

# Cloud Services for the Greek Research & Academic Community

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**ΕΕΛ/ΛΑΚ**

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OpenAccess Conference

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17.12.2010/ ΕΚΤ-ΕΙΕ

 National Technical University of Athens

**CSLab**

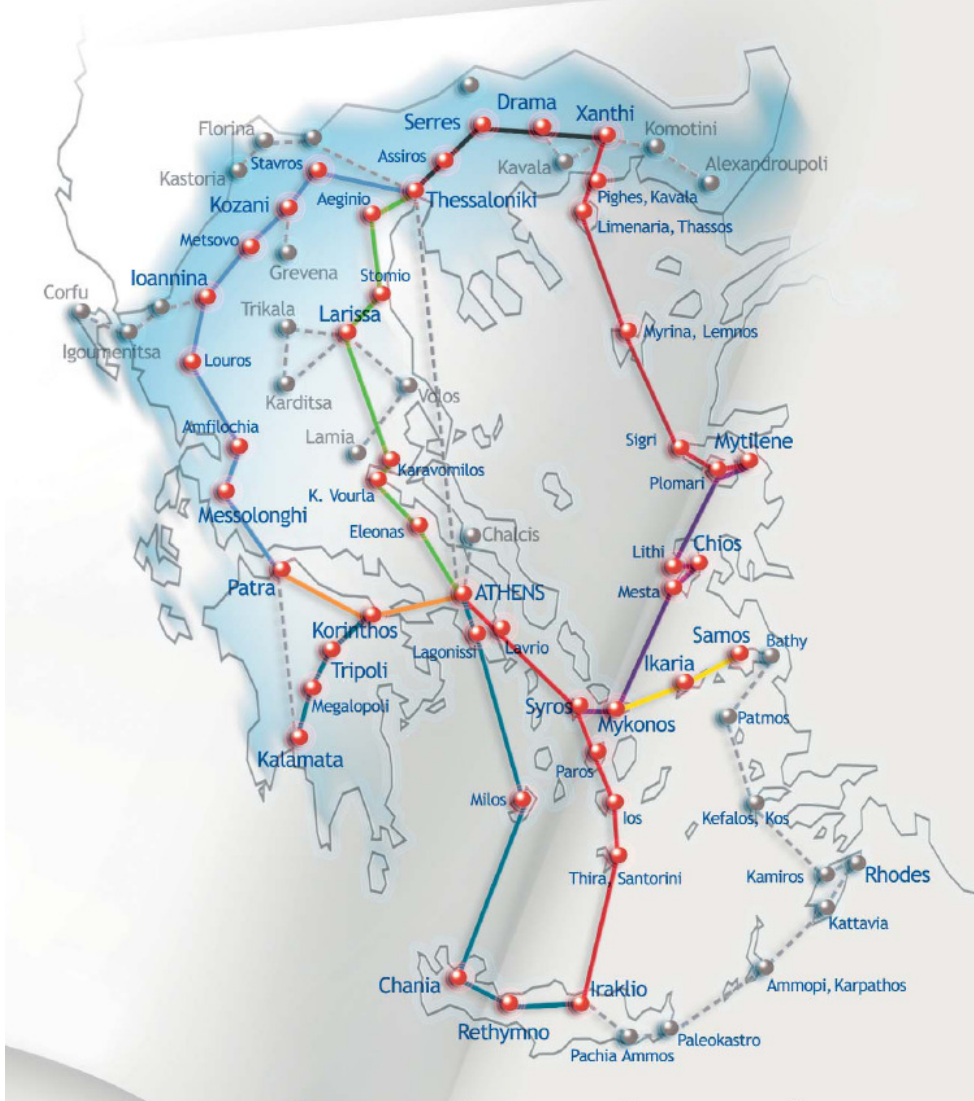


# GRNET

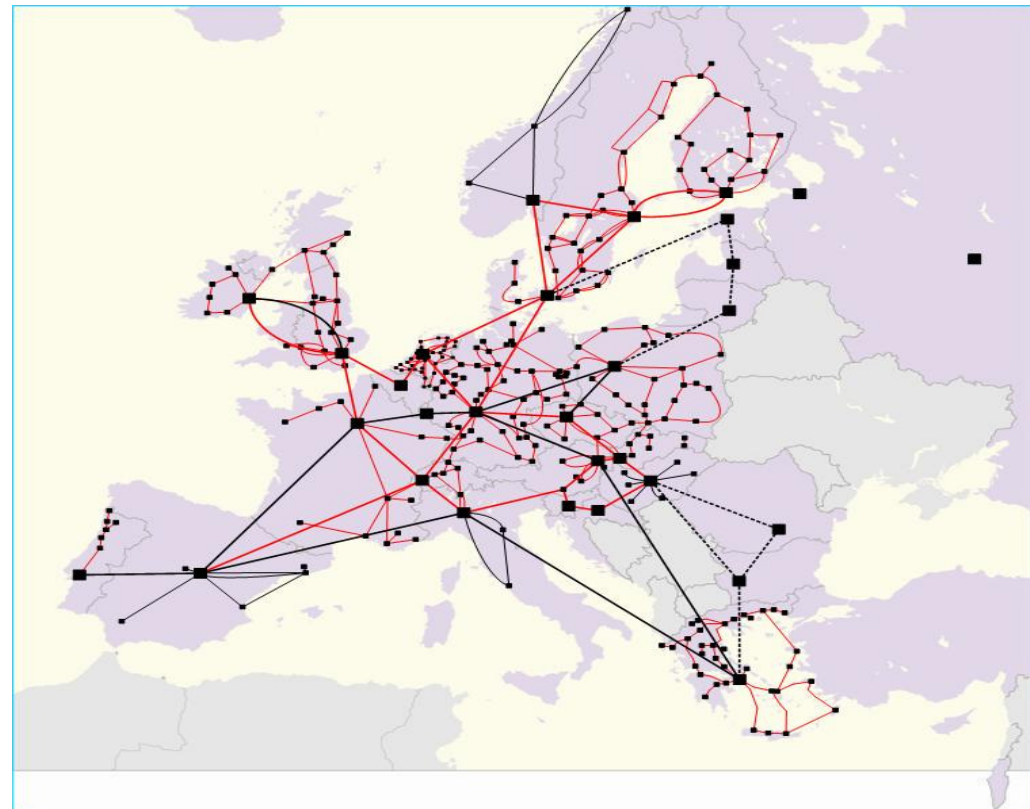
- state-owned company (SA) under GSRT
- provide advanced e-infrastructures/services to the Greek academic and research institutions:
  - National and international connectivity
  - Infrastructures/services (network, computing, storage) to the community
- promotion and dissemination of ICT in the public and private sector

# GRNET numbers:

- >**100** universities, research centers, academic organizations
- >**15.000** schools
- >**1.000.000** users (every day)
- Dark fiber backbone (**Nx10 Gbps**)
- access **1 || 10 Gbps per institution**
- International connectivity through GEANT network **3\*10 Gbps**
- Neutral point for the Greek Internet Exchange (GRIX) node – peering all Greek ISPs at 10Gbps each
- GRID services
- Storage Services
  - (e.g. Online Storage-Pithos, **50 or 100 GB/user–6500 users per day**)
- VPS VM provisioning (>**400** VMs) & Public Cloud (soon)
- 2 DataCenters (NRC & Ministry of Education premises)



- **35 PoPs**
  - **8410km fibers (IRU)**
    - MANs Attiki & Thessaloniki
    - DF loops **33** cities
- Single-mode fiber pair
- 15-years IRUs
- Availability >> 99%



# Cloud Services

- Virtual Private Servers (VPS)
  - Persistent volumes/longevity/non volatile VMs (RACKSPACE style)
- Public Cloud Services (VM, volumes)
  - Short lived/volatile instances (high churn rate)  
Amazon (AWS) style
- Online File Storage Service (Amazon S3 like)
  - Files, groups, REST API

# (1) VPS service

- Persistent VMs
- Persistent Storage (block level/Filesystem level)
- No backup (clients' responsibility)
- Security policy per VM
- Tape library access (offline storage)

## (2) Public Cloud Service

Mainly IaaS (Q2 2011):

- My Instances
- My Images
- My Disks (block storage)
- Quotas/credits per user

More to come (Q4 2011, Q1 2012):

