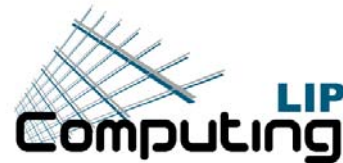# The Portuguese National Grid Initiative

Jorge Gomes

LIP Computing

Overview of the Portuguese NGI

Iniciativa Nacional Grid (INGRID)

- Initiative from the Portuguese Ministry of Science
  - Launched in April of 2006 in the context of LigarPortugal
    - "Ligar Portugal" is a larger initiative for the information society
  - Managed by the government agencies FCT and UMIC
    - Bodies from de Ministry of Science:
      - FCT is the Portuguese Science Foundation
      - UMIC is the the Portuguese Knowledge Society Agency
  - Technical coordination by LIP and UMIC

- Main objectives:
  - Reinforce the national competence and capacity in the grid computing domain
  - Enable the use of grid computing for complex problem solving
  - Integrate Portugal in international grid computing infrastructures
  - Reinforce the multidisciplinary collaboration among research communities
  - Promote conditions for commercial companies to find in the country know how in the grid computing domain

Iniciativa Nacional Grid (INGRID)

- Current areas of action:
  - Support for pilot application projects.
  - Expand and reinforce high speed network connectivity for grid computing.
  - Deployment and operation of grid computing infrastructures and support for the participation in international grid projects.

Iniciativa Nacional Grid (INGRID)

- Pilot projects:

  - First call for pilot applications launched in November of 2006
  - Funding of 1.500.000 €
  - Projects duration up to 3 years

  - 37 project proposals were received
  - Evaluation by an international board
  - 13 projects approved and ongoing since 2007

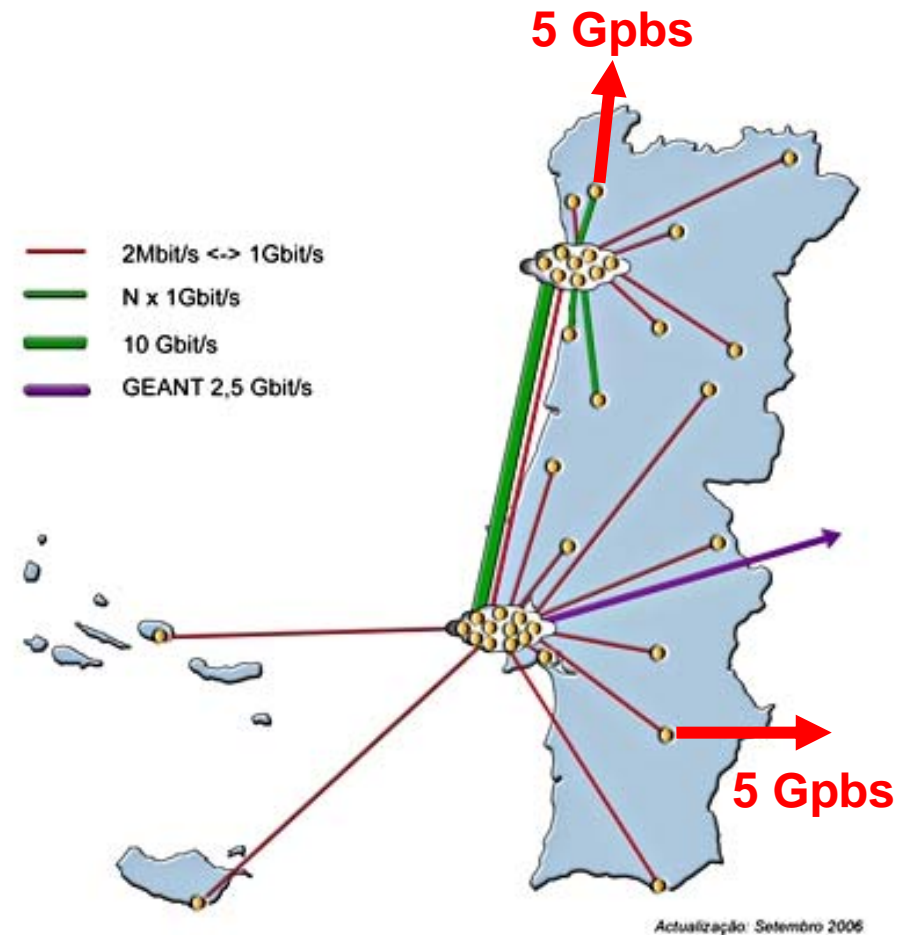- New call for complex applications support in 2009

