# Computing Coordination in Italy
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ICFA Workshop

Daegu-Korea

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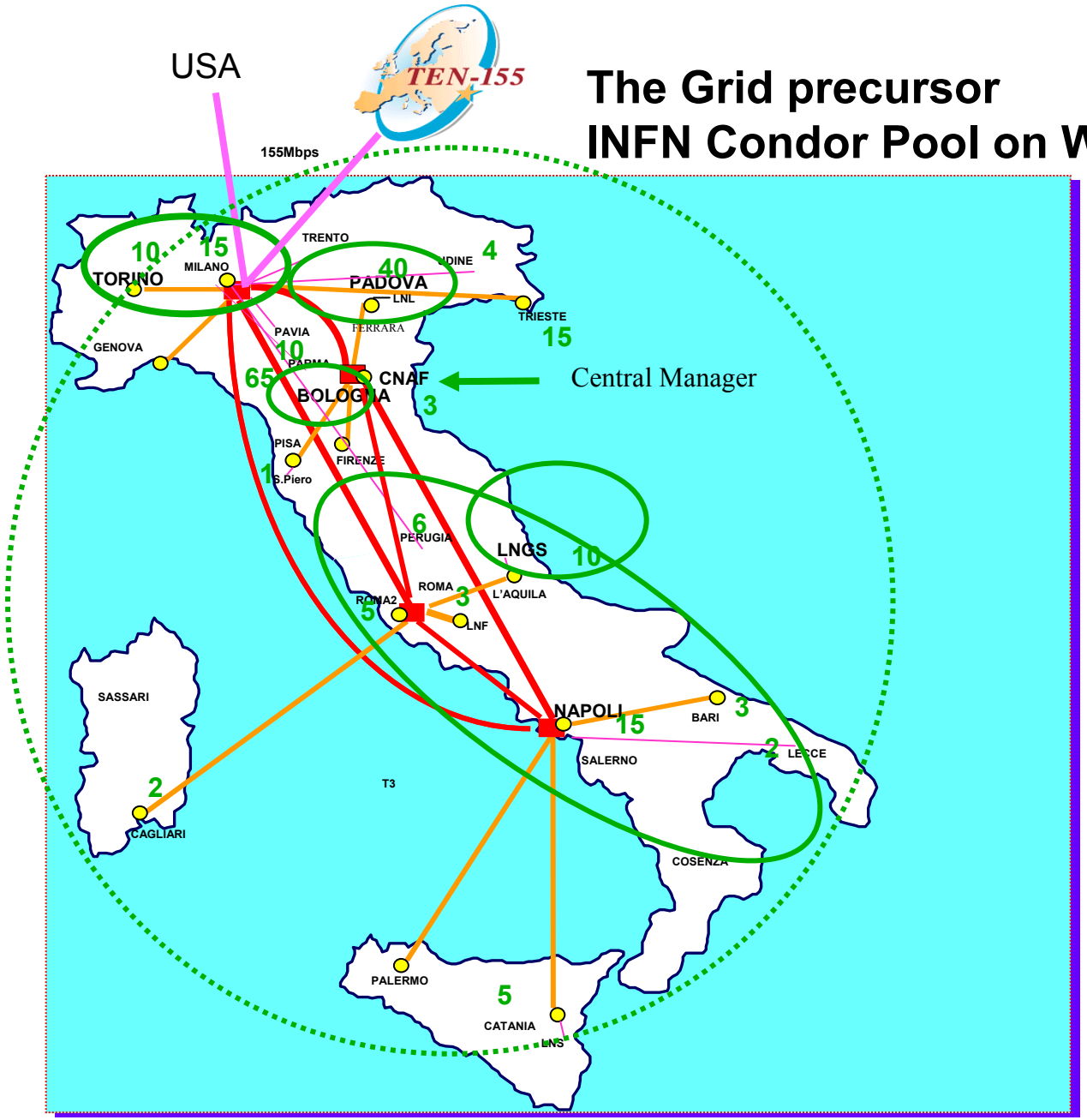
# Summary

- The Italian eInfrastructure evolution
  - The national projects:
    - INFN Grid, FIRB Grid.it,
- The INFN Middleware developments
- The c-Omega consortium for open Middleware support
- Conclusions

# The Grid precursor
# INFN Condor Pool on WAN: checkpoint domains




## GARR-B Topology

155 Mbps ATM based Network

access points (PoP)

main transport nodes

CKPT domain
# hosts

Default CKPT domain @ Cnaf

~500-1000 machines

6 ckpt servers ⇒ 25 ckpt servers

**In production > '98**

**Could not guarantee effective international resource sharing**

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

- National Grid project approved at beg. 2000
- Focused on the preparation of the INFN LHC comp. infrastructure
- The size of the project : 20 Italian Sites, ~100 people, ~ 50 FTE's
  - Budget devoted to the development of the LHC Regional Computing Centers and related collaborative Grid infrastructure
- ..but since the beginning the development of the middleware in INFN Grid was conceived as being of general use and has taken into account the requirements of other sciences
    - Biology (PD) and Earth Observation(Esrin-ESA-Frascati)
- 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,...), CNR, and Italian Industries
  - DatamatSPA and Nice have been major contributors in the joint developments of the Italian DataGrid middleware components
- INFN Grid has been and is the national container for INFN to coordinate the contribution to all EU and International Grid projects and to the GGF standardization
- Early R&D in Italy include work done in ISUFI (University of Lecce)
  - ->see S-PACI

