

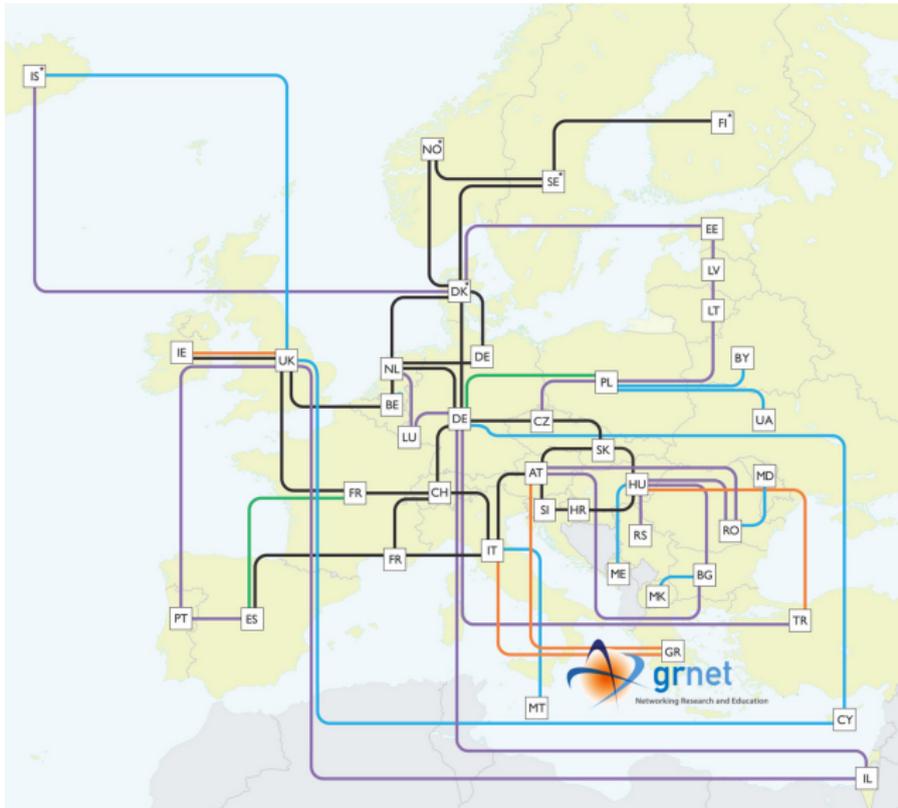
Outline

- 1 Introduction
- 2 User Perspective
- 3 Technology
- 4 Special Topics

Outline

- 1 Introduction
- 2 User Perspective
- 3 Technology
- 4 Special Topics

Who is GRNET?



Who is GRNET?

- Greek Research and Education Network
- Operates the network interconnection for all Greek academic institutions
- Operates a large infrastructure with multiple datacenters
- Participates in many national and European research projects
- Provides many services to the academic community
- Including Okeanos IaaS Cloud

Cloud Services by GRNET

The logo for Okeanos, featuring a stylized blue wave icon to the left of the word "okeanos" in a blue, lowercase, sans-serif font.

and

The logo for Okeanos GLOBAL, featuring the same stylized blue wave icon to the left of the word "okeanos" in a blue, lowercase, sans-serif font, followed by the word "GLOBAL" in white, uppercase, sans-serif font inside a blue rounded rectangle.

powered by

The logo for Synnefo, featuring the word "synnefo" in a green, lowercase, cursive font.

Who uses Synnefo?



- Academic courses in Greek and European institutions
- Academic research projects
- Infrastructure for academic institutions
- Individuals in Greek and European academic community
- Infrastructure for third parties (e.g. Ganeti)

synnefo

- Other national and international synnefo installations

`demo.synnefo.org`

`synnefo@googlegroups.com`

Outline

- 1 Introduction
- 2 User Perspective**
- 3 Technology
- 4 Special Topics

Web Interface

The screenshot displays the Okeanos web interface for managing virtual machines. The header features the Okeanos logo and a navigation bar with icons for a monitor, storage, network, IP, and a key. The main content area is titled "machines" and includes a "New Machine +" button and view options: "icon", "list", and "single".

Two virtual machines are listed:

- My New Debian server**: Status "Running" (indicated by four green squares). Details include the name "My New Debian server", the project "[snfdevs.dev.grnet.gr]", and the ID "snf-656347.vm.okeanos.grnet.gr". It has sub-menus for "info", "disks", and "IPs".
- My Old Debian server**: Status "Stopped" (indicated by four red squares). Details include the name "My Old Debian server", the project "[System project]", and the ID "snf-45119.vm.okeanos.grnet.gr". It also has sub-menus for "info", "disks", and "IPs".

Virtual Machines (VMs)

okeanos

Create new machine close

1 Image Select an OS
Choose your preferred image 2 3 4 5

Images

- System
- My images
- Shared with me
- Public

Available Images

	Windows Server 2012 R2 Datacenter	details
	Windows Server 2012 by system Windows Server 2012 Datacenter	15.31 GB details
	CoreOS stable by system CoreOS 522.6.0	2.93 GB details
	Ubuntu Server LTS by system Ubuntu 14.04.2 LTS	1.16 GB details
	Ubuntu Desktop LTS by system Ubuntu 14.04.2 LTS	3.66 GB details
	Kubuntu LTS by system Kubuntu 14.04.2 LTS	3.33 GB details

cancel next

Virtual Machines (VMs)

The screenshot shows the 'Create new machine' wizard in a web interface. The title bar includes a 'close' button. The main header area is divided into five numbered steps: 1, 2 (Flavor), 3, 4, and 5. Step 2 is active, with the instruction 'Select CPUs, RAM and Disk Size' and a note that 'Available options are filtered based on the selected image'. Below the header, there is a 'System project' dropdown menu. The main content area is organized into sections: 'Predefined' (with options Small, Medium, Large), 'CPUs' (52 left), 'Memory size' (52.00 GB left), 'Disk size' (520.00 GB left), and 'Storage' (with options Archipelago, Standard, Local, and Archipelago cached). Each section contains a row of buttons representing different configurations. The '4 x' CPU button, '4 GB' memory button, and '40 GB' disk size button are highlighted in orange. At the bottom, there are 'previous' and 'next' navigation buttons.

