



# HellasGrid - The National Grid Initiative in Greece

[www.hellasgrid.gr](http://www.hellasgrid.gr)

Fotis Karayannis  
HellasGrid Scientific Coordinator  
Greek Research and Technology Network - GRNET



# Outline

- ◆ GRNET overview:
  - ➔ Dual Mission: Research Networking and Grid infrastructure
- ◆ The HellasGrid National Grid initiative
  - ➔ Background
  - ➔ Infrastructure
  - ➔ Organisation
  - ➔ Statistics and applications communities
- ◆ HellasGrid as part of the European efforts
  - ➔ Networking and Grid projects
- ◆ Challenges/Experiences

# Outline

- ◆ **GRNET overview:**
  - ➔ Dual Mission: Research Networking and Grid infrastructure
- ◆ **The HellasGrid National Grid initiative**
  - ➔ Background
  - ➔ Infrastructure
  - ➔ Organisation
  - ➔ Applications communities
- ◆ **HellasGrid as part of the European efforts**
  - ➔ Networking and Grid projects
- ◆ **Challenges/Experiences**

# GRNET mission

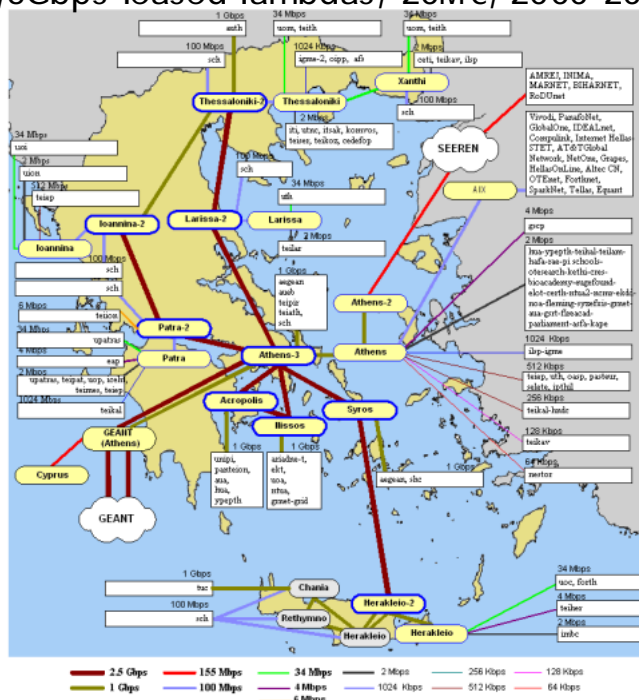
- ◆ State-owned company providing high-quality international and national *electronic infrastructure* services to the Greek academic and research institutions

➔ Initially focused on the *National Research and Education Network*

» Project management: certified by ISO 9001:2000

GRNET2:

2,5Gbps leased lambdas, 20M€, 2000-2005



GRNET3:

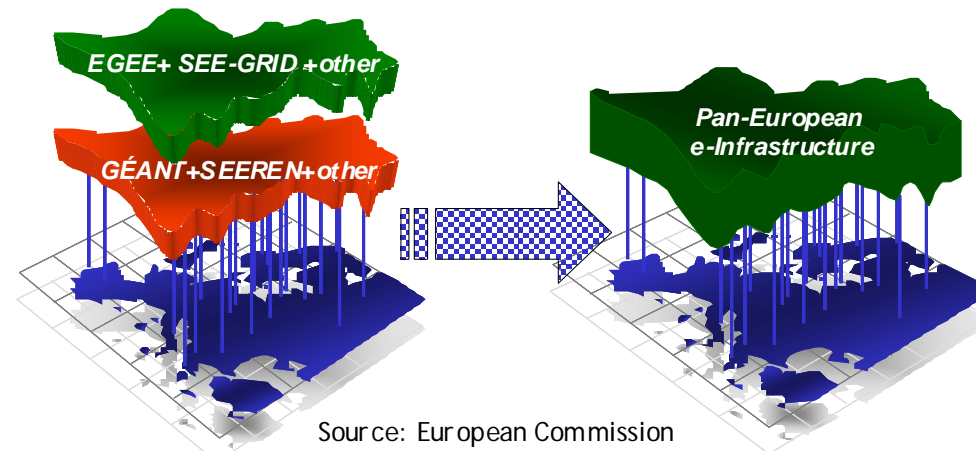
dark fibre based, 10Gbps capable, 30M€, 2005-2008



**Total of ~6.000 km of fiber**

# GRNET Dual Mission: Networks + Grids

- ◆ GRNET was one of the first NRENs in Europe to expand its services to high performance computing and the grid
  - ➔ Being infrastructure-oriented and application-neutral serving all user **e-Science** communities
  - ➔ Expanding its scope to e-Business and e-Government
- ◆ adopting the EU e-Infrastructure initiative:
  - ➔ The EU e-Infrastructures vision: Integrated **Networking + Grid (+ ..)** infrastructures



Source: European Commission

DG INFSOM Unit F3: Research Infrastructures

# Outline

- ◆ GRNET overview:
  - ➔ Dual Mission: Research Networking and Grid infrastructure
- ◆ **The HellasGrid National Grid initiative**
  - ➔ Background
  - ➔ Infrastructure
  - ➔ Organisation
  - ➔ Applications communities
- ◆ HellasGrid as part of the European efforts
  - ➔ Networking and Grid projects
- ◆ Challenges/Experiences