# The INFN Grid project and the Italian eInfrastructure

1. INFN Condor on WAN (started 1996, operational in 1998)
   - Integrate ~ 20 sites CPU resources into a national pool with 6 Ckpt domains
2. National testbed to evaluate Globus services in 1999
3. INFN-GRID, INFN special project, (February 2000-…)
   - National Grid infrastructure driven by INFN experiments 2-3 M€/year+22 M€ T1,2
4. DATAGRID , CERN Coord. EU Project, 3 years duration 10MEuro(2001-2003)
   - European integration and new M/W services for HEP, Biology, EO
5. DataTAG, CERN Coord. EU project, 2 years duration 4 MEuro(2002-2003)
   - Optical networking 1TB/0.5 Hours and Interoperability with US Grid, GLUE
6. Grid.IT, National project 3 years (2003-2005) MIUR funds 8.1 MEuro
   - Towards a national production eInfrastructure
7. eBusiness, eIndustry, eGovernment, EScience and, Technology --> (BIGEST) Italian Grid Initiative (2003 ->)
   - Try to provide Coordination of national eInfrastructure activities
8. The Italian grid infrastructure in the new EU project EGEE(2004 ->) 32 MEuro: INFN, S-PACI, ENEA…link with CINECA for DEISA
   - The new production EU eInfrastructure for all Sciences and beyond
9. LCG: the world-wide Grid for LHC experiments (2002 ->)

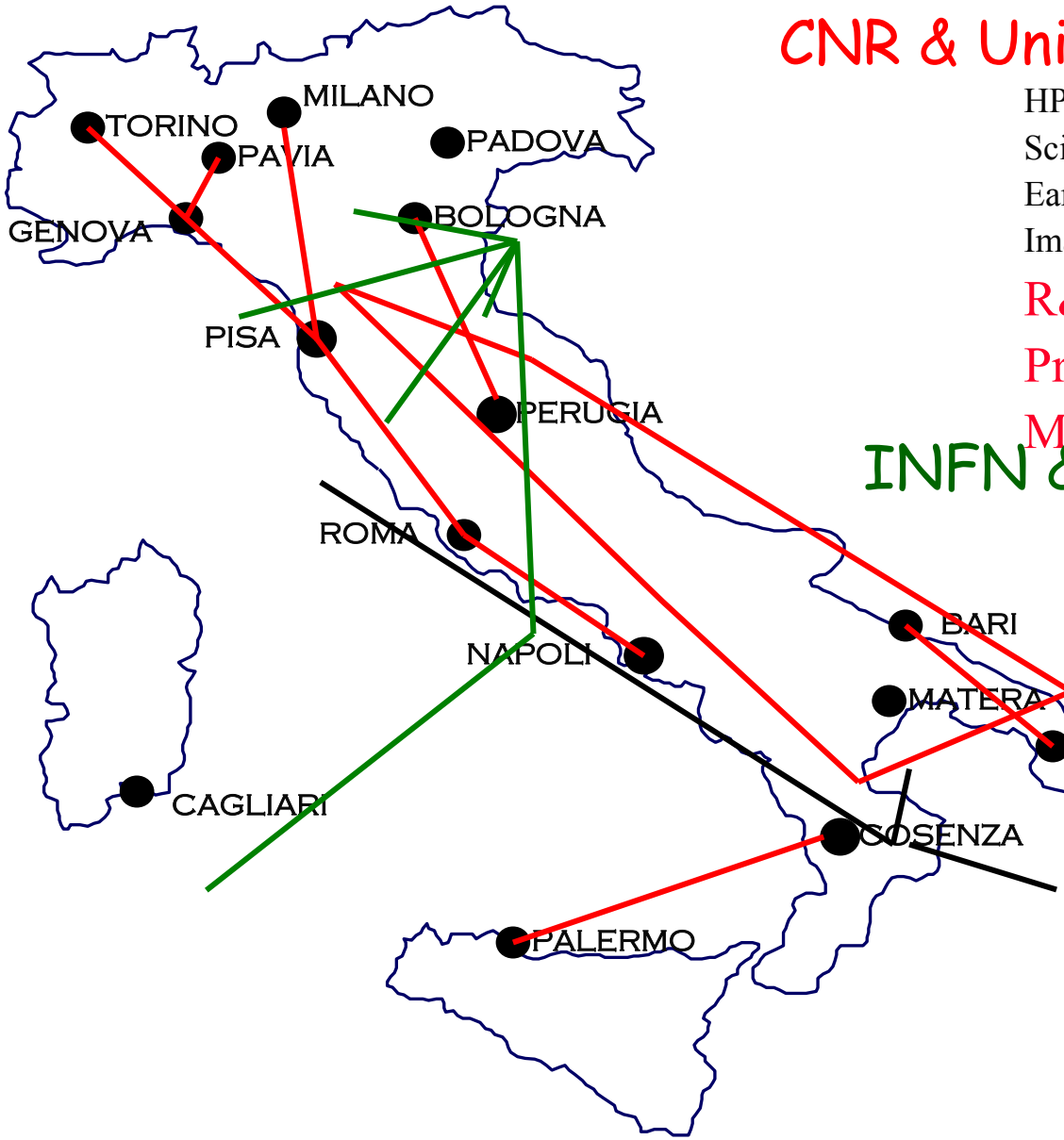
# From INFN Grid to an Italian Grid:

www.pd.infn.it/bigest

## The FIRB Grid.it Project

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

# The Grid.it National Project (8.1M€)




## CNR & University

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

R&D on next generation tools:

