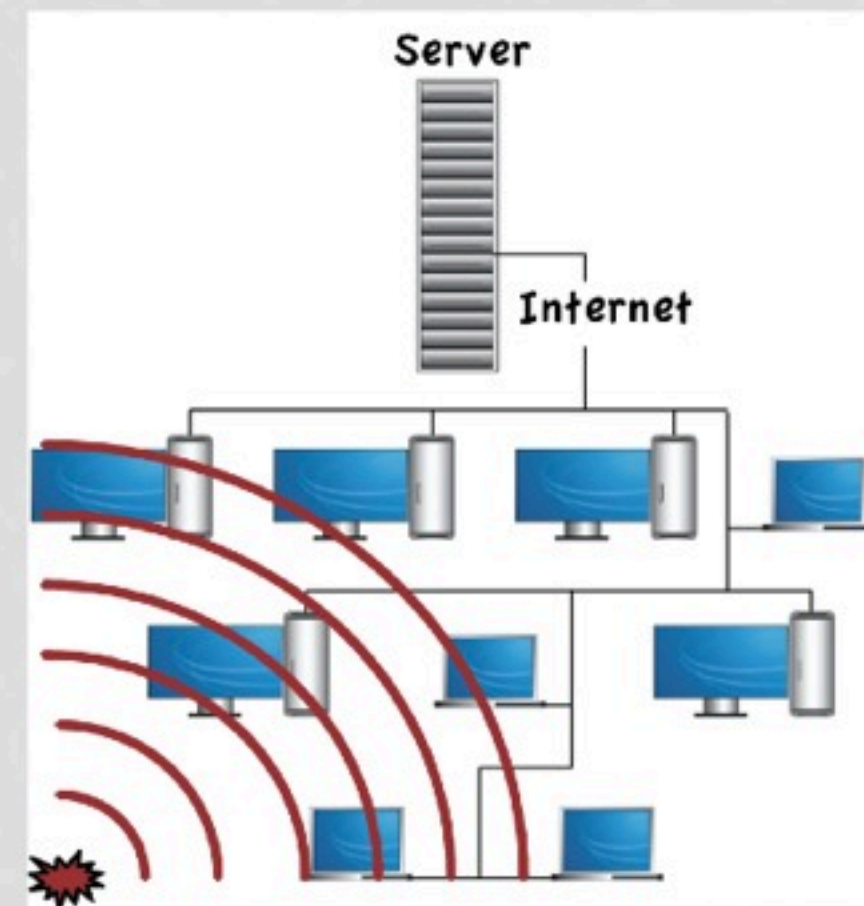
2. Distributed Computing

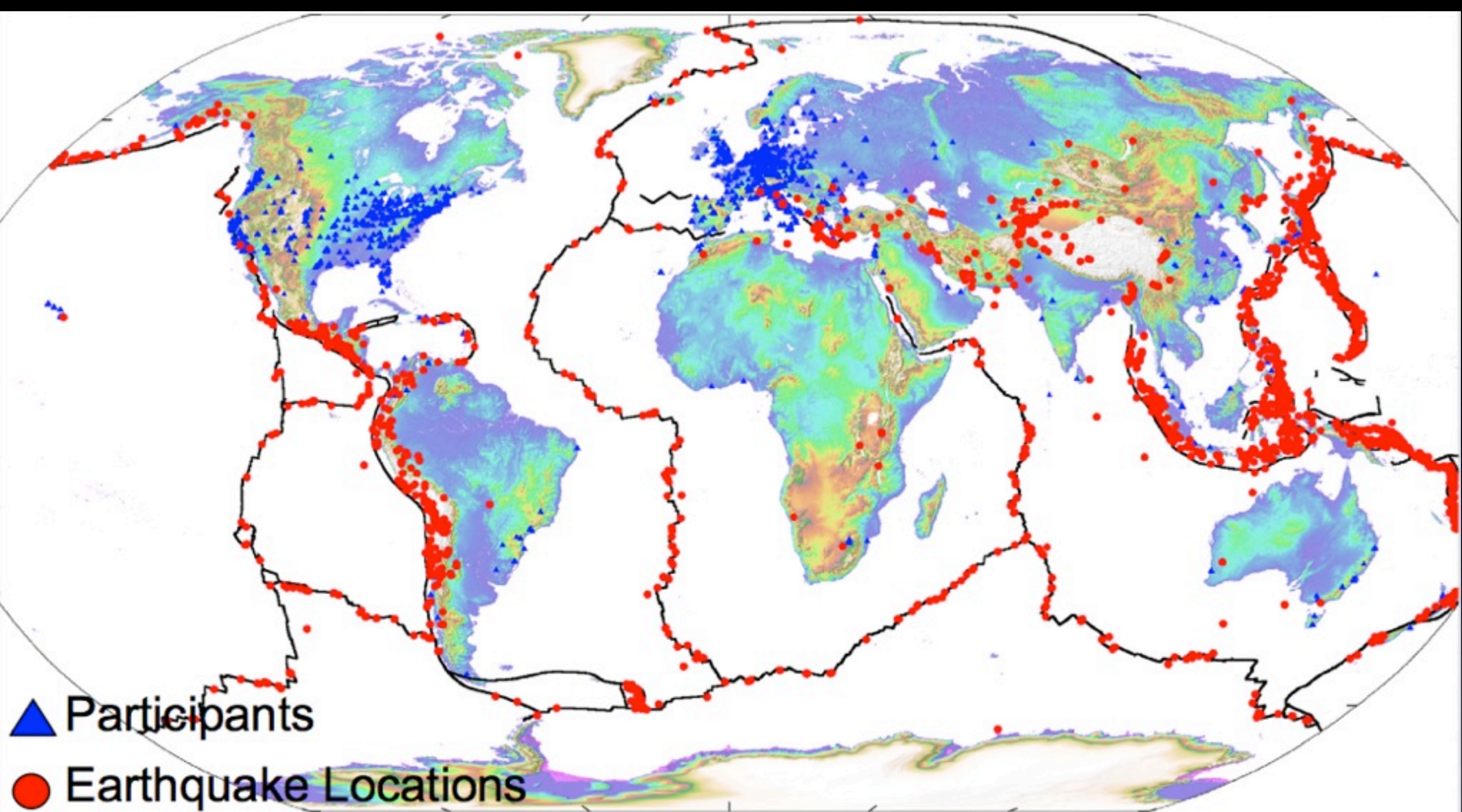
Volunteers donate CPU time to monitor sensors attached to their computer.

We use the Berkeley Open Infrastructure for Network Computing (BOINC) open-source distributed computing platform

Advantages:

- 1) Reduced infrastructure costs (existing networked computers process data and send information to us)
- 2) Easy to modify software and push changes to participants