Create new machine close

1 2 Flavor Select CPUs, RAM and Disk Size
Available options are filtered based on the selected image 3 4 5

System project

Predefined
Small
Medium
Large

CPUs (52 left) Choose number of CPU cores
1 x 2 x 4 x 8 x

Memory size (52.00 GB left) Choose memory size
512 MB 1 GB 2 GB 4 GB 8 GB 8 GB

Disk size (520.00 GB left) Choose disk size
5 GB 10 GB 20 GB 40 GB 60 GB 80 GB 100 GB

Storage Select storage type
Archipelago Standard Local
Archipelago cached

previous next

Virtual Machines (VMs)

The screenshot shows a 'Create new machine' dialog box with a progress indicator at the top. Step 3, 'Networking', is the active step. The dialog is titled 'Create new machine' and has a 'close' button in the top right corner. The progress indicator shows steps 1, 2, 3 (Networking), 4, and 5. Below the progress indicator, the title 'Networking configuration' is followed by the subtitle 'Connect machine to networks'. The main content area is titled 'Available networks' and contains the instruction 'Select the networks you want your machine to get connected to.' Below this instruction is a list of available networks. The first two items are 'Internet (public IPv6)' and 'Internet (public IPv4)'. The 'Internet (public IPv4)' item is highlighted in orange and has a checked checkbox. Below it are two sub-items: '192.168.4.31' (System project) and '192.168.12.2' (System project), both with checked checkboxes. A '+ create new...' link is also present. Below these are five other network entries: 'netone' (192.168.0.0/24), 'c' (192.168.3.0/24), 'd' (192.168.4.0/24), and 'e' (192.168.5.0/24), all with unchecked checkboxes. At the bottom of the dialog, there are two buttons: 'previous' (red) and 'next' (green).

Create new machine close

1 2 3 Networking Networking configuration
Connect machine to networks 4 5

Available networks

Select the networks you want your machine to get connected to.

<input checked="" type="checkbox"/>	Internet (public IPv6)	
<input checked="" type="checkbox"/>	Internet (public IPv4)	
<input type="checkbox"/>	192.168.4.31	System project
<input checked="" type="checkbox"/>	192.168.12.2	System project
+	create new...	
<input type="checkbox"/>	netone	192.168.0.0/24
<input type="checkbox"/>	c	192.168.3.0/24
<input type="checkbox"/>	d	192.168.4.0/24
<input type="checkbox"/>	e	192.168.5.0/24

previous next

Virtual Machines (VMs)

Create new machine close

1 2 3 **4 Personalize** Virtual machine custom options 5
Virtual machine custom options

Machine name

Public SSH keys

Your account contains the following SSH public keys. Select one or more to activate in your new machine. You will then be able to ssh with the corresponding private key without a password.*

gmet

Suggested tags

You may change machine tags later from the machines view.

Role

Database server File server

Mail server Web server Proxy

Virtual Machines (VMs)

Create new machine
close

1
2
3
4
5

Confirm

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

Machine name

My CoreOS stable server

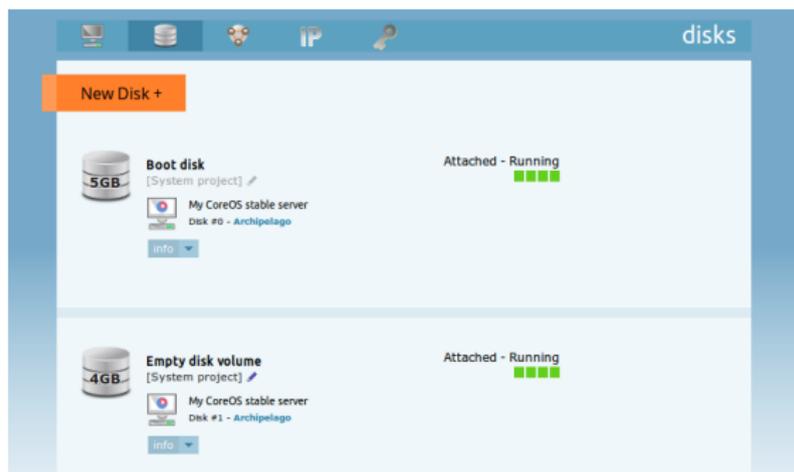
<p>Image</p> <p>CoreOS stable</p> <p>CoreOS 522.6.0</p> <hr/> <p>OS</p> <p>Coreos</p> <hr/> <p>Size</p> <p>2.93 GB</p> <hr/> <p>GUI</p> <p>No GUI</p> <hr/> <p>Kernel</p> <p>3.17.8+</p> <hr/> <p>Project</p> <p>System project</p>	<p>Flavor</p> <p>CPU</p> <p style="text-align: right;">1x</p> <hr/> <p>Memory</p> <p style="text-align: right;">1024 MB</p> <hr/> <p>Disk</p> <p style="text-align: right;">10.00 GB</p> <hr/> <p>Storage type</p> <p style="text-align: right;">Archipelago</p> <hr/> <p>Machine Tags</p> <p>No tags selected</p>	<p>SSH Keys</p> <p>gnet</p> <hr/> <p>IP Addresses</p> <p>192.168.12.2</p> <p>System project</p> <hr/> <p>Private networks</p> <p>No private networks selected</p>
---	--	--

previous

create machine

Volumes

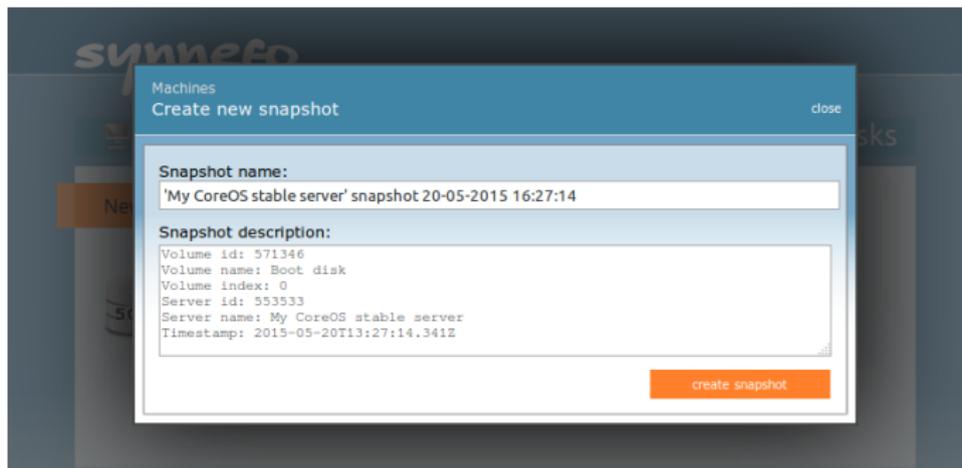
Virtual Disk Volumes for your VMs



- Create Disk Volumes for your VMs
- Take a Snapshot of any Volume
- Create a Volume from any Snapshot (even others')