Programming languages

M.Vanneschi Coordinator

## INFN & University

Grid infratsructure(INFN-Grid, DataGrid, DataTag

e-science applications: Astrophysics,

Bioinformatics, Geophysics, …

R&D on National eInfrastructure

## ASI

Applications of
Earth Observation

## *CNIT*

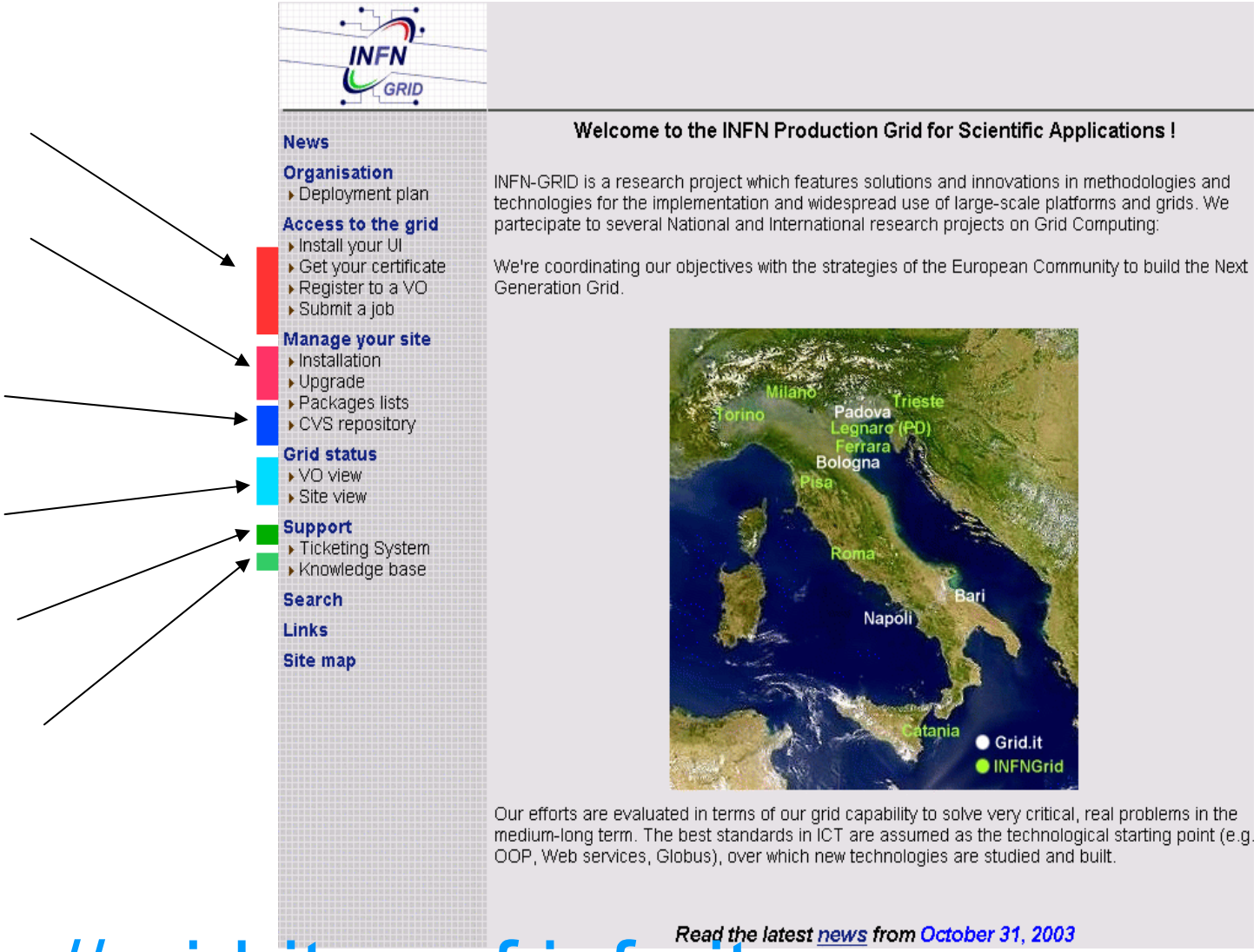
*R&D on optical networking*

# The national Grid.it eInfrastructure

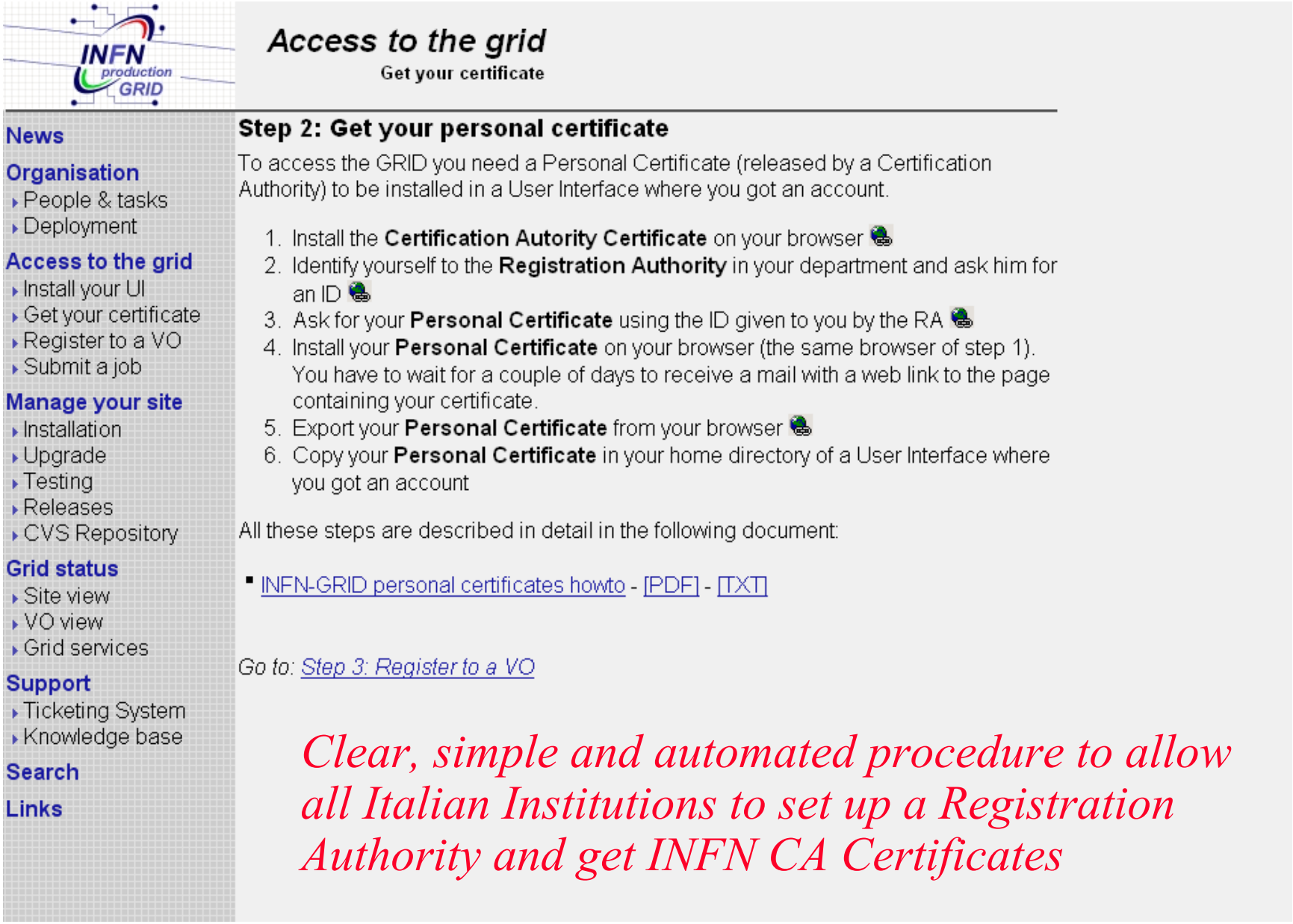
- In Grid.it INFN is responsible for the R&D of a national Grid Infrastructure and for studying and prototyping a national Grid Operation Service (GOS)
  - The generalization of the infrastructure support to other Sciences from INFN is a model successfully established in the past
  - Resources are provided by INFN and major Italian Centers
  - The GOS 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

