Open
Nebula
FRANKFURT
UNIVERSITY
OF APPLIED SCIENCES
SS19, Master – Information Technology
Prof. Christian Baun – Cloud Computing
Team: Christoph Gombert, Vincenzo Angrisano, Marcel Fiebig, Luca Jordan

INTRODUCTION
USE CASES

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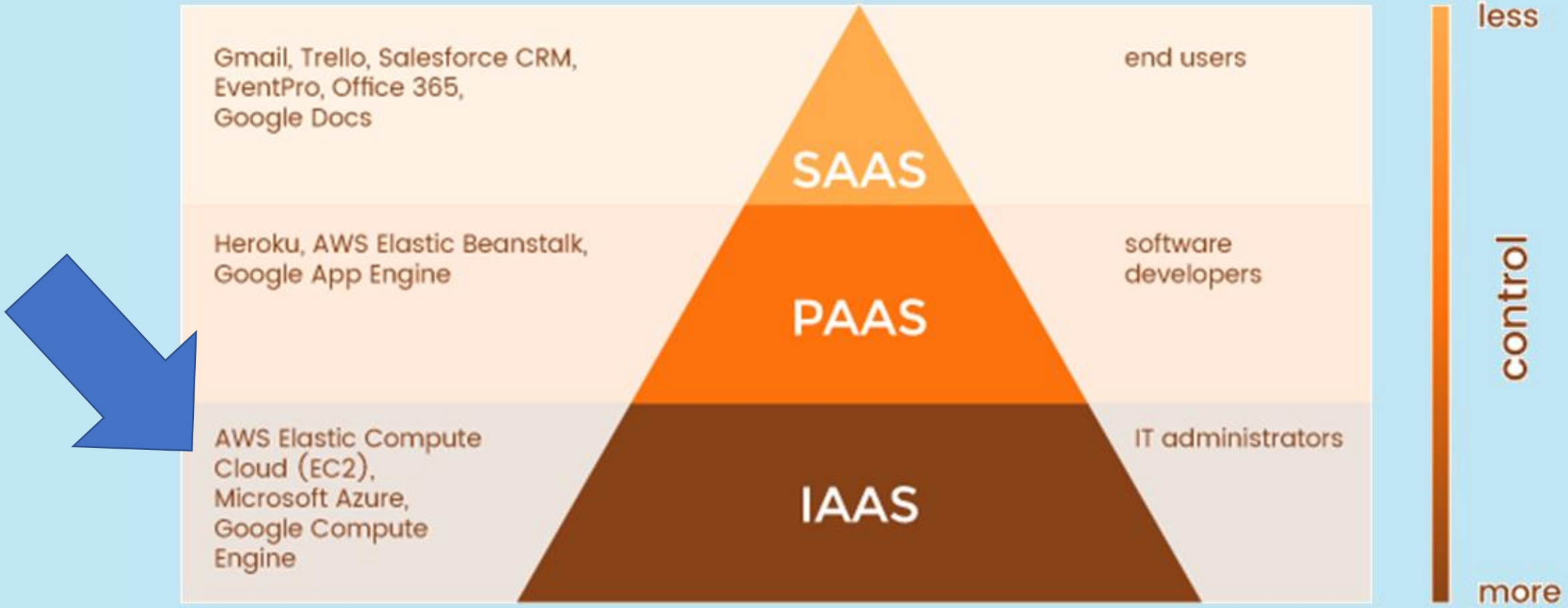
# ~/INTRODUCTION/




Source: https://rubygarage.org/blog/iaas-vs-paas-vs-saas

# ~/INTRODUCTION/

What is OpenNebula?

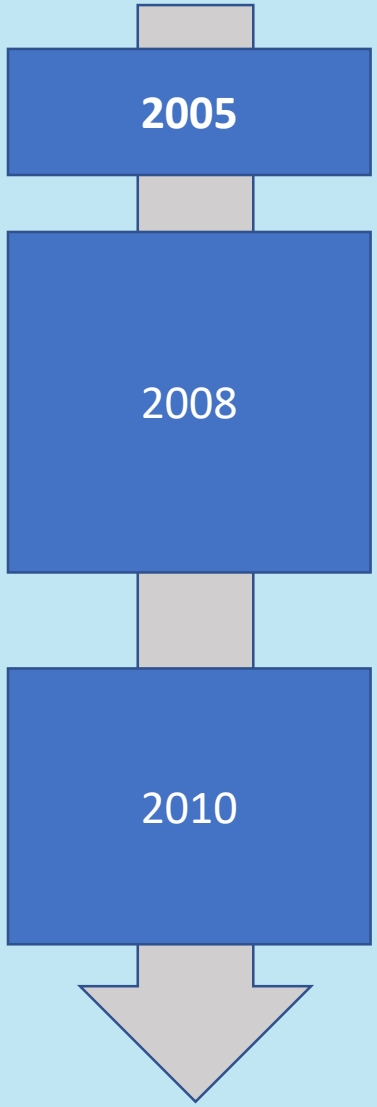
Vision

- We're moving into a world of open distributed cloud computing — where each organization can find the right private cloud architecture for its unique needs. Our aim is to bring beauty, peace of mind and simplicity to the **private enterprise cloud**.

Alternative to

- OpenStack, which is fragmented and too complex
- and VMware, which is too expensive and inflexible

# ~/INTRODUCTION/




- started as research project by Ignacio M. Llorente and Rubén S. Montero

- first public release
- matured through more than 100 open-source releases and more than 10 years of research and development
- close collaboration with an active and engaged community of users and developers.