INGRID projects

- G-Cast: Application of GRID-computing in a coastal morphodynamics nowcast-forecast system
- GridClass - Learning Classifiers Systems for Grid Data Mining
- PoliGrid - distributed policies for resource management in Grids
- Collaborative Resources Online to Support Simulations on Forest Fires (CROSS-Fire): a Grid Platform to Integrate Geo-referenced Web Services for Real-Time Management
- GRID for ATLAS/LHC data simulation and analysis

- GERES-med: Grid-Enabled REpositorieS for medical applications
- BING –Brain Imaging Network Grid
- GRITO – A Grid for preservation
- PM#GRID - GRID Platform Development for European Scale Satellite Based Air Pollution Mapping
- AspectGrid: Pluggable Grid Aspects for Scientific Applications
- P-found: GRID computing and distributed data warehousing of protein folding and unfolding simulations

Iniciativa Nacional Grid (INGRID)

- International High speed network connectivity
  - A new international link through Spain in the North of the country is now operational
    - Between Minho and Galicia
    - → 5 Gbps
  - A second link through Spain in the South of the country almost ready
    - Through Spanish Estremadura
    - → 5 Gbps
  - Provide
    - Better Geant connectivity
    - Better redundancy (ring between both countries)
    - Grid computing support

5 Gpbs

5 Gpbs

2Mbit/s <-> 1Gbit/s	
N x 1Gbit/s	
10 Gbit/s	
GEANT 2,5 Gbit/s	

Actualização: Setembro 2006

Iniciativa Nacional Grid (INGRID)
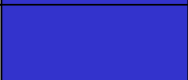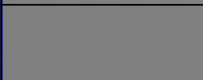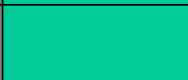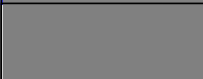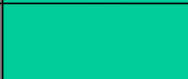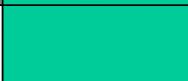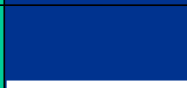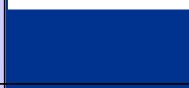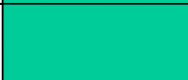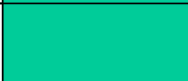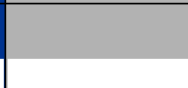
- National High speed network connectivity

  - Provisioning of connectivity for grid computing
    - Separation between commodity and grid traffic
    - Dedicated bandwidth in the backbone

  - A pilot for layer 2 connectivity between clusters is also being prepared

  - Local loop still a problem for grid computing at some sites

Iniciativa Nacional Grid (INGRID)

- The Portuguese NGI has been mostly a funding line for projects
- The participation in grid infrastructures has been left to the projects
  - NGI funded
  - EU funded such as Int.Eu.Grid, EGEE, EELA etc…

- The deployment of a national autonomous grid infrastructure is now a priority:
  - EGI will be based on national or regional infrastructures
  - Better long term support for local user communities and applications
- The first steps are now ongoing

Grid Computing in Portugal

Projects and Infrastructures

	DataGrid	CrossGrid	LCG	EGEE-I	EELA	EGEE-II	Int.Eu.Grid	EGEE-III
2001								
2002								
2003								
2004								
2005								
2006								
2007								
2008								

Participation in these projects gave origin to the Portuguese NGI

Portuguese resources

Resource centres:

- LIP
  - Lisbon
  - Coimbra
  - FCCN (core services)
- Lusíada University
  - Famalicão
- Porto University
  - Porto (3 clusters)
- Minho University
  - Braga (2 clusters)
- CFP-IST
  - Lisbon
- IEETA
  - Aveiro