- My applications
- My desktops
- My files (integration with existing Pithos service)

# (3) Online File Storage Service (Pithos)

## 1. personal online storage:

- *50GB/user*
- *Versioning (per file)*
- *Backup*
- *Groups*
- *Sharing*
- *Full text Search and tagging*
- *No filesize limit/no file expiration*
- *no traffic-bandwidth limit*
- rich web GUI client (access via the REST API)
- desktop client (access via the REST API)
- Firefox addon (via REST)



## 2. Storage as a Service (IaaS):

- Open REST API
- WebDAV interface

*A truly **scalable** online file storage infrastructure*



- [-] aai test
  - [-] Backups
    - name
    - Data
  - [+] Documents
    - Movies
    - Music
  - [+] SW
  - [+] Test
    - icons
  - [+] Trash
  - [+] My Shared
  - [+] Other's Shared

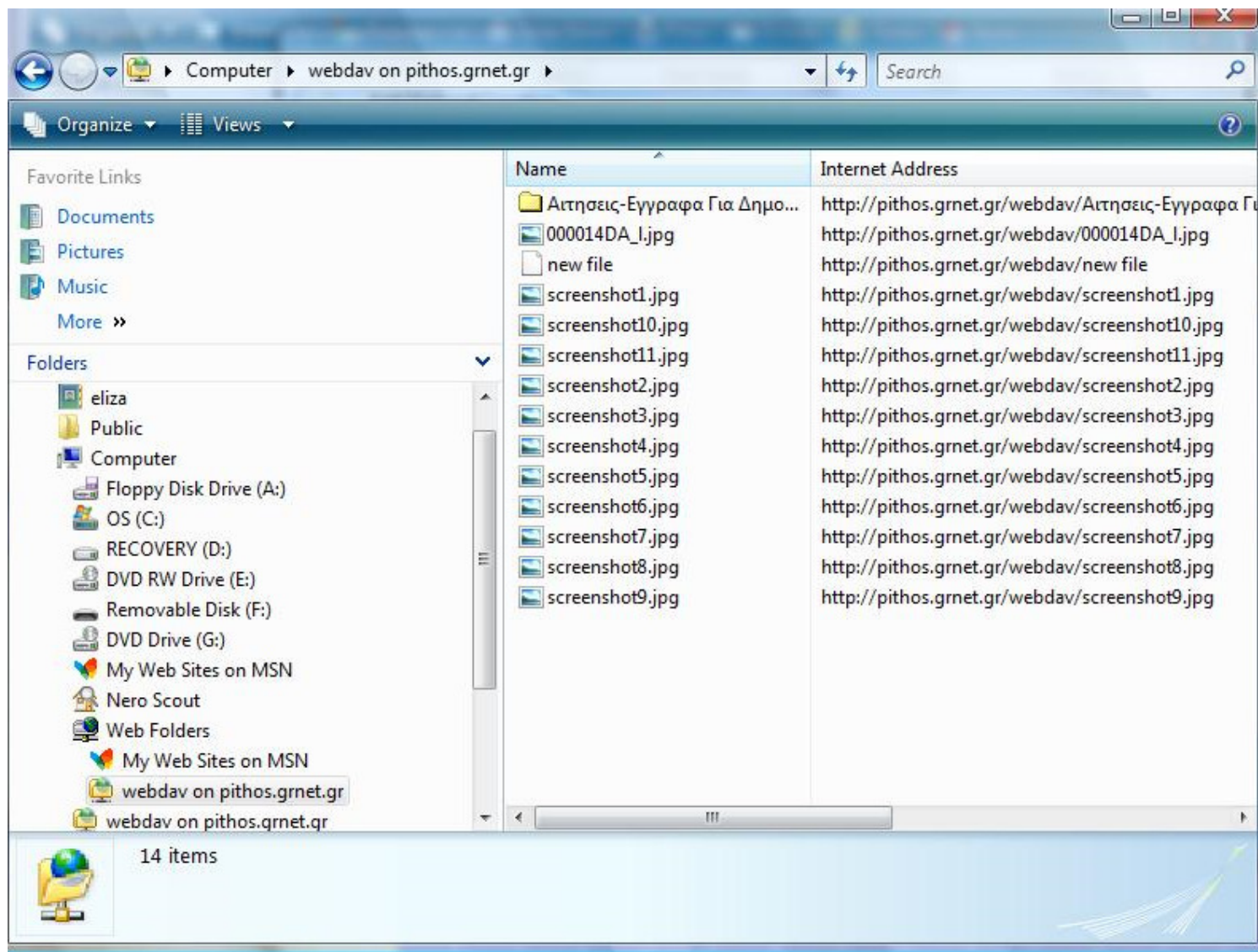
Files Groups Search Results

Name	Owner	Path	Version	Size	Date