# HellasGrid Background

- ◆ GRNET proposed to the Ministry of Economy and Finance / Information Society Programme Authority to establish a Grid strategy board (Q4 2002)
  - ➔ Consultation meetings among major interested stakeholders
- ◆ HellasGrid Task Force appointed by the Ministry of Economy and Finance (January 2003)
  - ➔ A **strategy group**: High-level institutes' representatives
    - Chaired by Special Secretary of the Information Society
    - Co-chaired by GRNET chairman of the Board (Ministry of Development / General Secretary of Research and Technology)
  - ➔ Supported by a **scientific committee**
    - Technical group editing documents
- ◆ Produced a **strategy** document proposing a National Grid Project (November 2003)  
[http://www.hellasgrid.gr/content/downloads/Strategic\\_Doc\\_Final\\_English\\_no\\_reviews.pdf](http://www.hellasgrid.gr/content/downloads/Strategic_Doc_Final_English_no_reviews.pdf)
- ◆ Signed Memoranda of Understanding at the end of 2003
  - ➔ Bilateral agreements between GRNET and each institute, whose members were appointed in the Task Force



# The HellasGrid members

## ◆ Coordinator

- ➔ Greek Research and Technology Network, GRNET -[www.grnet.gr](http://www.grnet.gr)

## ◆ Universities (10)

- ➔ Aristotle University of Thessaloniki, AUTH [www.auth.gr](http://www.auth.gr)
- ➔ Athens University of Business, AUEB [www.aueb.gr](http://www.aueb.gr)
- ➔ National Technical University of Athens, NTUA [www.ntua.gr](http://www.ntua.gr)
- ➔ University of the Aegean [www.aegean.gr](http://www.aegean.gr)
- ➔ University of Athens, UoA [www.uoa.gr](http://www.uoa.gr)
- ➔ University of Crete, UoC [www.uoc.gr](http://www.uoc.gr)
- ➔ University of Ioannina, Uoi [www.uoi.gr](http://www.uoi.gr)
- ➔ University of Macedonia, UoM [www.uom.gr](http://www.uom.gr)
- ➔ University of Patras UPATRAS [www.upatras.gr](http://www.upatras.gr)
- ➔ University of Pireus UNIPI [www.unipi.gr](http://www.unipi.gr)

## ◆ Research Centres (8)

- ➔ Research and Academic Computer Technology Institute, CTI [www.cti.gr](http://www.cti.gr)
- ➔ Centre for Research and Technology Hellas, CERTH [www.certh.gr](http://www.certh.gr)
- ➔ Institute of Computer Science - FORTH, [www.ics.forth.gr](http://www.ics.forth.gr)
- ➔ Institute of Accelerator Systems and Applications, IASA [www.iasa.gr](http://www.iasa.gr)
- ➔ Institute of Communication and Computer Systems, ICCS [www.iccs.ece.ntua.gr](http://www.iccs.ece.ntua.gr)
- ➔ National Meteorology Service, EMY [www.emy.gr](http://www.emy.gr)
- ➔ National Observatory of Athens, NOA [www.noa.gr](http://www.noa.gr)
- ➔ Research Centre Demokritos, DEMOKRITOS [www.demokritos.gr](http://www.demokritos.gr)



# The HellasGrid Infrastructure

- ◆ **Pilot** Phase (Phase I): 0,5M€ 2003-2004
  - ➔ GRNET Pilot Infrastructure installation
    - Isabella site: 64 CPUs, 10 TB SAN, 12 TB Tape Library
    - Participation in EGEE proposal, Coordination of SEE-GRID
- ◆ **Consolidation** Phase (Phase II): ~2M€, 2004-2006
  - ➔ The HellasGrid project funded by MNEC
    - Extension of Grid infrastructure (~800 CPUs, 30TB disks, 60TB tape libraries)
    - Integration in EGEE
      - The HellasGrid MoU was used to form a Joint Research Unit (JRU)
    - GRNET provided a recognition letter by the Ministry after EC request
    - Further application support (~0,5M Euros) - GRID-APP project  
[http://www.gsrt.gr/default.asp?V\\_ITEM\\_ID=4318](http://www.gsrt.gr/default.asp?V_ITEM_ID=4318)
- ◆ **Extension** Phase (Phase III): 2007-2008 ~2,5M€
  - ➔ Extension of the Grid infrastructure including a pilot high performance computing site (under way)
    - ~2800CPUs-20TB disks~2M€
    - GRNET Simple Storage (GSS) - 145TB disks ~ 0,5M€