Operations coordinated by LIP
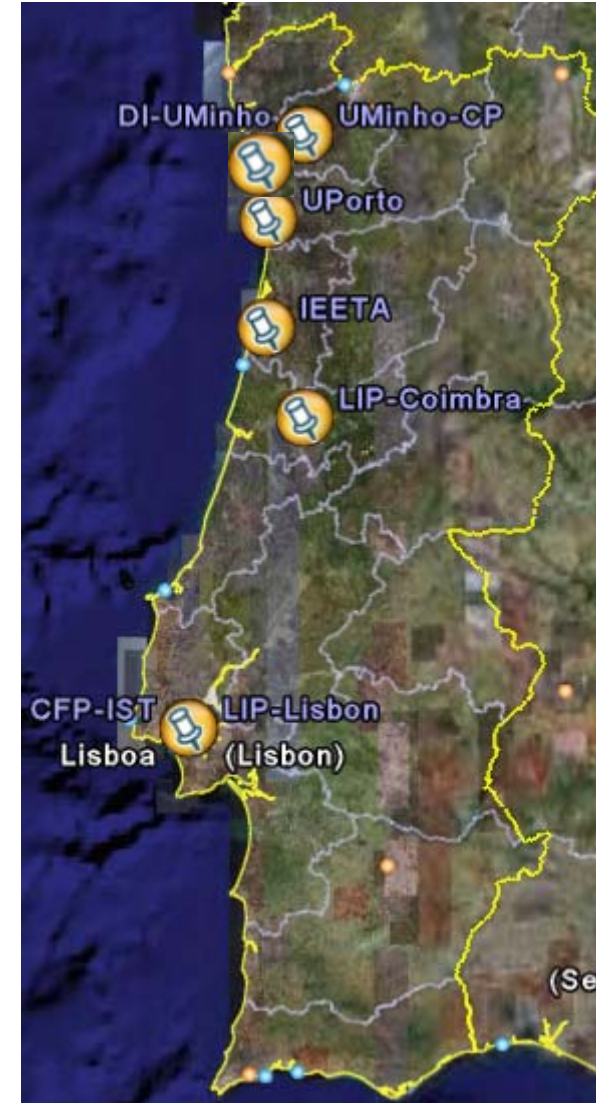
Usage and Users
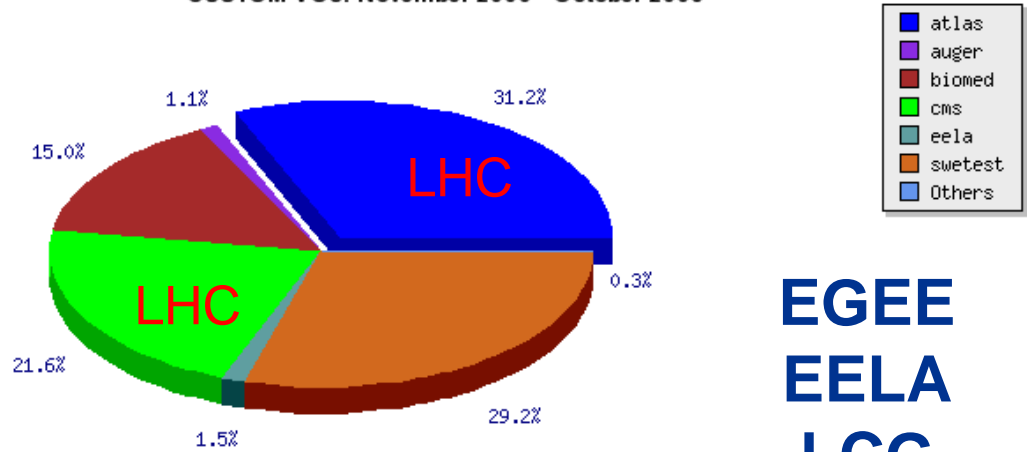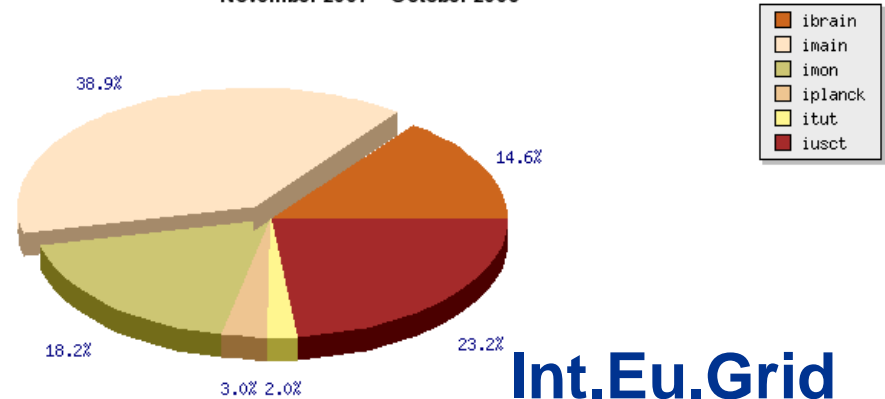
Portuguese LCG Tier-2