- main authors founded C12G Labs (now OpenNebula Systems)
- to provide additional services that many enterprise IT shops require for internal adoption
- project not tied anymore exclusively to public financing

# ~/INTRODUCTION/

## What is OpenNebula?

- simple and flexible turnkey open-source solution for

CLOUD MANAGEMENT

- manages storage, network, virtualization, monitoring and security technologies of virtual machines
- connect private with public clouds

DATA CENTER VIRTUALIZATION

- used to host multiple virtualized data centers on the same physical infrastructure
- simultaneously be used by separate applications and organizations
- reducing data center capital and operational costs

# ~/USE CASES/

## OpenNebula Use by the Numbers

**100k**
OpenNebula Package Downloads in the Last Year

**1500k**
OpenNebula Clouds Connected to the Marketplace

**16**
Data Centers in the Largest OpenNebula Federation

**300k**
Cores within the Largest OpenNebula Cloud

Akamai

BlackBerry

Booking.com

Telefónica

Source: www.opennebula.org

# ~/USE CASES/

- Content-Delivery-Network provider (Globally-Distributed)
  - Reliable, Secure, Fast
  - 15-30% of all internet Traffic
  - Customers: SKY, Adobe, Audi, Mtv, Airbnb

- **Vision**: Continuous, automated, end-to-end testing for all engineers on every component across akamai

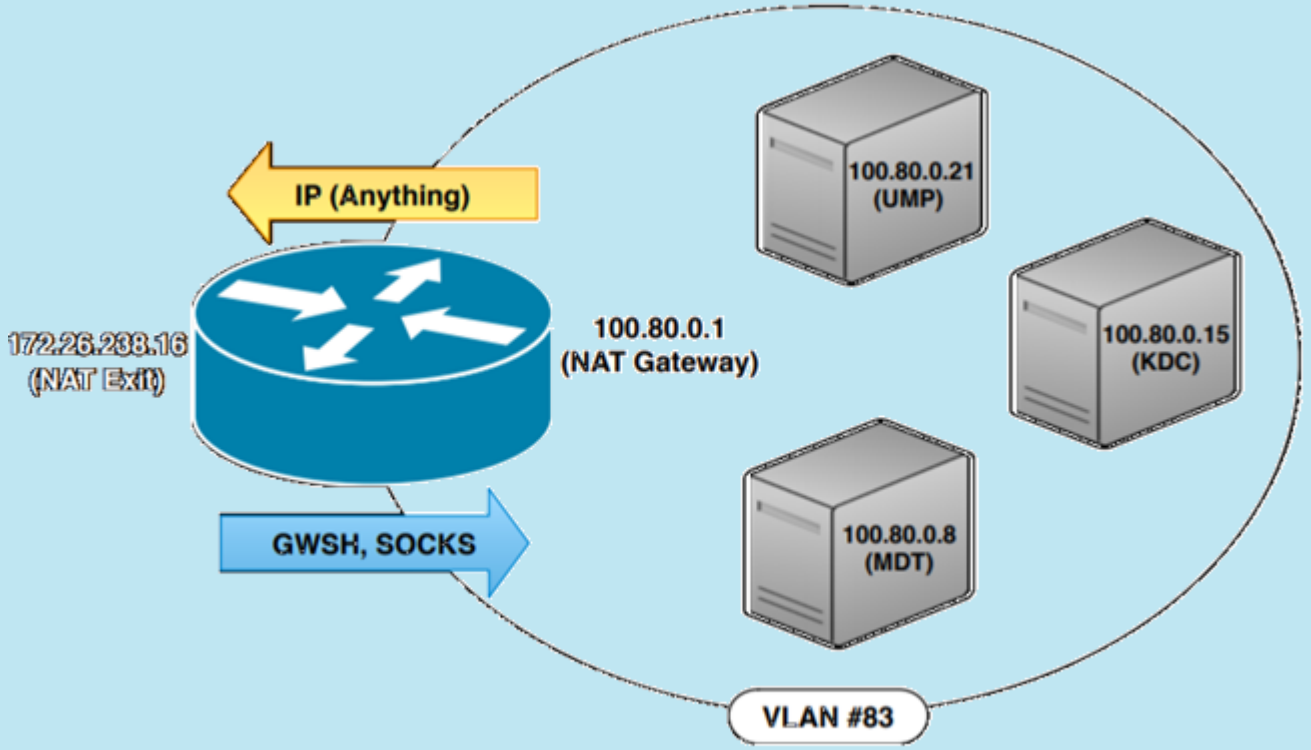
- **Approach**: Testnet Cloning - new instance of Akamai on VMs
  - web system on top "Resource Tracker" enables to modify/clone/save testnet with persistent snapshots

# ~/USE CASES/

**Challenges:**

- **Static IP addresses:** in Akamais productive network

→ Opennebula provides VLANs behind Gateways so IP addresses doesn't change, even in multiple test clones




Source: www.opennebula.org

# ~/USE CASES/

**Challenges:**

- Where to host and save VMs of Testnet?

