

eGovernment and eScience Cloud Initiatives in Greece

O. Prnjat, on behalf of GRNET Technical department

Outline

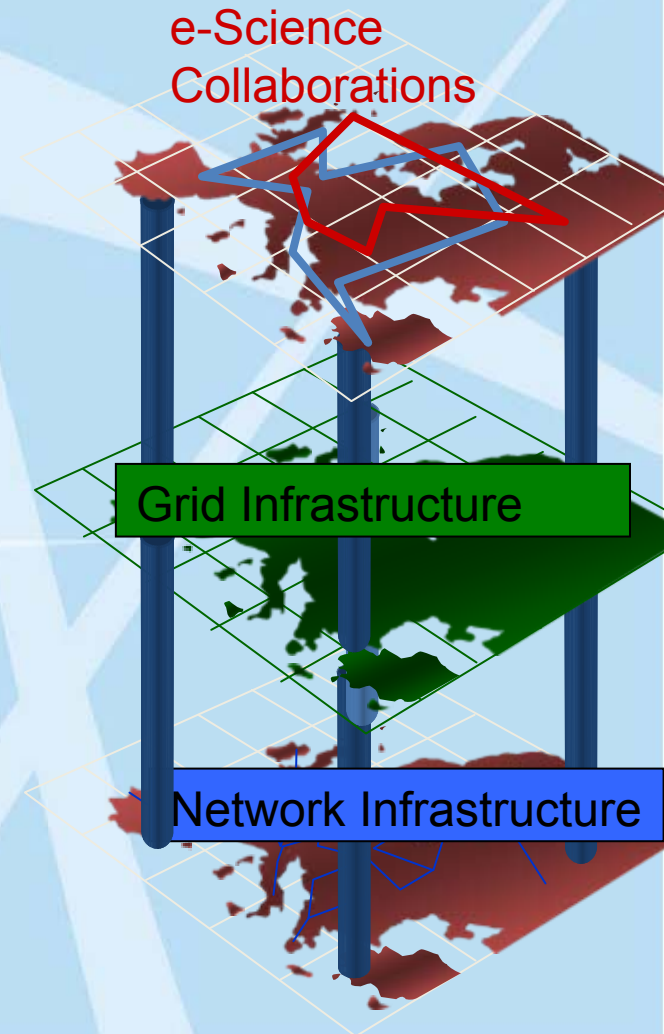
- GRNET overview
 - Dual Mission: Research Networking and DCI infrastructures
- GRNET network and Grid overview
- GRNET eGovernment cloud
- GRNET eScience cloud
- Pan-European Cloud initiatives participation

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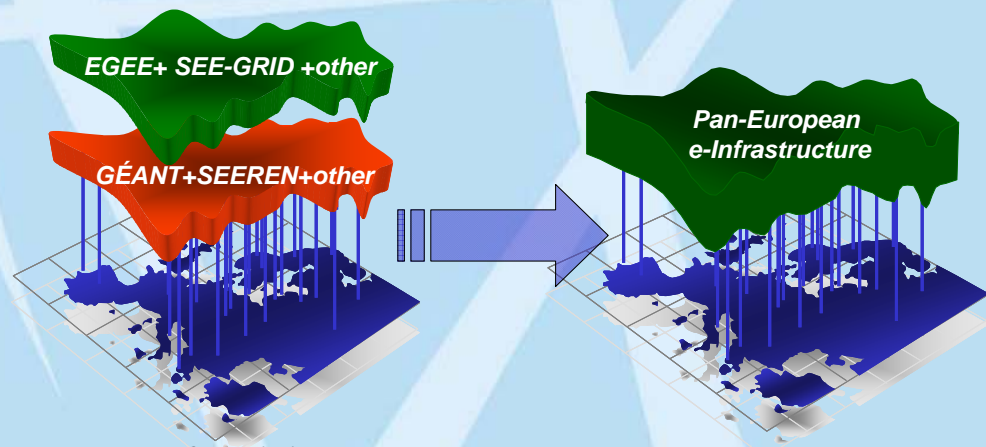
The pan-EU e-Infrastructures vision

