OpenNebula.org

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OpenNebula
Open Source Toolkit for Cloud Computing

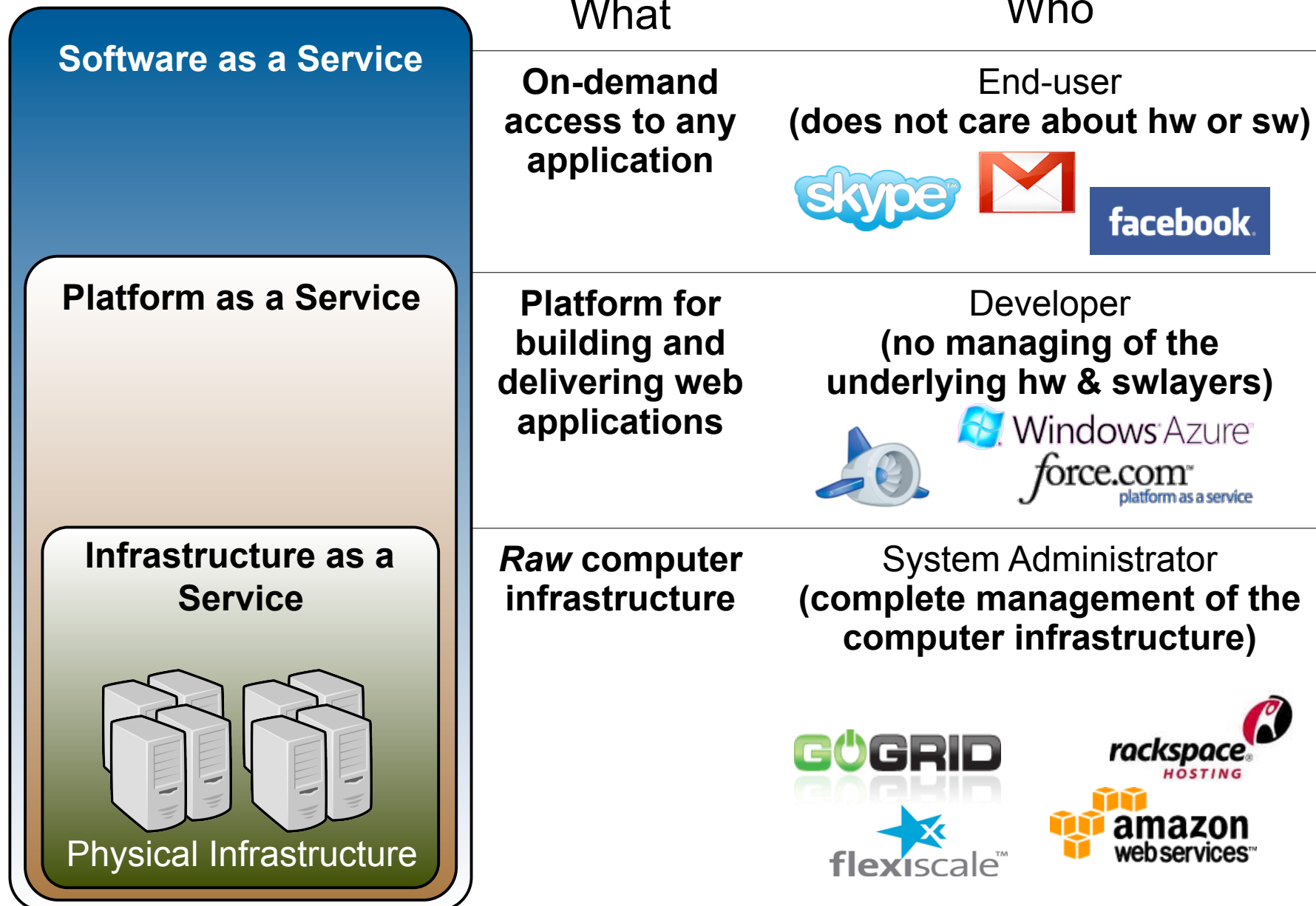**Constantino Vázquez Blanco**

DSA-Research.org
Distributed Systems Architecture Research Group
Universidad Complutense de Madrid

