okeanos

Delivering IaaS for the Greek Academic and Research Community

Vangelis Koukis
vkoukis@grnet.gr
Technical Coordinator, ~okeanos Project

Outline

- ~okeanos ?
- Rationale
- Design
- Platform
- Features
- Opensource
- Upcoming

What is ~okeanos?

What is ~okeanos?

‘okeanos’ is Greek for ‘ocean’.

What is ~okeanos?

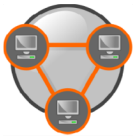
‘okeanos’ is Greek for ‘ocean’.

Oceans capture, store and deliver energy, oxygen and life around the planet.

Simplicity


LEGO
Builders of Tomorrow™
LEGOfamilyfun.com
Ages/edades
4+
6177
WARNING: CHOKING HAZARD
650
pcs/pzs

Compute

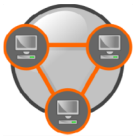


Network

Storage

Security

Virtual Machines

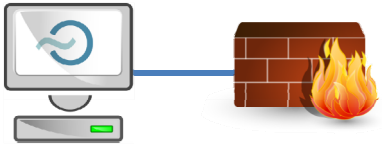


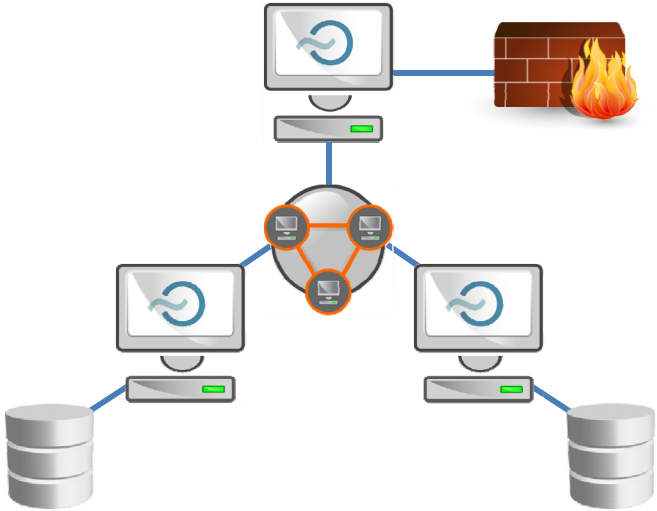
Virtual Ethernets

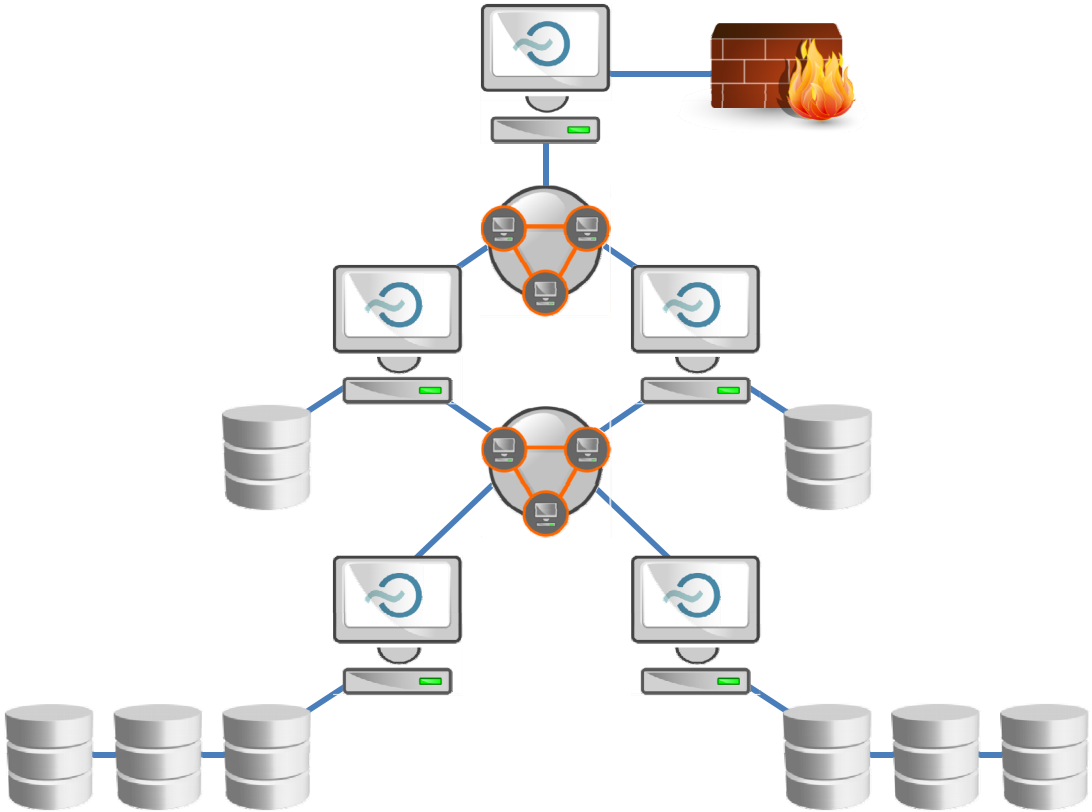
Virtual Disks

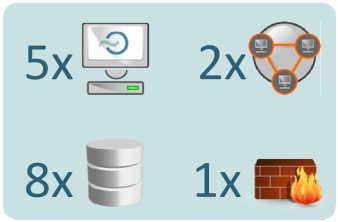
Virtual Firewalls

Flexibility








5x
2x
8x
1x

~okeanos service

- Goal: Production-quality IaaS
- Now in Alpha: from July 2011 / 350 VMs / 200 alpha users
- Target group: GRNET's customers
  - direct: IT depts of connected institutions
  - indirect: university students, researchers in academia
- Users manage resources over
  - a simple, elegant UI, or
  - a REST API, for full programmatic control

~okeanos service

- **Compute:** Cyclades
- **Files:** Pithos+
- **Images:** Plankton
- **Identity:** Astakos

- **Volumes:** Archipelago
- **Accounting/Billing:** Aquarium

Rationale

How it all started

How it all started

- Need for easy, secure access to GRNET's datacenters
  - ➡ User friendliness, simplicity
- Scalable to the thousands
  - ➡ #VMs, TBs, users (Pithos: ~10k)
- running within GRNET's AAI Federation
- Resell or build your own?

Build on commercial IaaS?

- Commercial IaaS
  - Amazon EC2 not an end-user service
  - Need to develop custom UI, AAI layers
  - Vendor lock-in
  - Unsuitable for IT depts
    - persistent, long-term servers, custom networking requirements
- Gain know-how, build on own IaaS → reuse for own services

What about opensource?

- Eucalyptus, OpenNebula, OpenStack
- Need a mature opensource core to *build* around
- Maturity, production-readiness?
  - ➡ proven in production environments, predictable
- Extensibility?
- Flexibility?
- Upgradeability, maintainability?

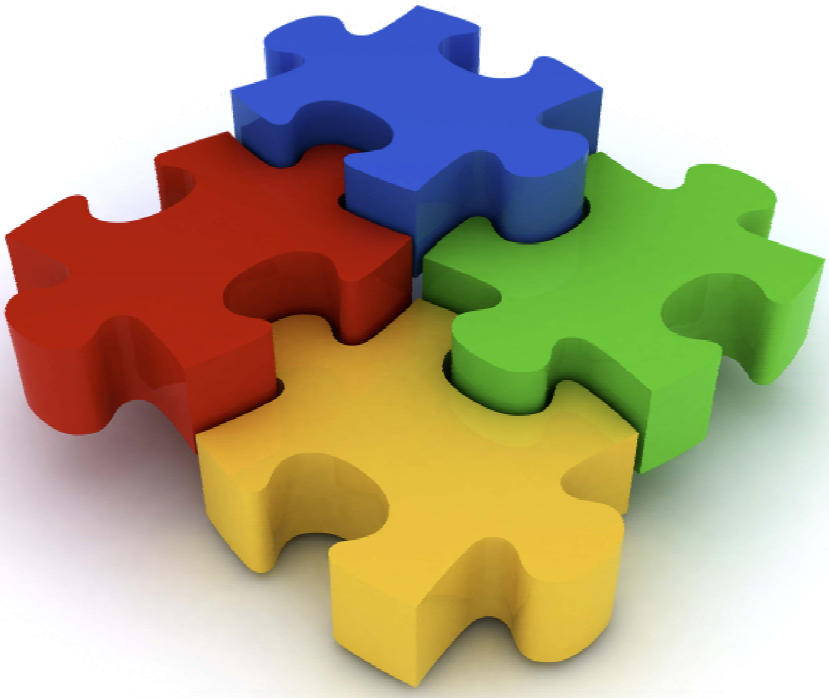
Design

~okeanos design decisions

- Reuse existing components
- Build on Google Ganeti
- target commodity hardware
- release to the community as opensource

~okeanos design principles

- No need to make the world
- No need to support *everything*
  - Service developed and maintained by ~10-15 people
- Start from the architecture…
  - …then discover, combine, reuse the right components
- And for everything that's not already available
  - Do it yourself!



Jigsaw puzzle

- Synnefo
  - custom cloud management software to power ~okeanos
- Google Ganeti backend
  - VM cluster management: physical nodes, VMs, migrations
- OpenStack APIs: Compute API v1.1, Object Storage API
  - with custom extensions whenever necessary
- Then everything comes together
  - UI, Networking, Images, Storage, Monitoring, Identity management, Accounting, Billing, Clients, Helpdesk

Why Ganeti?

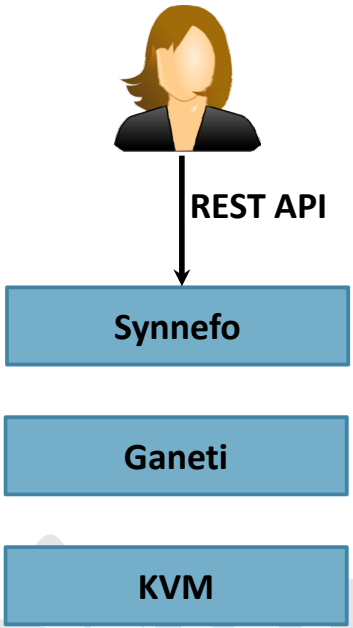
- No need to reinvent the wheel
- Scalable, proven software infrastructure
  - Built with reliability and redundancy in mind
  - Combines open components (KVM, LVM, DRBD)
  - Well-maintained, readable code
- VM cluster management in production is serious business
  - reliable VM control, VM migrations, resource allocation
  - handling node downtime, software upgrades

Why Ganeti?