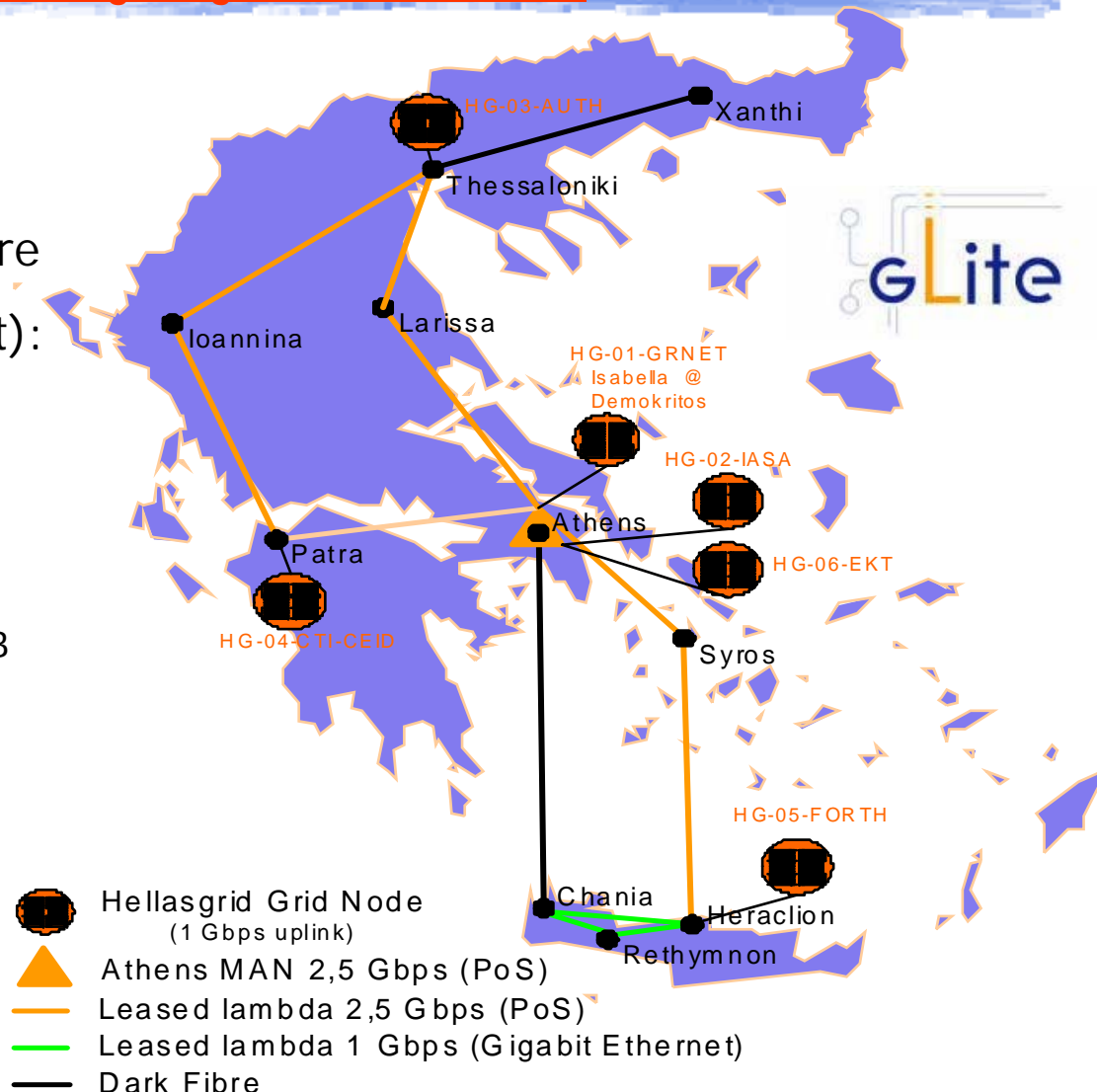




# HELLASGRID (HG) infrastructure

<http://www.hellasgrid.gr/infrastructure>

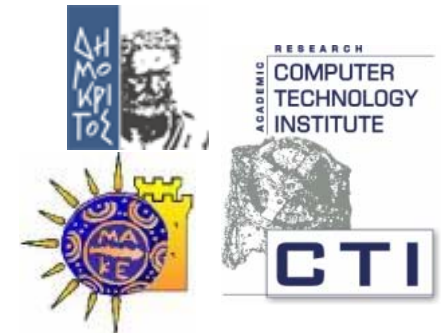
- **HG-01** cluster (pilot phase):
  - @Demokritos - Athens
  - 64 CPU, 10TB FC SAN, 12TB Tape Library, gLite middleware
- HG02-HG06 clusters (HG project):
  - Athens (NDC/EKT, **IASA**)
  - Thessaloniki (AUTH)
  - Crete (**ICS-FORTH**)
  - Patras (**CTI**)
- ~800 CPUs (x86\_64, 2 GB RAM, 80GB HDD, 2x Gbit)
- ~30 TBytes total raw SAN storage capacity
- ~80TBytes Tape Library
- 4 Access Grid nodes
  - Athens, Thessaloniki, Crete



# HG organisation: Teamwork!

- ◆ Overall coordination: GRNET headquarters
- ◆ Cooperation with HellaGrid partners:
  - ➔ Main site + ROC operator : HG-01-GRNET
    - Isabella, CSLAB@ICCS/NTUA Athens
  - ➔ HG-02...HG-06 sites + operation centers
    - NDC/EKT, IASA, AUTH, FORTH, CTI
  - ➔ 5 smaller private sites
    - AUTH, UoMacedonia, ICS FORTH, Demokritos, HEP-NTUA
  - ➔ HG CA and VOMS
    - GridAUTH, Dept. of Physics, AUTH
  - ➔ HG helpdesk
    - CTI, Patras
  - ➔ Regional monitoring tools
    - ICS-FORTH, Crete
  - ➔ HG user and application support
    - Demokritos + all site teams
  - ➔ 4 AccessGRID sites

**CSLab**



**Distributed Model: Geographical + Functional distribution**

**6 HellasGrid+5 private sites ~1000 CPUs in total**



# Hellasgrid Sites



HG-06-EKT

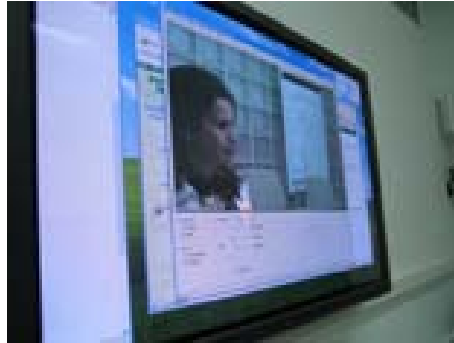
[http://www.cslab.ece.ntua.gr/~azisi/2006-06-02\\_HG-06-EKT.zip](http://www.cslab.ece.ntua.gr/~azisi/2006-06-02_HG-06-EKT.zip)

