OpenNebula : A Case Study

Presented by : Shree Mitra

The Foundation

- CEO: **Ignacio Martín Llorente**
- Founded: **2010 as C12G Labs**
- Founders: **Ignacio M. Llorente and Ruben S. Montero**
- Headquarters: **La Finca Business Park, Madrid, Spain**
- Subsidiaries: **OpenNebula Systems USA, LLC**
- Products: **OpenNebula**
- Website: **opennebula.io**

Who We Are?

- OpenNebula is an open-source cloud computing platform for managing heterogeneous distributed data centers.
- The openNebula platform manages a data center’s virtual infrastructure to build private ,public and hybrid implementations of infrastructure as a service.

Who We Are?

- OpenNebula is designed to be a simple but feature-rich ,production ready,customisable,solution to build and manage enterprise clouds.
- Simple to install
- Update and operate by the administrators
- Simple to use by end users

Our Vision

- We’re moving into a world of open distributed cloud computing — where each organization can find the right private cloud architecture and combination of geographically distributed clouds to efficiently execute their workloads and meet their cloud needs.
- Our aim is to bring beauty, peace of mind and simplicity to the private enterprise cloud.

Our Mission

- Enterprise cloud computing is the next step in the evolution of data center virtualization. OpenNebula combines existing virtualization and container technologies with advanced features for multi-tenancy, automatic provision and elasticity, following a bottom-up approach driven by the real needs of sysadmins and devops.

Our Mission

- Because no two data centers are the same, we don’t believe in a one-size-fits-all in the cloud. Instead of providing a turnkey solution that imposes requirements on your data center, OpenNebula makes cloud an evolution by leveraging existing IT infrastructure, protecting your investment and avoiding vendor lock-in.

Our Mission

- Our commitment to the open-cloud flows directly out our mission
- To become the simplest cloud enabling platform for the enterprise

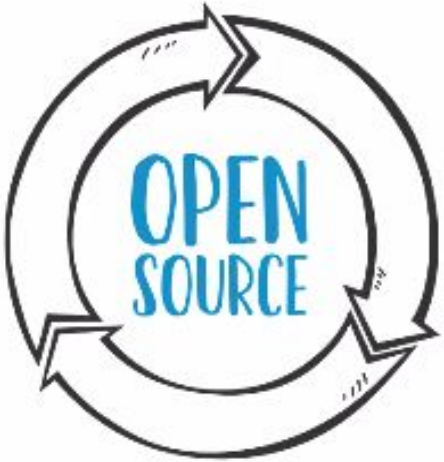
Our History

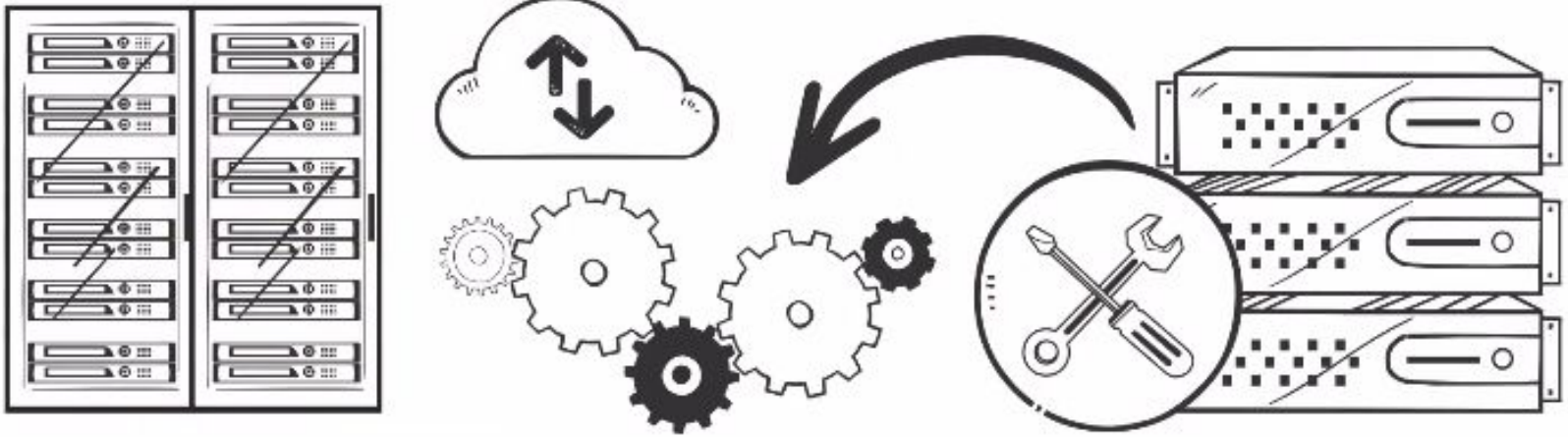
- The OpenNebula Project was started as a research venture in 2005 by **Ignacio M. Llorente** and **Ruben S. Montero**.
- The first public release of the software occurred in 2008.
- As the project matured it began to become more and more adopted and in March 2010 the primary writers of the project founded **C12G Labs**, now known as OpenNebula Systems, which provides value-added professional services to enterprises adopting or utilizing OpenNebula.

Our Description

- OpenNebula orchestrates storage, network, virtualization, monitoring, and security technologies to deploy multi-tier services as virtual machines on distributed infrastructures, combining both data center resources and remote cloud resources, according to allocation policies.

OpenNebula





According to the European Commission's 2010 report

"... only few cloud dedicated research projects in the widest sense have been initiated - most prominent amongst them probably OpenNebula ...".

Some Basic Terminology

- Virtualization

- Hypervisor

Virtualization

- Virtualization is a technique, which allows to share single physical instance of an application or resource among multiple organizations or tenants (customers). It does so by assigning a logical name to a physical resource and providing a pointer to that physical resource on demand.