- GRNET already had long experience with Ganeti
  - provides ~280 VMs to NOCs through the ViMa service
  - involved in development, contributing patches upstream
- Build on existing know-how for ~okeanos
  - Common backend, common fixes
  - reuse of experience and operational procedures
  - simplified, less error-prone deployment

Platform

Software Stack



Software Stack

REST API

Multiple users, multiple resources

Synnefo

Multiple VMs on cluster

Ganeti

Single VM

KVM

Platform Design

user@home

admin@home

GRNET
datacenter

Virtual
Hardware

Platform Design

user@home

Web Client

CLI Client

Web Client 2

admin@home

GRNET datacenter

Synnefo cloud management software

Google Ganeti

KVM

Debian

Virtual Hardware

Platform Design

user@home

Web Client

CLI Client

Web Client 2

admin@home

GRNET datacenter

Synnefo cloud management software

Google Ganeti

KVM

Debian

Virtual Hardware

Platform Design

user@home

Web Client

CLI Client

Web Client 2

admin@home

GRNET datacenter

Synnefo cloud management software

Google Ganeti

KVM

Debian

Virtual Hardware

Platform Design

user@home

Web Client

CLI Client

Web Client 2

admin@home

GRNET datacenter

Synnefo cloud management software

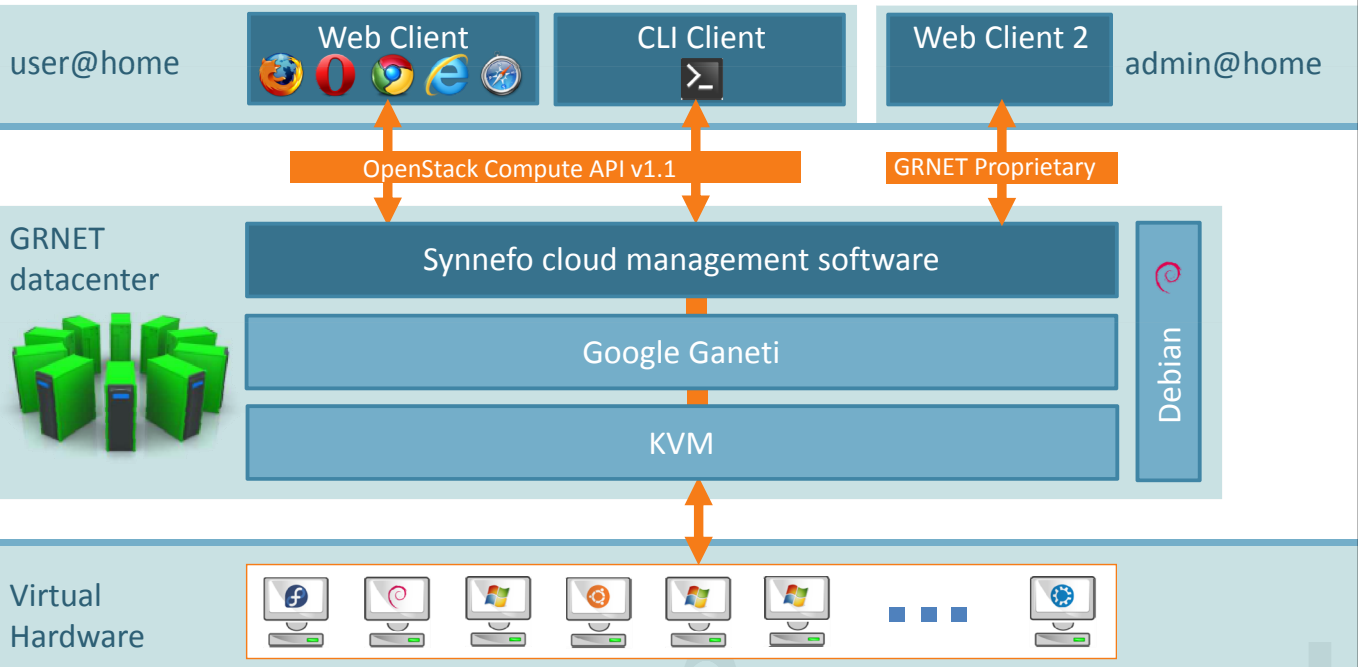
Google Ganeti

KVM

Debian

Virtual Hardware

Platform Design



Features

Virtual Machine Actions

My_Windows_desktop

Virtual Machine Actions

My_Windows_desktop

Start

Reboot

Shutdown

Virtual Machine Actions

My_Windows_desktop

Start

Console

Reboot

Shutdown

Destroy

IaaS – Compute (1)

- Virtual Machines
  - powered by KVM
    - Linux and Windows guests, on Debian hosts
  - Google Ganeti for VM cluster management
  - accessible by the end-user over the Web or programmatically (OpenStack Compute v1.1)

IaaS – Compute (2)

- User has full control over own VMs
  - Create
    - Select # CPUs, RAM, System Disk
    - OS selection from pre-defined Images, or custom Images
    - popular Linux distros (Fedora, Debian, Ubuntu)
    - Windows Server 2008 R2
  - Start, Shutdown, Reboot, Destroy
  - Out-of-Band console over VNC for troubleshooting

IaaS – Compute (3)

- REST API for VM management
  - OpenStack Compute v1.1 compatible
  - 3rd party tools and client libraries
  - custom extensions for yet-unsupported functionality
  - Python & Django implementation
- Full-featured UI in JS/jQuery
  - UI is just another API client
  - All UI operations happen over the API

IaaS – Network (Virtual Ethernets)

Internet

Private Network 1

IaaS – Network (Virtual Ethernets)

Internet

Private Network 1

IaaS – Network (Virtual Ethernets)

Internet

Private Network 1

IaaS – Network (Virtual Ethernets)

Internet

Private Network 1

IaaS – Network (Virtual Ethernets)

Internet

Private Network 1

Private Network 2

Private Network 3

IaaS – Network (Virtual Ethernets)

Internet

Private Network 1

Private Network 2

Private Network 3

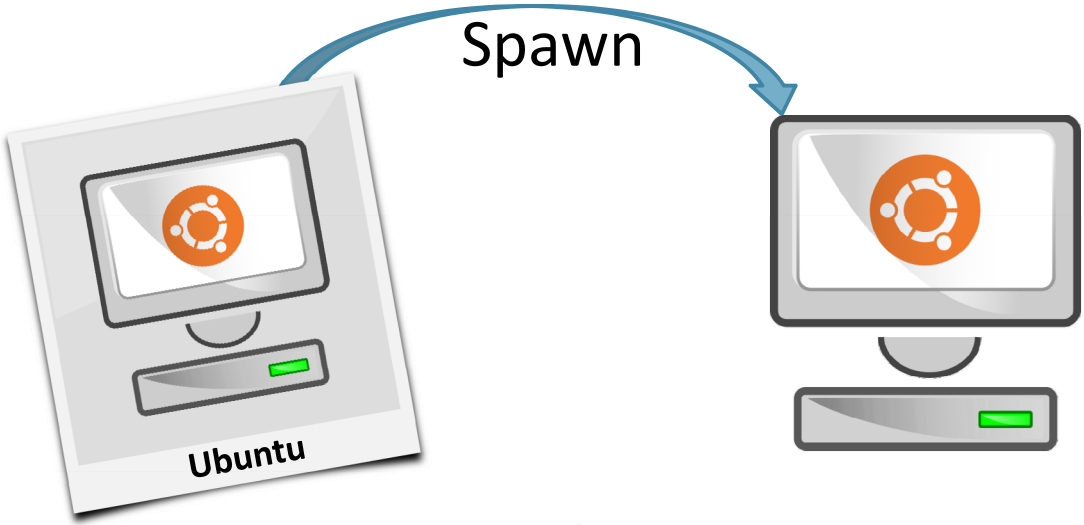
IaaS – Network - Functionality

- Dual IPv4/IPv6 connectivity for each VM
- Easy, platform-provided firewalling
  - Array of pre-configured firewall profiles
  - Or roll-your-own firewall inside VM
- Multiple private, virtual L2 networks
- Construct arbitrary network topologies
  - e.g., deploy VMs in multi-tier configurations
- Exported all the way to the API and the UI