IBERGRID Conference, Santiago de Compostela, 14 May 2007





# AccessGrid



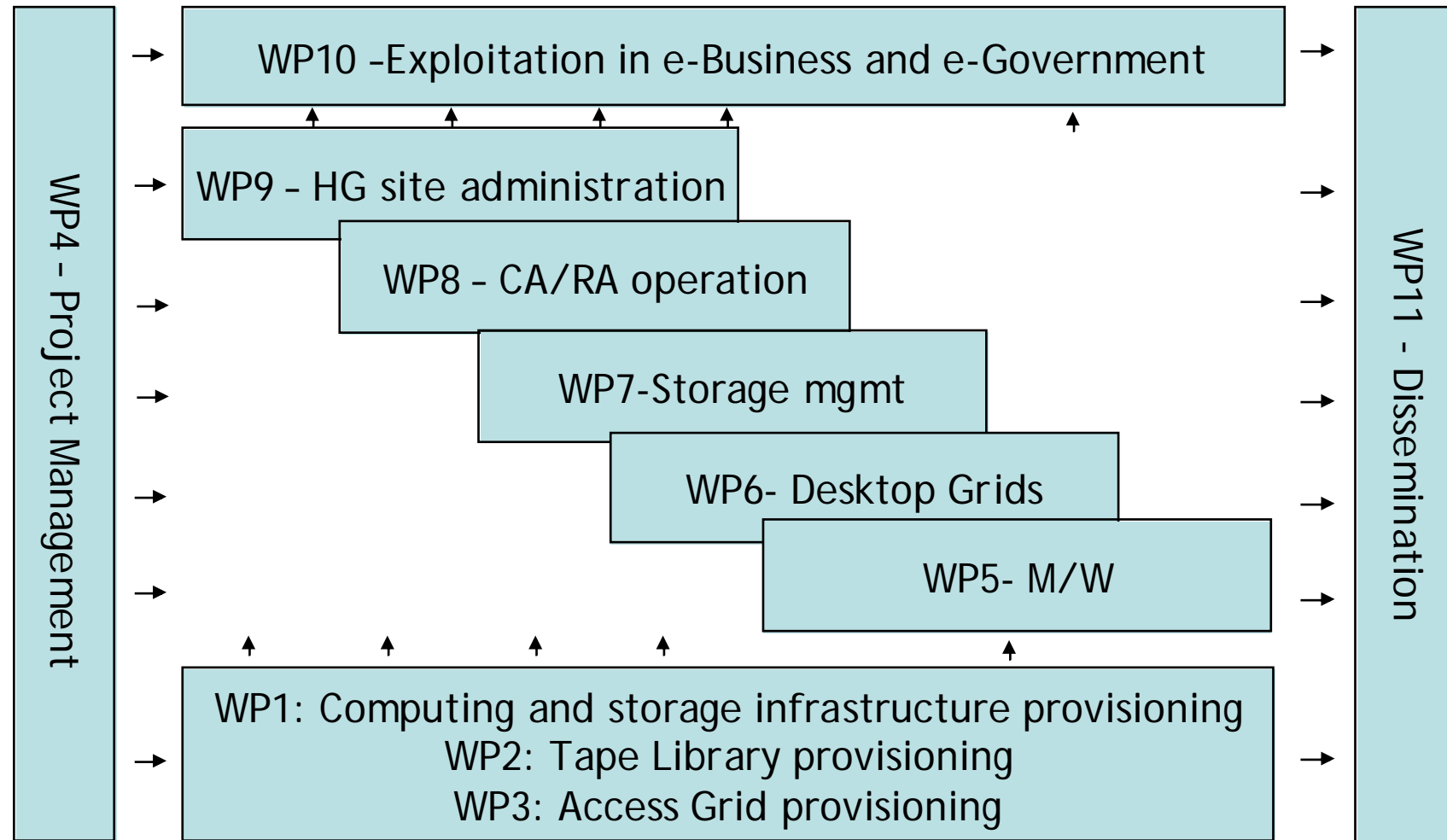
<http://www.ics.forth.gr/dcs/accessgrid.html>



# HG infrastructure hosting policies

- ◆ Hellasgrid equipment has been procured and is owned by GRNET
- ◆ Service Level and Policy Agreements for the sites have been signed with the hosting institutes
  - ➔ Sites support all applications
- ◆ Hosting institutes are usually part of the operational teams
- ◆ Hosting institutes cover the site preparation (CAPEX) and operational costs (OPEX)
  - ➔ Power supply, Air conditioning, UPS
- ◆ Site construction and preparation proved quite slow and complex