Hypervisor

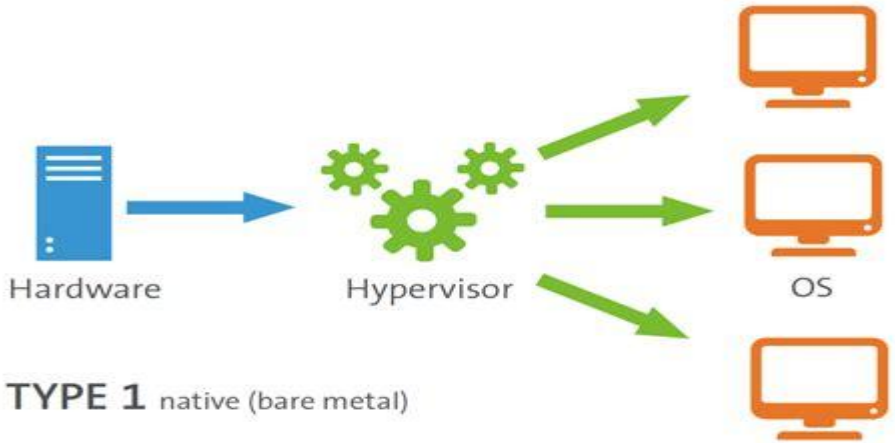
- The hypervisor is a firmware or low-level program that acts as a Virtual Machine Manager.
- There are two types of Hypervisor

    1. Type 1 Hypervisor
    2. Type 2 Hypervisor

Type 1 Hypervisor

- Type 1 hypervisor executes on bare system. **LynxSecure**, **RTS Hypervisor**, **Oracle VM**, **Sun xVM Server**, **VirtualLogic VLX** are examples of Type 1 hypervisor.
- The Type 1 hypervisor does not have any host operating system because they are installed on a bare system.

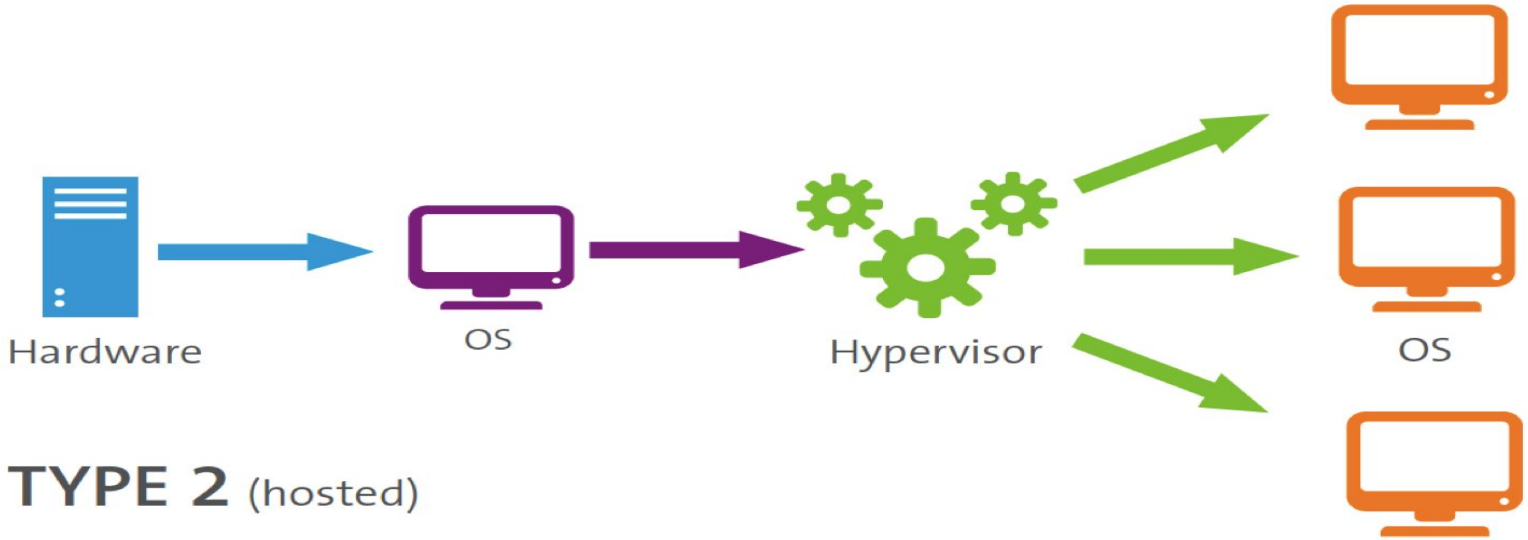
Type 1 Hypervisor



Type 2 Hypervisor

- Type 2 hypervisor is a software interface that emulates the devices with which a system normally interacts. **Containers**, **KVM**, **Microsoft Hyper V**, **VMWare Fusion**, **Virtual Server 2005 R2**, **Windows Virtual PC** and **VMWare workstation 6.0** are examples of Type 2 hypervisor.