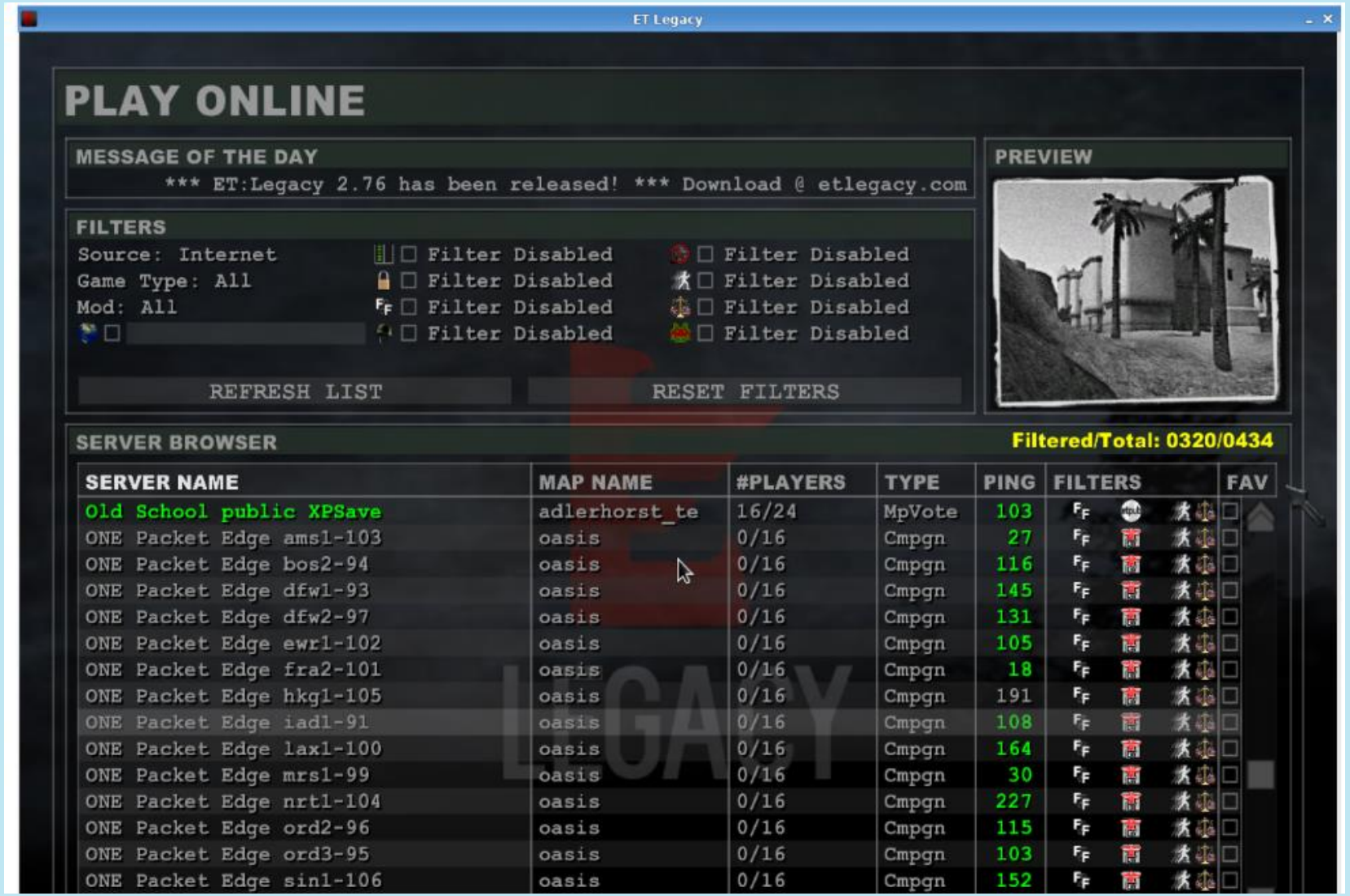
- Remote or Local storage & servers?
  - All remote / All local
  - Snapshots remote, running VMs on local?
  - Multiple image management software solutions

→Multiple Crashes of Testnets, not recovering VMs

- How to enable Load/Performance Testing on corporate physical hardware?

→ Partnership with Opennebula Team to create appropriate solutions

# ~/USE CASES/


ET Legacy
PLAY ONLINE
MESSAGE OF THE DAY
*** ET:Legacy 2.76 has been released! *** Download @ etlegacy.com
PREVIEW
FILTERS
Source: Internet
Game Type: All
Mod: All
Filter Disabled
REFRESH LIST
RESET FILTERS
SERVER BROWSER
Filtered/Total: 0320/0434
SERVER NAME
MAP NAME
#PLAYERS
TYPE
PING
FILTERS
FAV
Old School public XPSave adlerhorst_te 16/24 MpVote 103
ONE Packet Edge ams1-103 oasis 0/16 Cmpgn 27
ONE Packet Edge bos2-94 oasis 0/16 Cmpgn 116
ONE Packet Edge dfw1-93 oasis 0/16 Cmpgn 145
ONE Packet Edge dfw2-97 oasis 0/16 Cmpgn 131
ONE Packet Edge ewr1-102 oasis 0/16 Cmpgn 105
ONE Packet Edge fra2-101 oasis 0/16 Cmpgn 18
ONE Packet Edge hkg1-105 oasis 0/16 Cmpgn 191
ONE Packet Edge iad1-91 oasis 0/16 Cmpgn 108
ONE Packet Edge lax1-100 oasis 0/16 Cmpgn 164
ONE Packet Edge mrs1-99 oasis 0/16 Cmpgn 30
ONE Packet Edge nrt1-104 oasis 0/16 Cmpgn 227
ONE Packet Edge ord2-96 oasis 0/16 Cmpgn 115
ONE Packet Edge ord3-95 oasis 0/16 Cmpgn 103
ONE Packet Edge sin1-106 oasis 0/16 Cmpgn 152

# ~/USE CASES/

Open Nebula

Discover Use

A Lightning-fast Video Gaming Edge Cloud Use Case

APRIL 25, 2019 BLOG, COMMUNITY, EXPERIENCES, PROJECT

hare article

## A Lightning-fast Video Gaming Edge Cloud Use Case

**Launching a distributed gaming cloud across 17 global locations in just 25 minutes, for little more than pocket change!**

Source: www.opennebula.org

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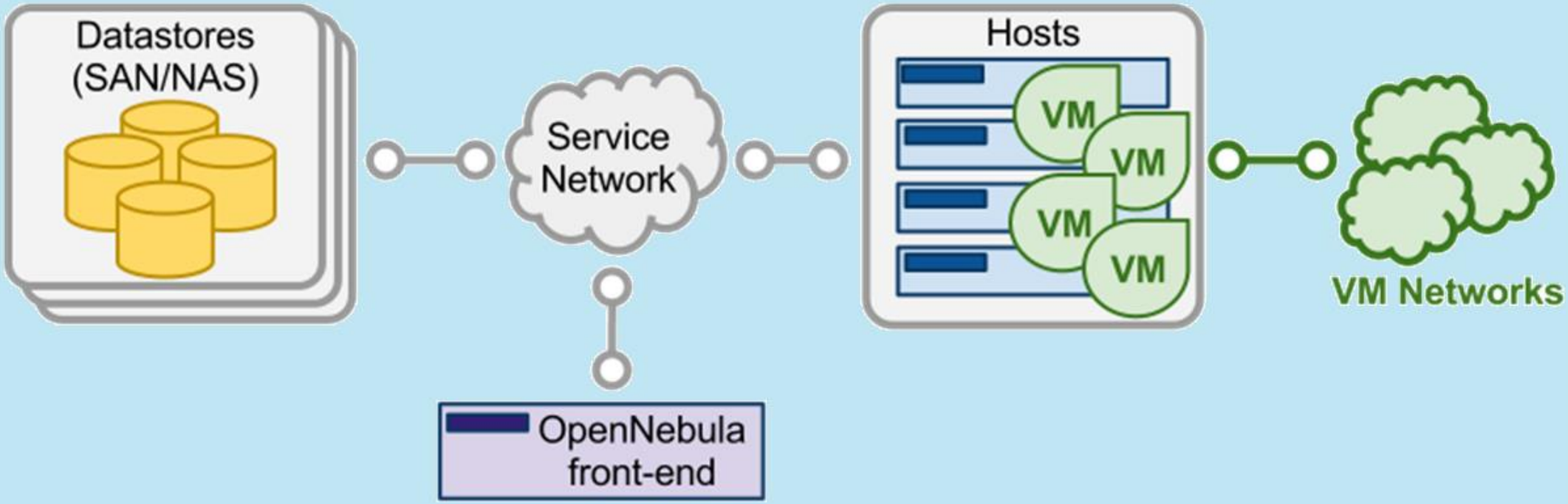
# ~/ARCHITECTURE/OVERVIEW/