Volumes

Virtual Disk Volumes for your VMs



- Create Disk Volumes for your VMs
- Take a Snapshot of any Volume
- Create a Volume from any Snapshot (even others')

VM Images

Create VM images from your own existing systems

```
OS: linux, Distro: ubuntu, Size: 2048MB, Source: /home/skalkoto/ubuntu.raw
```

```
Image Creator for synnefo (snf-image-creator version 0.4)
Choose one of the following or press <Exit> to exit.

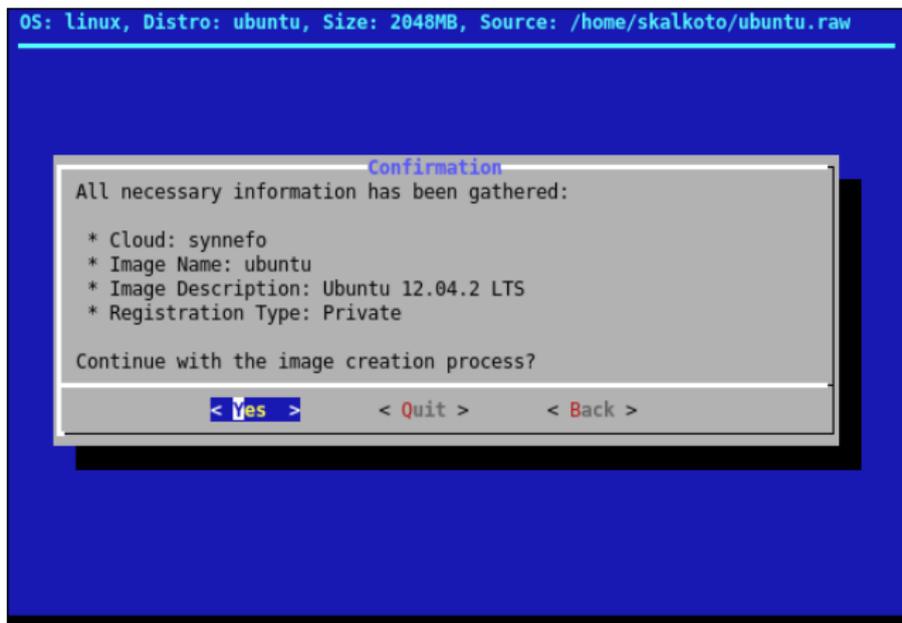
Customize  Customize image & cloud deployment options
Register   Register image to a cloud
Extract    Dump image to local file system
Reset      Reset everything and start over again
Help       Get help for using snf-image-creator

< OK >          < Exit >
```

<https://www.synnefo.org/docs/snf-image-creator/latest/>

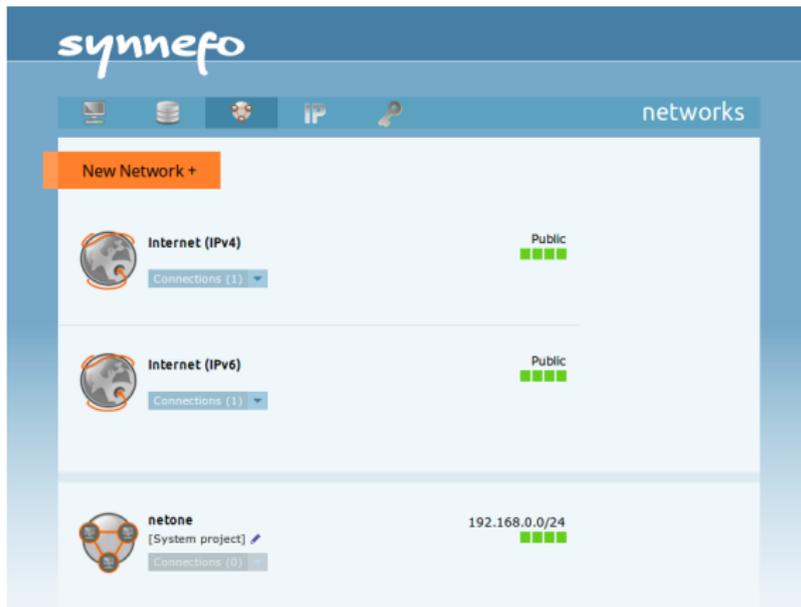
VM Images

Create VM images from your own existing systems



<https://www.synnefo.org/docs/snf-image-creator/latest/>

Networks



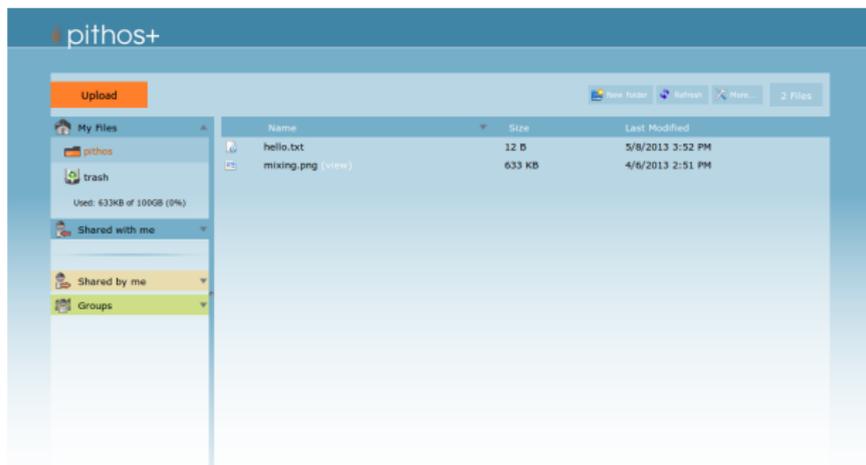
The screenshot shows the Synnefo network management interface. At the top, the Synnefo logo is displayed. Below it, a navigation bar contains icons for a server, storage, a gear, IP, and a key, with the word "networks" on the right. A prominent orange button labeled "New Network +" is located at the top left of the main content area. The main area lists three network entries:

- Internet (IPv4)**: Includes a globe icon, a "Connections (1)" dropdown, and a "Public" status with four green squares.
- Internet (IPv6)**: Includes a globe icon, a "Connections (1)" dropdown, and a "Public" status with four green squares.
- netone**: Includes a network diagram icon, "[System project]" with a pencil icon, "Connections (0)", and the IP address "192.168.0.0/24" with four green squares.