Type 2 Hypervisor



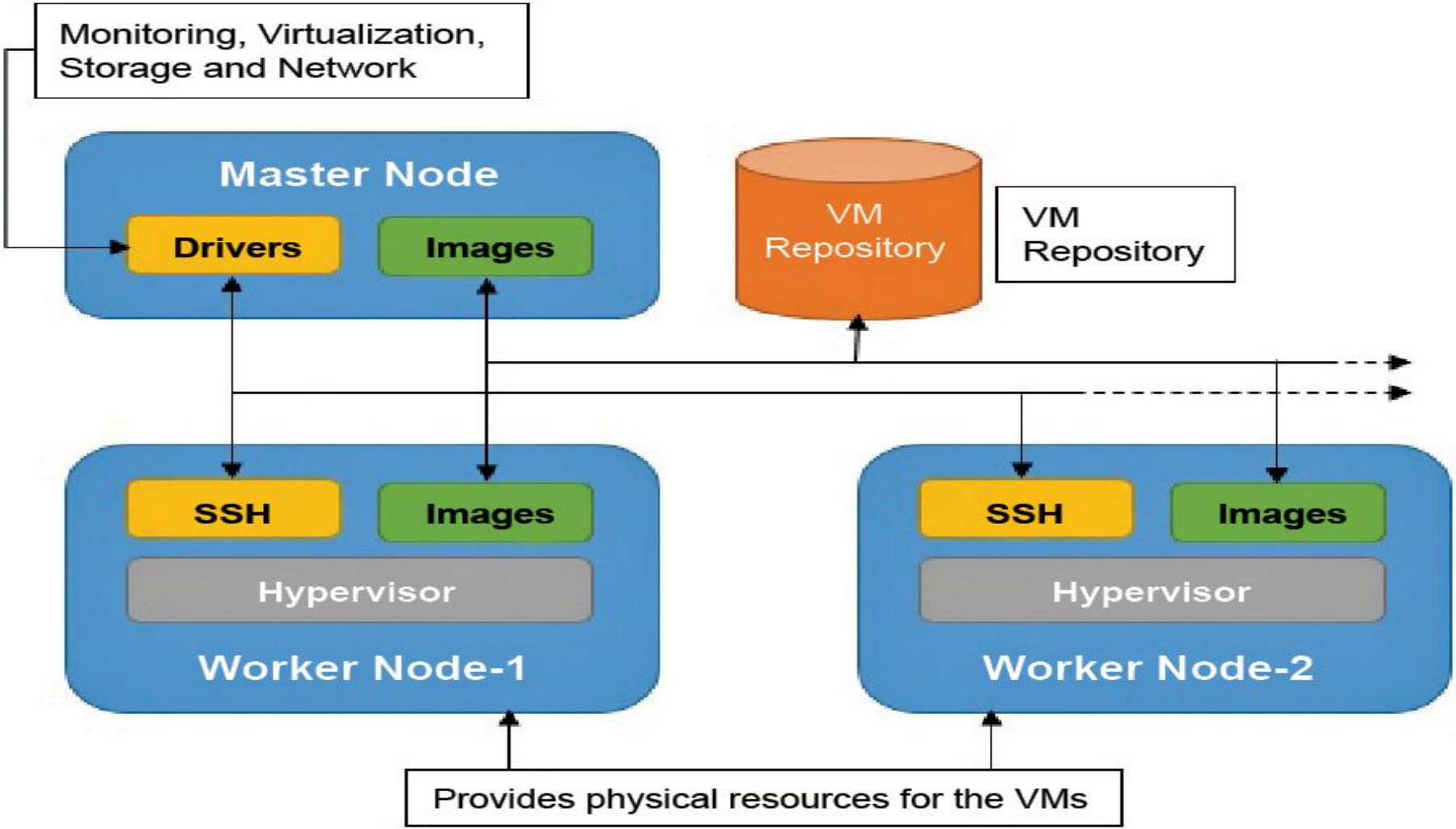
Internal Architecture of OpenNebula

Basic Components

- **Host:** Physical Machines running a supported Hypervisor.
- **Cluster:** Pool of hosts that shares datastores and virtual network.
- **Template:** Virtual Machine definition.
- **Image:** Virtual Machine disk Image.
- **Virtual Machine:** Instantiated Template

Components and Deployment Model

- The OpenNebula project deployment model resembles classic cluster architecture which utilizes
  - A front-end machine(Master node)
  - Hypervisor or enabled hosts(Worker nodes)
  - Datastores
  - A physical network


Monitoring, Virtualization, Storage and Network
Master Node
Drivers
Images
VM Repository
VM Repository
SSH
Images
Hypervisor
Worker Node-1
SSH
Images
Hypervisor
Worker Node-2
Provides physical resources for the VMs

Front-end Machine(Master Node)

- The Master node sometimes referred to as a front end machine,executes all the OpenNebula services.This is the machine where OpenNebula actually installed.
- The Master Node also provides the mechanism to maintain the entire system.

Hypervisor Enabled-Hosts

- The Worker Nodes or the Hypervisor Enabled-Hosts provide the actual computing resources needed for processing all jobs submitted by the Master Node.
- OpenNebula Hypervisor Enabled-Hosts use a virtualization Hypervisor such as Vmware,Xen or KVM.
- The KVM Hypervisor is used by default.

Storage

- The datastores simply holds the base images of the virtual machines.
- The used technologies are NAS,SANor direct attached storage.
- There are three different datastores in OpenNebula-
  - System Datastore
  - Image Datastore
  - File Datastore

Physical Networks

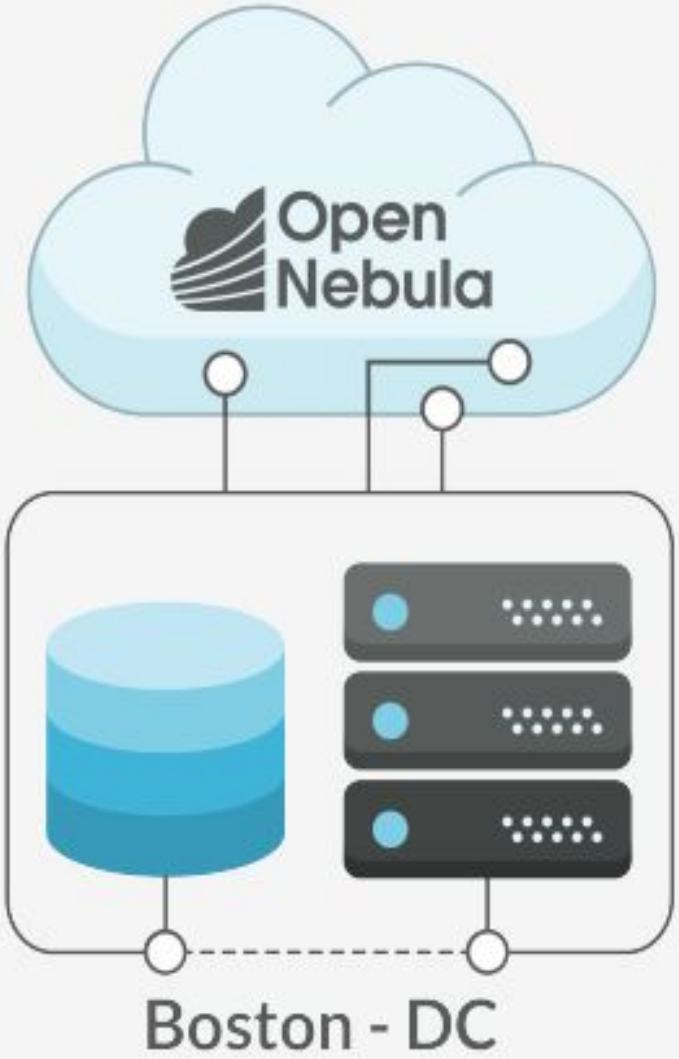
- Physical networks are required to support the interconnection of storage servers and virtual machines in remote locations.
- It is also essential that the Front-end Machine(Master Node) can connect to all the worker nodes on hosts.

What We Provide?

- OpenNebula provides a simple but feature-rich and flexible solution for the comprehensive management of virtualized data centers to enable on premise enterprise clouds in existing infrastructure.
- It can be primarily used as a virtualization tool to manage your virtual infrastructure in the data center which is usually referred as private cloud.
- It supports hybrid cloud to combine local infrastructure with public cloud-based infrastructure ,enabling highly scalable hosting environments.