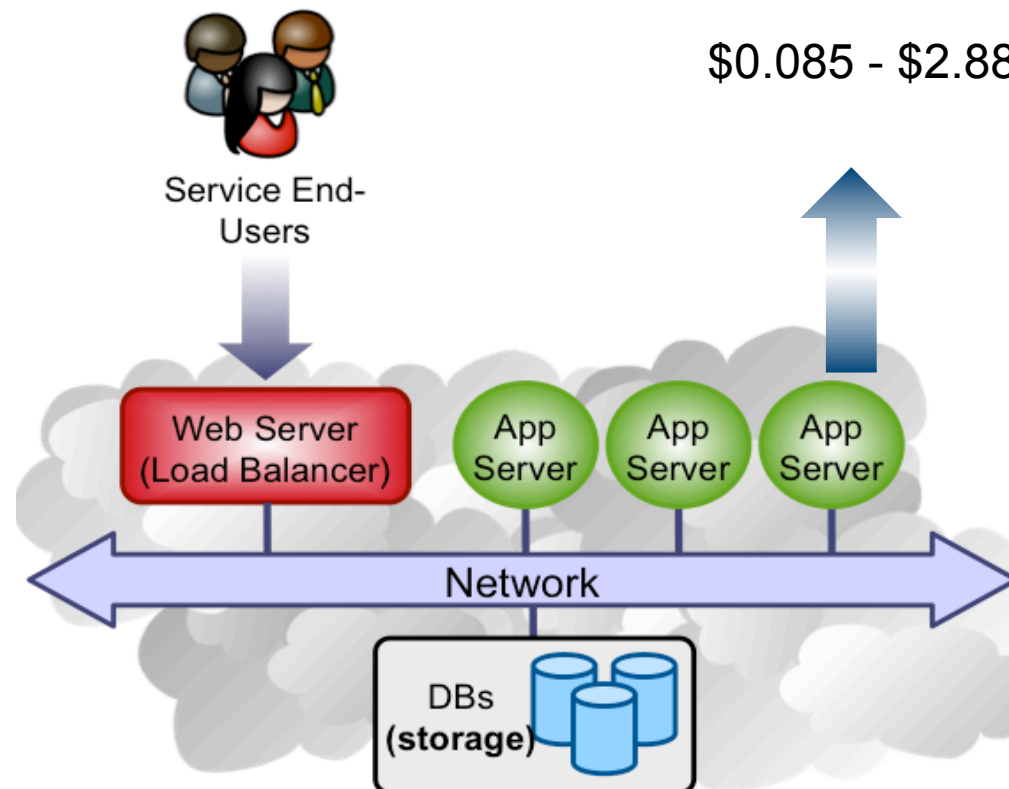# A Model for Delivering IT Capabilities

	What	Who
Software as a Service	**On-demand access to any application**	End-user **(does not care about hw or sw)**
Platform as a Service	**Platform for building and delivering web applications**	Developer **(no managing of the underlying hw & swlayers)**
Infrastructure as a Service	*Raw* computer infrastructure	System Administrator **(complete management of the computer infrastructure)**
Physical Infrastructure		

OpenNebula: *Open Source Toolkit for Cloud Computing*

IaaS Cloud Computing

Public Cloud Computing

- Simple Web Interface
- Raw *Infrastructure* Resources
- Pay-as-you-go (On-demand access)
- Elastic & *"infinite"* Capacity