Cash_Sale_4497_from_SPEC_54.pdf	aaitest@grnet-hq.admin.grnet.gr	/	1	59.9 KB	10/3/2009 3:36 PM
Coraline_1.jpg	aaitest@grnet-hq.admin.grnet.gr	/	1	52.4 KB	7/5/2009 1:57 AM
Doc1.doc	aaitest@grnet-hq.admin.grnet.gr	/	1	1 MB	12/3/2009 1:52 PM
Ecma-262.pdf	aaitest@grnet-hq.admin.grnet.gr	/	1	704.1 KB	15/3/2009 1:55 AM
a82b_magic_iq_box.jpg	aaitest@grnet-hq.admin.grnet.gr	/	1	13.6 KB	20/3/2009 12:49 AM
avgamnot.dll	aaitest@grnet-hq.admin.grnet.gr	/	1	267.8 KB	24/3/2009 2:07 PM
greece.gif	aaitest@grnet-hq.admin.grnet.gr	/	3	291 B	17/3/2009 2:51 PM
gssc-243.exe	aaitest@grnet-hq.admin.grnet.gr	/	1	2.1 MB	6/3/2009 3:44 PM
readme.txt	aaitest@grnet-hq.admin.grnet.gr	/	1	938 B	15/3/2009 1:57 AM
taxydromos-lynx.jpg	aaitest@grnet-hq.admin.grnet.gr	/	1	23.4 KB	15/3/2009 1:56 AM

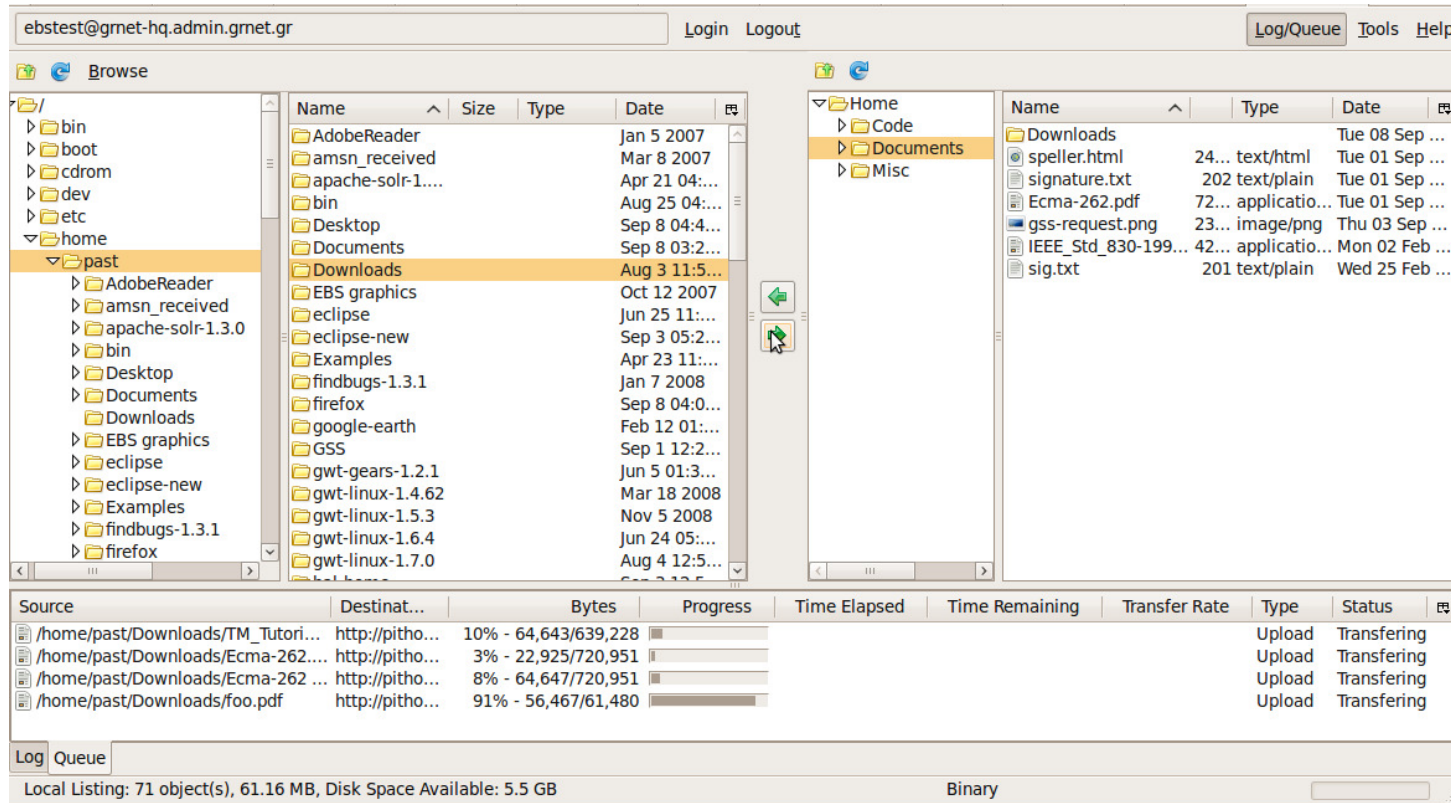
Totals: 74 files 325.9 MB used 29.7 GB free