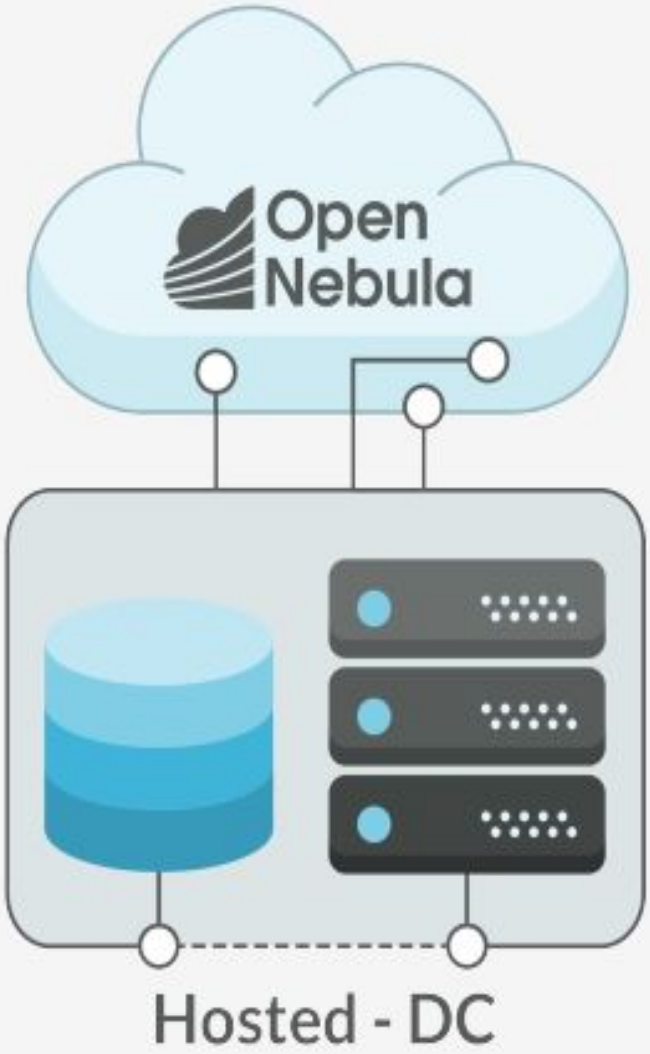
We Make Private Cloud Simple

On Premise Private Cloud: A Cloud in Your Own Data Center



- Steady workloads
- Predictable demand
- Security
- High performance

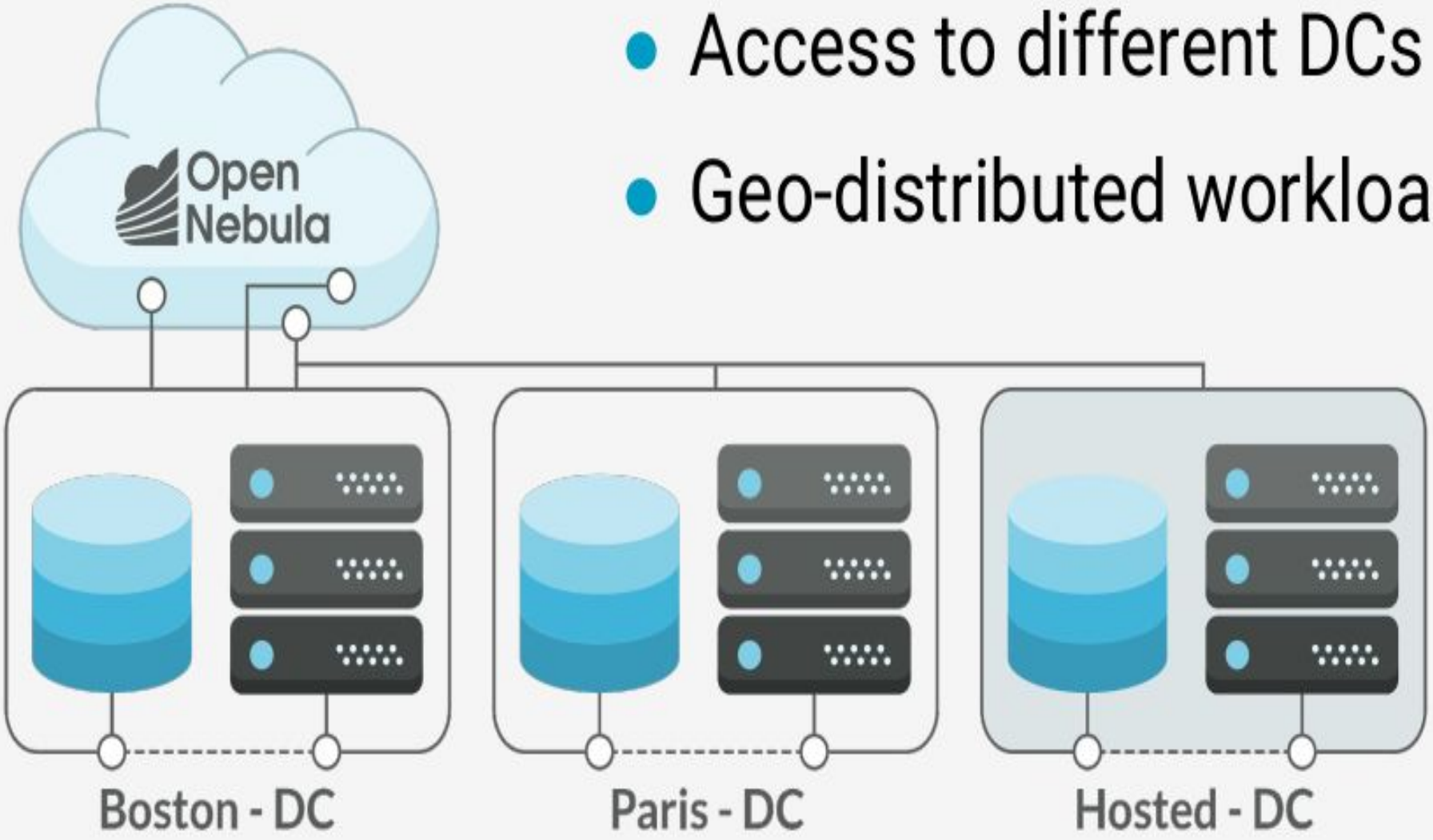
Hosted Private Cloud: A Cloud on Demand in a Bare-Metal Cloud Provider