CURRENT NETWORK

2000+ STATIONS GLOBALLY IN 67 COUNTRIES

ISGC 2011

Adopting Infrastructure as Code at GSI

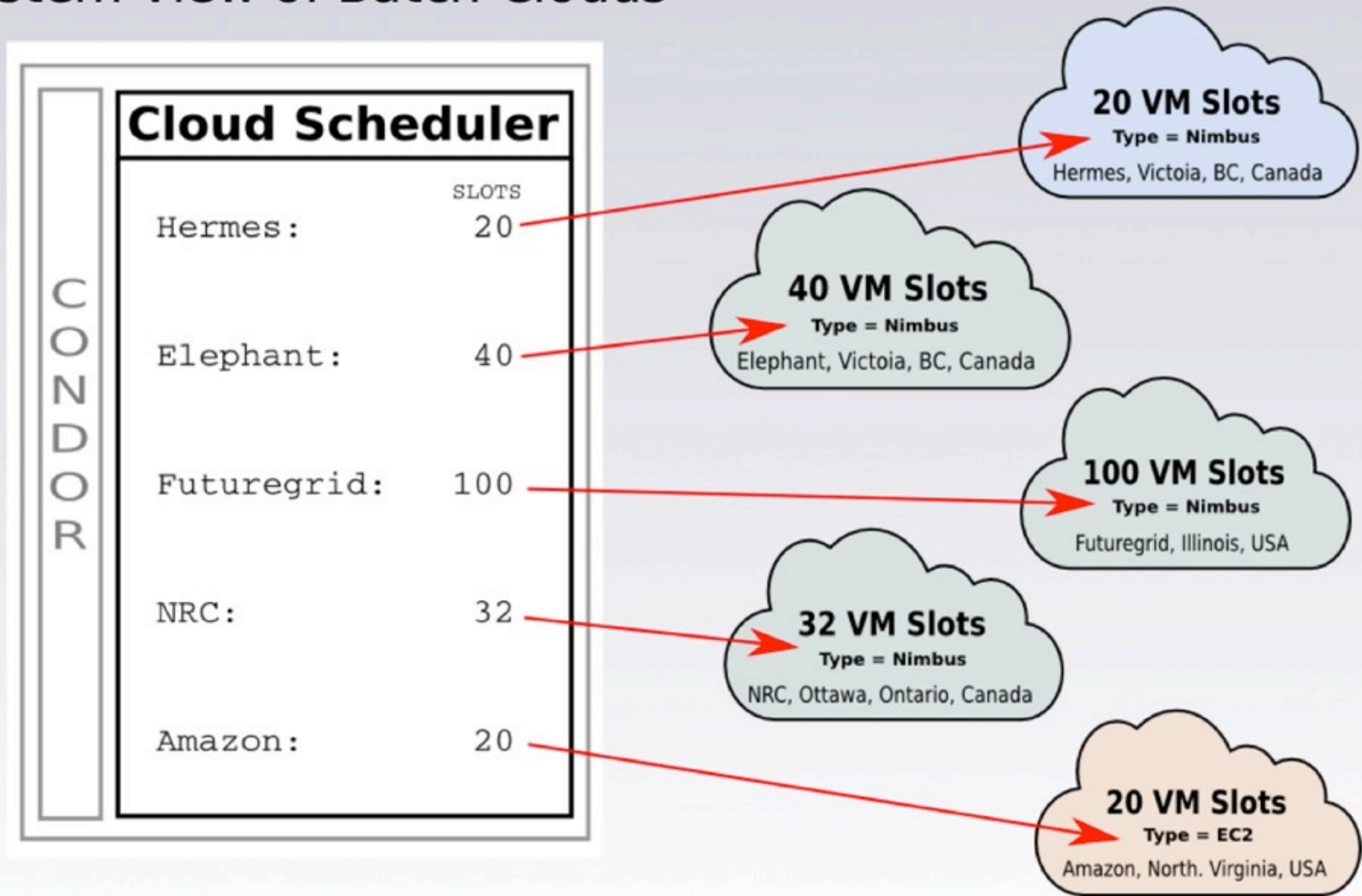
PoD

- Talk (HEP Applications).
- LIVE DEMO.
- After-session demos and hands on.

“Batch” Cloud

BaBar user analysis in a Distributed Cloud

System View of Batch Clouds



Sample Condor Job File (red text required for batch clouds/Cloud Scheduler)

```
Universe          =          vanilla
Log               =          SP-3429-Tau11-Run2-R24a3-3.l1341
Output            =          SP-3429-Tau11-Run2-R24a3-3.o1341
Error             =          SP-3429-Tau11-Run2-R24a3-3.e1341
Input            =          a52.tcl
should_transfer_files =      YES
when_to_transfer_output =    ON_EXIT
environment       =          CLUSTERID=1341
```

```
Requirements = VMType =?= "rsobie/rjs1"
+VMLoc        =          "http://elephant01.heprc.uvic.ca/api/images/raw/rsobie/rjs1"
+VMCPUArch    =          "x86"
+VMStorage    =          "1"
+VMCPUCores   =          "1"
+VMMem        =          "2555"
+VMAMI        =          "ami-64e1a0d"
+VMInstanceType =          "m1.small"
+VMJobPerCore =          True
```

```
getenv         =          True
```