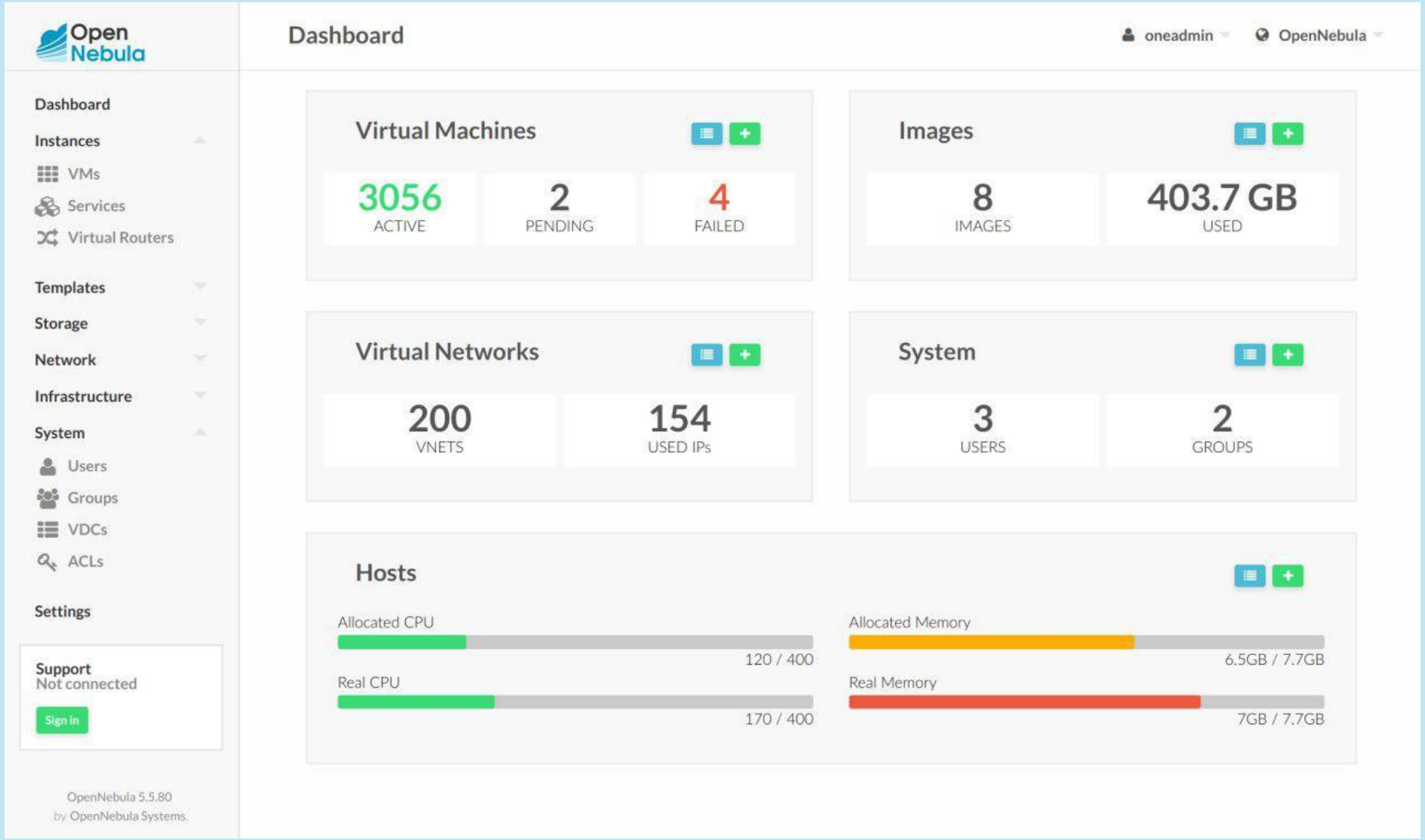
# ~/ARCHITECTURE/OVERVIEW/

- Frontend executes all OpenNebula Services
- Management daemon (oned) and scheduler (sched), Web Interface Server (sunstone server)
- Job Distribution → VM instanciation, networking, datastore management via Management network
- SQLite as Default DB

# ~/ARCHITECTURE/CORE COMPONENTS/FRONTEND

- Web-GUI for Datacenter Management
- Monitoring → Performance, VM Status, Capacity Consumption
- All commands can be submitted manually via commandline → Automation