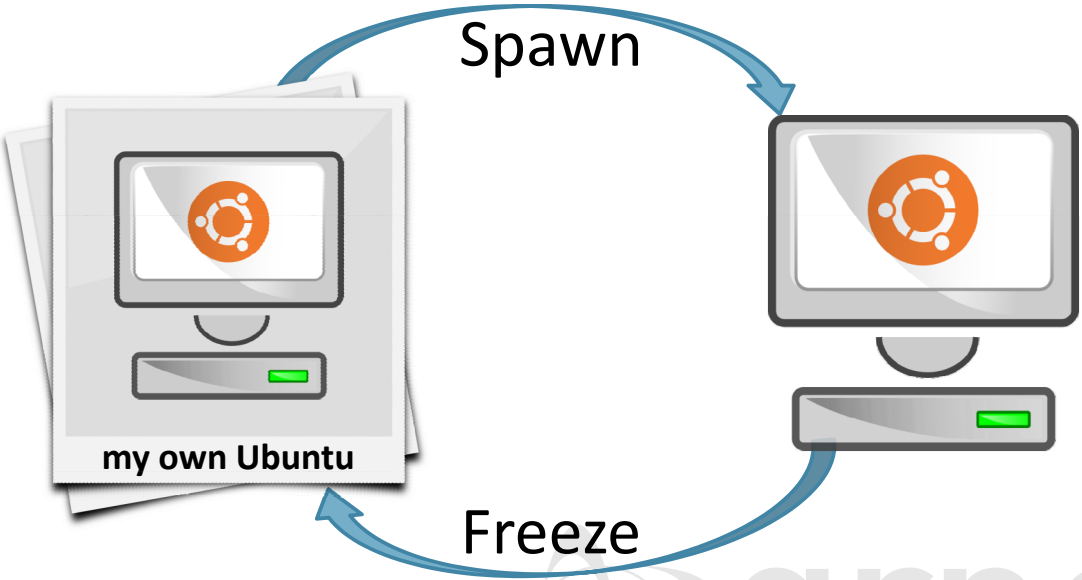
Unity

Images

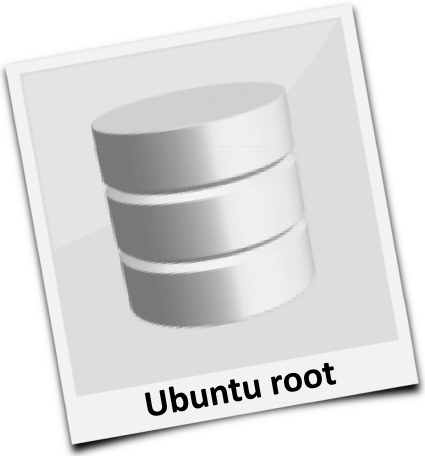
Images



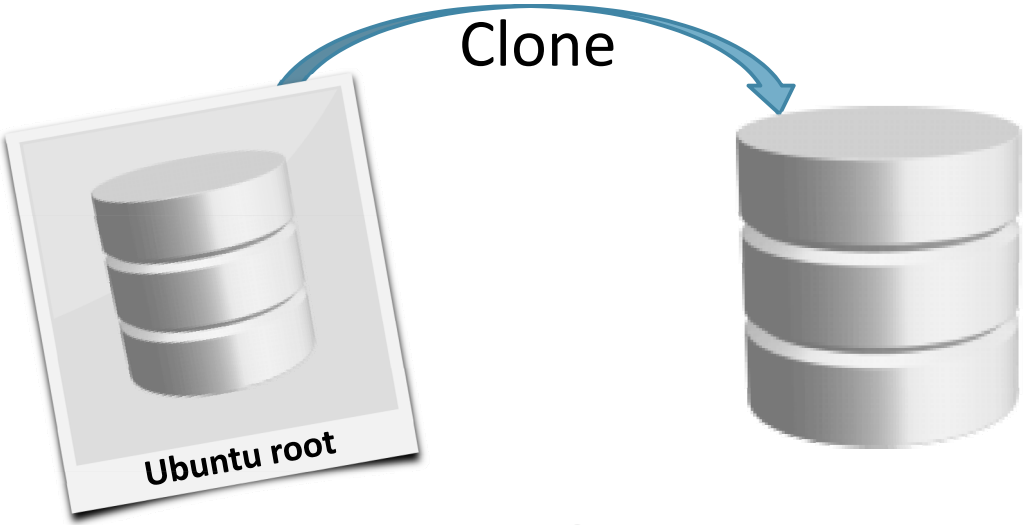
Images



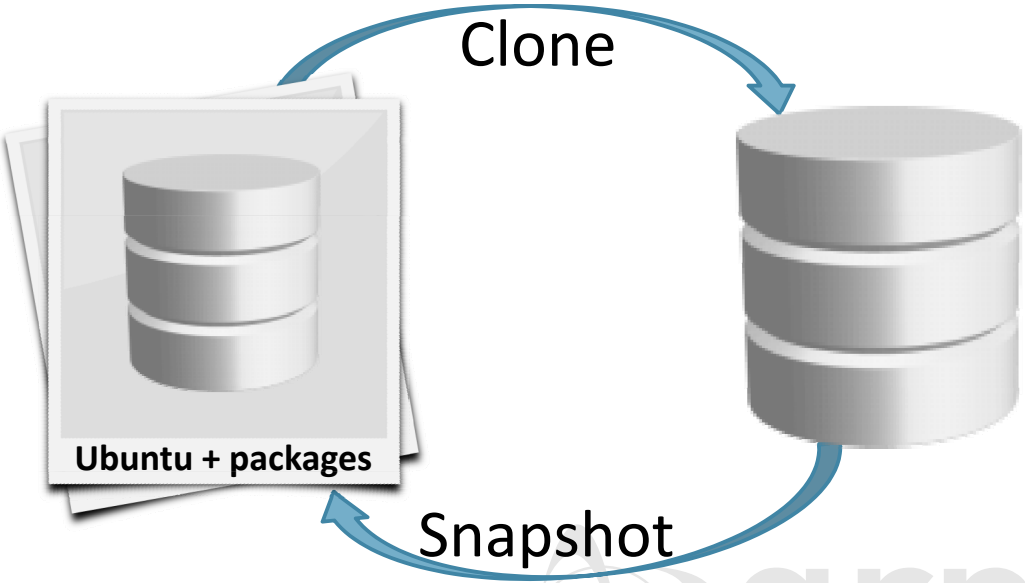
Images ↔ Storage



Images ↔ Storage



Images ↔ Storage

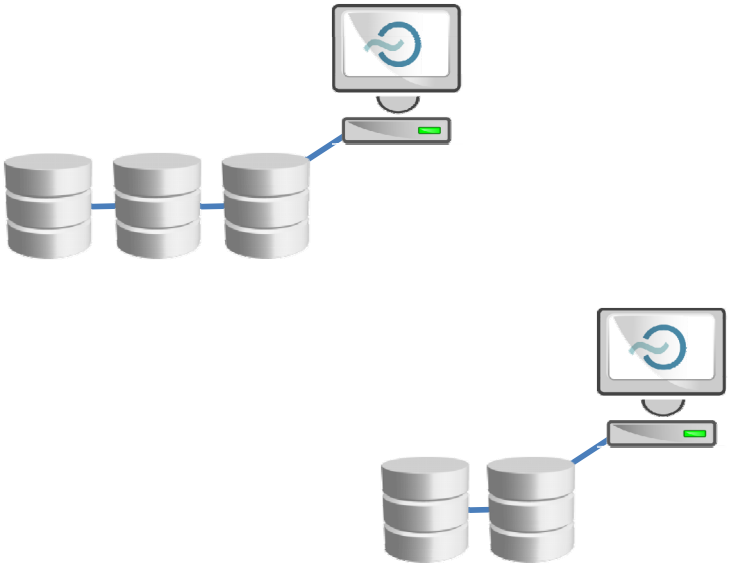


Images – Golden Image

Images – Golden Image

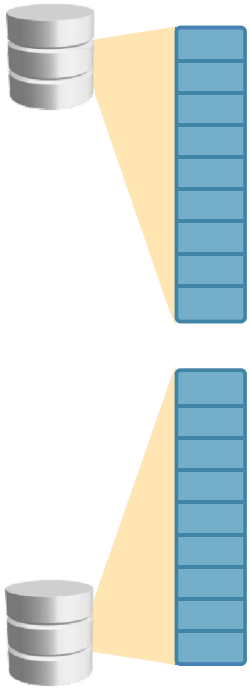
IaaS – Storage

IaaS – Storage

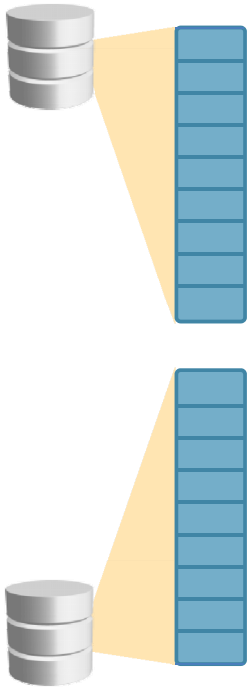


IaaS – Storage

IaaS – Storage

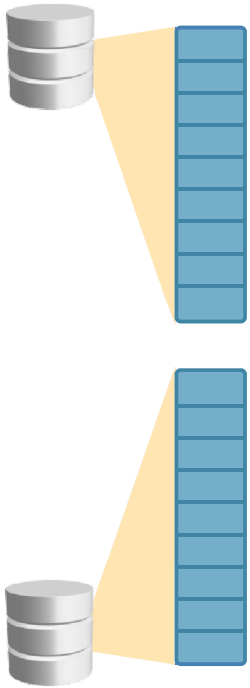


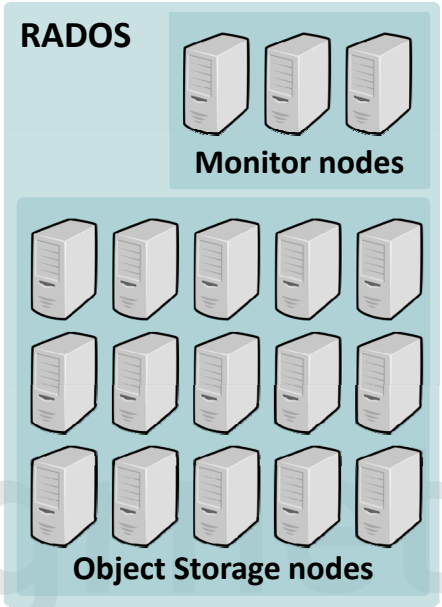
IaaS – Storage



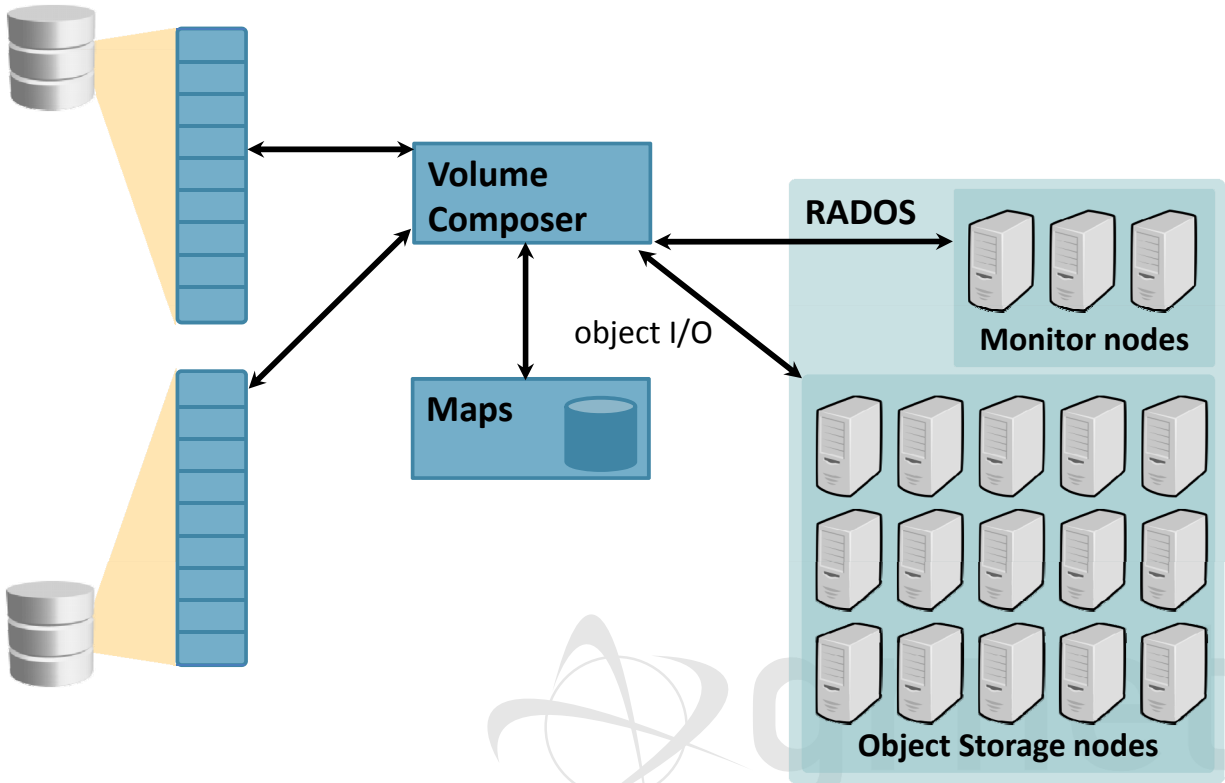
Storage

IaaS – Storage

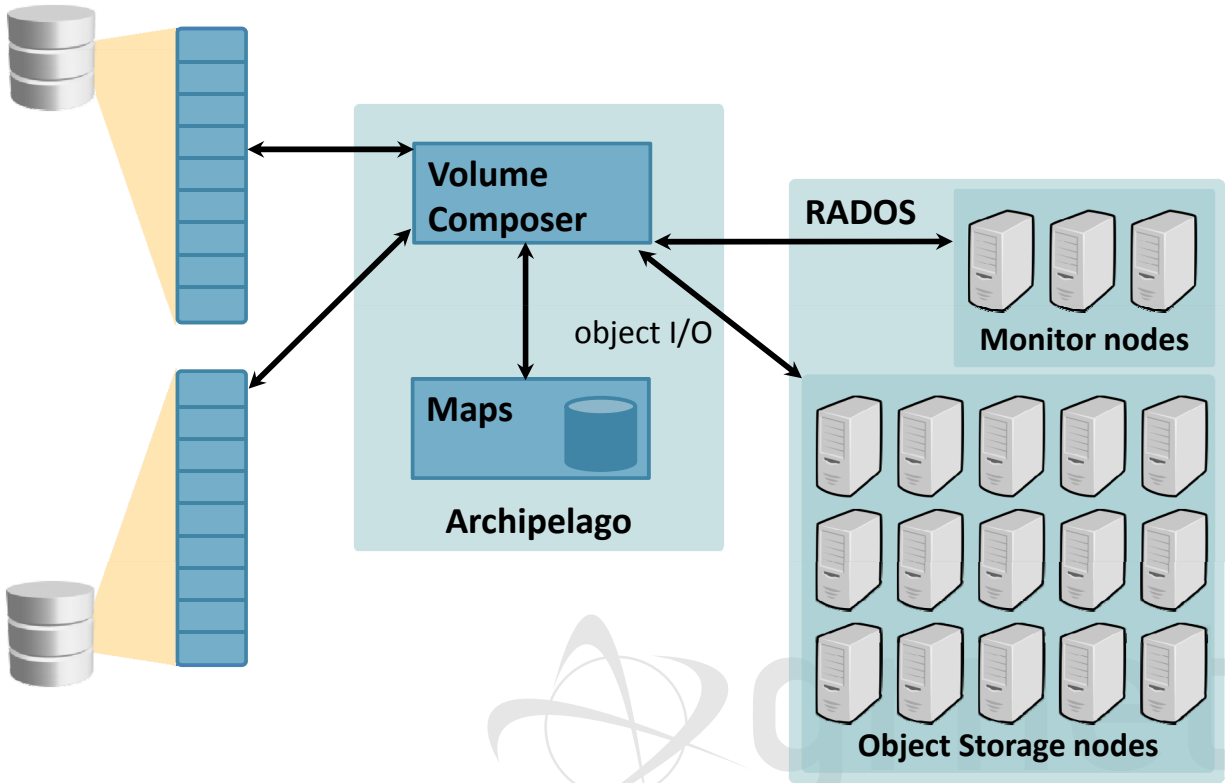