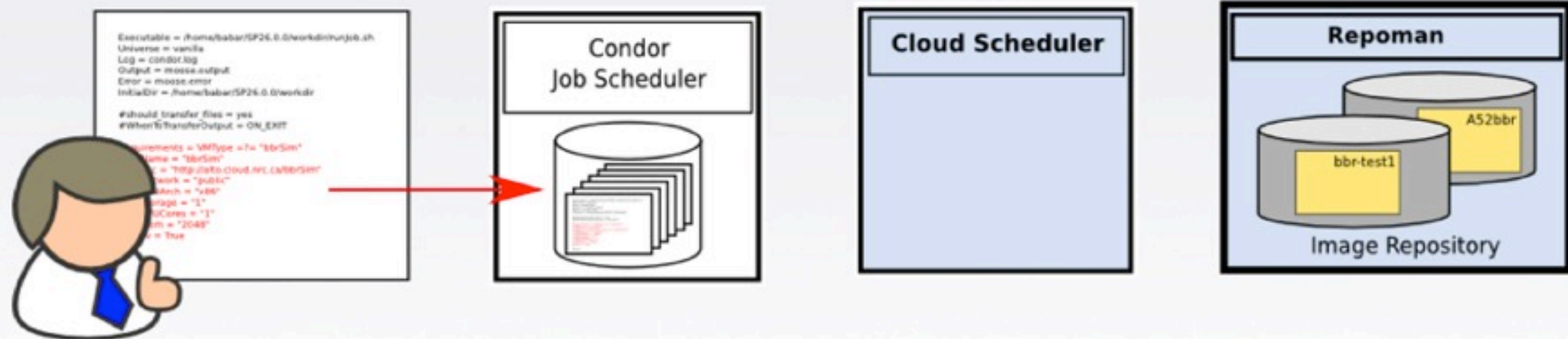