# ~/ARCHITECTURE/CORE COMPONENTS/FRONTEND/

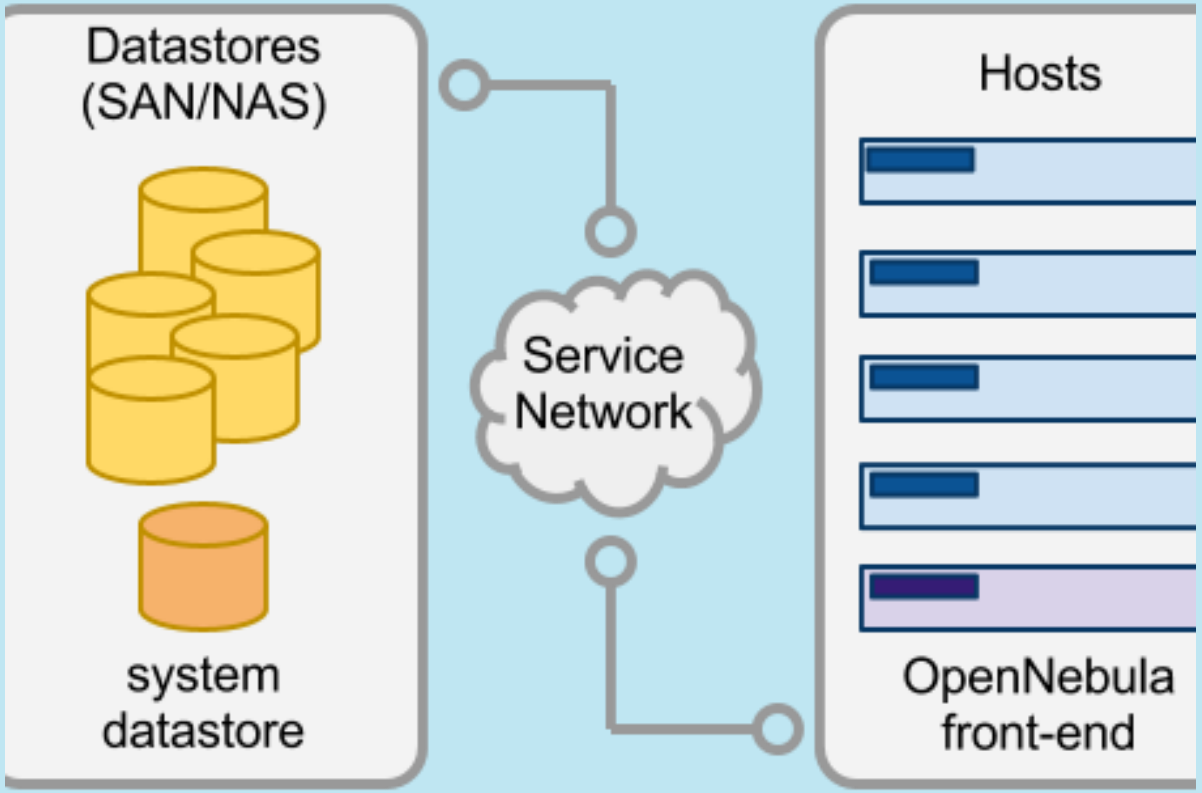


# ~/ARCHITECTURE/CORE COMPONENTS/WORKERNODES/

- Phyical Host Machines hosting the virtual Machines
- Each host registered on Frontend
- Number of VMs depending computing resources
- KVM Hypervisor as default solution → vCenter deployment also supported

# ~/ARCHITECTURE/CORE COMPONENTS/STORAGE/

- Uses datastores to store VM images → Connected via service Network
- System Datastore: System images for running VMs
- Image Datastore: Store disk image repository → Used for VM Deployment
- File Datastore: Special datastore for plain files → E.G. Can be used as kernels or contextfiles



# ~/ARCHITECTURE/CORE COMPONENTS/ADDITIONAL_COMPONENTS/

- Authentication: via SSH, User/Password, LDAP / AD
- Multi-VM Applications + Autocsaling
- Cloud Bursting
- Public Cloud

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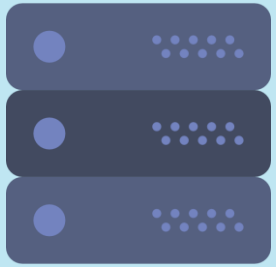
# ~/FEATURES/.OVERVIEW/

