“Ruđer Bošković” Institute
Electronic department
and Computing centre

GRID for Scientific and Economic development of Croatia

Our aspiration

Karolj Skala

Grid logo
Celebrum/globus
Evolution time base

- **1980s:** Internet (e-Mail)
- **1990s:** Web (e-Information)
- **2000s:** GRID (e-Science)
- **2010s:** SGRID (e-Society)
Grids are "super Internets" for high-performance computing: worldwide collections of high-end resources - such as supercomputers, storage, advanced instruments and immersive environments. These resources and their users are often separated by great distances and connected by high-speed networks.
TeraGrid
Croatian infrastructure as a part of European telecommunications
Communication infrastructure

• From 1991 to 2001 realised fiber optical infrastructure across the Croatia

• Total length 18 000 km (in plastic pipe)

• Monomodal optical fibre (1300 i 1550 nm).
Optical cable diversity

Optical cable length per surface unit km/km²
(source: Telecom Operators Companies Annual Reports)
The possible CRO GRID optical backbone

New Grid WAN
University centers:
Zagreb, Split, Rijeka,
Osijek, Varaždin

- Realised
- In realisation
- In plane 2002

(fiber: ITU.T G.652)
QoS paradox
Gb Campus Horvatovac
IRB optical LAN
Cluster computing

- 3 clusters: IRB and 2 extensions GF and Cibona
  - IRB
    - Computing nodes: 18 with dual P4 1 and 1.8 GHz
    - Operating systems: linux 7.2
    - Nerworks: Gigabith Ethernet, IP networks
  - GF
    - Computing nodes: 15 with P3 933 MHz
    - Operating systems: linux 7.2
    - Nerworks: Gigabith Ethernet, IP networks
  - CIBONA
    - Computing nodes: 45 with P4 1.5 GHz
    - Operating systems: linux 7.2
    - Nerworks: Gigabith Ethernet, IP networks
    - 10 Mb atmosferic laser link
    - 6 Mb microwave links
Cluster grozd.irb.hr
Cluster farm integration
Wireless LAN extension
Cluster grow

![Cluster growth chart](chart.png)

- **Ukupna frekvencija procesora [GHz]**

- **Datum postavljanja**
  - 1. 9. 2001.
  - 1. 4. 2002.
  - 1. 5. 2002.
  - 1. 8. 2002.
  - 1. 10. 2002.
  - 1. 11. 2002.

- **Cluster Types**
  - Cibona-grozd
  - GF-grozd
  - FK-grozd
  - IRB-grozd

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Created by Neevia Personal Converter trial version
http://www.neevia.com
Scientific Campus Horvatovac

Greate aspiration to scientific grid applications in Campus

- Ruđer Bošković Institute
- Faculty of science
  - Physics
  - Mathematics
  - Biology
- Institute of Physics
- Medical school University of Zagreb
Scientific projects in Campus

- 260 projects in the Campus Horvatovac in field of:
  - Physics
  - Chemistry
  - Mathematics
  - Molecular-biology
  - Medicine
  - Electronics
  - Computer science
Main Grid applications
(Campus Grid & Cro Grid)

- Scientific cluster computing
- Scientific instruments in grid (NMR,..)
- Scientific databases
- Distributed Data Aquisition (Marine ecology..)
- Scientific visualisation
Grid Research Directions

- **Computational Grid** – natural extension of cluster computing (CAMPUS GRID)
- **Data Grid** – large computational task on large volumes of data (CRO GRID)
- **Knowledge Grid** – knowledge discovery in large data sets (Grid Miner)
  - Joint project with Institute for Software Science University of Vienna “Development of New Grid Technologies for Advanced Scientific and Engineering Application”
Scientific Campus Grid goals

- Metacomputing technology
- Distributed computing test bed (3C)
- High-speed computing (Globus)
- High throughput computing (Condor)
- Virtual laboratory (teleimmersion)
- e-Science centre
e-Science Pipeline

modeling

simulation

visualization

GRID
Scientific visualisation

- 2D/3D visualisation
- Dynamic grid visualisation
- Teleimersion visualisation
Generic IT development timeline

• **Infrastrukture**
  IRB LAN/optical backbone/active equipment/local UTP
  2001/2002

• **Tehnologija**
  Grid technology clusters, farms of clusters, middleware, grid services
  2003/2004

• **Applications**
  e-Science center /scientific applications
  2005—...
Orientation and collaboration

Orientation to Grid projects:
- Campus Grid Horvatovac (2002-2005)
  - GridMiner
- Cro Grid (start from 2003?)

Existing cooperations:
- Cern Data Grid,
- Austro-Croatian grid project (grid testbed and data mining)
  - GridMiner
- Collaboration with projects in Hungary (program paralelisation)
  - P-Grade (www.sztaki.hu)
- Southaphtton University - AccessGrid node in Zagreb
More Information

http://grid.irb.hr

http://cluster.irb.hr