- The **Research Network infrastructure** provides fast interconnection and advanced services among Research and Education institutes of different countries'
- The **Research Distributed Computing Infrastructure** provides a distributed environment for sharing computing power, storage, instruments and databases through the appropriate software (middleware) in order to solve complex application problems
- This integrated networking & grid environment is called **electronic infrastructure (eInfrastructure)** allowing new methods of global collaborative research - often referred to as **electronic science (eScience)**
- The creation of the eInfrastructure is a key objective of the **European Research Area**



GRNET Dual Mission: Networks + Grids/Cloud/HPC

- GRNET was one of the first NRENs in Europe to expand its services to Distributed Computing Infrastructures
 - Being infrastructure-oriented and application-neutral serving all user e-Science communities
- Adopting the EU e-Infrastructure initiative:
 - Integrated Networking + Distributed Computing Infrastructures



Source: European Commission
DG INFOSOM Unit F3: Research Infrastructures

GRNET mission



- ◆ GRNET is a state-owned company operating under the supervision of the Ministry of Education (General Secretariat of Research & Technology)
- ◆ Its main mission is to provide high-quality electronic infrastructure services to the Greek academic and research institutions:
 - ➔ National and international connectivity services
 - ➔ Distributed Computing infrastructure services (computing, storage, visualisation)
- ◆ A secondary mission is the promotion and dissemination of the use of Information and Communication Technologies (ICT) in the public and private sector towards an e-Government, e-Learning and e-Business environment
- ◆ Main sources of funding are the Operational Programme for the Information Society, Ministry of Economy and Finance and European Commission projects
- ◆ GRNET has been certified by ISO 9001:2000 in project management

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- GRNET eScience cloud (Panos / Vang please)
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GRNET main networking tasks