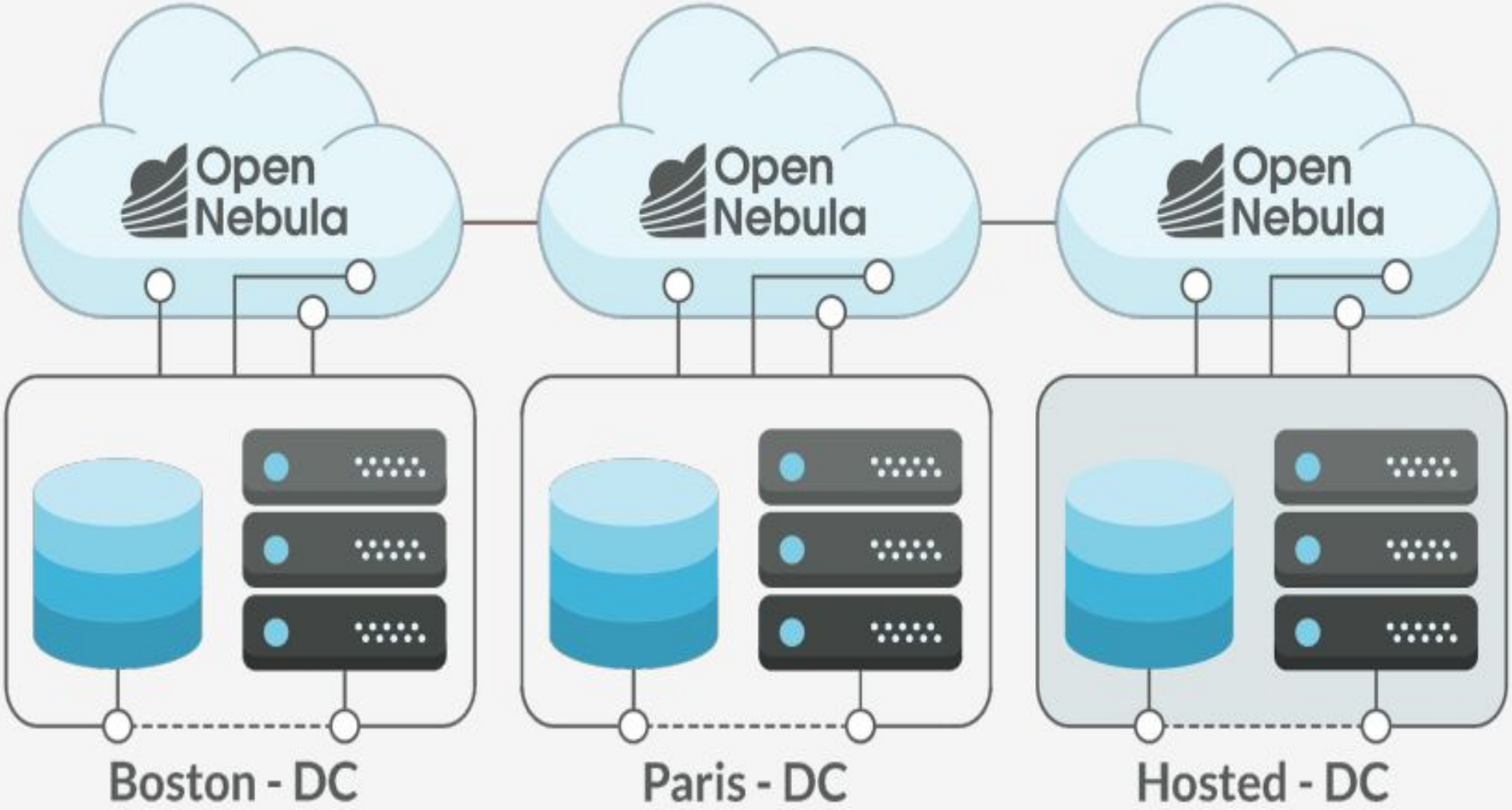
- Variable workload
- Unpredictable demand
- Evaluation
- Testing/development

Distributed Private Cloud: A cloud that combines your own data center with on demand resources