- LCG has been a driven force behind grid computing in the country

- The Portuguese federated Tier-2 is composed by 3 sites:
  - LIP-Lisbon ➔ 300 CPU cores (500) + 270TB (370)
  - LIP-Coimbra ➔ 160 CPU cores (200) + 180TB (200)
  - NGI main node ➔ (not yet available)

- Supporting two LHC VOs:
  - Atlas, CMS

WLCG accounting in SWE

NGI infrastructure
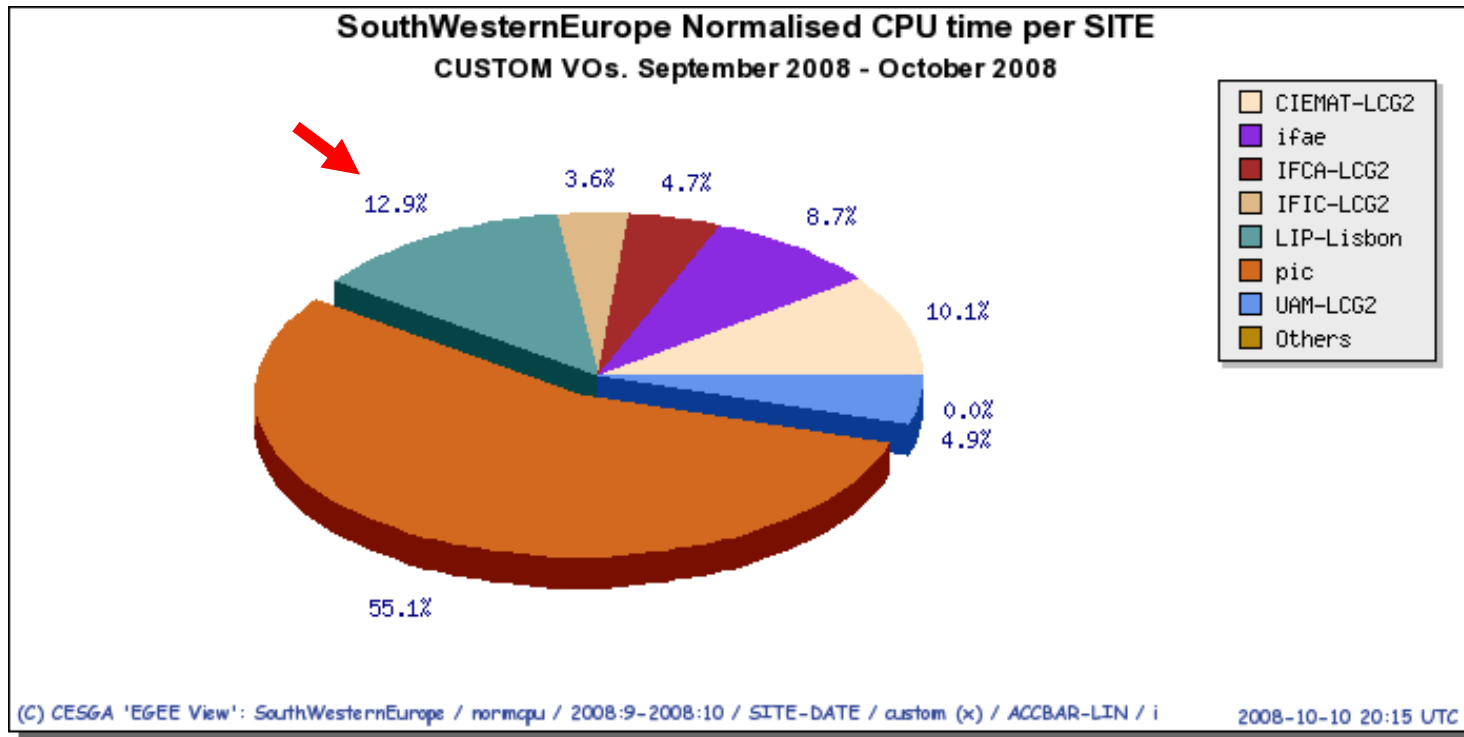
NGI infrastructure

- Objective:
  - Create an autonomous grid infrastructure based on new and existing resources.
  - Based on middleware widely in use
    - gLite, Int.Eu.Grid
  - Taking advantage of existing knowledge and experience