- Create virtual local networks
- Attach VMs to networks to create a topology

Files

Pithos Object Store



- Files and Folders in Pithos
- Also available as an Object Store API (OpenStack)
- Deduplication, Public or Access-Controlled Sharing

Projects

Simple Resource Management

REQUEST PROJECT

1. PROJECT DETAILS

Project name

myproject.mylab.ntua.gr

Homepage URL

myinstitution.org/myproject/

Description

2. MEMBERSHIP OPTIONS

Joining policy

owner accepts

Leaving policy

automatically accepted

Max members

Unlimited

3. RESOURCES

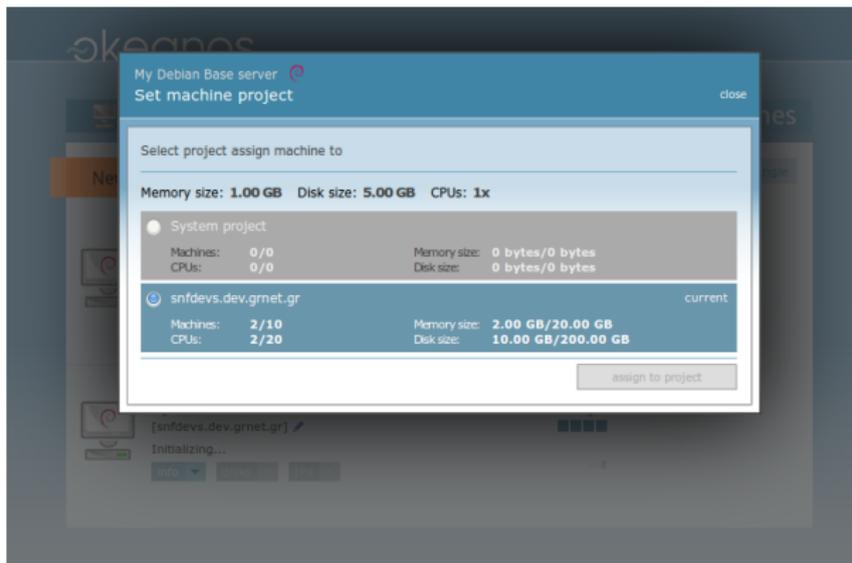


Compute resources (amount of VMs, CPUs, RAM, Hard disk)

- Request a Project with needed resources
- Project requests are moderated
- Invite users to join and consume project resources

Projects

Simple Resource Management



- Request a Project with needed resources
- Project requests are moderated
- Invite users to join and consume project resources

Command Line Tool & API Client Library

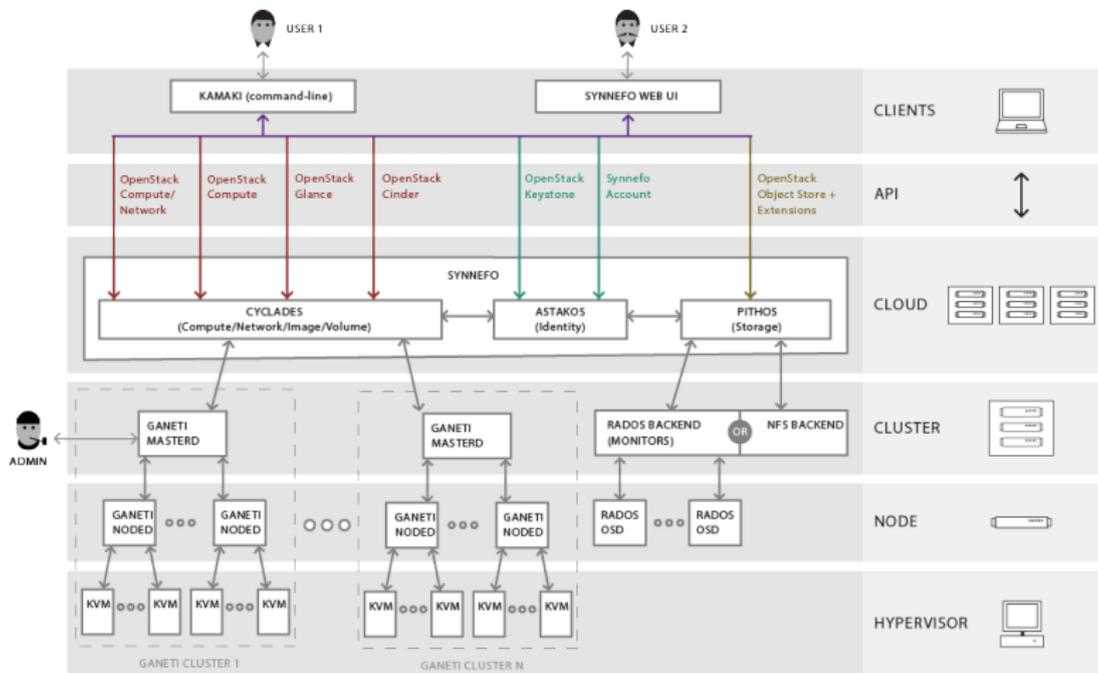
./kamaki

<https://www.synnefo.org/docs/kamaki/latest/>

Outline

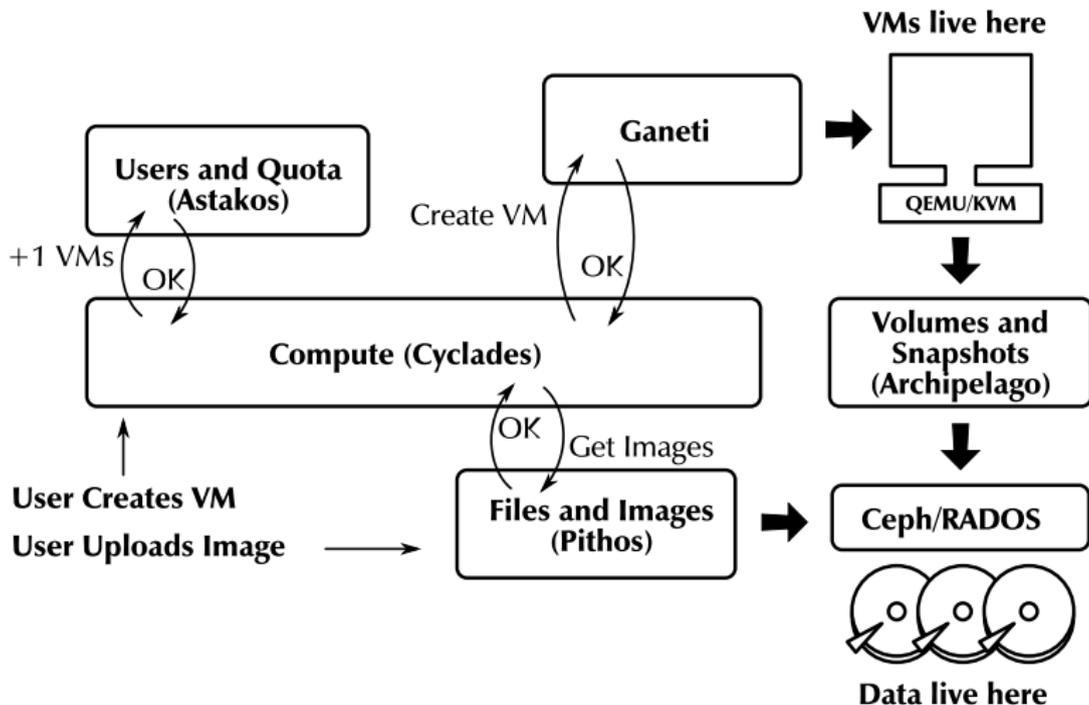
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Overview