# HG Work Packages



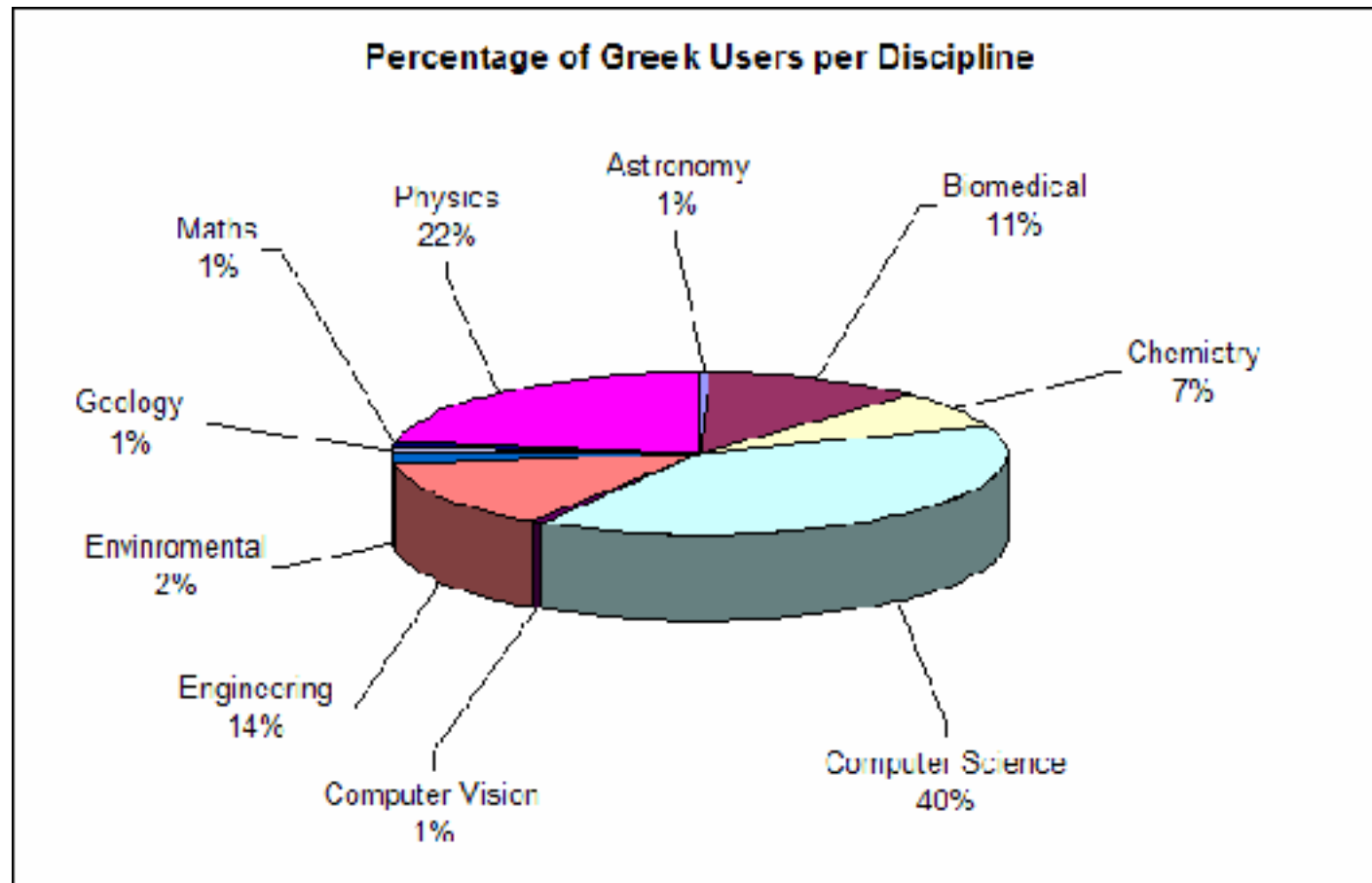


# HG WP highlights

- ◆ WP5: Middleware
  - ➔ M/W installation (gLite)
  - ➔ Pilot M/W and application s/w repository
    - Pilot Open M/W Institute Initiative (OMII)
- ◆ WP6: Desktop grids
  - ➔ Pilot integration of university and school PCs
- ◆ WP7: Storage mgmt
  - ➔ Integration of all storage infrastructures in a unified way
- ◆ WP8: Certification Authority
  - ➔ CA/RA operation
  - ➔ Integrated procedure for user registration and certificate issuing (NEW!)
    - <https://access.hellasgrid.gr/>
- ◆ WP9: Site administration
  - ➔ Including monitoring and management portal
- ◆ WP10: Exploitation in business and government (not started yet)
- ◆ WP11: Dissemination

Most WPs under development - Feedback by the end of the year

# Specialisations of HG registered users

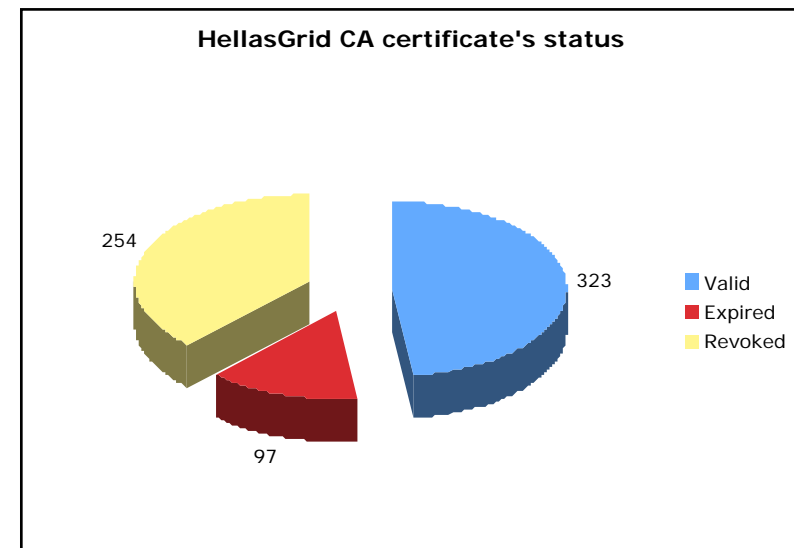
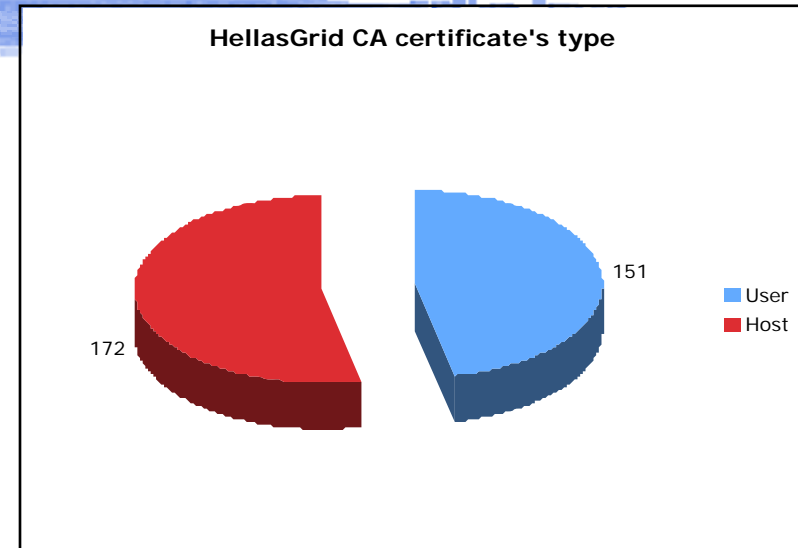