- Steps:
  - Deploy a main centre to provide grid core services and dedicated resources (ongoing)
  - Establish the operations structure
  - Integrate existing sites that wish to join
  - Integrate new sites

INGRID+ model

Main node

Existing resources
(EGEE, int.eu.grid, EELA, INGRID projects...)

Other resources

Users

Infrastructures and projects
INGRID
EGI
IBERGRID
LCG
...

Users:
– INGRID projects
– Virtual organizations (national and international)
– Other users with demanding computing requirements
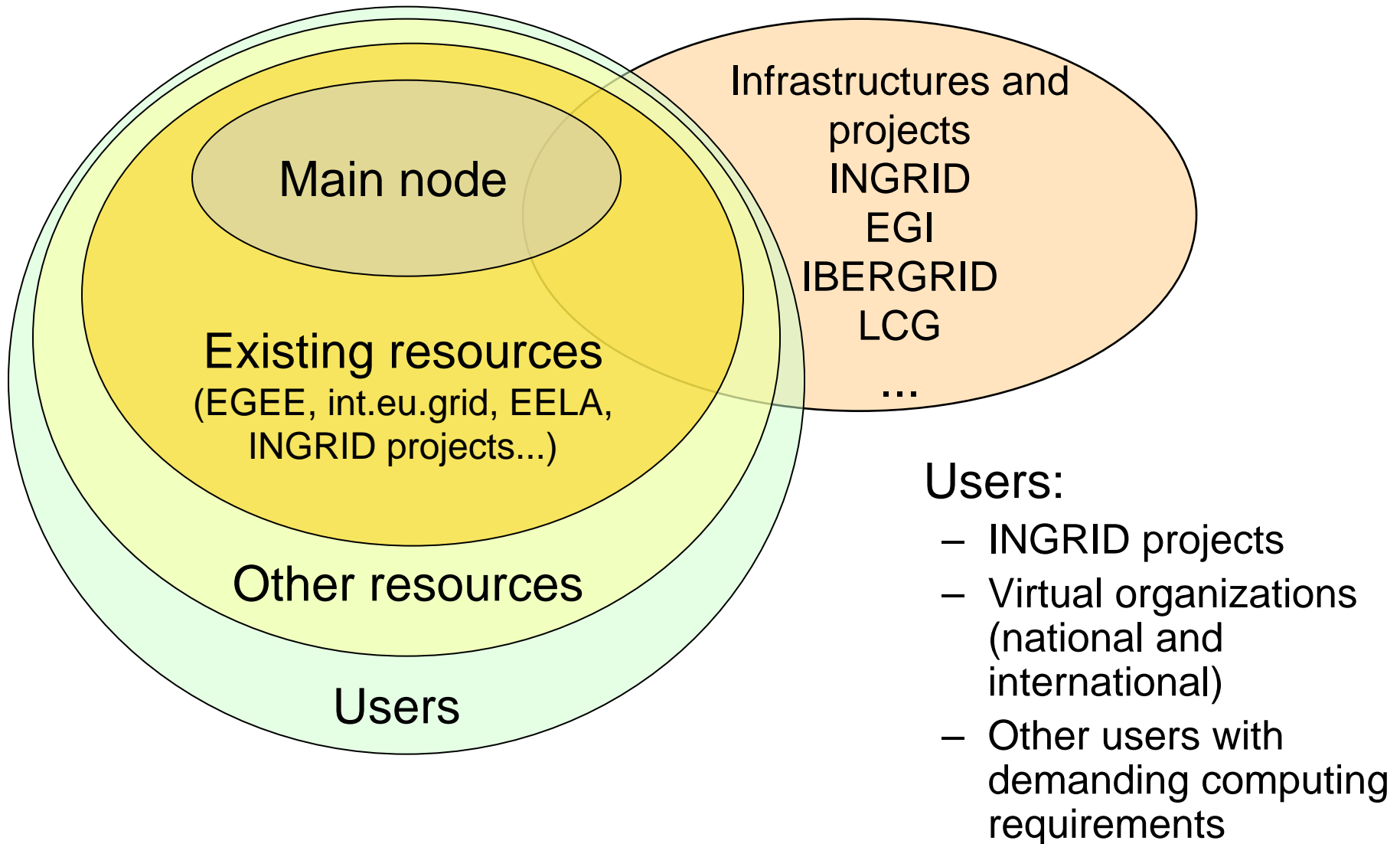
Main node - Objectives