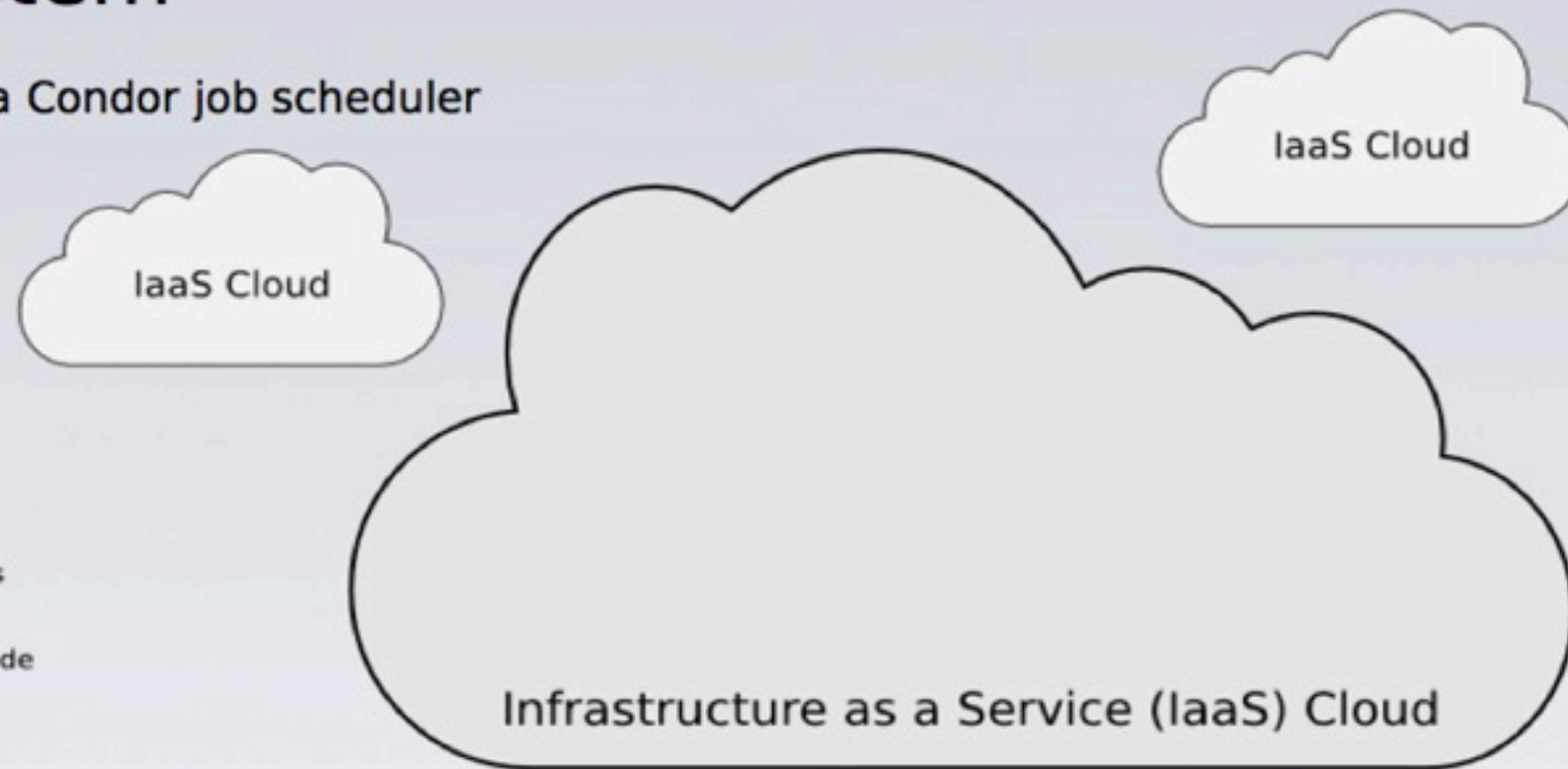
```
Queue
```