IaaS – Storage



IaaS – Storage



IaaS – Storage (1)

- First-phase deployment
  - System-provided *and* custom user Images
  - Redundant storage based on DRBD
  - VMs survive node downtime or failure
- Currently under testing
  - Reliable distributed storage over RADOS
  - Combined with custom software for snapshotting, cloning
  - Dynamic virtual storage volumes

IaaS – Storage (2)

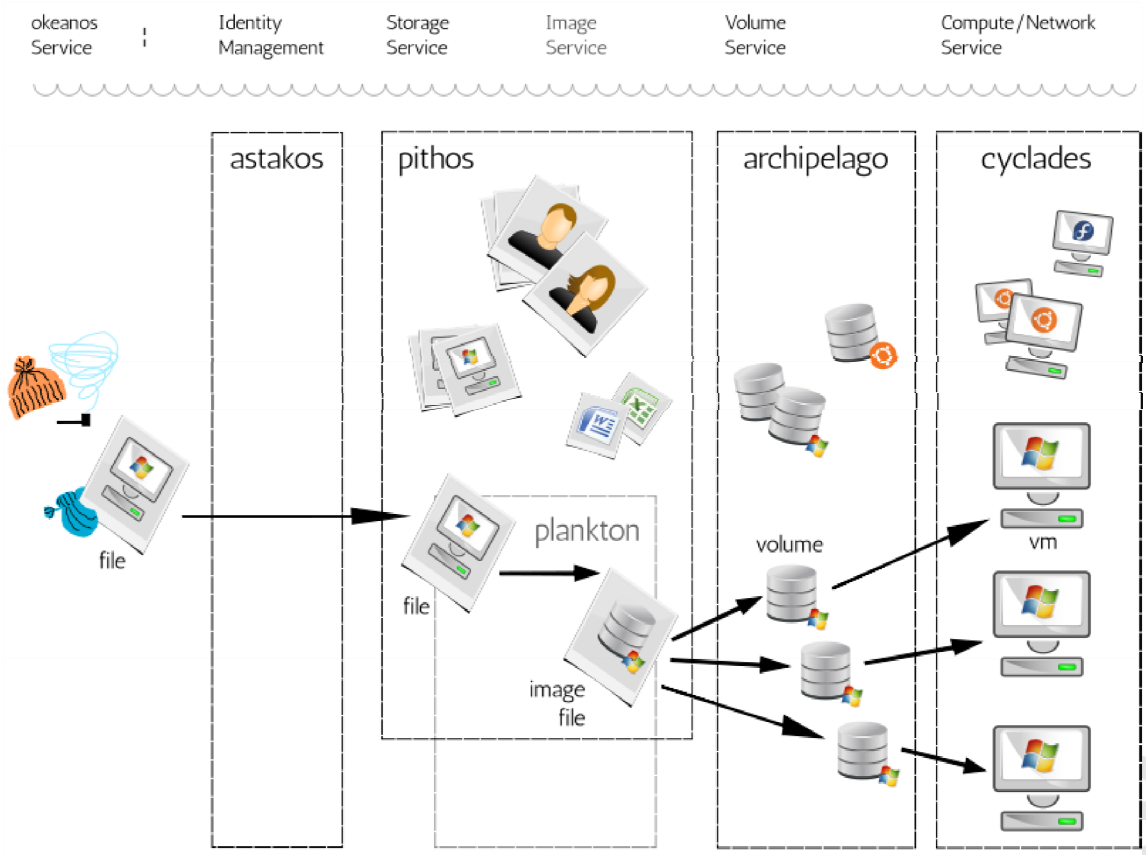
- Multi-tier storage architecture
  - Dedicated Storage Nodes (SSD, SAS, and SATA storage)
  - OSDs for RADOS
- Custom storage layer: Archipelago
  - manages snapshots, creates clones over RADOS
  - OS Images held as snapshots
- VMs created as clones of snapshots