Showing: 10 files (4.2 MB)

# webdav interface (Win 7/XP/Vista/MacOS/Linux)

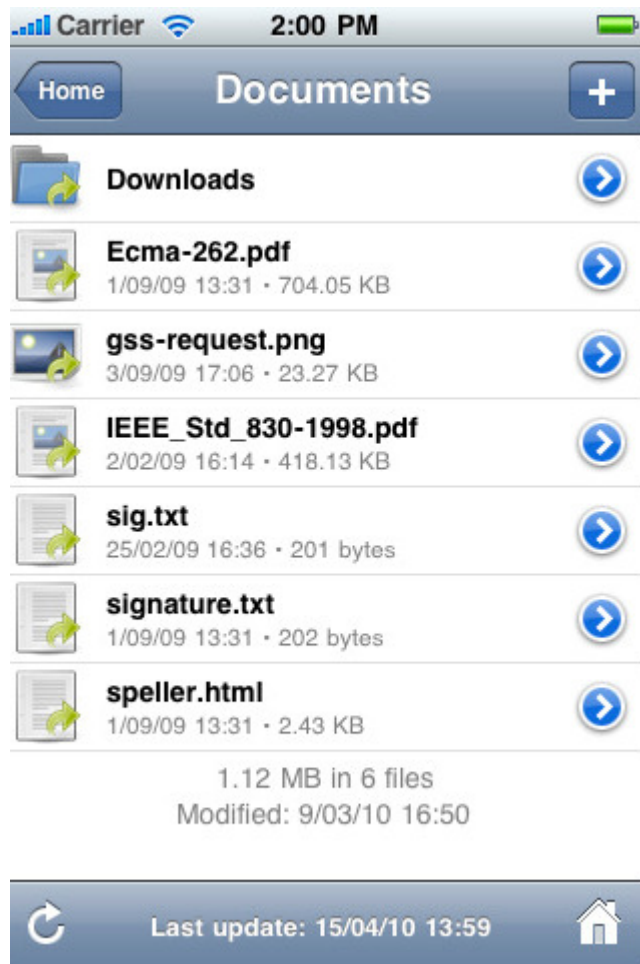
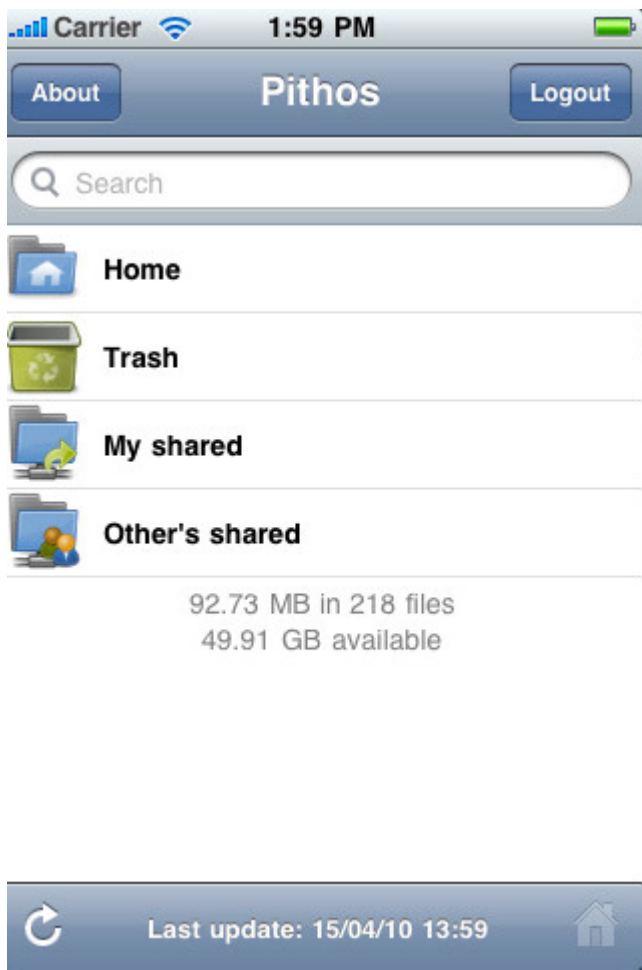