The Batch System

User submits jobs to a Condor job scheduler

Legend:

- User environments
- UVIC developed code



Components & References

- Open Source code developed by University of Victoria:
 - Cloud Scheduler $\geq 0.11.1$, <https://github.com/hep-gc/cloud-scheduler>
 - Repoman, <https://github.com/hep-gc/repoman>
- Other Open Source components used:
 - Scientific Linux 5.x (Xen, KVM), <http://www.scientificlinux.org>
 - Nimbus ≥ 2.5 , <http://www.nimbusproject.org>
 - Condor ≥ 7.4 , <http://www.cs.wisc.edu/condor>
 - MyProxy, <http://grid.ncsa.illinois.edu/myproxy>
 - Xrootd, <http://xrootd.slac.stanford.edu>
 - Lustre $\geq 1.8.3$, http://wiki.lustre.org/index.php/Main_Page
 - Squid 2.7.STABLE8, <http://www.squid-cache.org>
 - Munin 1.4.5 (epel repository), <http://munin-monitoring.org>

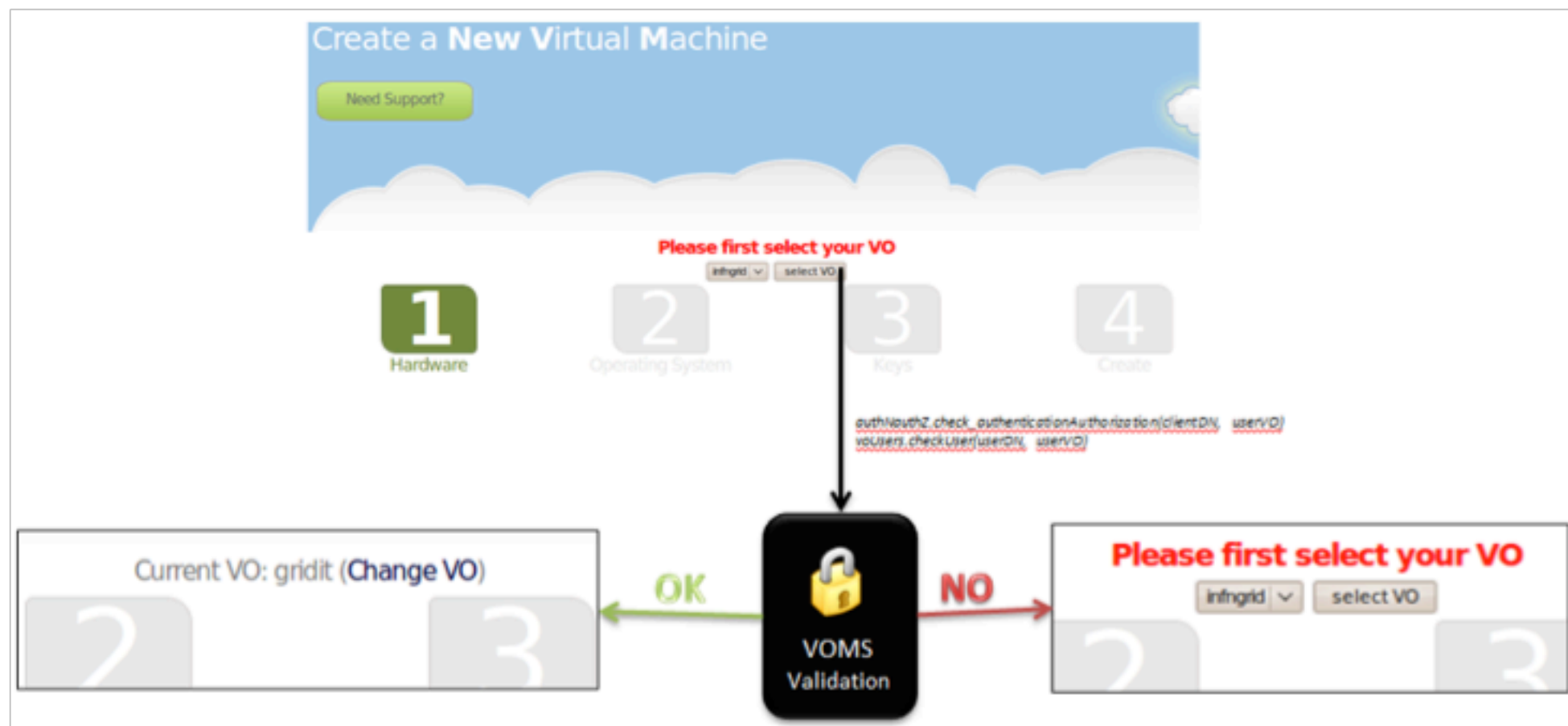
WNoDes Virtualized Cloud Resources

(The INFN Worker Nodes on Demand
Service)