- Access to different DCs
- Geo-distributed workloads

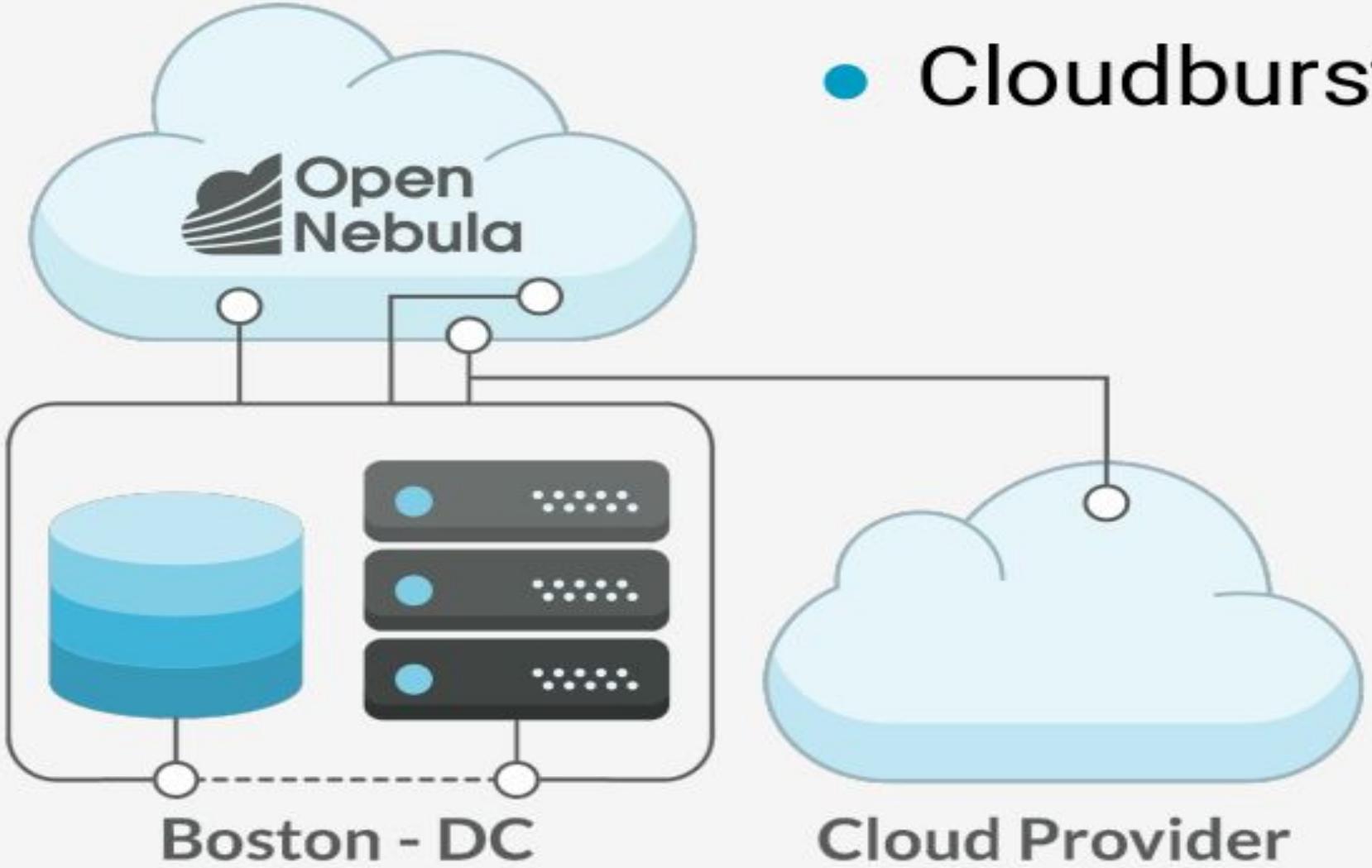


Federated Private Cloud: A federation of cloud instances


Open Nebula
Open Nebula
Open Nebula
Boston - DC
Paris - DC
Hosted - DC

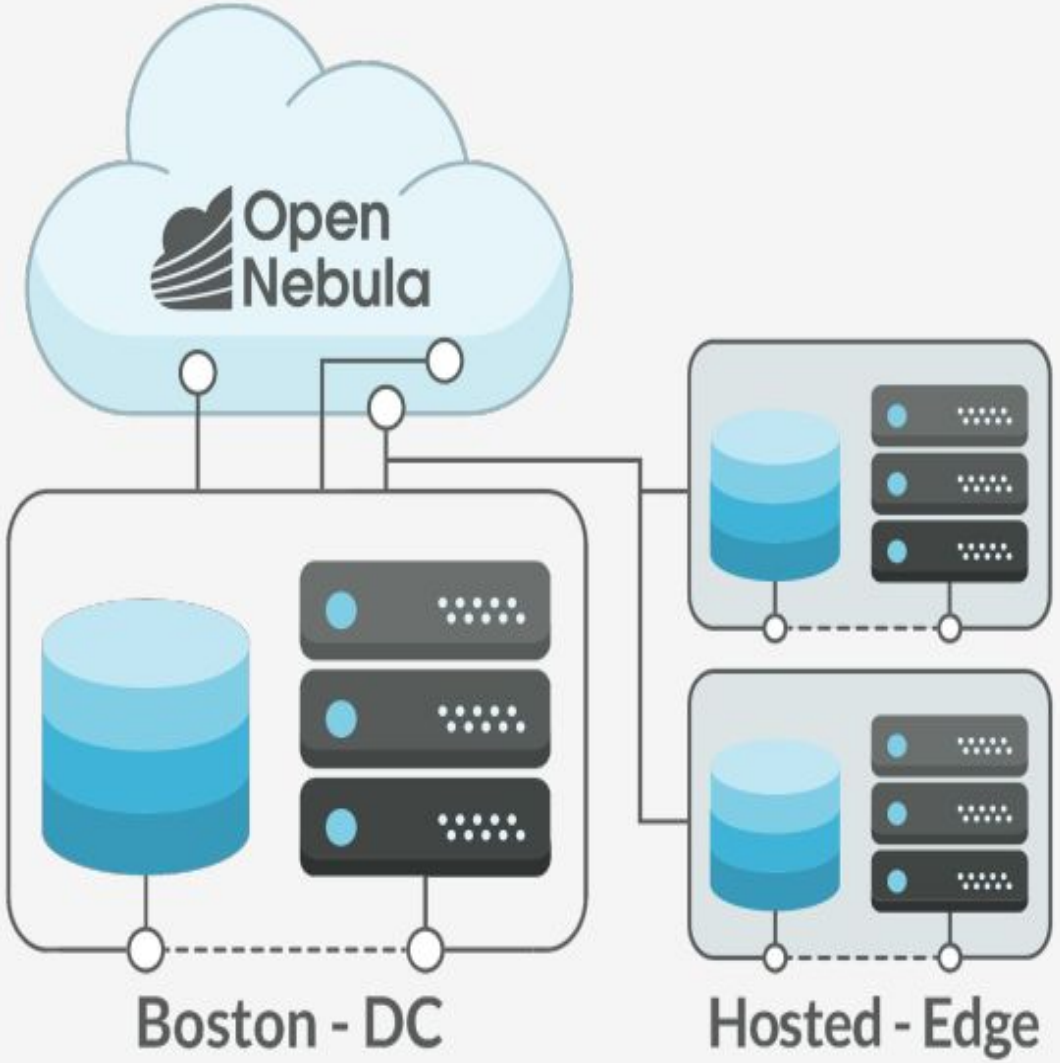
Hybrid Private Cloud: A cloud connected to remote public clouds

- Cloudbursting



Edge Private Cloud(ONEedge): A cloud connected to remote low latency edge resources

Latency as
Critical Factor



Edge Private Cloud: Demonstration in the field of video gaming

Why ONEedge?

- With OpenNebula-the powerful open source cloud management platform,as it’s core,ONEedge is the perfect solution to finally bring your private cloud to the edge.

Efficient

Low latency access to your services.

Easy

Automatic deployment of resources at the edge.

Fast

Edge resources are deployed and added to your cloud in a few minutes.

Flexible

Dynamic addition and removal of resources to meet real-time demands.

Scalable

Support thousands of geographically distributed edge resources.

Cost-effective

Edge nodes leased from third-party providers.

OpenNebula Systems Awarded H2020 SME Instrument Grant for Edge Computing

September 24, 2019 02:00 AM Eastern Daylight Time

MADRID--(BUSINESS WIRE)--Leading cloud management software vendor, OpenNebula Systems, announced today that the company was awarded €2.1M from the EU Horizon 2020 SME Instrument program to assist in the development and productization of ONEedge.io, its strategic project for bringing the private cloud to the edge through cloud disaggregation. The SME Instrument is a highly competitive program, which is part of the European Innovation Council (EIC) pilot that supports top-class innovators and entrepreneurs in implementing high-risk and high-potential innovation ideas to lead new emerging markets and major changes in how business is done.

The IoT market will reach $1 trillion next year and there is currently no strategically viable edge platform on which companies can offer their low-latency services to meet the needs of this huge market. This grant will provide the funding needed to drive OpenNebula's innovative edge computing approach to full software maturity and go to market quickly. ONEedge takes advantage of bare-metal offerings from public cloud providers to naturally evolve a private edge cloud, providing companies with an automated software-defined platform to build their own private, nimble edge computing environments based on highly-dispersed edge nodes in close proximity to the users, machines, and sources of data.

OpenNebula Sunstone

What is OpenNebula Sunstone?

- OpenNebula Sunstone is a graphical user interface (GUI), intended for both end users and administrators, which simplifies the typical management operations in private and hybrid cloud infrastructures.
- OpenNebula Sunstone allows one to easily manage all OpenNebula resources and perform typical operations on them.

Sunstone Views

- There are basically four different types of views in OpenNebula Sunstone-
  - Admin View
  - Group Admin View
  - Cloud View
  - User View

Admin View

Dashboard

oneadmin | OpenNebula

- Dashboard
- Instances
  - VMs
  - Services
  - Virtual Routers
- Templates
- Storage
- Network
- Infrastructure
- System
  - Users
  - Groups
  - VDCs
  - ACLs
- Settings

Support
Not connected

Sign in

OpenNebula 5.5.80
by OpenNebula Systems.