Number of registered users : ~200 (by December 2006)  
(some labs use only one username)

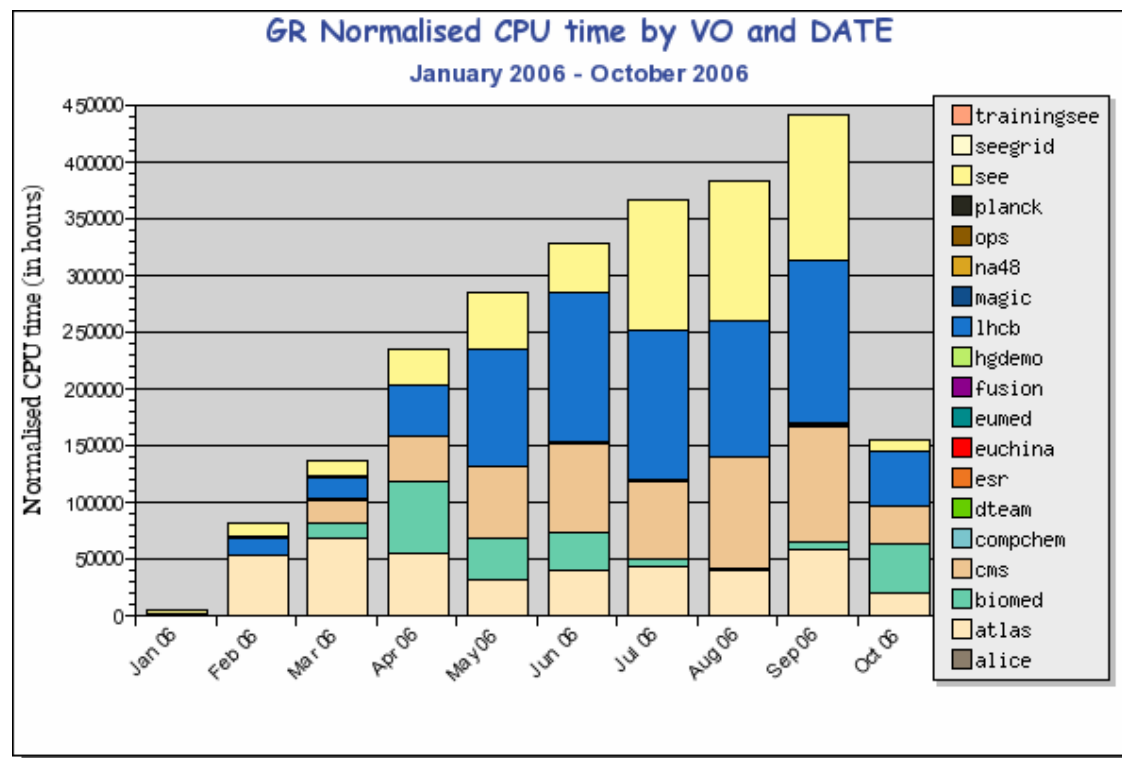
# Certification Authority Statistics

- ◆ HellasGrid CA:
  - ➔ 5 years of operations
  - ➔ 674 certificates
  - ➔ 323 active
    - 151 User
    - 172 Host