- Resource accounting, billing and management



- Public Cloud Migration

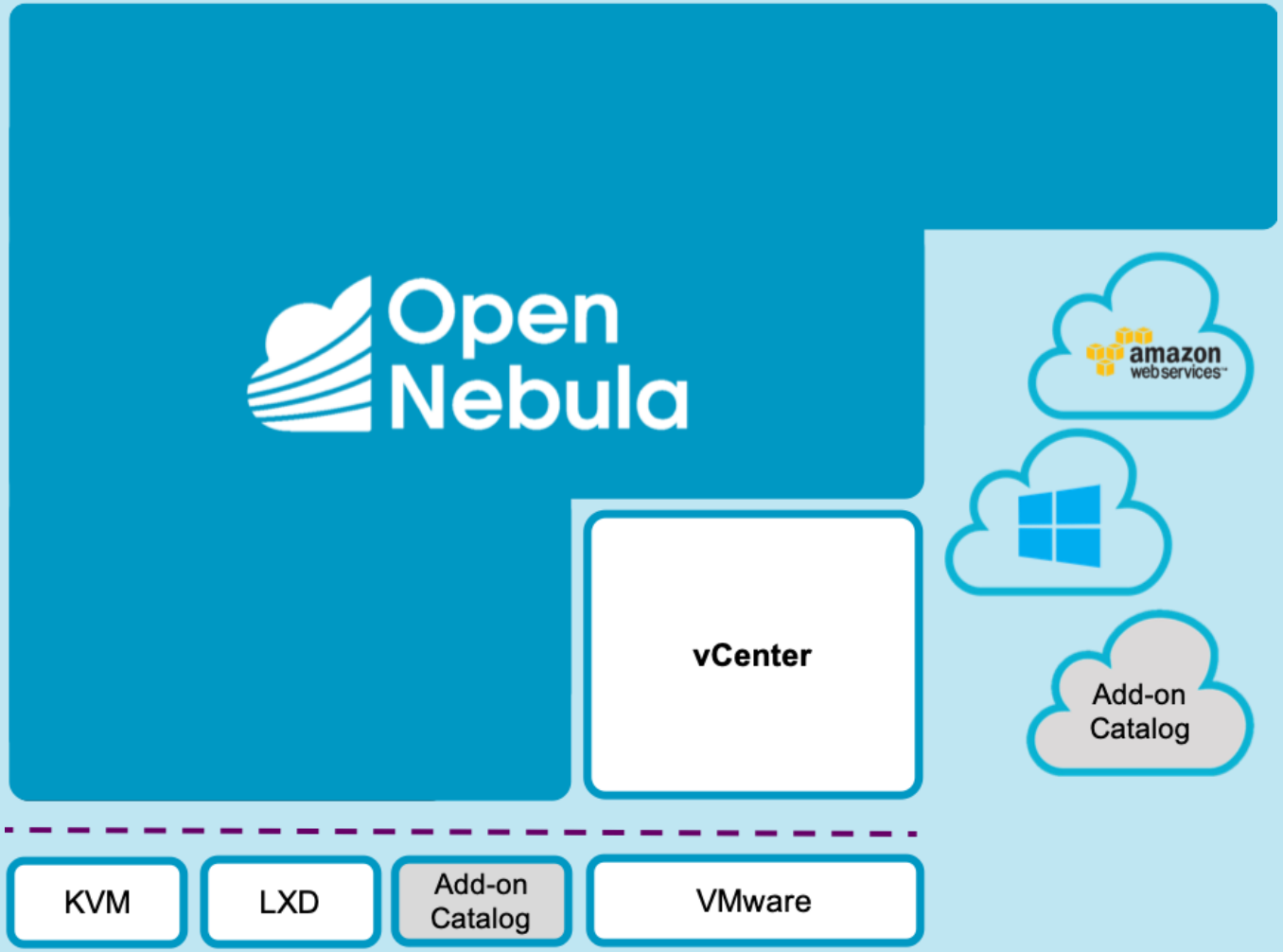
- Authentication/User Management

# ~/FEATURES/.RESOURCES/

- Two different interfaces to manage and interact with physical and virtual machines:
  - Command Line Interface (CLI)
  - SunStone (GUI)
- full control, monitoring and accounting of virtual resources
- Virtual machine template management
- VM Snapshots and disk resizing
- Define costs per CPU/MB per hour → Create reports (Showback)

# ~/FEATURES/.PUBLIC-CLOUD-MIGRATION/

- High scalability
- Elasticity
- Cloud Bursting




Source: www.opennebula.org

# ~/FEATURES/AUTHENTICATION/

- OpenNebula offers users and user groups
- Groups isolate users and prevent them from accessing resources allocated for other groups
- User(Username, Password, ID,  Group)

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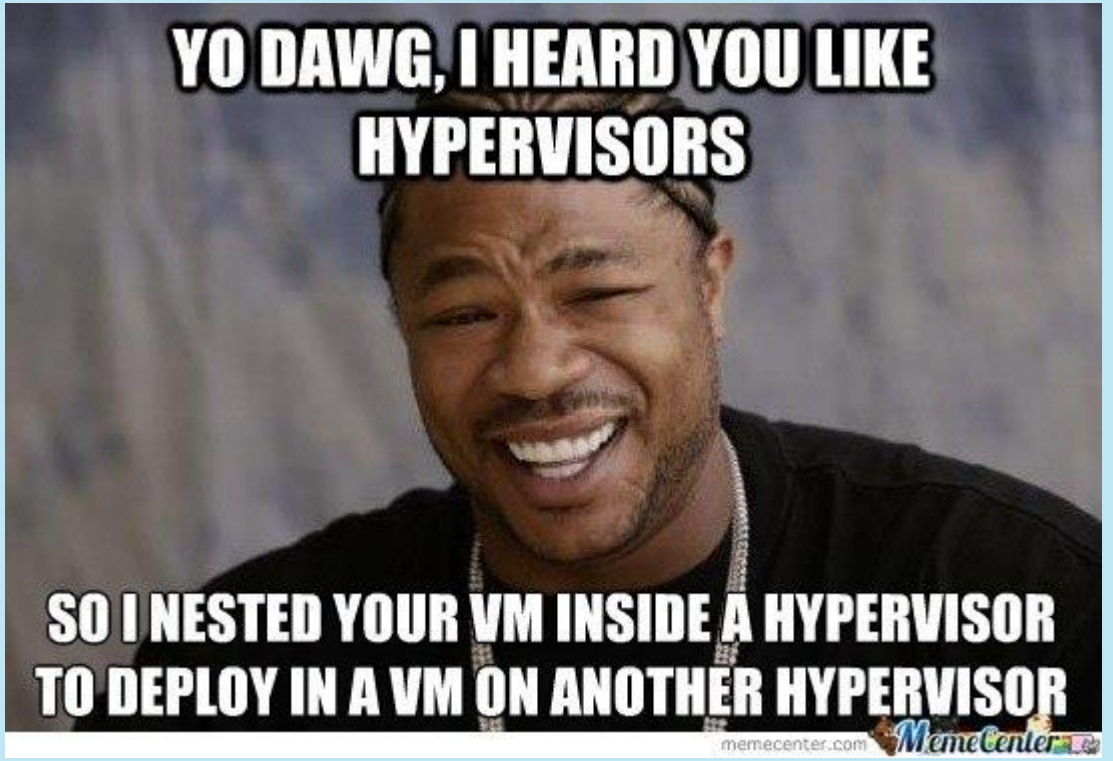
# ~/INSTALLATION_OVERVIEW/

- Install frontend on the master node + start services
- Install KVM node on the worker node + start service
- Configure passwordless SSH connection between master and worker
  --> necessary for the communication