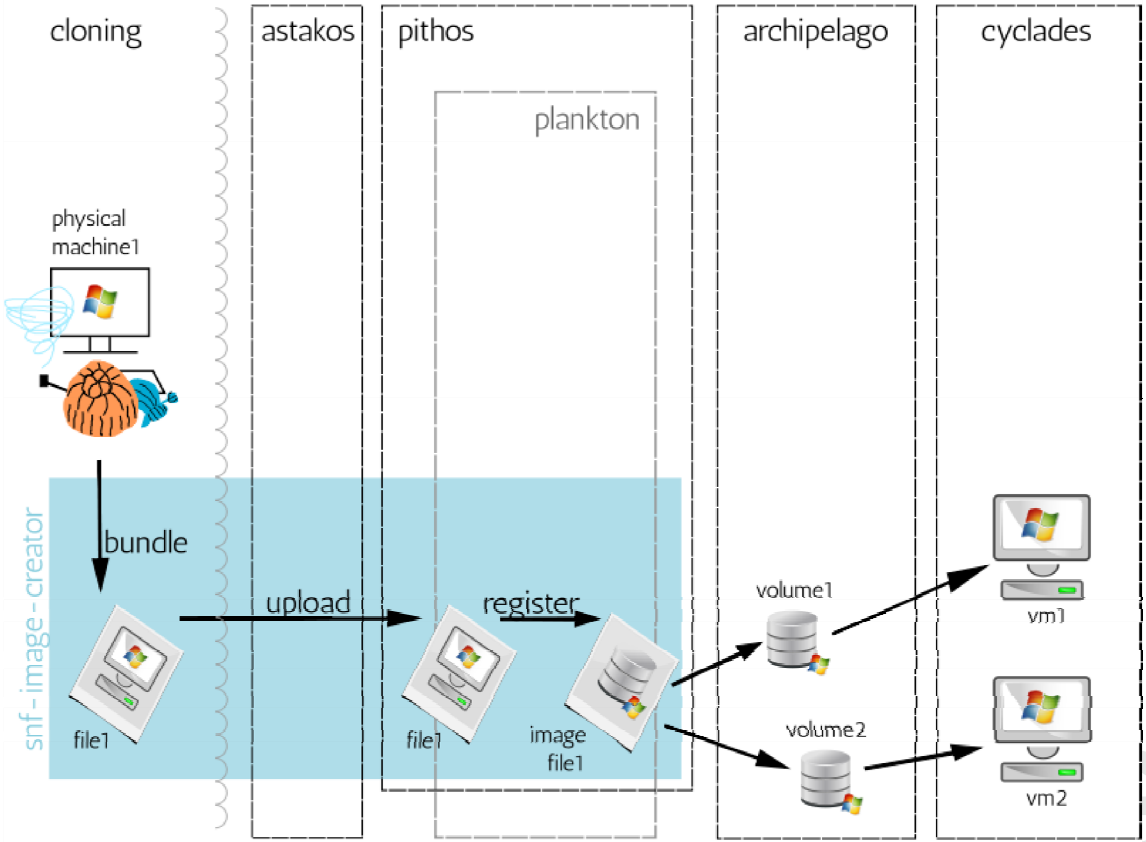
Custom Images: snf-image

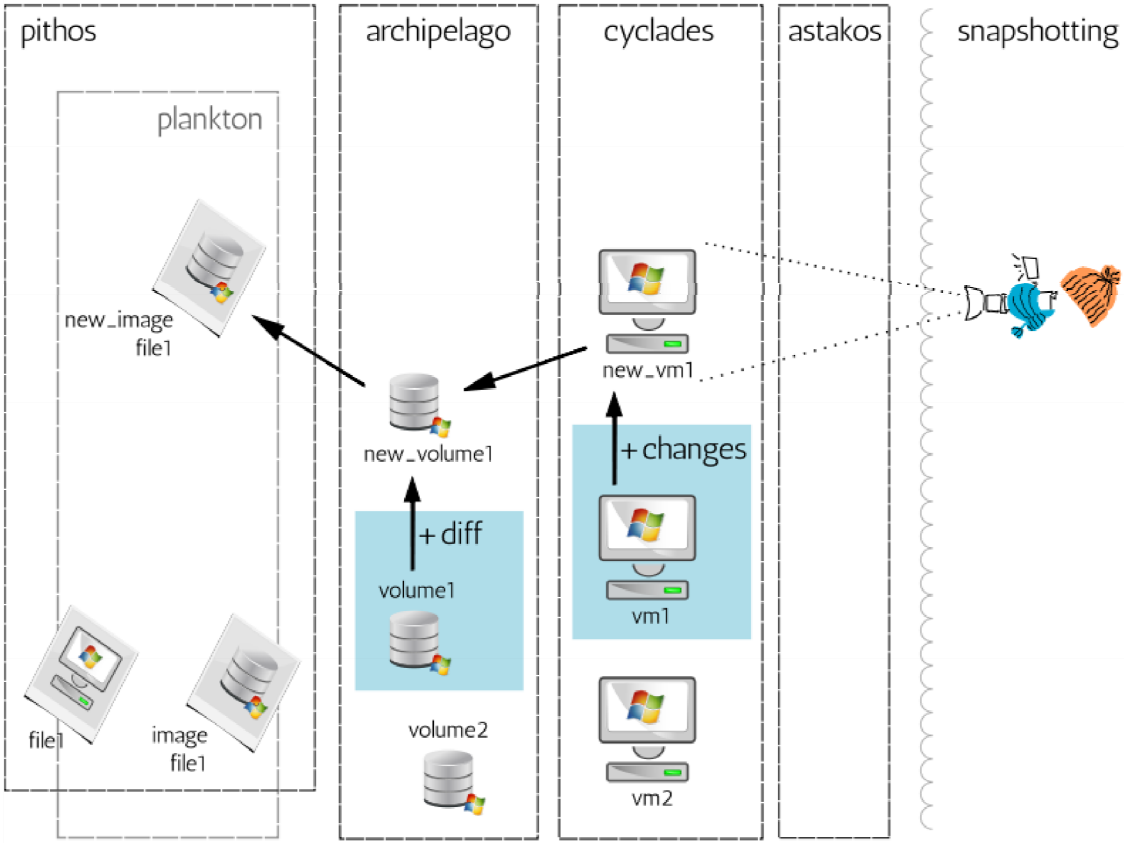
- *Untrusted* images
  - Host cannot touch user-provided data
  - Resize fs, change hostname, change passwords, inject files
- Split design
  - snf-image-host
  - snf-image-helper
- All customization in helper VM

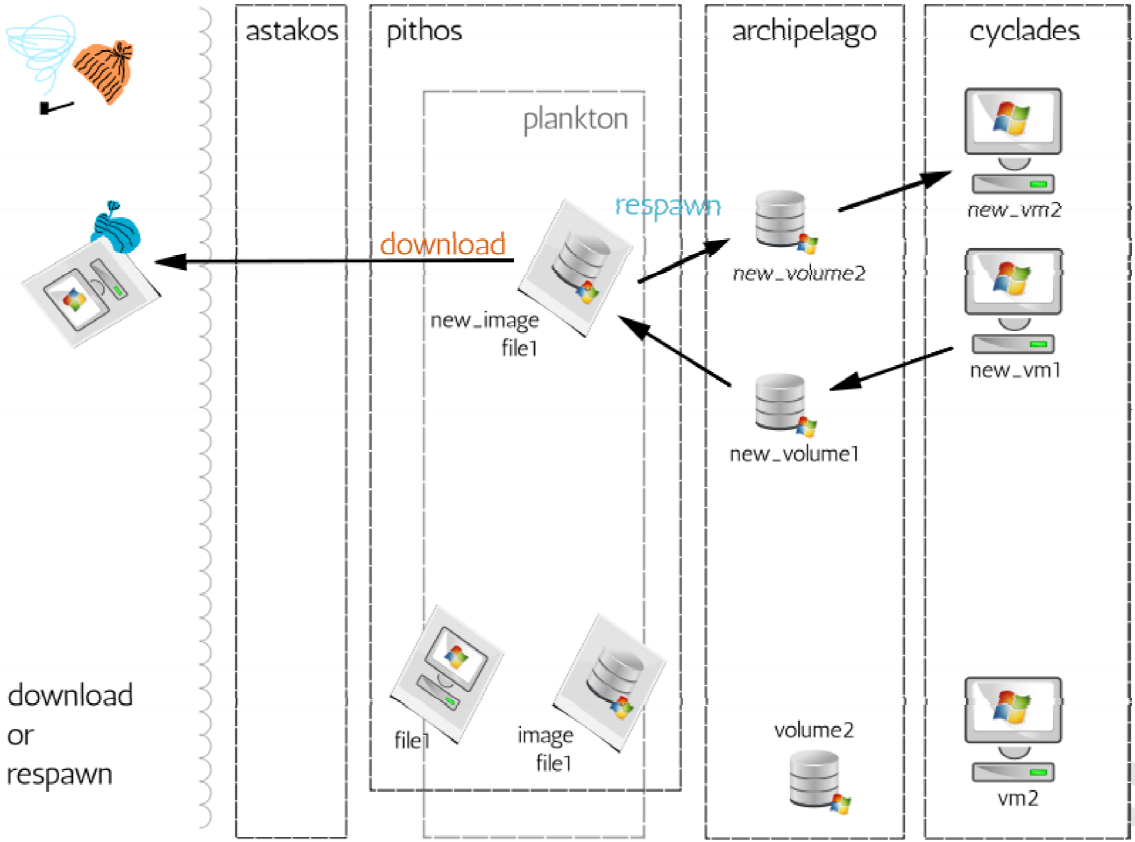
- OpenStack Object Storage API
- Block storage
- Content-based addressing for blocks
- Every file is a collection of blocks
- Web-based, command-line, and native clients
- Synchronization, deduplication
- An integral part of ~okeanos
  - User files, Image registry for VM Images
  - Goal: use common backend with Archipelago

Integration


okeanos Service
Identity Management
Storage Service
Image Service
Volume Service
Compute/Network Service
astakos
pithos
archipelago
cyclades
file
file
plankton
image file
volume
vm


cloning
astakos
pithos
plankton
archipelago
cyclades
physical machine1
bundle
snf-image-creator
upload
register
file1
file1
image file1
volume1
volume2
vm1
vm2


pithos
archipelago
cyclades
astakos
snapshotting
plankton
new_image
file1
file1
image
file1
new_volume1
+ diff
volume1
volume2
new_vm1
+ changes
vm1
vm2


astakos
pithos
archipelago
cyclades
plankton
respawn
download
new_image
file1
new_volume2
new_vm2
new_vm1
new_volume1
file1
image
file1
volume2
vm2
download
or
respawn

Support services

- **Identity:** Astakos
  - Provides the user base for ~okeanos
  - Once authenticated, the user retrieves a common auth token for programmatic access
- **Accounting / Billing:** Aquarium
  - Underlying crediting and billing infrastructure

Tools

./kamaki

```
$ ipython

In [1]: from kamaki.client import Client
In [2]: c = Client('http://localhost:8000/api/v1.1', "1234527db2…")
In [3]: c.list_flavors()
…
In [4]: i = c.list_images()
In [5]: i[5]
{u'created': u'2011-06-09T00:00:00+00:00',
 u'id': 7,
 u'metadata': {u'values': {u'OS': u'windows',
                           u'size': u'11000'}},
 u'name': u'Windows',
 u'progress': 100,
 u'status': u'ACTIVE',
 u'updated': u'2011-09-12T14:47:12+00:00'}
In [6]: c.create_server('mywin1', 3, 5)
```

./kamaki

```
$ ./kamaki
Usage: kamaki <group> <command>  [options]
…
  --api=API       API can be either openstack or synnefo
  --url=URL       API URL
  --token=TOKEN   use token TOKEN
…

Commands:
  flavor info           get flavor details
  flavor list           list flavors
…
  image create          create image
  image delete          delete image

$ ./kamaki server shutdown 101 --url=http://localhost:8000/api/v1.1
--token=1234527db2…
```

Upcoming

Current and Upcoming features

- Now: Alpha2
  - Common user base, custom user images on Pithos+
- short-term: Synnefo v0.10, Beta
  - Ultra-lightweight VMs on Archipelago with RADOS backend
- medium-term
  - OCCI bridge
  - Volumes: clonable / snapshottable / attachable disks
- Upcoming beta in fully populated datacenter

Sights

okeanos alpha

options | en

machines

New Machine +

Welcome to ~okeanos !