- Objectives:
    - Create a dedicated datacenter for grid computing services
    - Core centre to start building a larger distributed infrastructure
    - Provide adequate housing conditions:
        - Electrical power
        - Air conditioning
        - Network connectivity
        - Redundancy
        - Security
        - Operation and management
    - House grid core services for grid infrastructures
    - Provide a considerable processing and storage capacity for scientific computing.
        - House grid resources from other organizations
    - Provide resources stimulating users and organizations do adhere.

- First step towards the creation of a national grid infrastructure.

Main node - Location

- The main node is being built by a consortium of research organizations under the Portuguese NGI umbrella:
  - LIP, FCCN, LNEC
- The project started in the summer of 2007.
- It will become operational in the end of 2008.
- The centre is located at the LNEC campus very near to the FCCN NOC in Lisbon
- Excellent network connectivity:
  - FCCN national backbone
  - Géant PoP

- Built inside an already existing pavilion
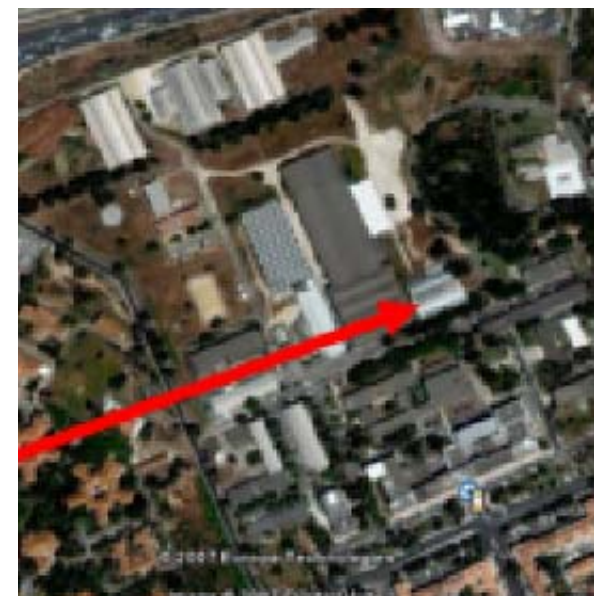
Main node - Details