# ~/PROJECT_ENVIRONMENT/



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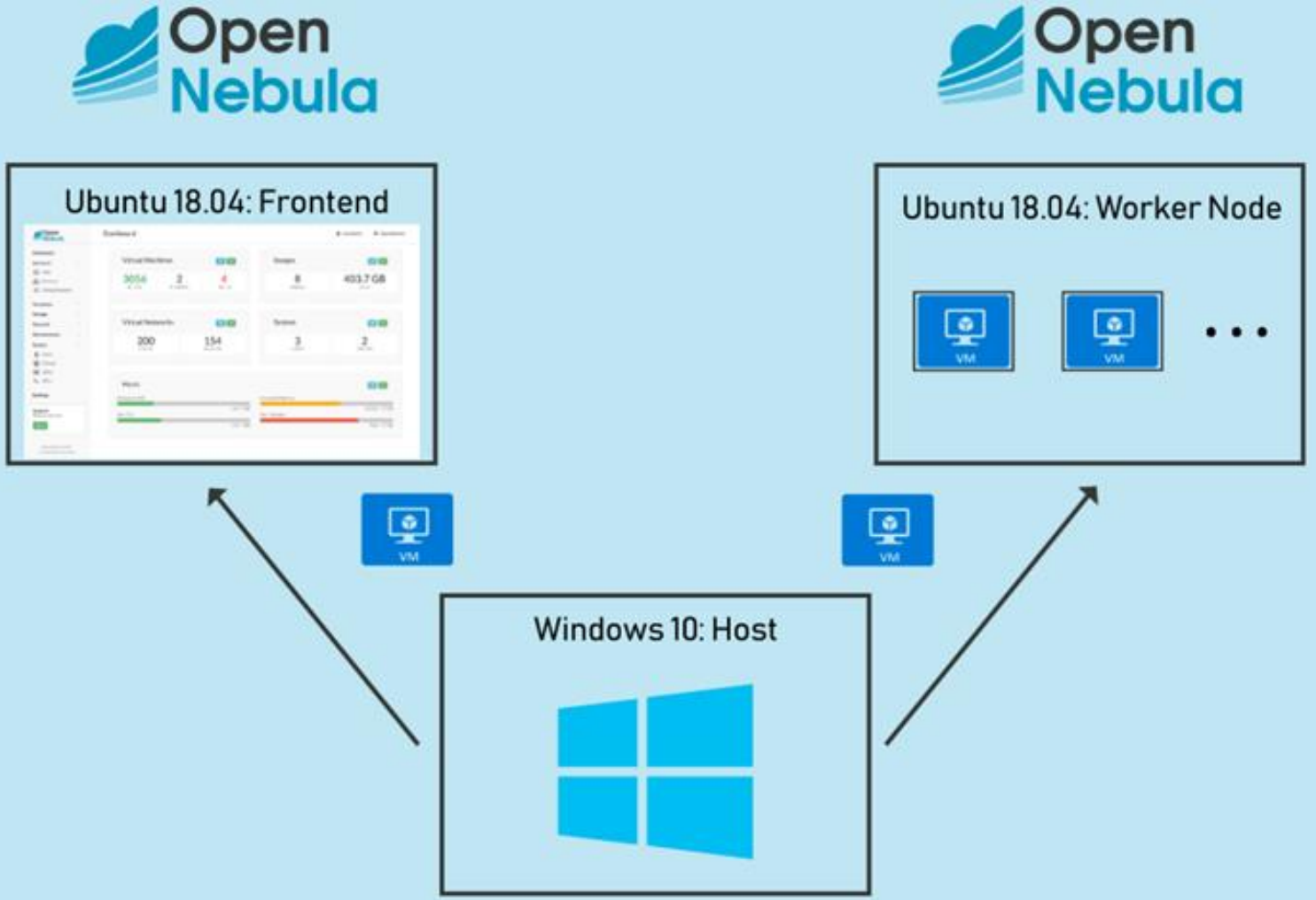