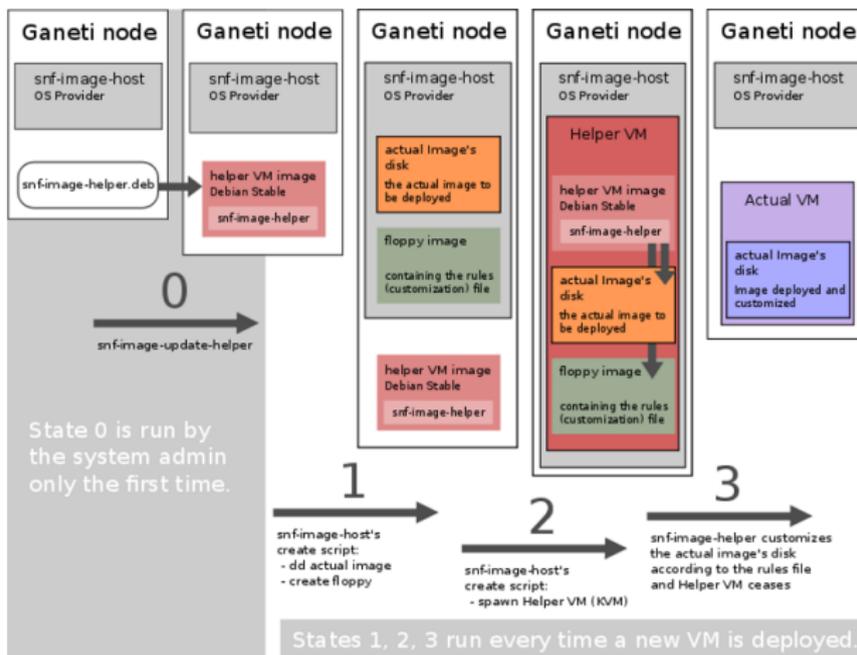
Compute Virtualization

Example: Create a VM



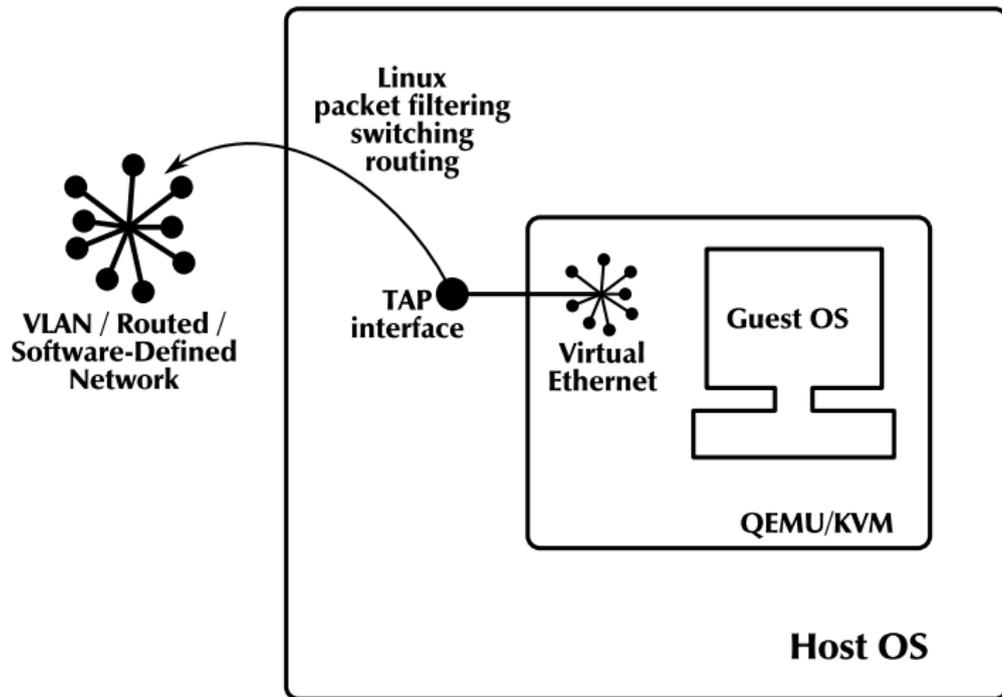
Compute Virtualization

Deploy and Custom Images (passwords, resize, file injection, etc.)