Virtual Machines

3056	2	4
ACTIVE	PENDING	FAILED

Images

8	403.7 GB
IMAGES	USED

Virtual Networks

200	154
VNETS	USED IPs

System

3	2
USERS	GROUPS

Hosts

Allocated CPU
120 / 400

Allocated Memory
6.5GB / 7.7GB

Real CPU
170 / 400

Real Memory
7GB / 7.7GB

Group Admin View

OpenNebula

Dashboard

alice | OpenNebula

- Dashboard
- Instances
  - VMs
  - Services
- Templates
- Network
- System
- Settings

OpenNebula 5.0
by OpenNebula
Systems.

VMs 2

ACTIVE 2 PENDING 0 FAILED 0

CPU hours

Memory GB hours

Disk MB hours

Users 2

CPU hours

Memory GB hours

Disk MB hours

Cloud View

Officially supported

Virtual Machines

11	103	17	46	0
Owner	RUNNING	DEPLOYING	OFF	ERROR

4

Group

User View

Dashboard

oneadmin OpenNebula

- Dashboard
- Instances
- Templates
  - VMs
  - Services
  - Virtual Routers
  - VM Groups
- Storage
- Network
- Settings

OpenNebula 5.5.80
by OpenNebula Systems.

Virtual Networks

15	6
VNETS	USED IPs

Images

1	1 GB
IMAGES	USED

Virtual Machines

10	2	0
ACTIVE	PENDING	FAILED

ONED

- The OpenNebula daemon `oned` manages the cluster nodes, virtual networks, virtual machines, users, groups and storage datastores.

OpenNebula Scheduler

- The Scheduler is in charge of the assignment between pending Virtual Machines and known Hosts. OpenNebula's architecture defines this module as a separate process that can be started independently of `oned`.

Why Use OpenNebula?

- If you are looking for an easy-to-use, but powerful, open source platform for your private, hybrid or edge cloud infrastructure, you are at the right place.
- Welcome to OpenNebula, the Cloud Management Platform that brings flexibility, scalability, simplicity and vendor independence to support the growing needs of developers and DevOps admins across clouds.

SIMPLE & EFFICIENT

Use a single management layer to reduce complexity, resource consumption and operational costs.

VMs & CONTAINERS

Combine containers with virtual machine workloads in a common shared environment to get the best of both worlds.

MULTI-HYPERVISOR

Integrate any type of hypervisor, from fully virtualized to system containers and serverless deployments.

HYBRID & EDGE

Embrace multi-cloud, hybrid and edge cloud computing by easily expanding your on-premises infrastructure on demand.

Test Drive

Deploy an OpenNebula cloud for development or product evaluation in 5 minutes!

vOneCloud on vCenter

Try Now

miniONE on KVM

Try Now

miniONE on LXD

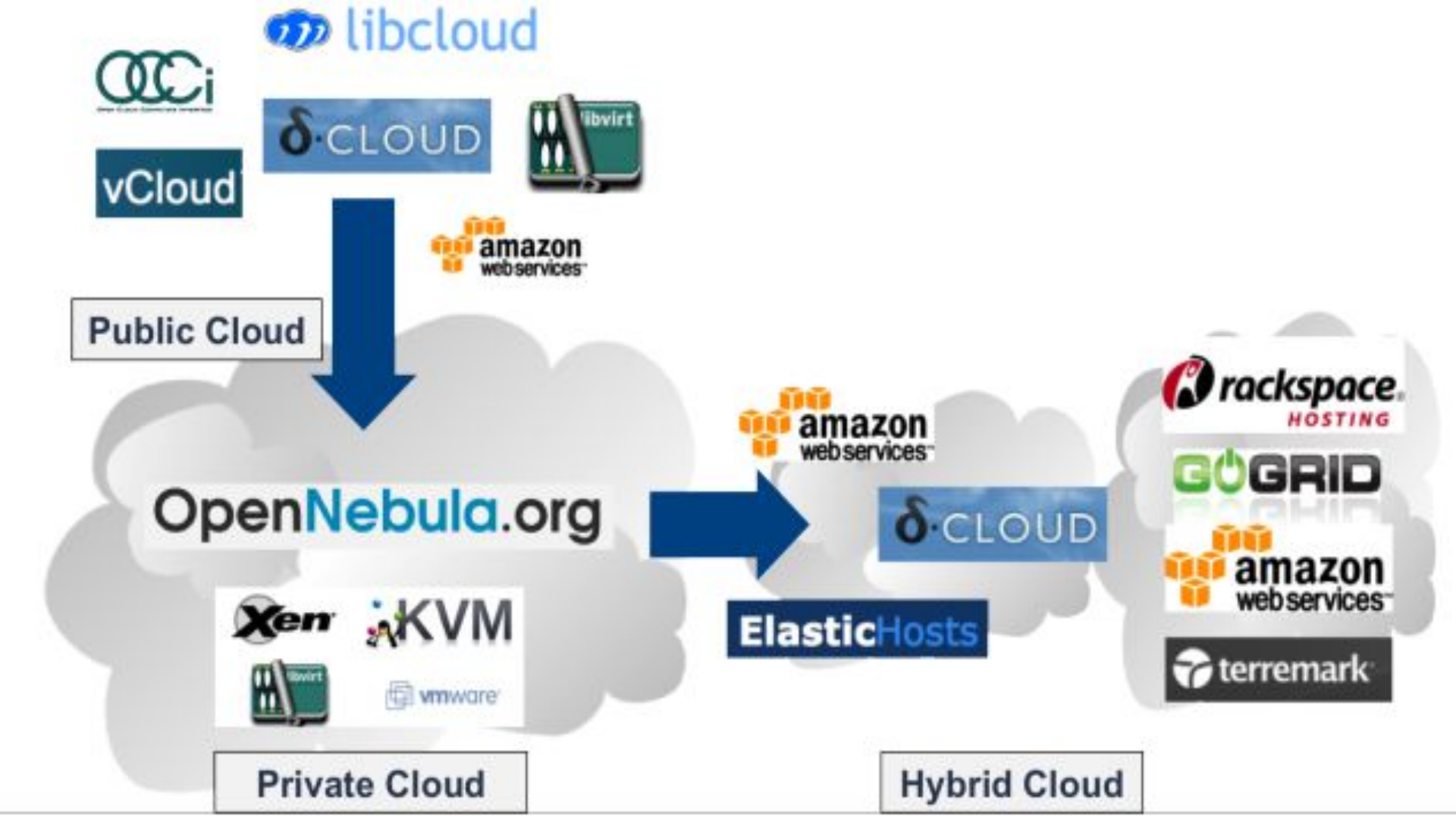
Try Now

miniONE on Firecracker

Try Now

Why Use OpenNebula?