Statistics: December 2006



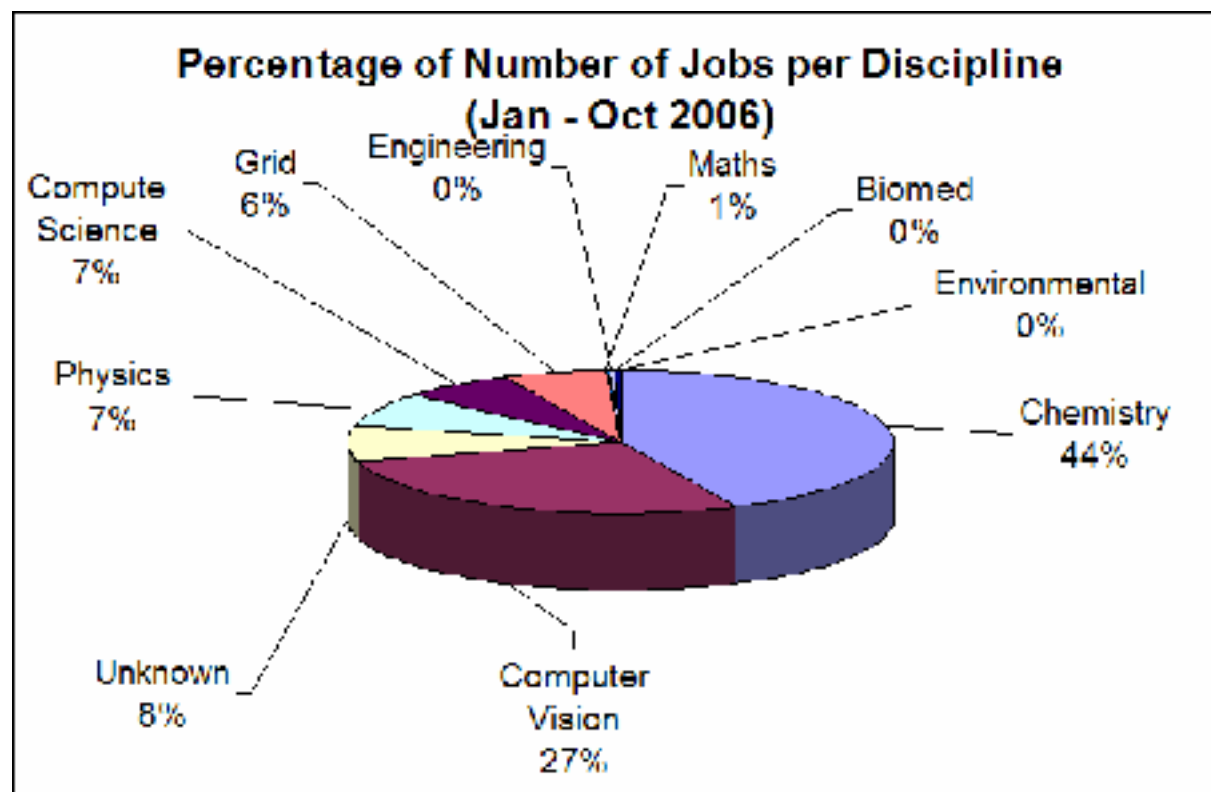
# VO usage statistics of GR sites



Production usage mainly by HEP, Biomed and local VO (South East Europe VO)

Statistics: October 2006

# HG infrastructure utilisation by Greek users only

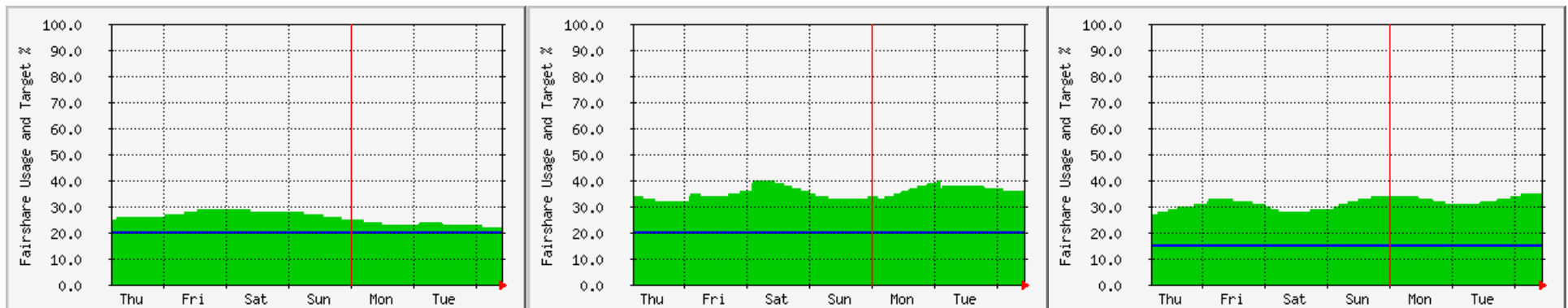


Statistics acquired through the South East Europe Resource Broker  
(Obviously the same resources are used by the EGEE communities)

# Site utilisation statistics

## ◆ Maui Graphs

- ➔ HG-01-GRNET Isabella (<https://mon.isabella.grnet.gr/maui> )
- ➔ HG-02-IASA Marie (<http://mon.marie.hellasgrid.gr/maui> )
- ➔ HG-03-AUTH Afroditi (<http://ce01.afroditi.hellasgrid.gr/maui> )
- ➔ HG-04-CTI-CEID Kallisto (<http://mon.kallisto.hellasgrid.gr/maui/> )
- ➔ HG-05-FORTH Ariagni (<http://mon01.ariagni.hellasgrid.gr/maui> )
- ➔ HG-06-EKT Athena (<https://mon.athena.hellasgrid.gr/maui> )

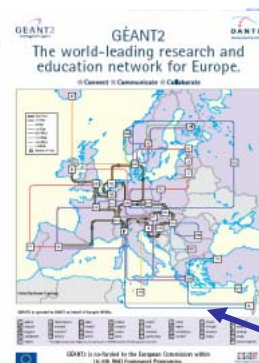


# Outline

- ◆ GRNET overview:
  - ➔ Dual Mission: Research Networking and Grid infrastructure
- ◆ The HellasGrid National Grid initiative
  - ➔ Background
  - ➔ Infrastructure
  - ➔ Organisation
  - ➔ Statistics and applications communities
- ◆ **HellasGrid as part of the European efforts**
  - ➔ Networking and Grid projects
- ◆ Challenges/Experiences