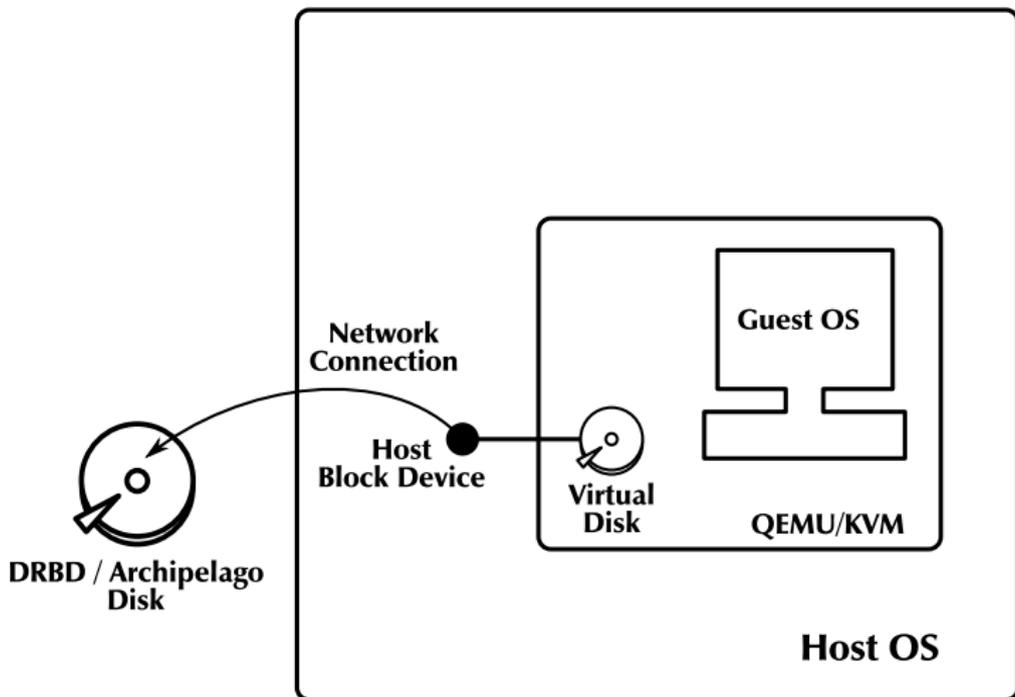
synnefo.org/docs/snf-image/latest

Network Virtualization



Volumes

Virtualization of Disks



Volumes

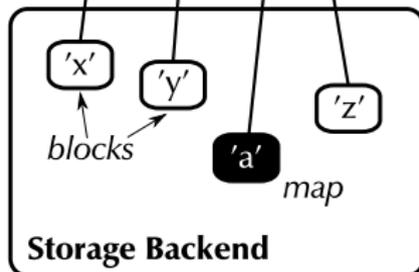
Archipelago Disk Volumes

Disk Volume Logical Block Addressing



Physical Disk

Archipelago Volume Block Map

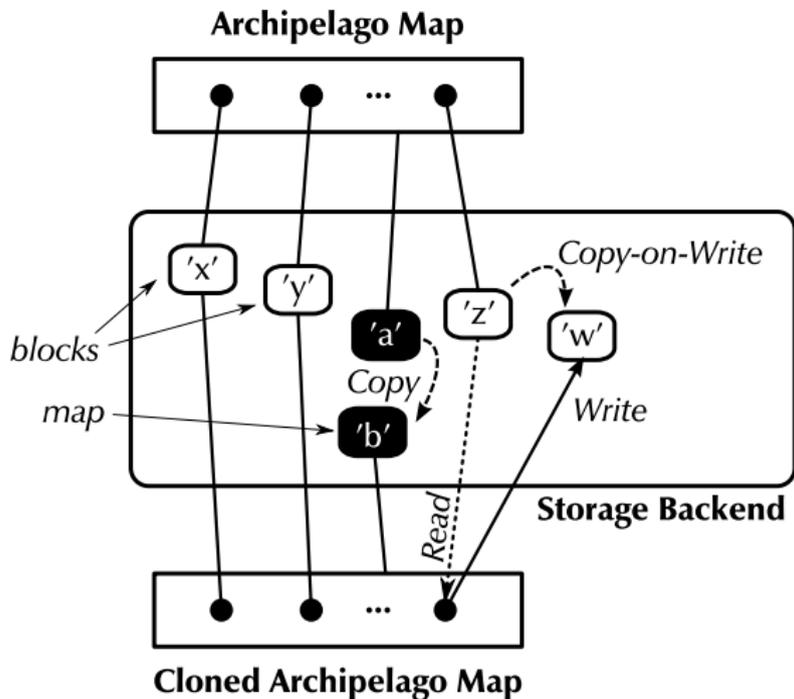


Storage Backend

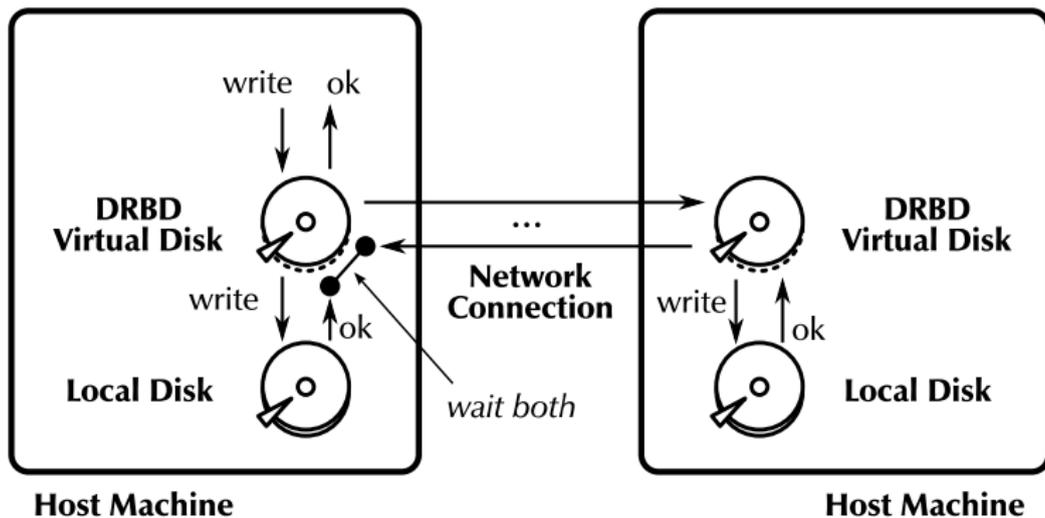
- LBA just enumerates blocks as 1..N
- Archipelago gives them proper names
- But now have to save those names in a **map**