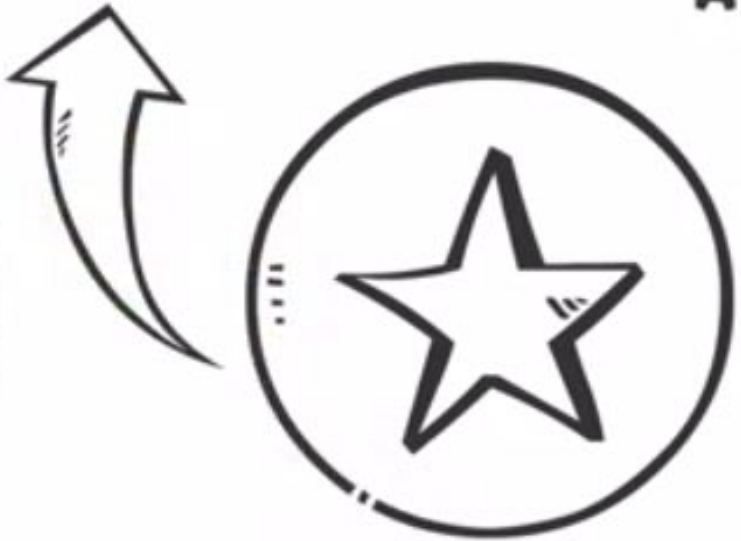
- It also claims standardization, interoperability and portability, providing cloud users and administrators with a choice of several cloud interfaces (**Amazon EC2 Query**, **OGF Open Cloud Computing Interface** and **vCloud**) and hypervisors (**VMware vCenter**, **KVM**, **LXD** and **AWS Firecracker**), and can accommodate multiple hardware and software combinations in a data center.


libcloud
OCCi
δ·CLOUD
libvirt
vCloud
amazon web services
Public Cloud
OpenNebula.org
Xen
KVM
libvirt
vmware
Private Cloud
amazon web services
δ·CLOUD
ElasticHosts
Hybrid Cloud
rackspace HOSTING
GOGRID
amazon web services
terremark

FLEXIBILITY

SCALABILITY

INTEROPERABILITY



Our Community

USE OpenNebula

Download it...Deploy it...Run it.

Share your Feedback.

Contribute CODE

Apache 2.0 licensed.

Help develop and test new features.

Get INVOLVED

Spread the word.

Promote its use to the broader public.

Share Your Insight

The OpenNebula Blog

- How have you used OpenNebula?
- What are your EXPERIENCES?
- What has worked WELL?
- Recommended IMPROVEMENTS?

The Developer’s Forum: Give a helping hand to develop our OpenNebula system more stronger

The Developer's Forum

- Over 1700 users
- Present your QUESTIONS
- Provide ANSWERS to others
- RESEARCH previous discussions

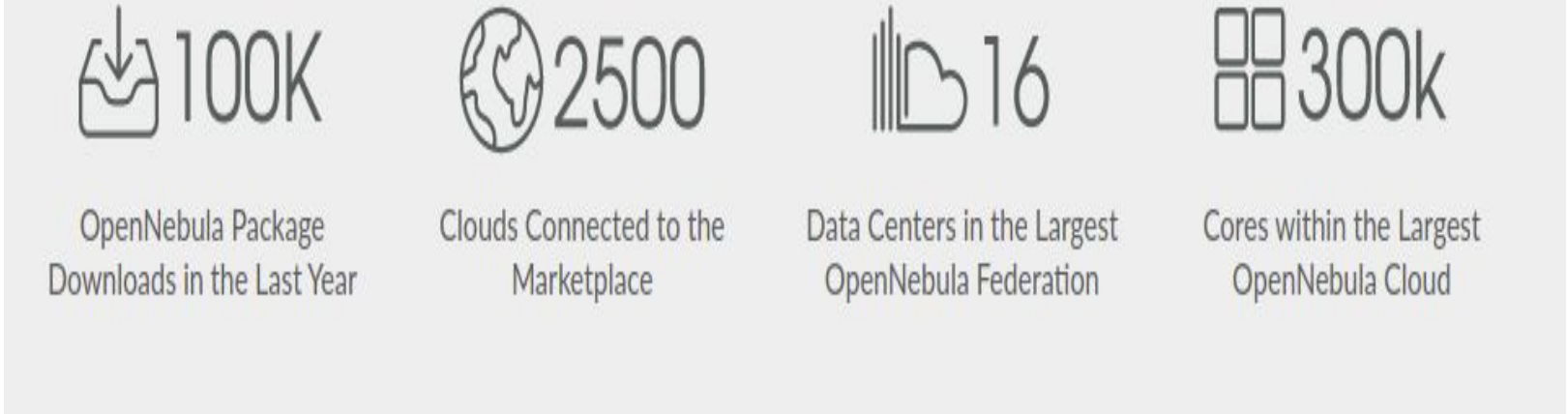
Contribute Code

- **GitHub:** The heart of our development collaboration

  https://github.com/OpenNebula/one

- Lead new Add-on project
- Contribute to an existing one
- Use the developer's forum
  - Share ideas
  - Collaborate

OpenNebula By The Numbers



Vendor

Hewlett Packard Enterprise

ca technologies

HITACHI DATA SYSTEMS

Telco

BlackBerry

Akamai

Telefonica

Gaming

NORDEUS

CRYTEK

unity

ludia

Public

U.S.ARMY

CSIC

rinis

Vlaanderen
is milieubewust

SaaS

trivago

intuit

Direct

fuze

cewe

BEST BUY

runtastic

IT Services

bit

Dustin

Iguane solutions

ptisp

Banking

BDO

produban

TransUnion

NasdaqDubai

Academic

UCL Université catholique de Louvain

lrz

HARVARD

UNIVERSITÉ DE STRASBOURG

KENT STATE UNIVERSITY

OUR CONTACT

OpenNebula Headquarters

Paseo de la Castellana 93 – 2nd floor
28046 Madrid, Spain

OpenNebula Labs - Spain

C/ Faraday 7 – Madrid Science Park
28049 Madrid, Spain

OpenNebula Labs - Czech Republic

Cyrilská 7 – Impact Hub Brno
602 00 Brno, Czech Republic

OpenNebula USA Headquarters

1500 District Avenue
Burlington, MA 01803, USA

Phone

+ 34 91 829 8445
+1 617 453 3829

Website

OpenNebula.systems
OpenNebula.org
OpenNebula.pro


Open
Nebula

Thank You