# GRNET as part of European efforts



SEE-FIBER



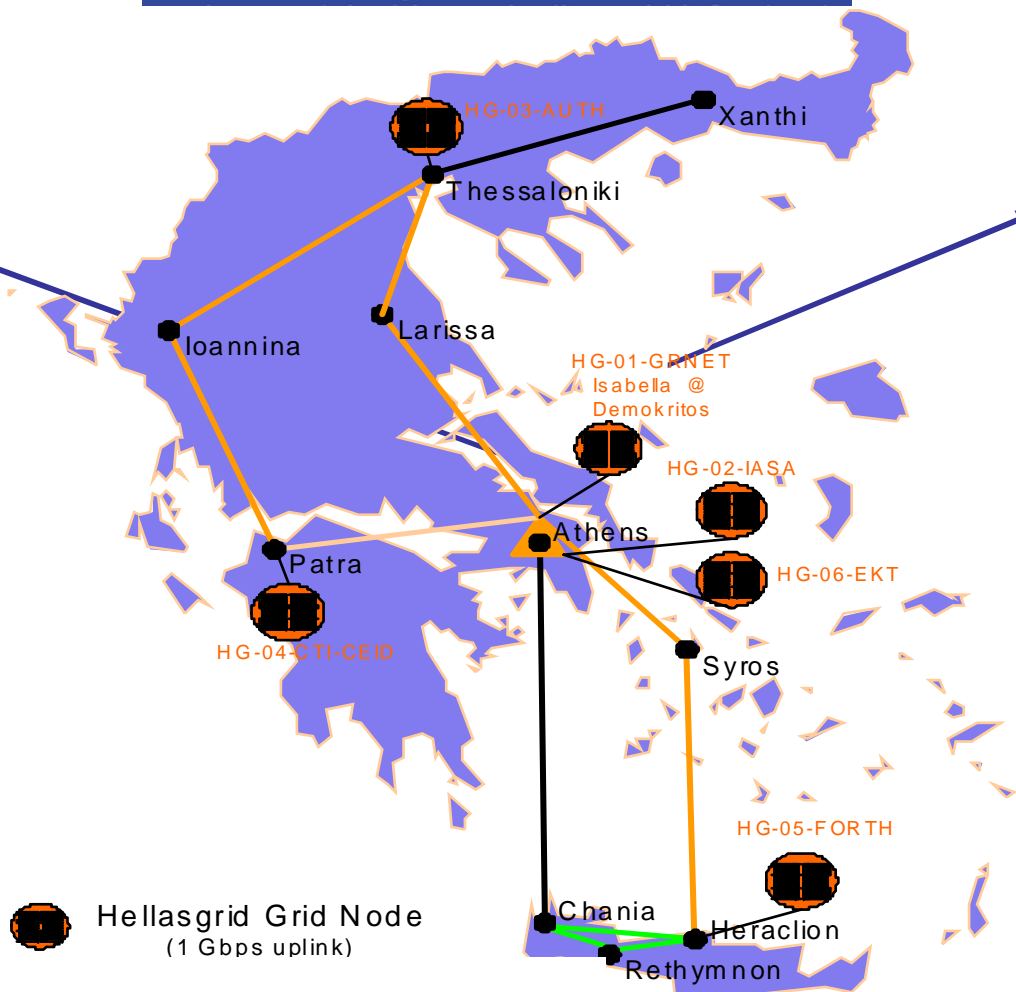
ORIENT



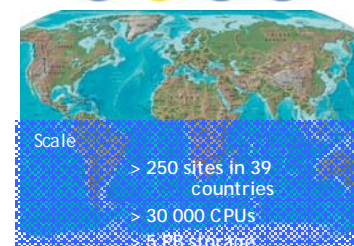
OGF EU\*

PAGE Partnership for Advanced Computing in Europe \*

EGI - European Grid Initiative



eGee



# GRNET as part of European efforts (II)

- ◆ GRNET has strong collaboration with the European initiatives
  - ➔ Following the path of our European friends
- ◆ But also with the regional areas
  - ➔ South East Europe and the Mediterranean
- ◆ European Commission: vital role of integrating the national efforts
- ◆ e-IRG high level policy body initiated during the Greek presidency

[www.e-irg.org](http://www.e-irg.org)

# SEE Europe promoting the NGI/EGI model

- ◆ NGI: National Grid Initiative
  - ➔ Infrastructure oriented & application neutral
    - Not driven by application communities
- ◆ GRNET acts as an **early champion** for the SEE area
  - ➔ One partner per country since EGEE Phase II
- ◆ EGEE-SEE federation and SEE-GRID countries adopted the same model!

# Outline

- ◆ GRNET overview:
  - ➔ Dual Mission: Research Networking and Grid infrastructure
- ◆ The HellasGrid National Grid initiative
  - ➔ Background
  - ➔ Infrastructure
  - ➔ Organisation
  - ➔ Statistics and applications communities
- ◆ HellasGrid as part of the European efforts
  - ➔ Networking and Grid projects
- ◆ Challenges/Experiences

# Challenges/Experiences/Conclusions

- ◆ Building the HG infrastructure proved difficult
  - ➔ **Housing, SLAs** with local institutes are slow, complex and expensive!
- ◆ Getting **applications /users** to exploit the infrastructure is slow!
  - ➔ Training/education and dissemination is important
  - ➔ Application projects and funding are essential!
- ◆ **Sustainability** of the infrastructure and services
  - ➔ Equipment will need to be changed after 3-5 years
- ◆ Local “**incubators**” for GRID technology needed:
  - ➔ Experts in local sites
- ◆ Operators should have appropriate **mentality (shifts, support)**
  - ➔ Gained a lot from networking experience (NOCs, NOC-ROC cooperation)
- ◆ Regional, Pan-European and International **collaborations** are vital
  - ➔ Our European friends lead the way: Middleware, VOs, support projects

# EDG Training -Athens, 2003



Thank you!

For more:



[www.hellasgrid.gr](http://www.hellasgrid.gr)

[www.egee-see.org](http://www.egee-see.org)

<mailto:fotis@grnet.gr>