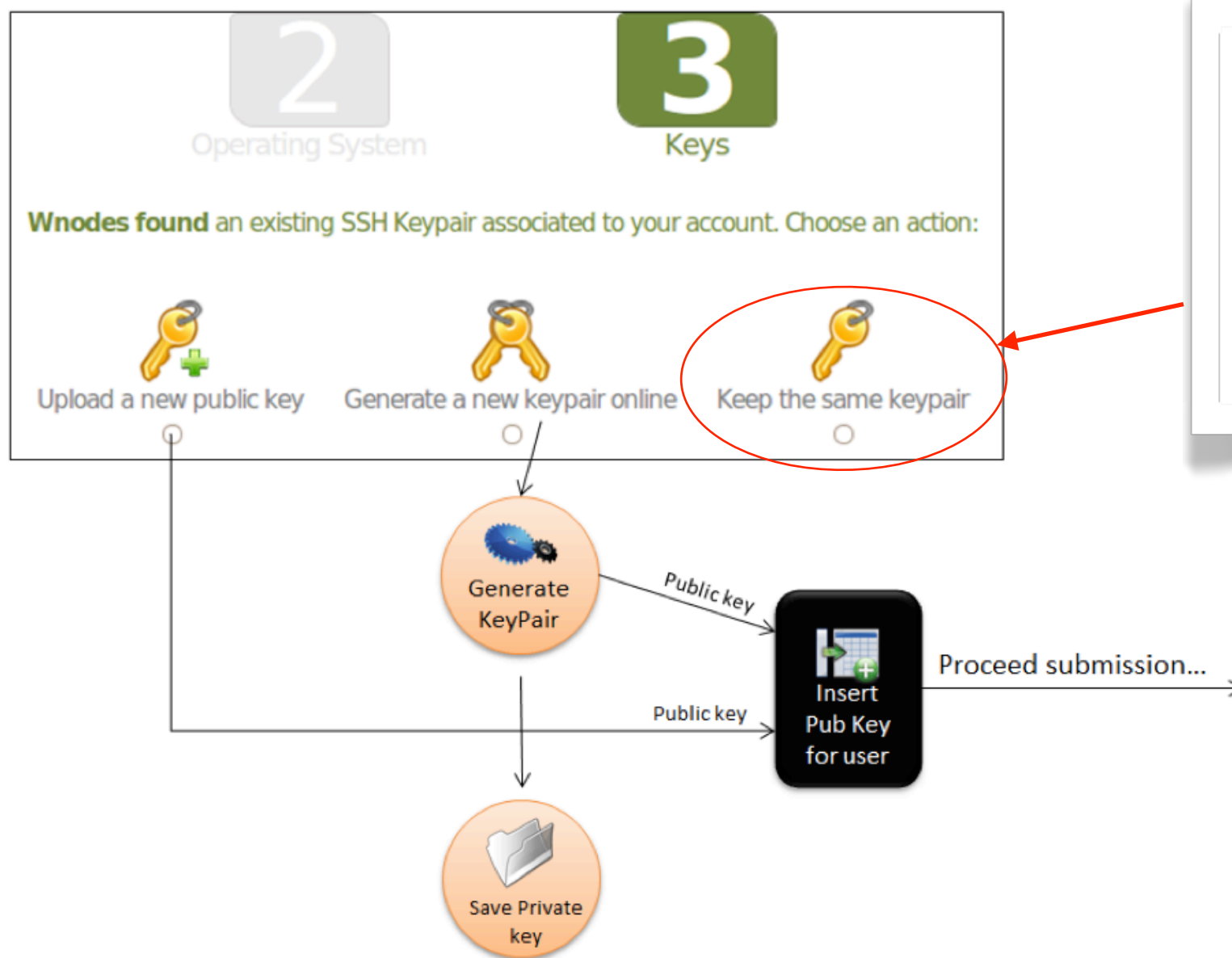
- Uses Linux KVM to virtualize resources on-demand; the resources are available and customized for:
 - direct job submissions by local users
 - Grid job submissions (with direct support for the EMI CREAM-CE and VOMS components)
 - instantiation of Cloud resources
 - instantiation of Virtual Interactive Pools (VIP)
- VM scheduling is handled by a LRMS (a “batch system software”)
 - No need to develop special (and possibly unscalable, inefficient) resource brokering systems
 - The LRMS is totally invisible to users for e.g. Cloud instantiations
- No concept of “Cloud over Grid” or “Grid over Cloud”
 - WNoDeS simply uses all resources and dynamically presents them to users as users want to see and access them

The Cloud Web Interface

- Integrated VOMS / gLite Argus support
 - VO selection validate through VOMS servers
 - Resource usage (wallclock time) billed to the VO
 - Access authorization based on policies defined on an Argus server



Public/Private ssh keys



Single sign-on (reusing an ssh key pair)

The ssh public key is put by WNoDeS on the created VMs using `libguestfs`