

# The Grid activities in Italy

and the eBusiness

eIndustry

eGovernment

EScience and

Technology

(BIGEST) Italian Grid Initiative

Athens - June 2003

Mirco Mazzucato

INFN-Padova

[mirco.mazzucato@pd.infn.it](mailto:mirco.mazzucato@pd.infn.it)

# Summary

- The general case for Grids
- The national Italian grid strategy
  - The evolution of the national projects:
    - INFN Grid, FIRB Grid.it, PON S-PACI
- The new IG-BIGEST initiative for FP6
- The current challenges
- Conclusions

# Why Grids are generally interesting ?

- Italy started to develop the Grid technology and related infrastructures in the second half of 1999 (INFN Grid). Main motivations:
- Modern fundamental Science requires more and more global collaboration (eScience) : improve efficiency, avoid effort duplication, combine distributed expertise (INFN has 25 sites), build up critical mass....
- The scientific world and modern societies have to face the large development of digital instruments which produce an enormous amount of distributed raw data
  - High Energy Physics detectors: 10 PBytes/year in 2007
  - Earth Observation satellites: Envisat 500 TBytes/year now
  - Mammography screening of the population in Italy: 200TBytes/year
  - Genome databases now ~100TBytes... quickly growing
  - .....
- These raw data need to be transformed in precious piece of knowledge:
  - Laws of nature, new discoveries, innovative technologies, early cancer diagnosis ....
- Grids can provide a general technology to develop an infrastructure supporting this task

# ...not only for e-Science

- Also modern Industries, Business and Governments rely more and more on innovative processes which are increasingly based on the cycle:
  - Theoretical modelling of the problem
  - Simulation/Calculations of different options and input data
  - Selection of best solution
  - Realization
- and to keep competitiveness require to assemble quickly distributed teams in Virtual Organization accessing large computing resources, distributed data and using collaborative methods similar to eScience
- The Grid middleware can provide common services that all e-Science, e-Industry, e-Business and e-Government Grid applications can use
- as TCP/IP provides a common Internet access protocol to Science and Industry
- As the WEB provides a general solution which has allowed large scale economies and large synergies between different sectors of the society

# The Italian Grid National Strategy

- At the end of 1999 in Italy, after a careful evaluation, INFN Grid decided that Grids were the promising enabling technology for HEP and eScience in general.
- The development of all components of a national Grid infrastructure has been actively pursued, since then
  - Fostering the development of the Grid middleware and international integration through European funded projects
    - DataGrid, DataTAG....
  - leveraging from CERN managerial expertise
  - Promoting since the beginning the creation of European Standards
- Promoting the international collaborations (with US Globus, Condor, iVDGL, PPDG, GGF...) to allow worldwide interoperability
  - GLUE, World Grid, MAGIC....
- The national Grid infrastructure is now a reality constantly developed by a series of coordinated national projects
  - Garr (NREN) for the underline broadband Research Networking
  - INFN Grid, FIRB Grid.it, S-PACI PON for Grids
- integrated at international level through EU DataGrid, DataTAG ...



# Early Grid R&D in Italy : The INFN-GRID Project



- Early national Grid project approved in Europe: beg. 2000
- Focused on the preparation of the INFN LHC comp. infrastructure but aiming, since then, at a general solution
- The size of the project : 20 Italian Sites, ~100 people, ~ 50 FTE's
  - Budget of ~30 M€ devoted to the development of Regional Computing Centers and related collaborative Grid infrastructure
- It is a successful example of collaboration between physicists, sw engineers, computer professionals and computer scientists (CS Dep. of Universities of VE, PD, BO, CT, TO,...) and Italian Industries
  - DatamatSPA and Nice have been major contributors in the developments of the DataGrid middleware and have now top level expertise in Globus based Grid middleware at European and International Level
- It has realized now a reliable INFN grid infrastructure (20 sites) with necessary supporting general services