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# ~/COMPETITOR_PRODUCTS/

openstack®

EUCALYPTUS

Piston
PISTON {CLOUD} COMPUTING

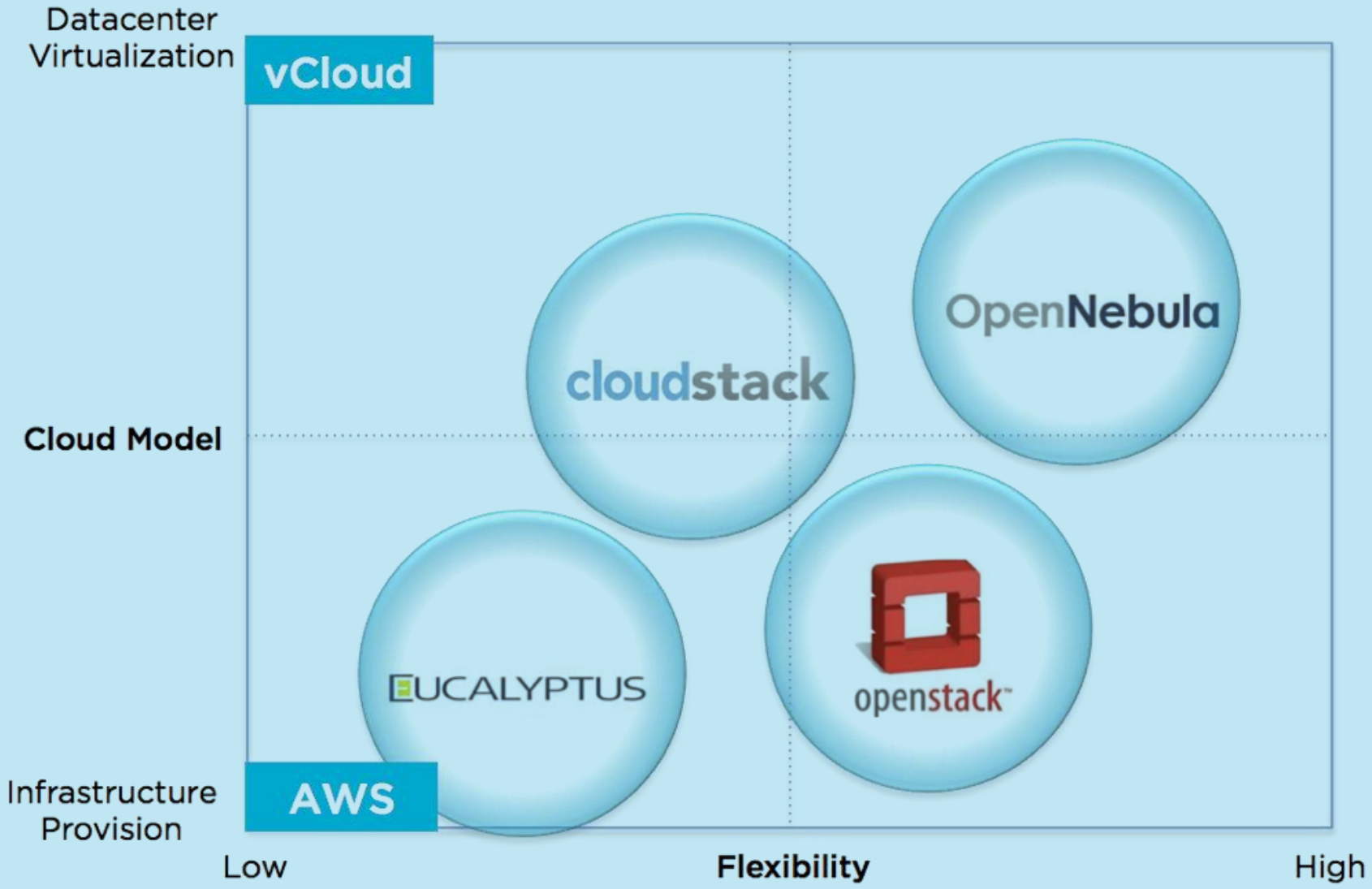
AppScale

connectloud

apachecloudstack
open source cloud computing

Source: https://www.google.de/imghp

# ~/COMPETITOR_PRODUCTS/

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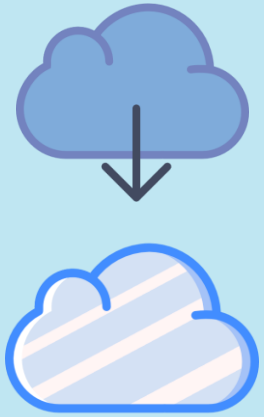


## WHICH PLATFORM DO YOU CHOOSE?

- Size of deployment
- Types of services to be hosted
- User base
- Hardware/budget limitations
- Complexity of the system
- Fault tolerance importance
- Compatibility with other clouds

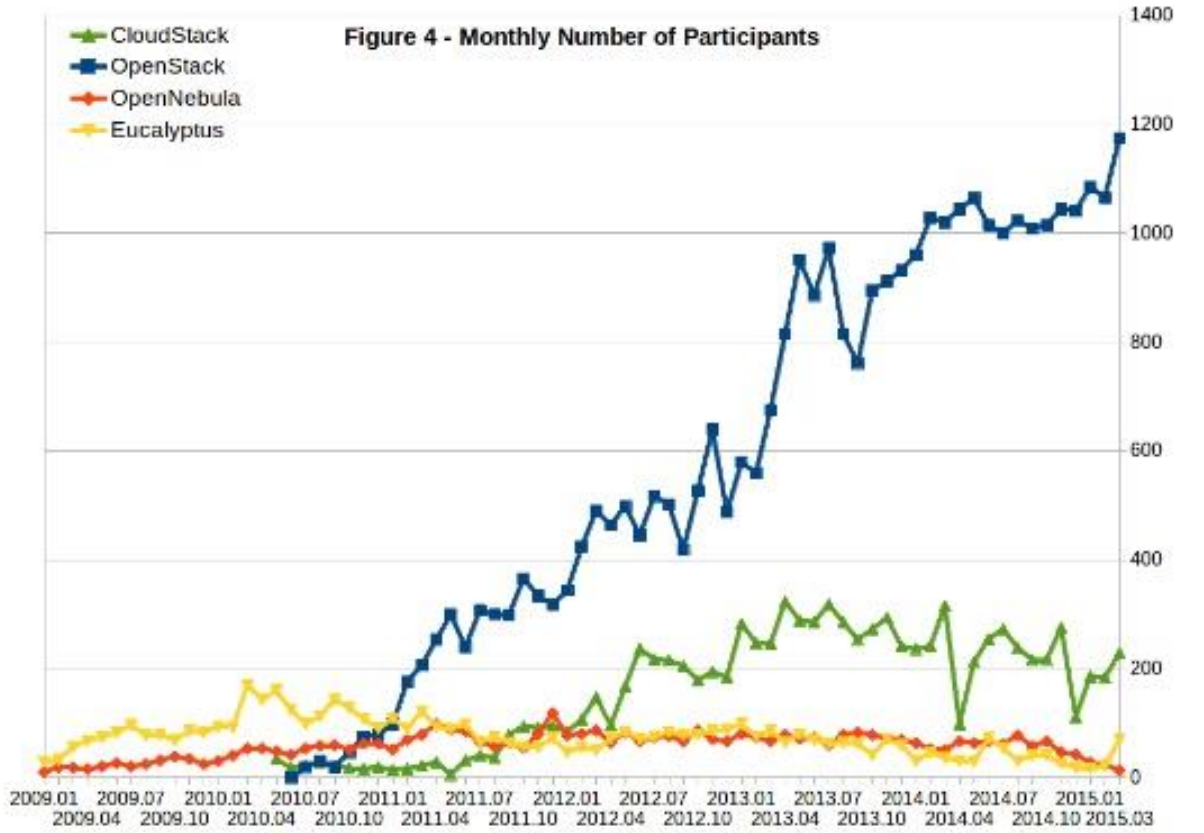
# ~/COMPETITOR_PRODUCTS/

NO SINGLE WINNER OR LOSER

- Solving different problems
- No perfect solution for everything
- Try each platform out first
- Map out what your end goal is
- Thank about:
  - Scalabilty
  - Manageability
  - Fault-tolerance

# ~/COMPETITOR_PRODUCTS/

## Number of participants



Thank
You

# References:

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- www.opennebula.org
- Cables: https://cdn.duden.de/_media_/small/K/Kabelsalat-201020549370.jpg
- Meme: https://www.koendiels.be/getting-started-with-projectfifo-inside-kvm-on-linux-ubuntu-16-04