Volumes

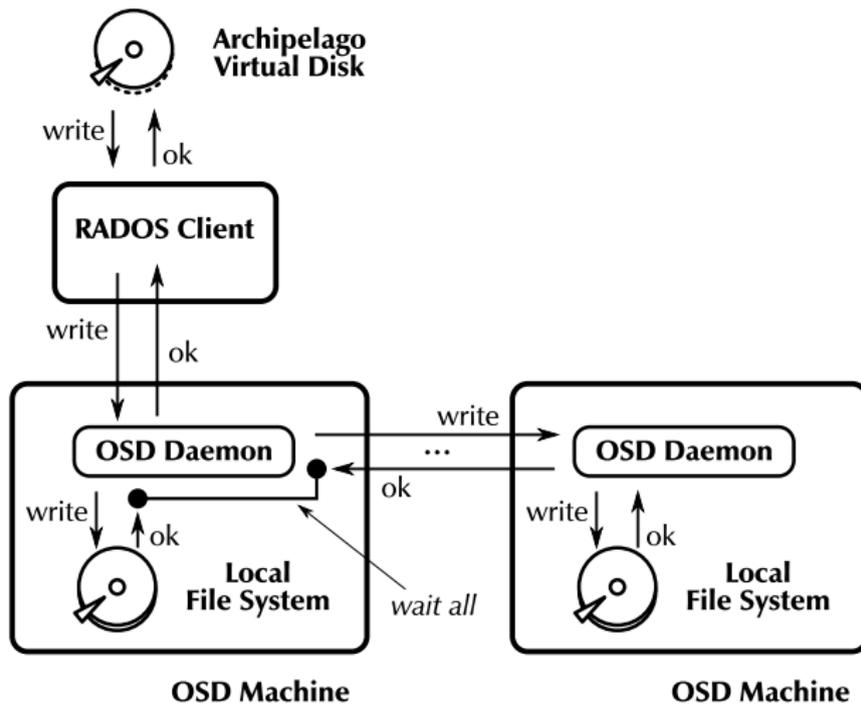
Thin Provisioning



Volume Data Replication



Volume Data Replication

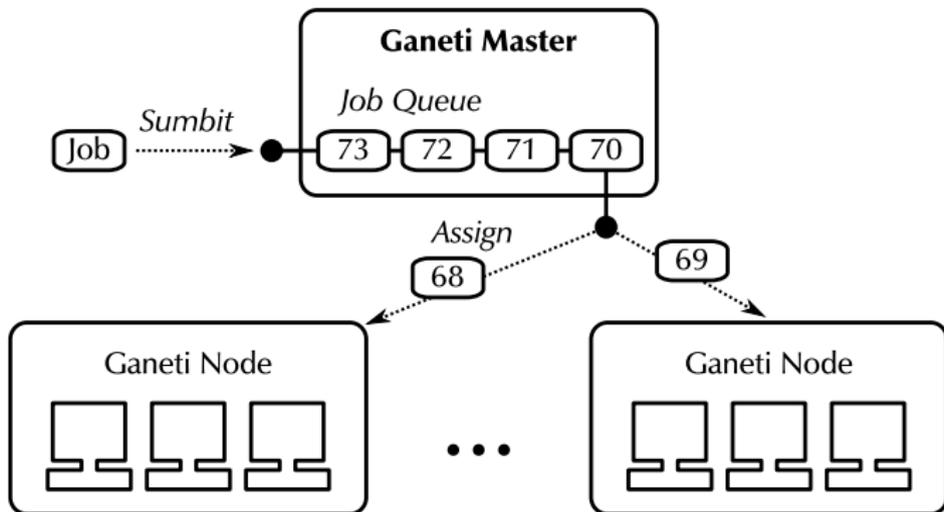


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Distributed Consistency

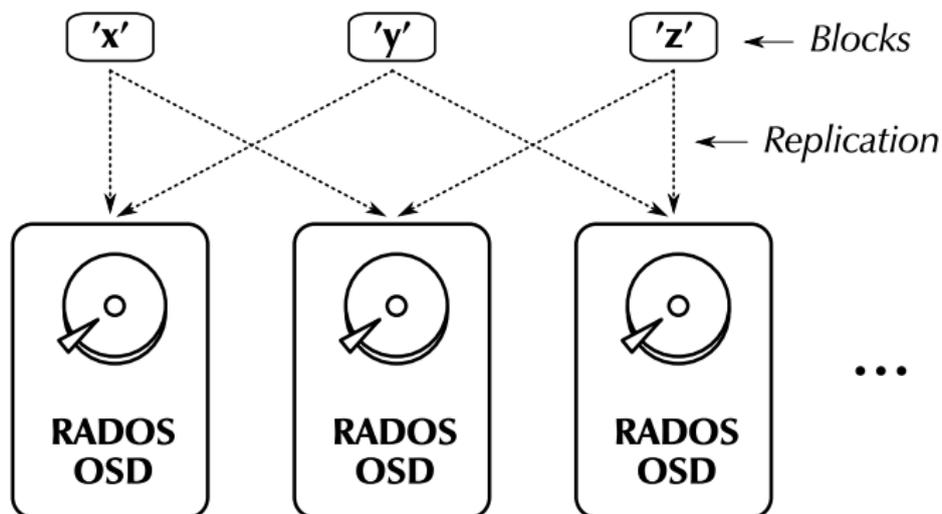
Virtual Machines



- Where is my VM?
- How is that job doing?
- Ganeti answers consistently even when nodes fail