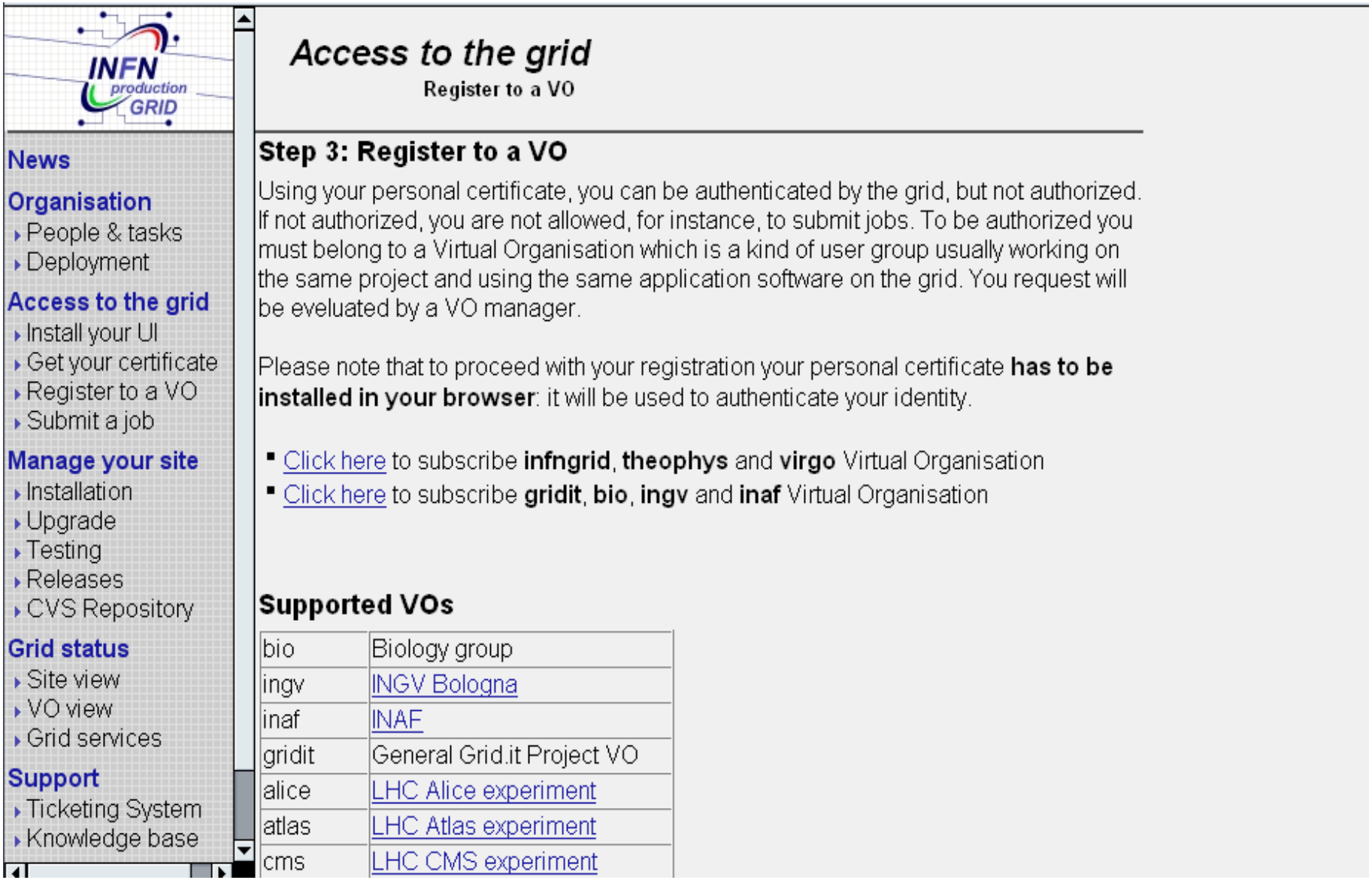
# Grid.IT Production Grid: Operations Portal