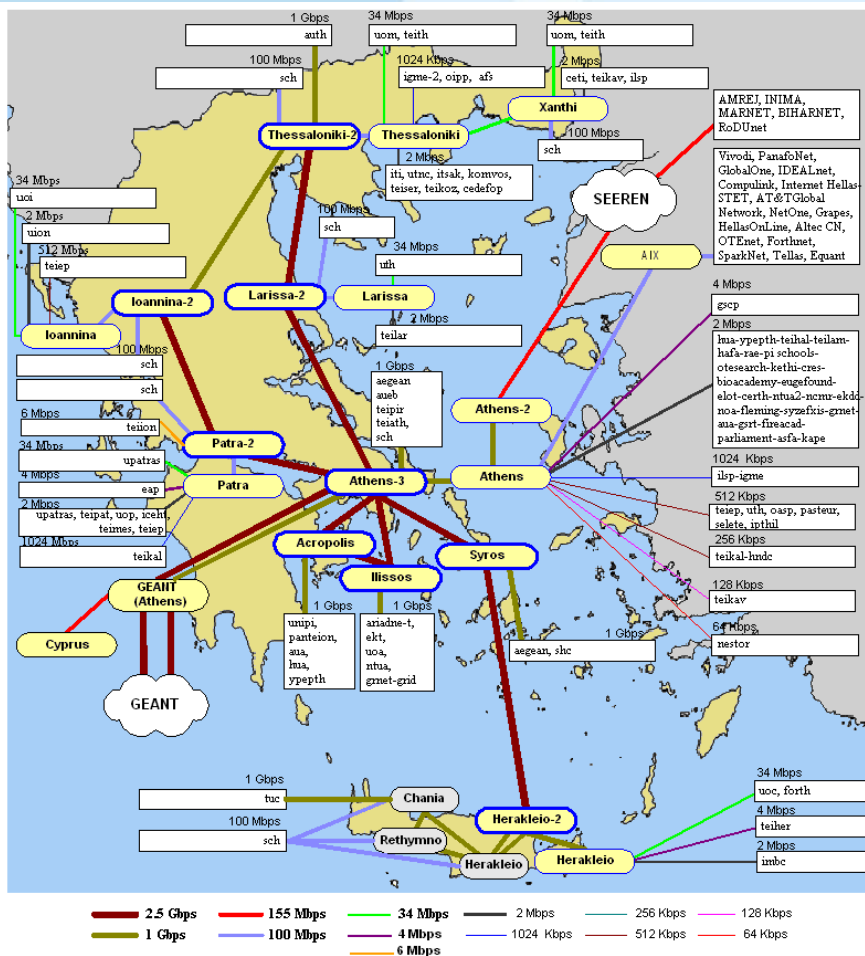


- Interconnects academic and research institutions (> 100), primary and secondary schools (around 6.400) strengthening communication and cooperation. Reaching up to 1.000.000 end-users
- Continuously upgrades the national backbone (currently at 2.5 Gbps), institutions access (currently to 1/10 Gbps) and international backbone (currently at 3*10 Gbps)
- Operates the GR Internet Exchange (GRIX), peering of Greek commercial Internet Service Providers
- Cooperates with Greek and international research and academic institutions for the development of innovative networking services
- Disseminate the Information Society and influence the European Research Area via Applied Research, Technology Integration, Solution Demonstration and Consultancy

The GRNET network: From GRNET2 to GRNET3

GRNET2:
2,5Gbps leased lambdas, 20M€, 2000-2005

GRNET3:
dark fibre based, 10Gbps capable, 30M€, 2005-2008



Total of ~6.000 km of dark fibers!

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**)
 - ~1200 Cores
 - ~40 TBytes total raw SAN storage capacity
 - ~80TBytes Tape Library
- 4 Access Grid nodes
 - Athens, Thessaloniki, Crete



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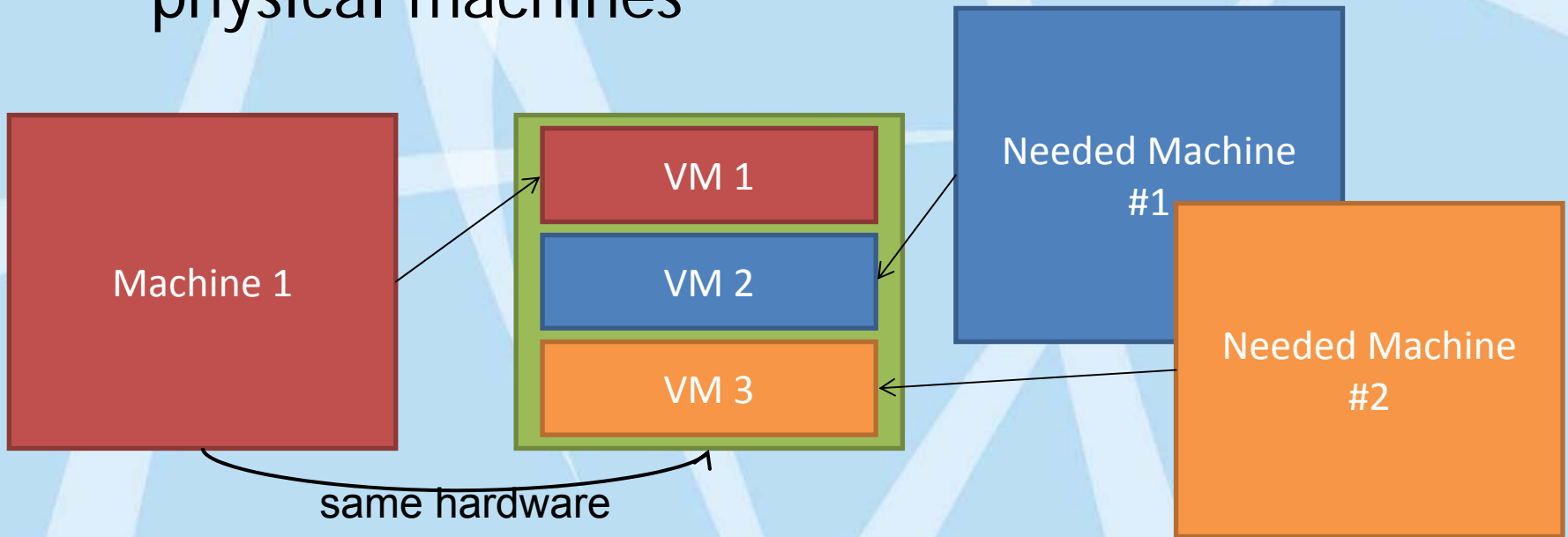
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Current government IT status