- Computer room area 370m^2
- Electrical power:
  - 1st step:1000 kVA
  - 2nd step 2000 kVA
- Protected power
  - 2x UPS 200kVA
    - Future expansion
  - Diesel generator
  - Power factor correction
- Chilled water cooling:
  - Chillers with free-cooling (2x 375kW)
    - Future expansion to 2 additional units
  - Close-control units (3x150kW+47kW)
- Raised floor 85 cm
- Fire detection
  - Very Early Warning Smoke Detection
- 2.500.000 €
- To be delivered this week

Computing Blade Centers
SGE cluster

Support Services
Blade Centers

Core
10gigabit
Ethernet
switch

net

Storage = Lustre + StoRM

1st phase:
~1000 CPU cores
~ 624 TB of storage
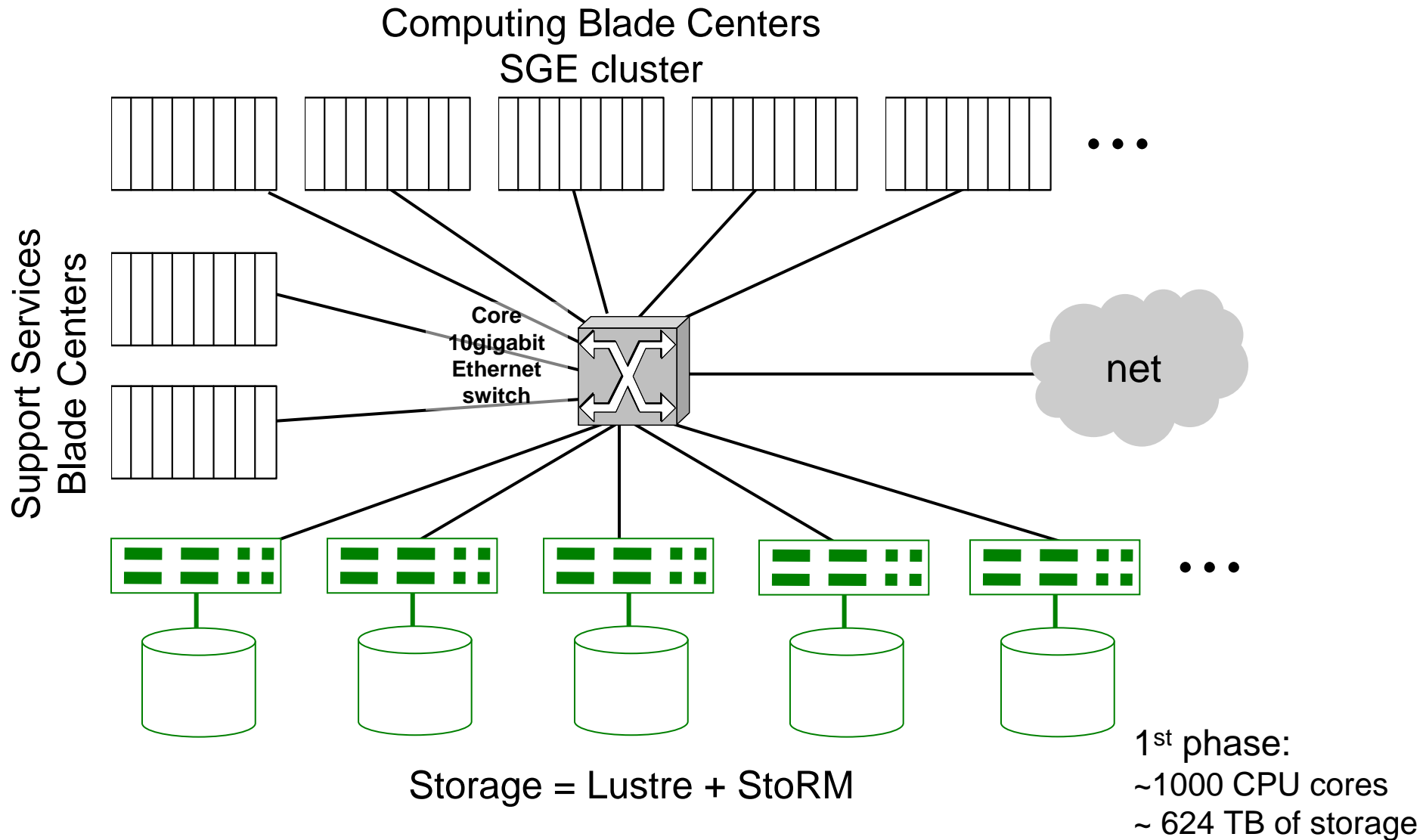
Middleware