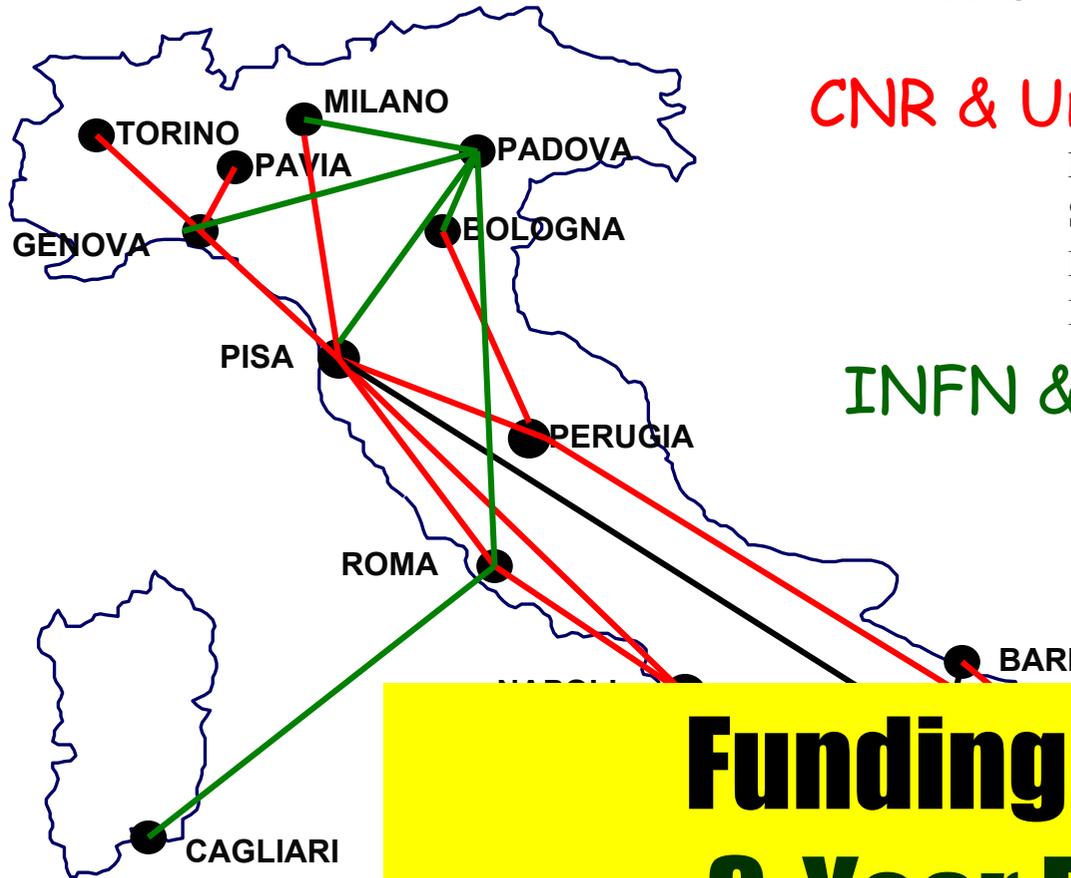
# From INFN Grid to an Italian Grid:

[www.pd.infn.it/biggest](http://www.pd.infn.it/biggest)

## The FIRB Grid.it Project

FIRB: Fondo per gli Investimenti della Ricerca di Base (fondi MIUR da UMTS)

# The Grid National Program



## CNR & University

HPC, Parallel Programming, Grid computing,  
Scientific libraries, Data base and knowledge discovery,  
Earth Observation, Computational chemistry,  
Image processing, ...

## INFN & University

Grid infratructure(INFN-Grid, DataGrid, DataTag) ,  
e-science applications: Astrophysics,  
Bioinformatics, Geophysics, ...