From this panel you will be able to manage your Virtual Machines (VMs).

The panel is currently empty, because you don't have any VMs yet. Start by clicking the orange button on the top left. The wizard will guide you through the whole process.

For more information or help, click here.

Create new machine

close

1 Image — Select an OS: Choose your preferred image — 2 3 4

Image type

- System
- My images
- Shared with me
- Public

Categories

no categories available

Available images

Windows by images@okeanos.grnet.gr Windows 2008 R2, Aero Desktop Ex...	10.28 GB details
CentOS by images@okeanos.grnet.gr CentOS 6.0	599.70 MB details
Fedora by images@okeanos.grnet.gr Fedora 16 Desktop Edition	2.58 GB details
Kubuntu by images@okeanos.grnet.gr Kubuntu 11.10	2.78 GB details
Ubuntu by images@okeanos.grnet.gr Ubuntu 11.10	2.48 GB details
Debian Desktop by images@okeanos.grnet.gr Debian Squeeze Desktop	3.24 GB details
Debian Base by images@okeanos.grnet.gr Debian Squeeze Base System	450.03 MB details

cancel | next

Create new machine

close

1 2 Flavor — Select CPUs, RAM and Disk Size — 3 4

Available options are filtered based on the selected image

Predefined

- Small
- Medium
- Large

CPUs — Choose number of CPU cores

1x | 2x | 4x

Memory size — Choose memory size

1024 MB | 2048 MB | 4096 MB

Disk size — Choose disk size

5 GB | 10 GB | 20 GB

Storage — Select storage type

DRBD

DRBD storage.

previous | next

Create new machine

close

1 2 3 Personalize — Virtual machine custom options — 4

Virtual machine custom options

Machine name

My CentOS server

Public SSH keys

manage keys

Select ssh keys

No ssh keys in your account. Create/import a new key now.

Suggested tags

You may change machine tags later from the machines view.

Role

Database server | File server | Mail server | Web server | Proxy

previous | next

SSH keys

Manage your ssh keys

close

Back to machine create wizard

SSH public keys list

generate new | create/import new +

You can use SSH keys to establish a secure connection between your computer and the virtual machines.

No public keys exist add one now

The panel is currently empty, because you don't have any VMs yet. Start by clicking the orange button on the top left. The wizard will guide you through the whole process.

For more information or help, click here.

SSH keys

Manage your ssh keys

close

Back to machine create wizard

SSH public keys list

generate new | create/import new +

You can use SSH keys to establish a secure connection between your computer and the virtual machines.

Your new public key has been added click here to download private key. close

rsa public key

fingerprint: e7:92:a9:fc:36:a2:d0:7c:8f:33:e5:97:49:e0:a4:cc

For more information or help, click here.

Create new machine close

1 2 3 Personalize — Virtual machine custom options — 4

Virtual machine custom options

Machine name

Lab database server

Public SSH keys

manage keys

Select ssh keys

public key ☑

Suggested tags

You may change machine tags later from the machines view.

Role

Database server | File server | Mail server | Web server | Proxy

previous next

Create new machine close

1 2 3 4 Confirm

Confirm your settings
Confirm that the options you have selected are correct

Machine name

Lab database server

Image

CentOS

CentOS 6.0

OS	**Centos**
Size	**599.70 MB**
GUI	**No GUI**
Kernel	**2.6.32**

Flavor

CPUs	**2x**
Memory	**2048 MB**
Disk	**10.00 GB**
Storage type	**DRBD**

Machine Tags

Role Database server

SSH Keys

public key

previous create machine

Machine password

close

Your new machine is now buidling... (this might take a few minutes)

Write down your password now: **HidlhyVw3D**

You will need this later to connect to your machine.
After closing this window you will *NOT* be able to retrieve it again

view machine

cyclades pithos+ kpap@grnet.gr

okeanos alpha

options | en

machines

New Machine +

icon list single

Lab database server

Initializing...

info

Building...

Destroy

powered by synnefo **v0.9.7**

okeanos alpha

options | en

machines

New Machine +

icon list single

Building...

Finalizing...

Lab database server

CPUs:	2
RAM (MB):	2048
System Disk (GB):	10
Image Name:	CentOS
Image Size (MB):	599.70 MB
Public IPv4:	not set
Public IPv6:	not set

tags

Destroy

previous next

Lab database ...

CPU Utilization

Network Utilization

okeanos alpha

options | en

machines

New Machine +

icon | list | single

Lab database server

167.92 MB of 599.70 MB (28%)

Building...

info

CPUs: 2
RAM:2048MB
System Disk: 10GB

Image: CentOS
Image Size: 599.70 MB

CPU

Net

Full report

Role : Database s...
OS : centos

Manage Tags

okeanos alpha

options | en

machines

New Machine +

icon | list | single

Lab database server

IPv4 83.212.5.194 IPv6 ...a800:ff:fe74:a484

info

Running

cyclades | pithos+ | kpap@grnet.gr

okeanos alpha

options | en

machines

New Machine +

icon | list | single

Lab database server

IPv4 83.212.5.194 IPv6 ...a800:ff:fe0e:3194

info

Running

Reboot
Shutdown
Confirm X
Console
Destroy

Lab web server

IPv4 83.212.5.196 IPv6 ...a800:ff:fee5:b48a

info

Running

cyclades | pithos+ | kpap@grnet.gr

okeanos alpha

options | en

machines

New Machine +

icon | list | single

Lab database server

IPv4 83.212.5.194 IPv6 ...a800:ff:fe0e:3194

info

Running

Reboot
Shutdown
Confirm X
Console
Destroy

Lab web server

IPv4 83.212.5.196 IPv6 ...a800:ff:fee5:b48a

info

Running

Reboot
Confirm X
Shutdown
Console
Destroy

Your actions will affect 2 machines

Cancel all | Confirm all

cyclades | pithos+ | kpap@grnet.gr

okeanos alpha

options | en

machines

New Machine +

icon | list | single

Lab database server

IPv4 83.212.5.194 IPv6 ...a800:ff:fe0e:3194

info

Shutting down...

Lab web server

IPv4 83.212.5.196 IPv6 ...a800:ff:fee5:b48a

info

Rebooting...

okeanos alpha

options | en

machines

New Machine +

icon | list | single

Lab web server

IPv4 83.212.5.196 IPv6 ...a800:ff:fee5:b48a

info

Running

Lab database server

IPv4 83.212.5.194 IPv6 ...a800:ff:fe0e:3194

info

Stopped

okeanos alpha

options | en

machines

New Machine +

icon | list | single

Search:

	OS	Name	Flavor	Status
☐		Lab database server	2 CPU, 2048MB, 10GB	Stopped
☐		Lab web server	2 CPU, 2048MB, 10GB	Running

Start
Reboot
Shutdown

Destroy

okeanos alpha

options | en

machines

New Machine +

icon list single

Stopped

Lab database server

CPUs:	2
RAM (MB):	2048
System Disk (GB):	10
Image Name:	CentOS
Image Size (MB):	599.70 MB
Public IPv4:	83.212.5.194
Public IPv6:	2001:db8::a800:ff:fe0e:3194