- User documentation
- site managers documentation
- Software repository
- Monitoring
- Trouble tickets system
- Knowledge base




http://grid-it.cnaf.infn.it


INFN production GRID
Access to the grid
Get your certificate
News
Organisation
People & tasks
Deployment
Access to the grid
Install your UI
Get your certificate
Register to a VO
Submit a job
Manage your site
Installation
Upgrade
Testing
Releases
CVS Repository
Grid status
Site view
VO view
Grid services
Support
Ticketing System
Knowledge base
Search
Links
Step 2: Get your personal certificate
To access the GRID you need a Personal Certificate (released by a Certification Authority) to be installed in a User Interface where you got an account.
1. Install the Certification Autority Certificate on your browser
2. Identify yourself to the Registration Authority in your department and ask him for an ID
3. Ask for your Personal Certificate using the ID given to you by the RA
4. Install your Personal Certificate on your browser (the same browser of step 1). You have to wait for a couple of days to receive a mail with a web link to the page containing your certificate.
5. Export your Personal Certificate from your browser
6. Copy your Personal Certificate in your home directory of a User Interface where you got an account
All these steps are described in detail in the following document:
INFN-GRID personal certificates howto - [PDF] - [TXT]
Go to: Step 3: Register to a VO
Clear, simple and automated procedure to allow all Italian Institutions to set up a Registration Authority and get INFN CA Certificates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Submit a job
Manage your site
Installation
Upgrade
Testing
Releases
CVS Repository
Grid status
Site view
VO view
Grid services
Support
Ticketing System
Knowledge base
Access to the grid
Register to a VO
Step 3: Register to a VO
Using your personal certificate, you can be authenticated by the grid, but not authorized. If not authorized, you are not allowed, for instance, to submit jobs. To be authorized you must belong to a Virtual Organisation which is a kind of user group usually working on the same project and using the same application software on the grid. You request will be eveluated by a VO manager.
Please note that to proceed with your registration your personal certificate has to be installed in your browser: it will be used to authenticate your identity.
Click here to subscribe infngrid, theophys and virgo Virtual Organisation
Click here to subscribe gridit, bio, ingv and inaf Virtual Organisation
Supported VOs
bio Biology group
ingv INGV Bologna
inaf INAF
gridit General Grid.it Project VO
alice LHC Alice experiment
atlas LHC Atlas experiment
cms LHC CMS experiment

# Italian Grid MW activities

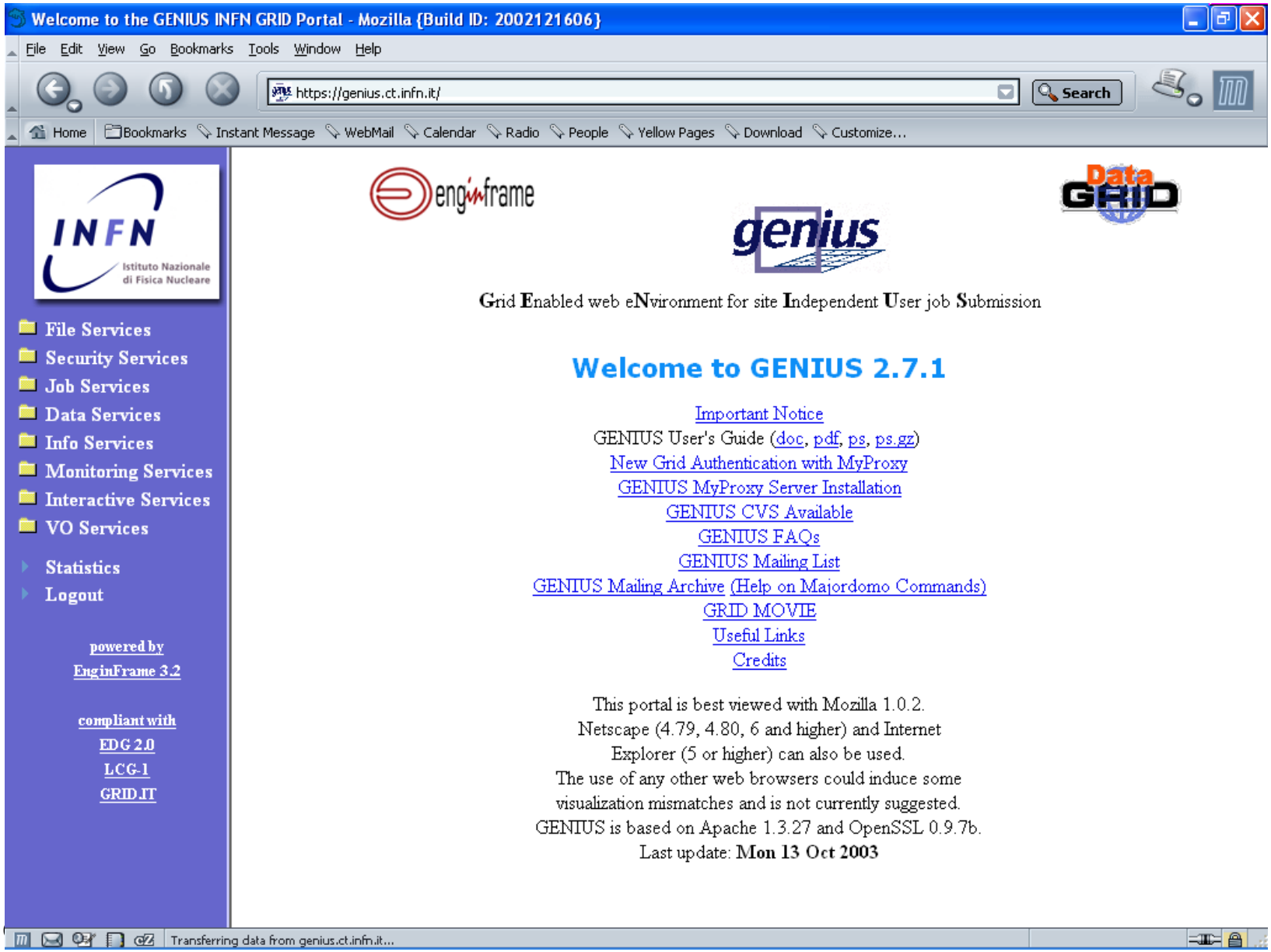
- INFN Grid had beteen the goals to promote innovation and exploiation of Grids in Industry, Business and Services(Hospitals, Administration, School)
  - INFN is realizing the Italian Hadron Therapy Facility, Sinchrotron Rad. Fac…
- MW components supported and released by INFN include
  - WMS: Workload Mangement Service (with EDG, LCG, EGEE) for distributed scheduling and resource management in a Grid environment
  - Data Management Services
    - Virtual Db replication and Replicas Consistency Service (with Grid.it)
    - SToRM: Storage Resource Management Service for Storage allocation and File pinning with SRM interface over Unix file systems (with Grid.it)
  - Portals and Grid User Interface: UI (with Datamat) , Genius Portal (with Nice)
    - With PDA and Cellular Phone interface
  - VOMS: VO oriented Authentication/Authorization Service (with LCG, EGEE, Grid.it)
  - GridICE: General Grid Monitoring Service (with LCG)
  - DGAS: Economy based Grid Accounting Service (with EGEE)
  - G-PBOX: VO oriented Policy enforcing framework (with Grid.it)
  - VO oriented User Support systems (with Grid.it)
- All are made available with the general Open Source Licence of EGEE, supported and evolving towards Web and "Grid Services"