# FireGSS plugin for Firefox using REST



+

Android Market (Pithos), AppleStore Market (Pithos) (for ipad/iphone)



# Composite Services (2012+)

- Scientific Software as a Service
- Labs / Science 2.0 Environments as a Service
- Management Software as a Service
- Platform (e.g. DB, app server) as a Service
- Disaster recovery as a Service
- Data archiving as a Service
- Backup as a Service

# Design Specs

## Commodity Hardware

Common denominator:

#VM instances (in various VM 'flavors')

QoS-Guaranteed ratios:

VMs/Core, RAM/Core, disks(spindle)/core

# IT Facilities for Cloud Services:

- new Datacenter (40 racks)
  - green high-density architecture
  - PUE <1.8 / 1600KVA
  - In-row cooling
  - Fully virtualized
- ‘High’ Density (but not too dense...)
  - ~30.000 VMs (20 racks, 1500 VM/rack)
    - VMs with 1.5GB RAM
    - QoS in disk/core overcommitment
    - Block storage provisioning/elastic volumes per user
    - Persistent Storage
    - 100GB/user – 6K users already in [Pithos storage](#) (S3 like online storage service)







# IT Facilities for Cloud Services: (cont.)

- Disaster Recovery DC (@RFI stage)
  - Container based solution
  - Up to 1MW
  - Low PUE (<1.6)
  - Outdoor installation (close to hydroelectric plant facility)
  - Water cooling per rack / Freecooling

# 'Going Green' necessity

- Operation Costs (power) are huge!
- Space is always not enough – density against green

We need both **green** & **dense** infrastructure solutions...

while '**elegant**' ones in terms of services!

# Budgeting issues / Profiling your Facility

Various TCO models:

- IT capital costs
- site capital costs
- operating expenses
- energy costs

At the end:

€ Cost per VM

Could it be competitive to global market?

(i.e. ~200-250€/year/VM – what kind of VM?)

# Notes, **not** to be considered final ones:

4 year time window:

- 54.2% IT capital costs
- 22.9% energy costs (too much/considering 100% usage-not realistic-usually 50% of it)
- 12.2% operating expenses (people etc)
- 10.7% site infrastructure capital cost (too low- depends on location-building-etc)

Secret recipe?

# No secret Sauce / Open 'Ingredients'

- Open API for VM provisioning (RackSpace API+EC2 API)
- Open API for Storage
- linux + KVM
- own open source sw for cloud management (google ganeti + openstack)

Openness is a  
multiplier





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

# Thank you

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