tags

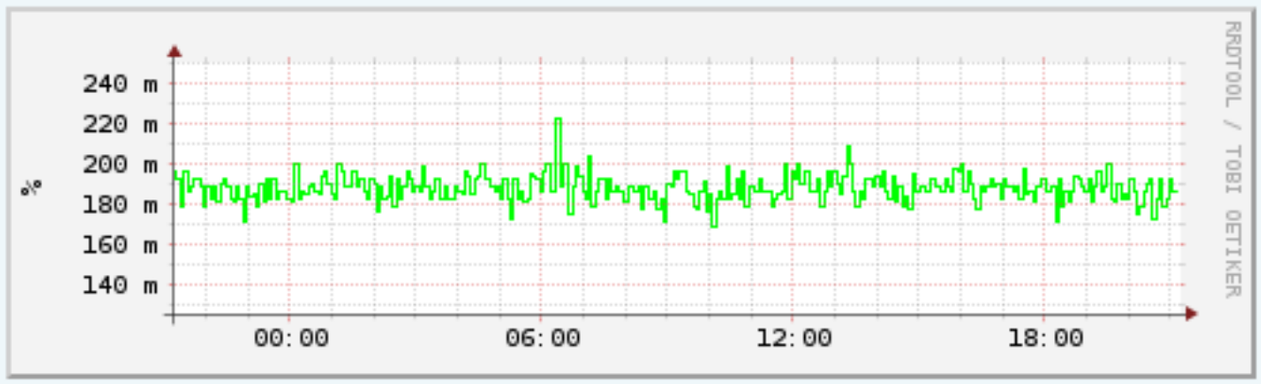
Start

Destroy

previous next

Lab database ...
Lab web server

CPU Utilization



Stopped

Image Size (MB): 599.70 MB

Public IPv4: 83.212.5.194

Public IPv6: 2001:db8::a800:ff:fe0e:3194

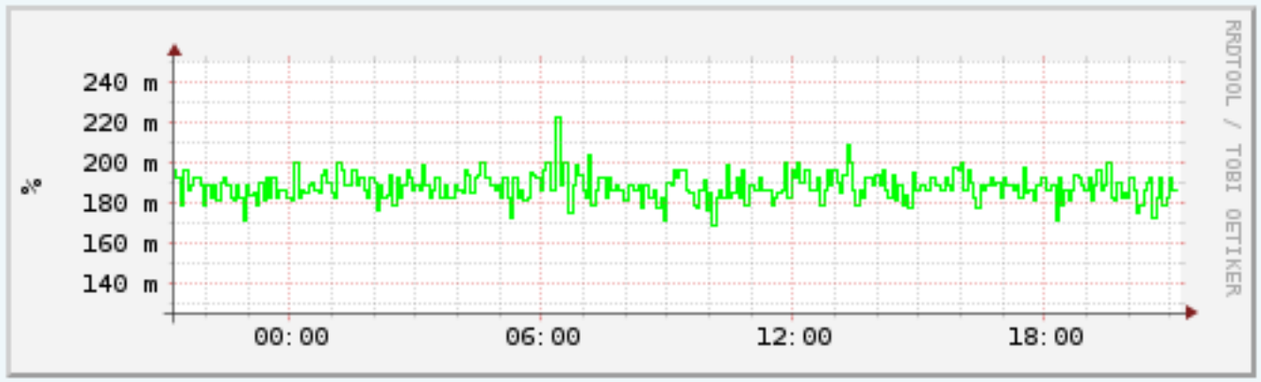
tags

previous next

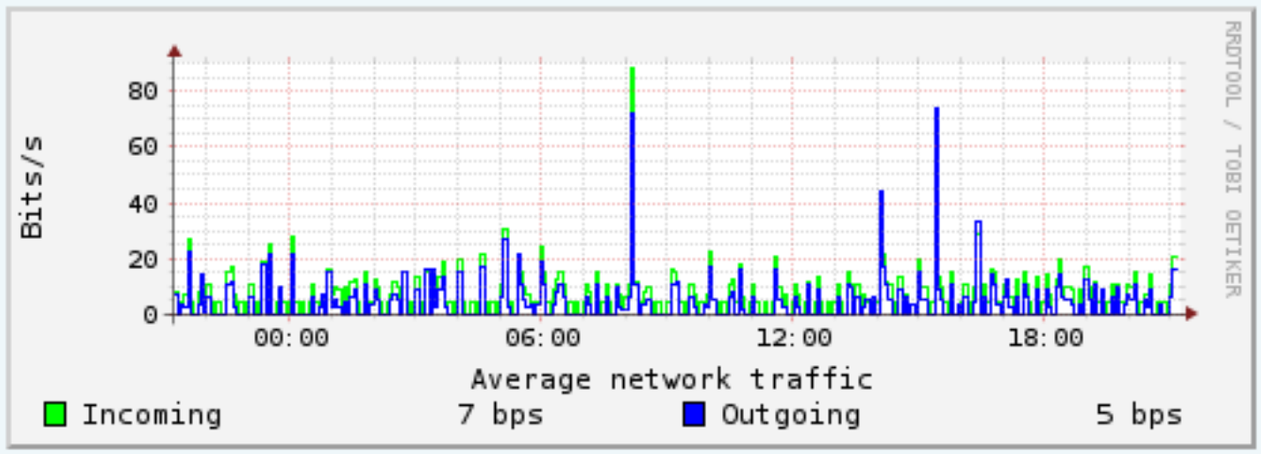
Lab database ...

Lab web server

CPU Utilization



Network Utilization



Lab web server

Manage tags

close

Role	OS	Add new tag +
Web server	debian	

Lab web server Running

IPv4 83.212.5.196 IPv6 ...a800:ff:fee5:b48a

info

CPUs: 2
RAM:2048MB
System Disk: 10GB
Image: Debian Base
Image Size: 450.03 MB

CPU
CPU: 0.2%
Net
TX/RX: 0.00/0.00 Mbps
Full report

Role : Web server
OS : debian
Manage Tags

Lab database server Stopped

IPv4 83.212.5.194 IPv6 ...a800:ff:fe0e:3194

info

Lab web server

Manage tags

close

Key: Value: save cancel

OS Owner Role

Role
Web server

OS
debian

Add new tag +

CPUs: 2
RAM:2048MB
System Disk: 10GB
Image: Debian Base
Image Size: 450.03 MB

CPU
CPU: 0.2%
Net
TX/RX: 0.00/0.00 Mbps
Full report

Role : Web server
OS : debian
Manage Tags

Lab database server

IPv4 83.212.5.194 IPv6 ...a800:ff:fe0e:3194

info

Stopped

Lab web server

Manage tags

close

Key: software Value: apache 2.3 save cancel

OS Owner Role

Role
Web server

OS
debian

Add new tag +

CPUs: 2
RAM:2048MB
System Disk: 10GB
Image: Debian Base
Image Size: 450.03 MB

CPU
CPU: 0.2%
Net
TX/RX: 0.00/0.00 Mbps
Full report

Role : Web server
OS : debian
Manage Tags

Lab database server

IPv4 83.212.5.194 IPv6 ...a800:ff:fe0e:3194

info

Stopped

Lab web server

Manage tags

close

Role	OS	software	Add new tag +
Web server	debian	apache 2.3	

Lab web server Running

IPv4 83.212.5.196 IPv6 ...a800:ff:fee5:b48a

info

CPUs: 2
RAM:2048MB
System Disk: 10GB
Image: Debian Base
Image Size: 450.03 MB

CPU
CPU: 0.2%
Net
TX/RX: 0.00/0.00 Mbps
Full report

Role : Web server
OS : debian
soft... : apache 2.3
Manage Tags

Lab database server Stopped

IPv4 83.212.5.194 IPv6 ...a800:ff:fe0e:3194

info

okeanos alpha

options | en

networks

New Network +

Internet

machines (2)

Public network

okeanos alpha

options | en

networks

New Network +

Internet

Public network

machines (2)

Lab database server

Firewall (Off)

IPv4: 83.212.5.194
IPv6: 2001:db8::a800:ff:fe0e:3194

Details

Lab web server

Firewall (Off)

IPv4: 83.212.5.196
IPv6: 2001:db8::a800:ff:fee5:b48a

okeanos alpha

options | en

networks

New Network +

Internet

Public network

machines (2)

Lab database server

IPv4: 83.212.5.194
IPv6: 2001:db8::a800:ff:fe0e:3194

Firewall (Off)

Lab web server

IPv4: 83.212.5.196
IPv6: 2001:db8::a800:ff:fee5:b48a

Firewall (Off)

- **Unprotected mode (Firewall off)**
- Fully protected mode (Firewall on)
- Basically protected mode (Firewall on)

Apply

okeanos alpha

options | en

networks

New Network +

Internet

Firewall update...

machines (2)

Lab database server

Firewall (Off)

IPv4: 83.212.5.194
IPv6: 2001:db8::a800:ff:fe0e:3194

Lab web server

Firewall (Off)

IPv4: 83.212.5.196
IPv6: 2001:db8::a800:ff:fee5:b48a

okeanos alpha

options | en

networks

New Network +

Internet

Public network

machines (2)

Lab database server

IPv4: 83.212.5.194
IPv6: 2001:db8::a800:ff:fe0e:3194

Firewall (Off)

Lab web server

IPv4: 83.212.5.196
IPv6: 2001:db8::a800:ff:fee5:b48a

Firewall (On)

Details

1 machine needs to be rebooted for changes to apply.

Cancel all | Reboot all

Networks

Create new private network

close

Network name: lab servers network

create network

New Network +

Internet — Public network

machines (2)

Lab database server

Firewall (Off)

IPv4: 83.212.5.194

IPv6: 2001:db8::a800:ff:fe0e:3194

Lab web server

Firewall (On)

IPv4: 83.212.5.196

IPv6: 2001:db8::a800:ff:fee5:b48a

okeanos alpha

options | en

networks

New Network +

Internet

Public network

machines (2)

Lab database server

IPv4: 83.212.5.194
IPv6: 2001:db8::a800:ff:fe0e:3194

Firewall (Off)

Lab web server

IPv4: 83.212.5.196
IPv6: 2001:db8::a800:ff:fee5:b48a

Firewall (On)

lab servers network

Private network

machines (0)

Add Machine

Destroy

cyclades | pithos+ | kpap@grnet.gr

okeanos alpha

options | en

lab servers network

Connect machine

close

Select machines to add

Lab database server
centos

Lab web server
debian

connect machines

Lab database server

IPv4: 83.212.5.194
IPv6: 2001:db8::a800:ff:fe0e:3194

Firewall (Off)

Lab web server

IPv4: 83.212.5.196
IPv6: 2001:db8::a800:ff:fee5:b48a

Firewall (On)

lab servers network

machines (0)

Private network

Internet

Public network

machines (2)

Lab database server

IPv4: 83.212.5.194
IPv6: 2001:db8::a800:ff:fe0e:3194

Firewall (Off)

Lab web server

IPv4: 83.212.5.196
IPv6: 2001:db8::a800:ff:fee5:b48a

Firewall (On)

lab servers network

Private network

machines (2)

Add Machine

Destroy

Lab database server

Connect to manage private IPs

Lab web server

Connect to manage private IPs

Disconnect

Details

cyclades | pithos+ | kpap@grnet.gr

okeanos alpha

options | en

API access...

ssh public keys...

S

New Machine +

icon | list | single

Lab web server

IPv4 83.212.5.196 IPv6 ...a800:ff:fee5:b48a

info

Running

Lab database server

IPv4 83.212.5.194 IPv6 ...a800:ff:fe0e:3194

info

Stopped

SSH keys

Manage your ssh keys

close

SSH public keys list

generate new | create/import new +

You can use SSH keys to establish a secure connection between your computer and the virtual machines.

rsa Other key

fingerprint: 7f:c6:3e:3d:08:aa:e7:a5:86:e9:2f:2b:77:99:64:b4

rsa Home key — hide key − | edit | remove ✖

fingerprint: 3f:77:76:b5:c6:0a:71:b9:d3:05:58:b3:08:71:f8:6b

```
ssh-rsa
AAAAB3NzaC1yc2EAAAADAQABAAABAQC82eQyHQ7QpKFpbvpMBl/0SNai5hA52BnU1sI9TscdcAqa
frILS5aNrwYg2yyw/kWnnxNQbGRlQKKs48HzeD5Yjkm3a8bsTbyqIf
/IRZRANpanNm4i3GyLLVjI4EOQUUgsJUk86
/eytd5einE23OZDyzRbk8j9sLWaOeZ2W8l9e8wfBkMQ0V5uA7hb/DlqllMJq96Ng
/SbMb6qHeih17b4nS7TehJJ5cewrRoqk9B0cDR67G63n+eMJNaAiatd30uK7clqruYRqJ7Oj2ccQ
```

rsa Lab servers key

fingerprint: e7:92:a9:fc:36:a2:d0:7c:8f:33:e5:97:49:e0:a4:cc

SSH keys

Manage your ssh keys

close

SSH public keys list

Generating... | create/import new +

You can use SSH keys to establish a secure connection between your computer and the virtual machines.

rsa Other key

fingerprint: 7f:c6:3e:3d:08:aa:e7:a5:86:e9:2f:2b:77:99:64:b4

rsa Home key

fingerprint: 3f:77:76:b5:c6:0a:71:b9:d3:05:58:b3:08:71:f8:6b

rsa Lab servers key

fingerprint: e7:92:a9:fc:36:a2:d0:7c:8f:33:e5:97:49:e0:a4:cc

SSH keys

Manage your ssh keys

close

SSH public keys list

generate new | create/import new +

You can use SSH keys to establish a secure connection between your computer and the virtual machines.