# General User Interface : GENIUS PORTAL

## Jointly developed by INFN and Nice

- Based on WEB portal architecture
- Support for generic applications
- Basic Requirement: Grid transparent access
- It must be accessed from everywhere and by "everything" (desktop, laptop, PDA, WAP phone).
- It must be redundantly "secure" at all levels: 1) secure for web transactions, 2) secure for user credentials, 3) secure for user authentication, 4) secure at VO level.
- All available grid services must be incorporated in a logic way, just "one mouse click away".
- Its layout must be easily understandable and user friendly.

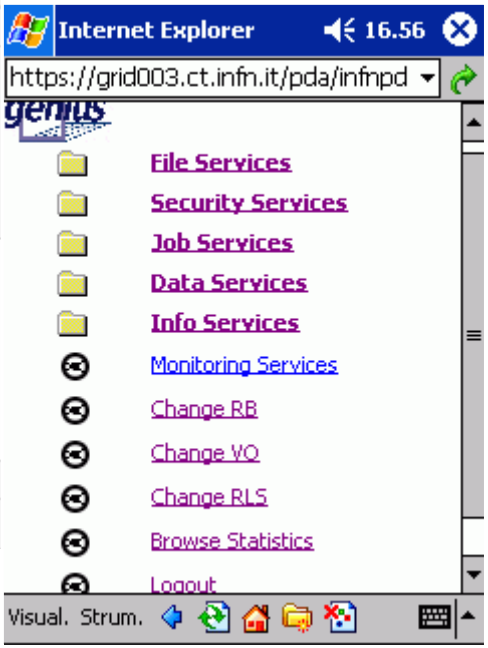
# GENIUS: interfaced to ~ 100 Grid services



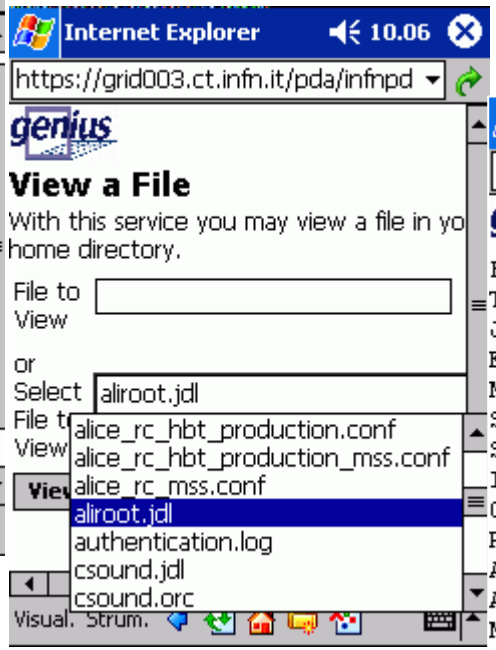
# GENIUS: PDA version (1)