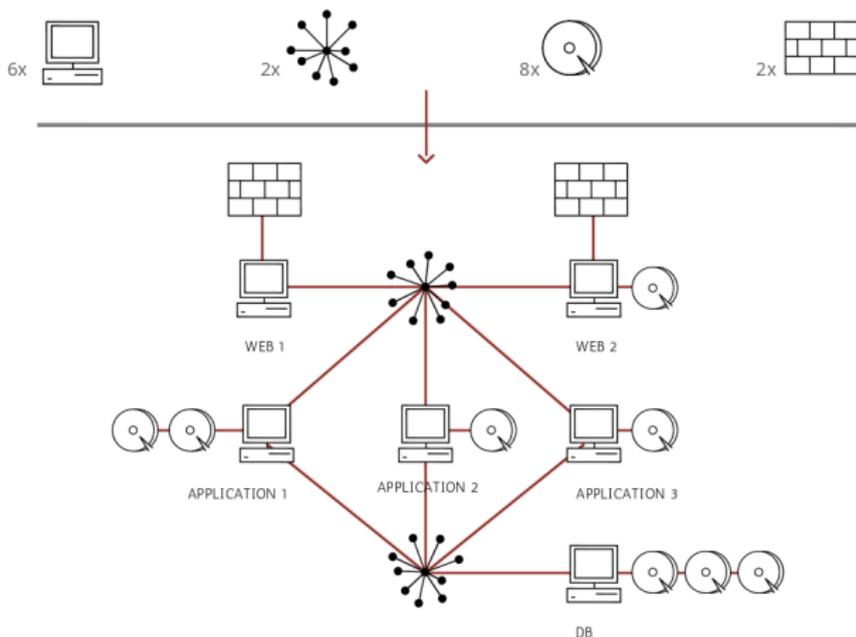
Distributed Consistency

Volumes



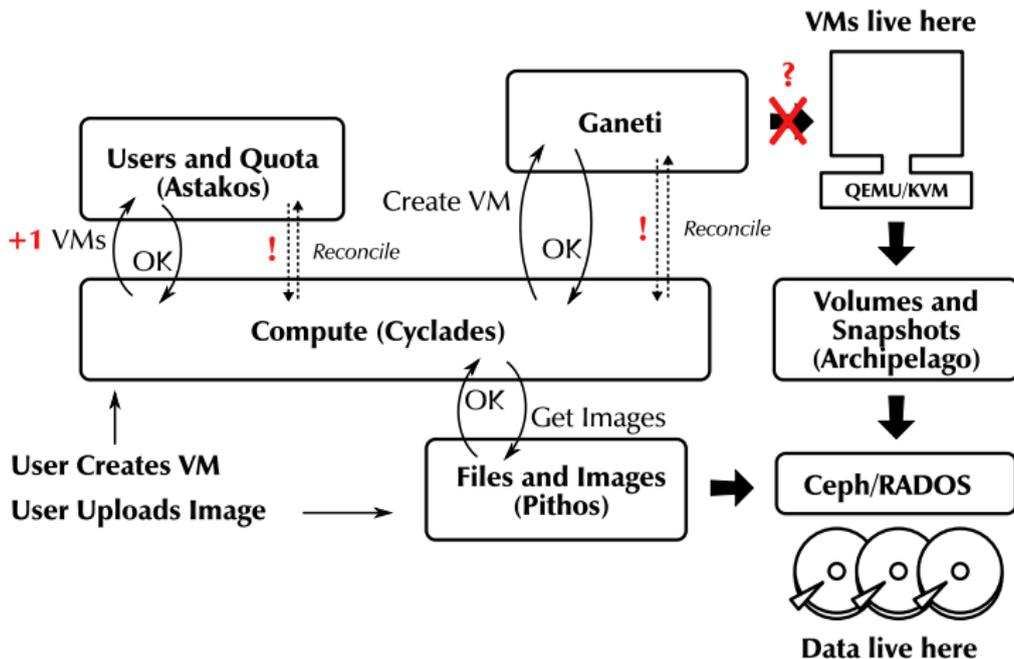
- Where is my data?
- How is that write going?
- RADOS answers consistently even when nodes fail

Appliances, Clusters, Services



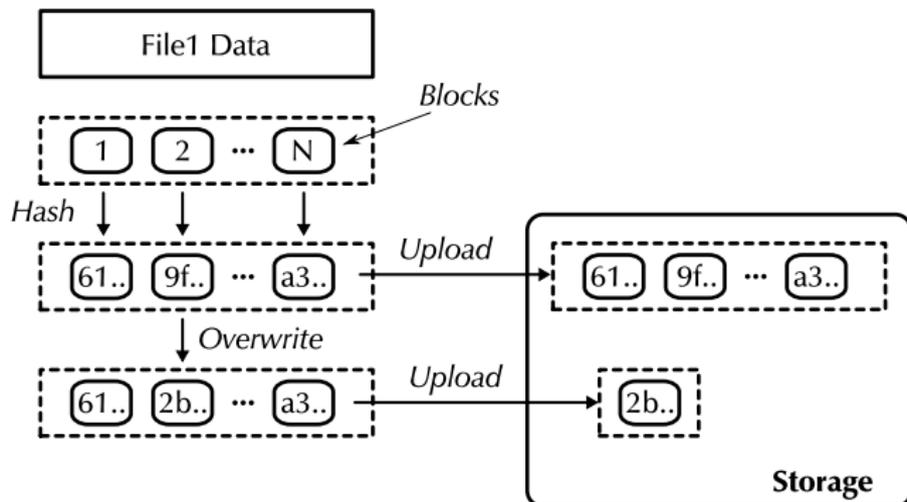
Deploy special-purpose VMs from custom Images to create topologies and service-oriented architectures

Failures and Reconciliation



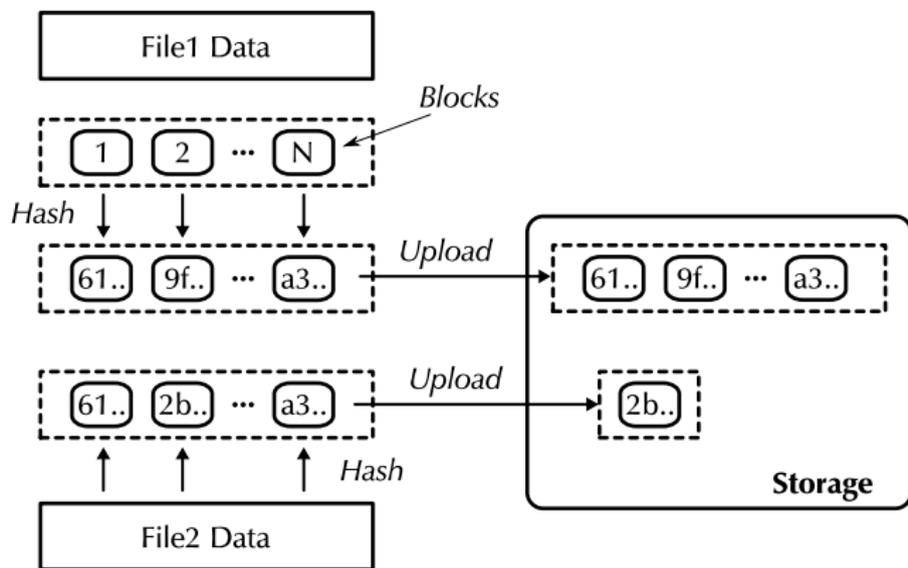
- What happens when not all agree on what is going on?
- Loosely coupled distributed components must *reconcile*

Deduplication



- Collision-resistant hashes make blocks *content-addressable*
- Data sharing among files saves space and makes uploads faster

Deduplication



- Collision-resistant hashes make blocks *content-addressable*
- Data sharing among files saves space and makes uploads faster

Thank you! Questions?

okeanos.grnet.gr
synnefo.org
synnefo@googlegroups.com

The logo for okeanos, featuring a blue circular icon with a white wave-like shape inside, followed by the word "okeanos" in a blue, lowercase, sans-serif font.

The logo for synnefo, featuring the word "synnefo" in a green, lowercase, sans-serif font.

The logo for grnet, featuring a stylized graphic of three overlapping curved lines in blue and orange, followed by the word "grnet" in a blue, lowercase, sans-serif font.