- Multiple small-to-medium Information Systems scattered in Public Sector
 - Many computer rooms / server rooms
 - Under-used
 - Devalued very fast
 - Need specialized personnel (administration)
 - High energy consumption
- €300m for server hardware during Operational Program “Information Society”
- Redundant computing power cannot be utilized
- Since there is no money for new equipment
 - → New Applications cannot be delivered to Public Sector
 - → No New Applications for Citizens

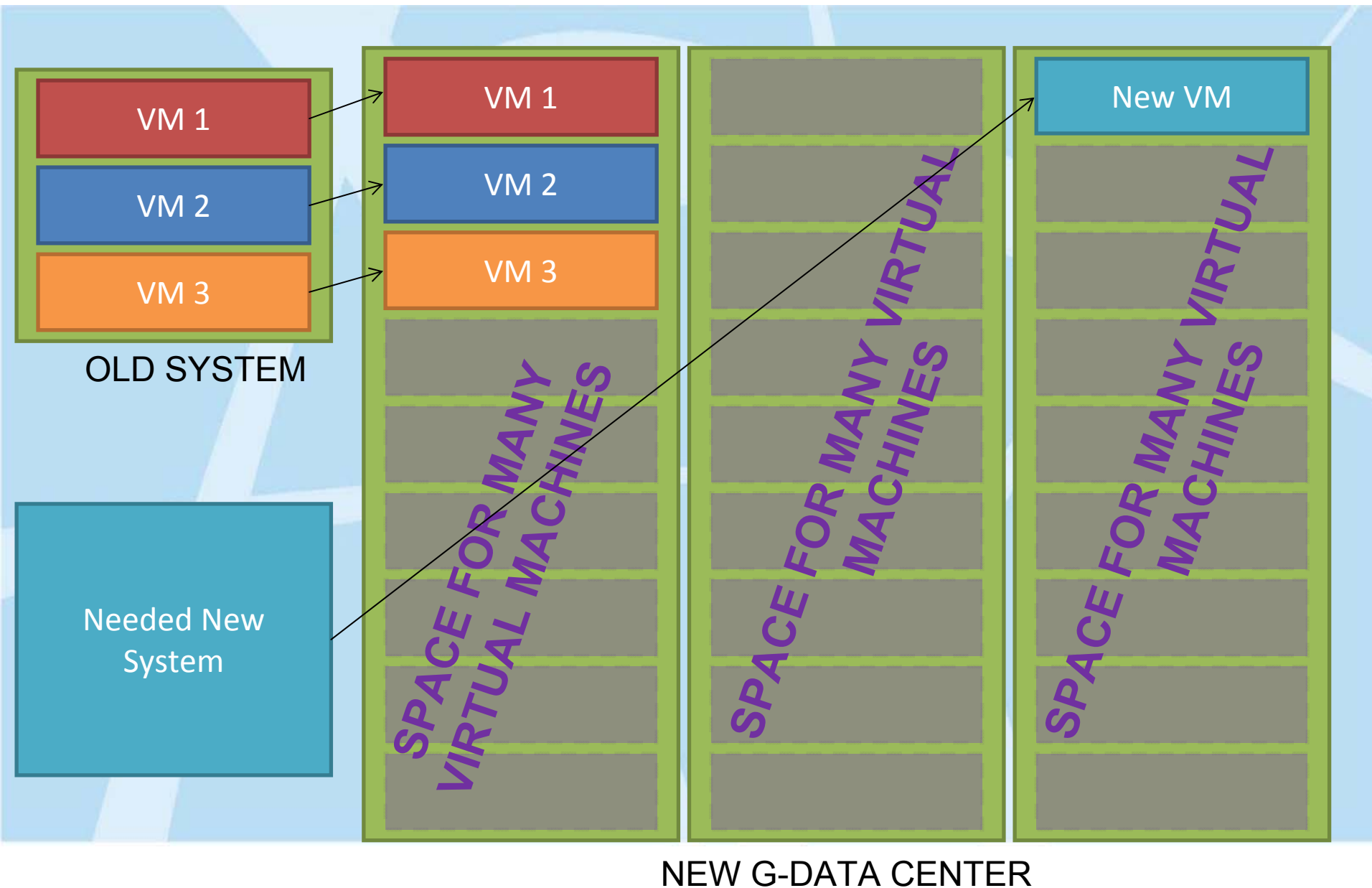
G-cloud development strategy (1)