## Home Page

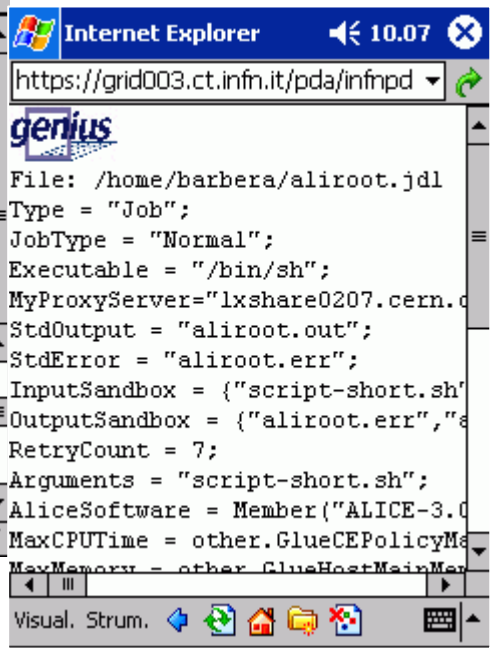

## Servizi



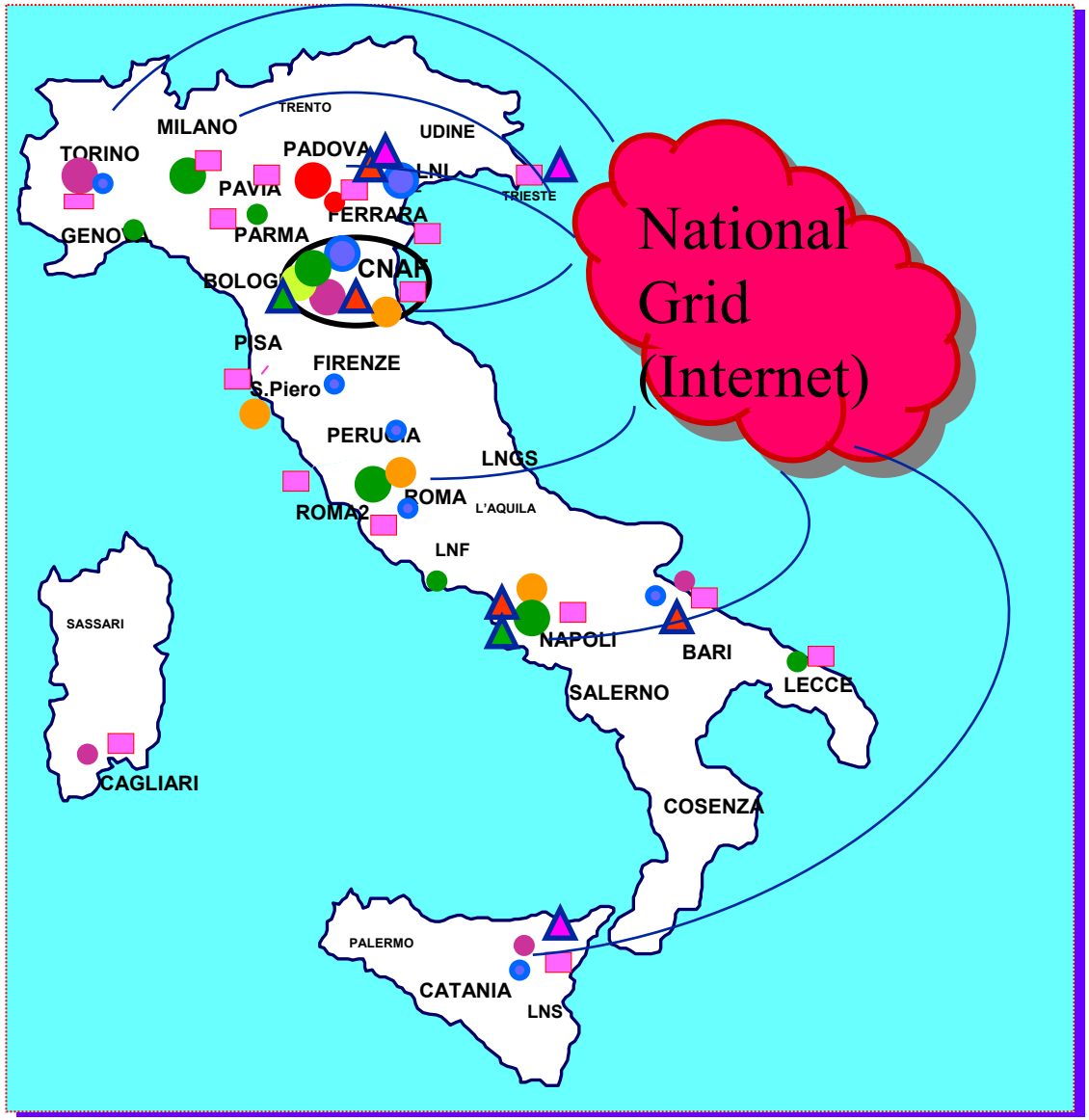

## Remote file browsing




## Remote file inspection



# Italian – Grid now *(Site/resource map)*




**INFN**

- CMS T2 — T2/3
- Atlas T2 — T2/3
- Alice T2 — T2/3
- LHCb T2 — T2/3
- Babar
- VIRGO

T2 (~150 nodes 50 TB)
T3 (10-15 nodes)
T1 Cnaf (~800 nodes, 220TB disk 1600 TB Tape MSS)

**grid.it resources**

- INFN (15-25 nodes)
- INAF (5-10 nodes)
- INGV (NEC computers),
- BIO (tbd)

general purpose resources (8-15 nodes)

Tot. ~ 2000 nodes, 4000 processors + S-Paci + ENEA+…

- INFN is a major EGEE/LCG resource provider
- The other components of the Italian eInfrastructure are the general Computing facilities as CINECA, Cilea, and …….