- What do we want:
  - Not reinvent the wheel
  - Interoperability with other organizations
  - Long term support
  - Reliability
  - Low cost
- Choice:
  - Long term: may depend on decisions taken at European level in EGI
  - Short term:Start with gLite the EGEE middleware
  - Medium term: consider other user needs
- gLite:
  - Possibly the most used middleware in European and other grid infrastructures
  - Actively maintained.
  - Already being used by the Portuguese resource centres in EGEE, Int.Eu.Grid and EELA
  - gLite developers participate actively in the international standardization bodies
  - We will integrate additional components when needed
 - MPI support with Int.Eu.Grid middleware extensions.

Expanding the infrastructure

- Support for the integration of computing resources in the country:
  - Initially focus on existing resource centres
  - Expand to other sites at a later stage
  - Concentrate on gLite resources

- Launch funding line for cluster integration:
  - Provide human resources for grid resource management
  - Provide the equipment necessary to integrate the resources and implement a grid site
  - Reinforce cluster local capacity with resources that will be dedicated to be shared
  - Support electrical power costs

Future

- Europe is moving towards an European Grid Infrastructure
  - Model based on the NGIs
- Transition will start during EGEE-III
- The NGIs must become ready for this new model
  - The Portuguese grid infrastructure is being prepared with this transition in mind
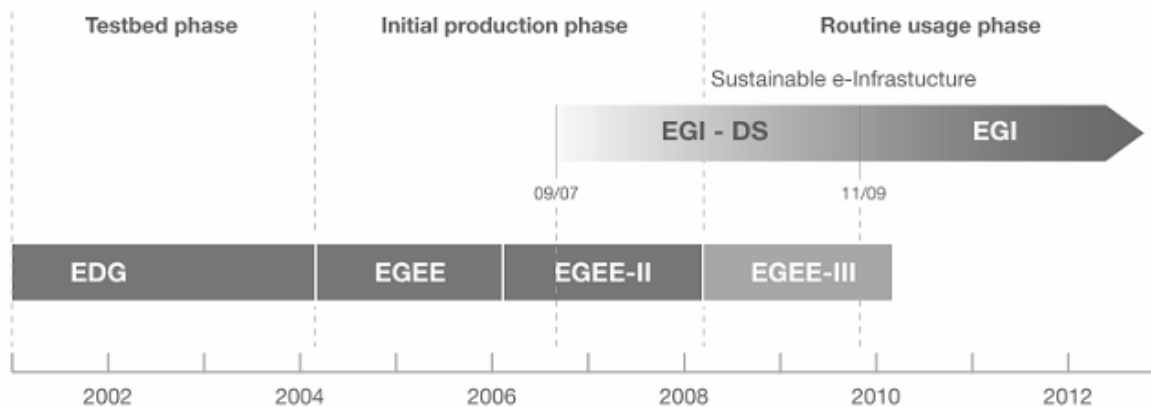
- **IBERGRID**
  - A common Iberian grid infrastructure is being prepared:
    - In the context of agreements between the Portuguese and Spanish governments
    - Sharing of resources between Portugal and Spain
  - Main areas:
    - Networking, grid, supercomputing and applications
  - Based on and profiting from the current collaboration in the framework of European projects:
    - int.eu.grid, EELA, EGEE
  - IBERGRID may become the equivalent to the Southwest federation in EGEE