- Phase 1: Virtualize everything
 - Old physical systems are converted to virtual machines
 - New system needs are covered from current physical machines



- Phase 2: Build few but BIG G-Data Centers
 - Utilize virtualisation
 - Since old systems are already VMs (1st Step) are easily migrated to G-Data Centers
 - New systems are created as VMs from the beginning
- Benefits:
 - Reduced administration needs/costs
 - Easier migration and disaster recovery procedures
 - Improved energy efficiency
 - Rapid development of new services
 - Low services downtime

G-cloud development strategy (2)



- Phase 3: Share software, licenses, storage
- Sharing Software (eg. 2 Apps share same DBMS for non-critical systems)
- Sharing Licenses (eg. 2 Apps share same DBMS license)
- Sharing Storage (eg. Apps utilize space from common storage array)

G-cloud: policy background



- A MoU has been signed among all players (GRNET, Infosoc SA, Ktimatologio, Management Organization Unit, General Secretariat of Information Systems, and others) to define the national policy on government cloud computing. This team led by the Cabinet Office (included representatives from over 10 Government departments) set out to define how the public sector could utilize the Cloud Computing approach to ICT delivery and explore what benefits and challenges this approach would create.
- There is an open call from Information Society Operational Program of 25 mil. Euro.
 - GRNET SA and Infosoc SA are going to submit proposals for the implementation of G-Cloud.

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eScience cloud: policy aspects

- Vision: virtualization and storage services for the Greek scientific community
- Strategy: gradual offering of services, starting with storage (Pithos), moving to VM on demand, and then SaaS
- Policy background: existing MoU in place for Grid computing, expanding for HPC as well
- Current and planned funding: in the context of GRNET4 project

eScience cloud: Pithos

- Online storage of 50Gbytes for all Greek academic and research community
- Access by web browsers, webDAV, iPhone, Android
- Open source implementation and API
- Now under development version 2 of the API, compatible with either Amazon S3 or Rackspace Cloud Files
- pithos.grnet.gr

- Current infrastructure:
 - Computational resources:
 - 1 Blade enclosure (16s)
 - 1 Rack populated with 32 single U servers
 - Storage resources:
 - 1 SAN & 1 NAS ~450Tbytes
 - Network resources,
 - 10Gig redundant connections with the backbone
- Access policies: through Shibboleth federation; credit-based mechanism under development

eScience cloud: planned infrastructure



- Budget 3.324.000€ excluding VAT
- 4896 cores total
 - 24x 1U dual 6core = 288 cores/rack * 17 rack OR
 - 12x 2U dual 12core = 288 cores/rack * 17 rack
- Petabyte local storage (SAS)
 - (4disks/12core) => 2.4TB/12core * 4896 = 980TB
- Petabyte distributed storage (SSD/SAS/SATA)
 - SSD (6disks) 6 x 64GB = 384GB/storage server * 36 = 2.3TB total
 - SAS (12disks) 12 x 600GB = 7.2TB/storage server * 36 = 260TB total
 - SATA (12disks) 12 x 2TB = 24TB/storage server * 36 = 864TB total
- 2x1 Gig Ethernet interconnections for compute nodes.
- 2x10 Gig Ethernet interconnections for storage nodes.
- 2x10 Gig Ethernet connection with the outside world.

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Pan-European Cloud initiatives participation

- GRNET has strong collaboration and leadership role in nascent pan-European cloud initiatives
- StartusLab
- ECEE
 - An initiative by NRENs and other partners in Europe, based on close collaboration on Grid computing, to extend into cloud computing
 - Leverage national cloud infrastructures for Europe-wide projects, like EGEE.

StratusLab



<http://stratuslab.eu/>

- Goal
 - Create comprehensive, open-source, IaaS cloud distribution
 - Focus on supporting grid services
- Information
 - 1 June 2010–31 May 2012 (2 years)
 - 6 partners from 5 countries
 - Budget : 3.3 M€ (2.3 M€ EC)
- GRNET's role
 - Leading the Infrastructure Operations activity
 - Has dedicated physical resources and provides the project's reference cloud service.
 - Request account: support@stratuslab.eu



CNRS (FR)



UCM (ES)



GRNET (GR)



SIXSQ (CH)



TID (ES)



TCD (IE)

Thank you

- Thank you!