# The SPACI Consortium:

a flexible, robust, secure and scalable IT infrastructure

## Southern Partnership for Advanced Computational Infrastructure

*3 MEuro startup funds by MIUR*

*1.4 Tflops*


SPACI infrastructure part of the EGEE production Grid

**ISUFI/CACT**

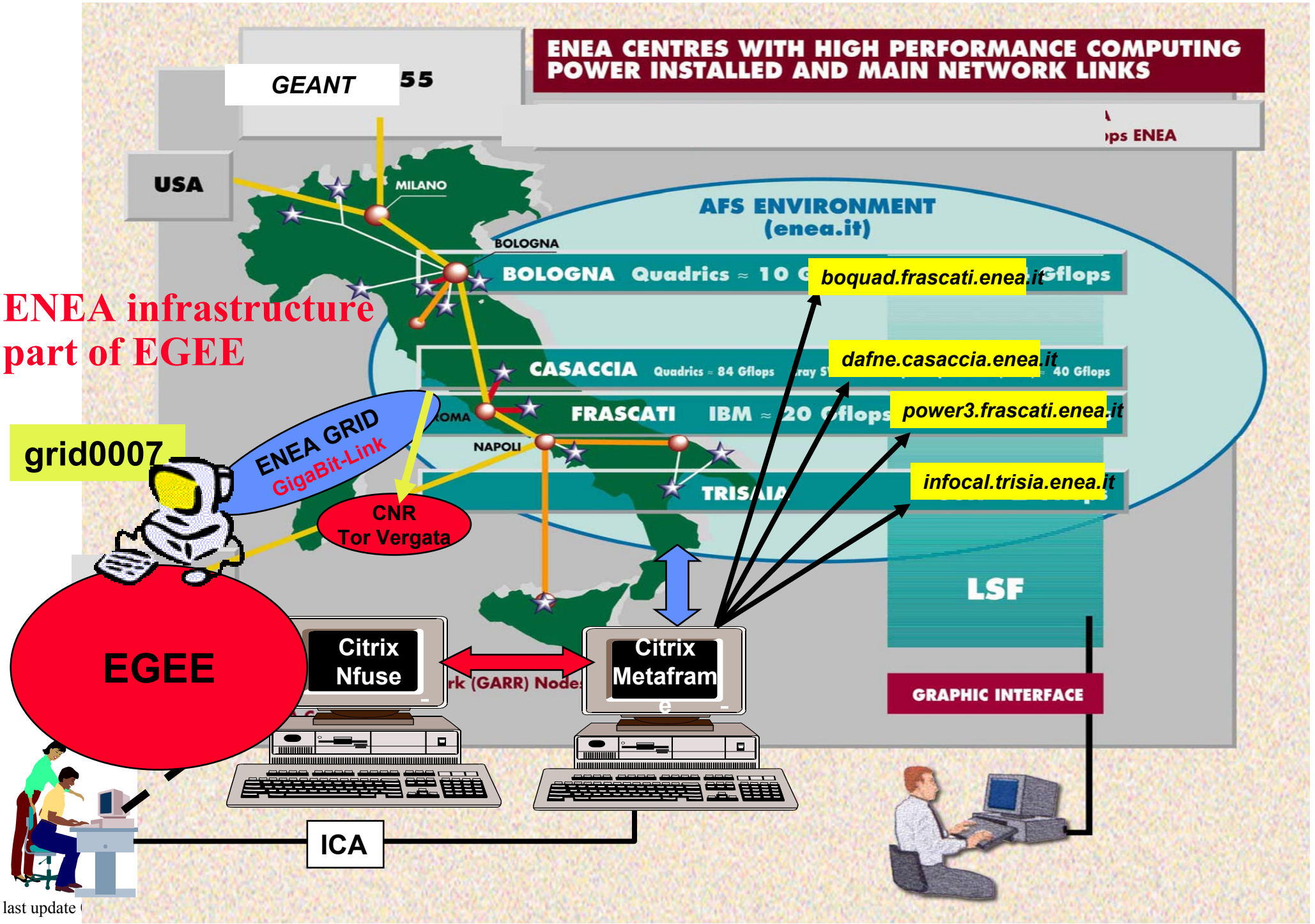
**Center for Advanced Computing Technologies**
**University of Lecce**
**Director: Prof. Giovanni Aloisio**

**DMA/ICAR**

**Dept. of Mathematics and Applications**
**University of Naples "Federico II" & ICAR (Section of Naples)**
**Director: Prof. Almerico Murli**

**MIUR/HPCC**

**Center of Excellence for High Perfomance Computing**
**University of Calabria**
**Director: Prof. Lucio Grandinetti**




# ENEA infrastructure part of EGEE

last update

# The strategy towards innovation and general Grid exploitation:C-OMEGA

- Leverage the large integration and standardization effort of international and national research projects like EDG, LCG, EGEE, AVO, Grid.it… to make available to Italian end user communities a coherent platform of interoperable "Grid Services" customized for Italian user applications
  - eSience Intitutions: HEP, Biology, Astophysics, Geophysics and Climate….
  - Early commercial adopters: StocK Exchange Db, Financial risk analysis
- Guarantee evolution and adherence to international standards
- The next step: The Consortium for the Open Mw Enabling Grid Applications (C-OMEGA)
  - Advanced negotiation with Government
  - Initial participation include all major Italian Research Institutions
  - 5-6 large Italian Companies
  - ~15 SMEs
  - The Italian Computing Consortia
  - Several Service Institutions: Health, Government
- Main goal of c-OMEGA is to support the innovation and exploitation process
  - Delivering and certifying a platform of Grid Services
  - Supporting pilot exploitation by Industry, Business and Services

# Conclusions

- First generation of Grid services are ready for production Grids and already currently in use in Grid.IT in Italy
- They are still evolving for more functionalities, robustness and security
  - Application as LHC experiments Data Challenges indicate clear directions for the evolution to satisfy those communities
- Some major services are still new or missing very important functionalities required by user communities
  - Metadata Catalogs, User defined collections, Reliable Data and Metadata replication services, Policy Framework……..
- Next major step now for INFN and Italy is towards: ***Bringing Grid & Web Services Together and developing still missing services***
- LHC experiments (~10K people) need to have a fully operational infrastructure in place for 2007. LCG/EGEE are concentrating on providing basic services especially those missing and a general Grid infrastructure
- Grid.it and INFN, ISUFI, ENEA,S-PACI Universities etc are the Italian reference
- The Consortium c-OMEGA should favor the transfer of HENP Grid achievements to the general society