Your new public key has been added click here to download private key. close

rsa public key

fingerprint: c1:d1:f8:6f:c1:1f:ea:6a:08:fb:74:c5:3e:cc:3f:3c

rsa Other key

fingerprint: 7f:c6:3e:3d:08:aa:e7:a5:86:e9:2f:2b:77:99:64:b4

rsa Home key

fingerprint: 3f:77:76:b5:c6:0a:71:b9:d3:05:58:b3:08:71:f8:6b

rsa Lab servers key

fingerprint: e7:92:a9:fc:36:a2:d0:7c:8f:33:e5:97:49:e0:a4:cc

API Access

close

Use the following API key along with the ./kamaki client to manage your cloud resources from outside this page.

The API key provides full access to your *~okeanos* account, so always keep it private.

Lab database server

IPv4 83.212.5.194 IPv6 ...a800:ff:fe0e:3194

info

Stopped

cyclades | pithos+ | kpap@grnet.gr

pithos+

Upload

New folder | Refresh | 0 Files

Used: 0B of 50GB (0%)

- Pithos
- Trash
- My Shared
- Others' shared
- Groups

Name	Size	Last Modified

cyclades | pithos+ | kpap@grnet.gr

pithos+

Upload

Used: 0B of 50G

Pithos

Trash

My Shared

Others' sha

Groups

0 Files

File upload

X

Folder pithos

Select files

Add files to the upload queue and click the start button.

Filename	Size	Status

Drag files here.

Add files | Start upload | 0 b | 0%

cyclades | pithos+ | kpap@grnet.gr

pithos+

Upload

Used: 0B of 50G

Pithos

Trash

My Shared

Others' sh

Groups

0 Files

File upload

X

Folder pithos

Select files

Add files to the upload queue and click the start button.

Filename	Size	Status
vi-vim-cheat-sheet.gif	155 KB	0%
1201.4995v1.pdf	332 KB	0%
okeanos_whitepaper.pdf	957 KB	0%
Add files Start upload	1 MB	0%

cyclades | pithos+ | kpap@grnet.gr

pithos+

Upload

Used: 0B of 50G

Pithos

Trash

My Shared

Others' sha

Groups

0 Files

File upload

X

Folder pithos

Select files

Add files to the upload queue and click the start button.

Filename	Size	Status
vi-vim-cheat-sheet.gif	155 KB	100%
1201.4995v1.pdf	332 KB	100%
okeanos_whitepaper.pdf	957 KB	15%

Uploaded 2/3 files | 1 MB | 44%

cyclades | pithos+ | kpap@grnet.gr

pithos+

Upload

New folder | Refresh | 3 Files

Used: 1.4MB of 50GB (0%)

- Pithos
- Trash
- My Shared
- \+ Others' shared
- Groups

Name	Size	Last Modified
1201.4995v1.pdf	332.5 KB	27/3/2012 10:54 PM
okeanos_whitepaper.pdf	957.4 KB	27/3/2012 10:54 PM
vi-vim-cheat-sheet.gif (view)	154.9 KB	27/3/2012 10:54 PM

cyclades | pithos+ | kpap@grnet.gr

pithos+

Upload

New folder | Refresh | More... | 3 Files

Used: 1.4MB of 50GB (0%)

- Pithos
- Trash
- My Shared
- Others' shared
- Groups

Name	Size	Last Modified
1201.4995v1.pdf	332.5 KB	27/3/2012 10:54 PM
okeanos_	957.4 KB	27/3/2012 10:54 PM
vi-vim-cl	154.9 KB	27/3/2012 10:54 PM

- Upload
- Cut
- Move to Trash
- Copy
- Delete
- Properties
- Sharing
- Versions
- Download

cyclades | pithos+ | kpap@grnet.gr

pithos+

Upload

New folder | Refresh | More... | 3 Files

Used: 1.4MB of 50GB (0%)

- Pithos
- Trash
- My Shared
- + Others' shared
- Groups

Last Modified

KB 27/3/2012 10:54 PM

KB 27/3/2012 10:54 PM

KB 27/3/2012 10:54 PM

File properties X

Name okeanos_whitepaper.pdf

Folder pithos

Owner kpap@grnet.gr

Last modified 27/3/2012 10:54 PM

Meta data +

Name **Value**

OK

cyclades | pithos+ | kpap@grnet.gr

pithos+

Upload

New folder | Refresh | More... | 3 Files

Used: 1.4MB of 50GB (0%)

- Pithos
- Trash
- My Shared
- Others' shared
- Groups

Name	Size	Last Modified
1201.4995v1.pdf	332.5 KB	27/3/2012 10:54 PM
	7.4 KB	27/3/2012 10:54 PM
	4.9 KB	27/3/2012 10:54 PM

File permissions X

Users/Groups Read Write

Add Group | Add User

Public ☐

OK

cyclades | pithos+ | kpap@grnet.gr

pithos+

Upload

New folder | Refresh | More... | 3 Files

Used: 1.4MB of 50GB (0%)

- Pithos
- Trash
- My Shared
- Others' shared
- Groups

Name	Size	Last Modified
1201.4995v1.pdf	332.5 KB	27/3/2012 10:54 PM
		/3/2012 10:54 PM
		/3/2012 10:54 PM

File permissions X

Users/Groups Read Write

Add Group | Add User

Public ☑ *When this option is enabled, the file will be readable by everyone. By checking this option, you are certifying that you have the right to distribute this file and that it does not violate the Terms of Use.*

OK

cyclades | pithos+ | kpap@grnet.gr

pithos+

Upload

1 Files

Used: 1.4MB of 50GB (0%)

- Pithos
- Trash
- My Shared
- Others' shared
  - images@okeanos.grnet.gr
- Groups

Name	Size	Last Modified
okeanos_whitepaper.pdf	957.4 KB	27/3/2012 10:54 PM

cyclades | pithos+ | kpap@grnet.gr

pithos+

Upload

More... | 0 Files

Used: 1.4MB of 50GB (0%)

Name | Size | Last Modified

- Pithos
- Trash
- My Shared
- Others' shared
  - images@okeanos.grnet.gr
- Groups

cyclades | pithos+ | kpap@grnet.gr

pithos+

Upload

New folder | Refresh | More... | 3 Files

Used: 1.4MB of 50GB (0%)

- Pithos
- Trash
- My Shared
- Others' shared
  - images@okeanos.grnet.gr
- Groups
  - lab files

Name	Size	Last Modified
1201.4995v1.pdf	332.5 KB	27/3/2012 10:54 PM
	7.4 KB	27/3/2012 10:54 PM
	4.9 KB	27/3/2012 10:54 PM

File permissions X

Add permission X

Users/Groups Read Write

lab files ▼ ☑ ☐

OK

cyclades | pithos+ | kpap@grnet.gr

pithos+

Upload

New folder | Refresh | More... | 3 Files

Used: 1.4MB of 50GB (0%)

- Pithos
- Trash
- My Shared
- Others' shared
  - images@okeanos.grnet.gr
- Groups
  - lab files

Name	Size	Last Modified
	2.5 KB	27/3/2012 10:54 PM
	7.4 KB	27/3/2012 10:54 PM
	4.9 KB	27/3/2012 10:54 PM

File versions X

Version	Date
232	27/3/2012 10:51 PM
238	27/3/2012 10:54 PM

Version	Date
232	27/3/2012 10:51 PM
238	27/3/2012 10:54 PM

OK

machines

New Machine +

icon | list | single

Lab web server
IPv4 83.212.5.196 IPv6 ...a800:ff:fee5:b48a
info

Running

Lab database server
IPv4 83.212.5.194 IPv6 ...a800:ff:fe0e:3194
info

Stopped

accounts

E-mail address	kpap@grnet.gr
First name	Kostas
Last name	Papadimitriou
Authentication Token	11111222/8liA==
Token expiration date	2012-04-21 15:08:43
Renew token	

UPDATE

accounts

Old password ●●●●●

New password

New password confirmation

CHANGE

accounts

Message

SEND

cyclades pithos+ Sign in

accounts

LOGIN

kpap@grnet.gr

SUBMIT

Forgot your password?

new to okeanos ? CREATE ACCOUNT

Opensource

Opensource

- Synnefo: Cyclades / Pithos+ / Astakos
  - https://code.grnet.gr/projects/synnefo
  - https://code.grnet.gr/projects/pithos
  - https://code.grnet.gr/projects/astakos
- snf-image
  - https://code.grnet.gr/projects/snf-image
- kamaki
  - https://code.grnet.gr/projects/kamaki
- vncauthproxy
  - https://code.grnet.gr/projects/snf-vncauthproxy

Opensource

- Synnefo: Cyclades / Pithos+ / Astakos
  - https://code.grnet.gr/projects/synnefo
  - https://code.grnet.gr/projects/pithos
  - https://code.grnet.gr/projects/astakos
- snf-image
  - https://code.grnet.gr/projects/snf-image
- kamaki
  - https://code.grnet.gr/projects/kamaki
- vncauthproxy
  - https://code.grnet.gr/projects/snf-vncauthproxy

`pip install` or **`apt-get install`** everything!

okeanos

https://okeanos.grnet.gr

Thank You!

Questions?