**Funding: €8.1 M**  
**3-Year Project**  
**Start-up: November 2002**  
**UR INFN: €1.58M**

# The national Grid.it eInfrastructure

- In Grid.it INFN is responsible for the creation of a national Grid Infrastructure and for studying and prototyping a national Grid Operation Service (GOS)
  - The generalization of the infrastructure support is a model successfully established in Italy with the research network (GARR)
- The GOS will also support several Italian Sciences applications and the operation of the Italian infrastructure also in the context of the new European Infrastructure project EGEE
- The Italian eScience Grid.it infrastructure currently support:
  - Astrophysics
  - Biology
  - Computational Chemistry
  - Geophysics
  - Earth Observation
- but other sciences are joining thanks to new MIUR funds (e.g. new S-PACI and other PON projects)

# The Italian Grid for Business, Industry, Government, EScience&Technology (IG-BIGEST)

- It is a new national initiative leveraging from INFN, FIRB Grid.it and PON projects and aiming at coordinating all Italian Grid efforts in view of the participation to EU FP6 and international grid projects
- IG-BIGEST is coordinated by INFN and includes all Italian Sciences Institutions, major computing centers and many Industries ready to invest in early tests
- The IG-BIGEST main objectives are
  - To promote the creation of a general EU grid infrastructure for eScience integrating all available EU national infrastructures and open to industry early test . Make current Grid middleware robust and fault tolerant for this production infrastructure to allow to start EU eScience
    - ->EU eInfrastructure proposal: EGEE
  - To promote R&D on open Grid issues
  - To support development of specific components and usage of Grid by major applications in e-Science, eIndustry and eGovernment
    - ->New projects: SUGAR SSA.....

# Current Challenges for an EU eInfrastructure

- Grid infrastructures are now seen by many governments as a Science and society development enabling factor and large funds are made available in Europe but also in US (Cyber-infrastructure) and Japan..
- The Grid technology will become robust and stable thanks to new projects like EU EGEE
- EGEE will provide also:
  - effective integration of the national testbeds into an EU eInfrastructure
  - Development of user communities
  - Promotion of national and regional coordinating structures at technical level
- However the general managerial and administrative structure to support these developments in Europe is very weak(even if very good progress was done with EGEE)
  - Projects like EGEE have definite goals, are focused and ends
  - Cannot provide effective long term foundation for an EU eInfrastructure
  - Cannot provide EU wide roadmaps integrated with national programs
- Policies for resource sharing within communities having common objectives (VO), security issues, accounting etc start to be generally addressed only now and could cause an enormous waist of efforts if not generally addressed and supported at a general governmental level

# Summary and some answers

- Italy with the IG-BIGEST initiative, has set up a national level of coordination to actively and concretely promote with other EU partners, the development of ERA and of the related EU eInfrastructure supporting the development of EU wide eScience, eGovernment, eIndustry and eBusiness.
  - ERA and EU eInfrastructure should give Europe the edge on Scientific Research and Industrial/Commercial outreach, allowing the building up of critical mass in all domains
- It is now time for Europe to address also the issue of putting in place a solid foundation to the Grid level of the EU eInfrastructure: similar to what was done in the past with NREN, Dante and Geant,

# Grids and Networks

- An EU grid infrastructure foresees two major layers:
  - Networks
  - Grid middleware Services (Including Computing, Storages..)
- Tight collaboration between the two layers should be put in place preserving the different objectives and expertise
- Grid infrastructures desperately require L1, L2 and L3 end to end provisioning
  - L2 VPN between CNAF and CERN allows sustained 1 Gbps traffics
  - CMS already next year need to transfer several TB/day
  - L1 is a Grid dream and Grids would certainly favor a collaboration with telecom operators to develop a purely optical networking solution. Not pursuing these developments may be dramatic for EU
- Grids communities will certainly profit of IPv6 but cannot probably compete with mobile market requirements as driving force

# Final Conclusions

- Italy and IG-BIGEST will continue to promote at EU level all aspects of Grids development: R&D, S/W Engineering, deployment of infrastructure, operation, development of specific components for applications for eScience, eBusiness, eIndustry&Government, eHealth...
- The Italian Government encourages the constitution at EU level of appropriate level of coordinations and structures for Grids to
  - establish European roadmaps for the deployment of ERA,
  - related EU eInfrastructures
  - related Grid technology developments
  - promote and plan usage of EU eInfrastructure by application communities both scientific and industrial
  - address policies issues
- in agreement and well integrated with grid National programs