$0.085 - $2.88

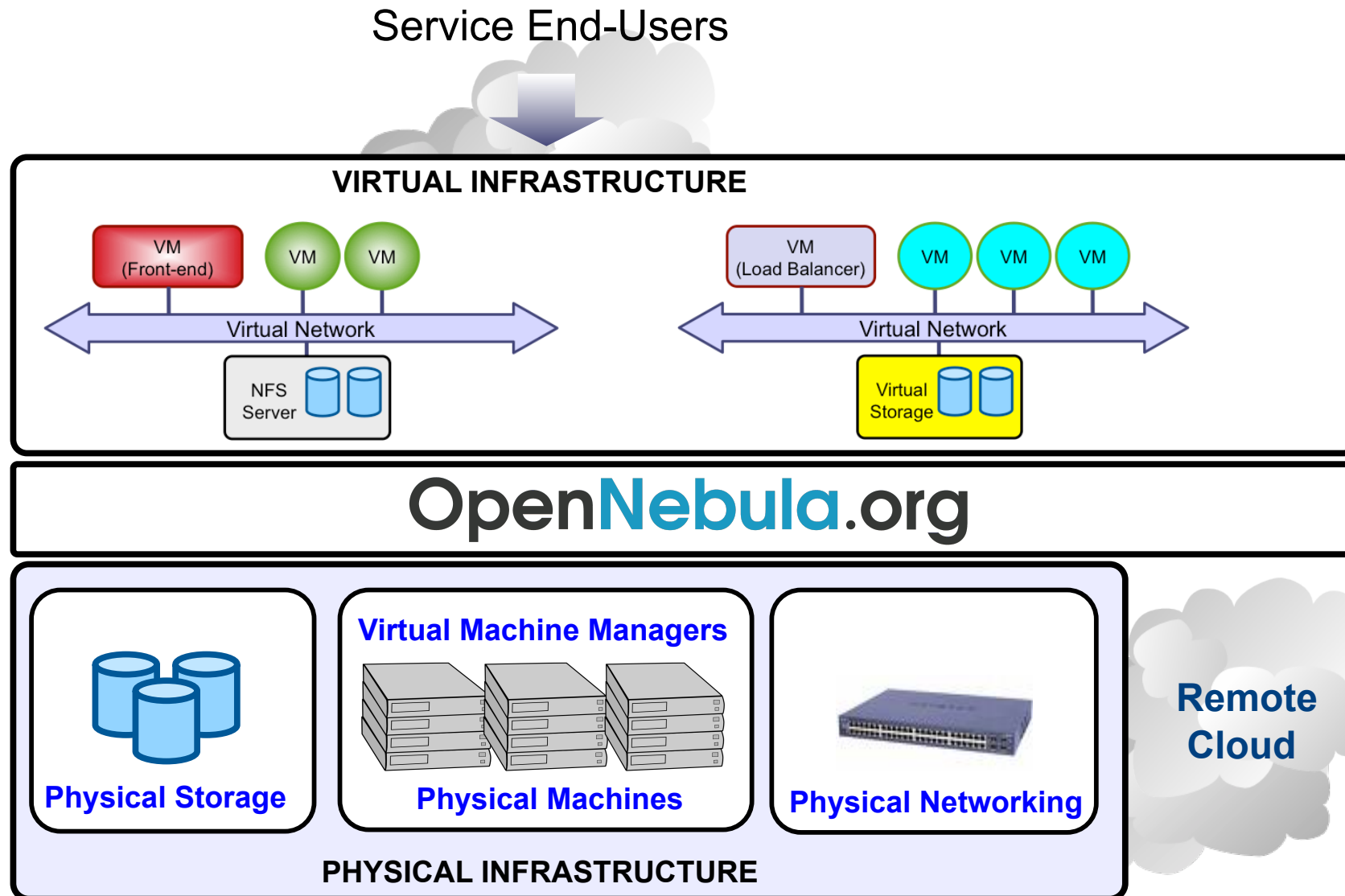Service End-Users

Web Server (Load Balancer)

App Server

App Server

App Server

Network

DBs (storage)

IaaS Cloud Computing

Private Cloud Computing

- Simplify internal operations

- Dynamic allocation of resources

- Higher utilization & operational savings

- Security concerns, **A "Public Cloud behind the firewall"**

Hybrid Cloud Computing

• Supplement the capacity of the Private Cloud

• **Utility Computing dream made a reality!**

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Physical Infrastructure

Commercial Cloud

The Data Center is the Computer
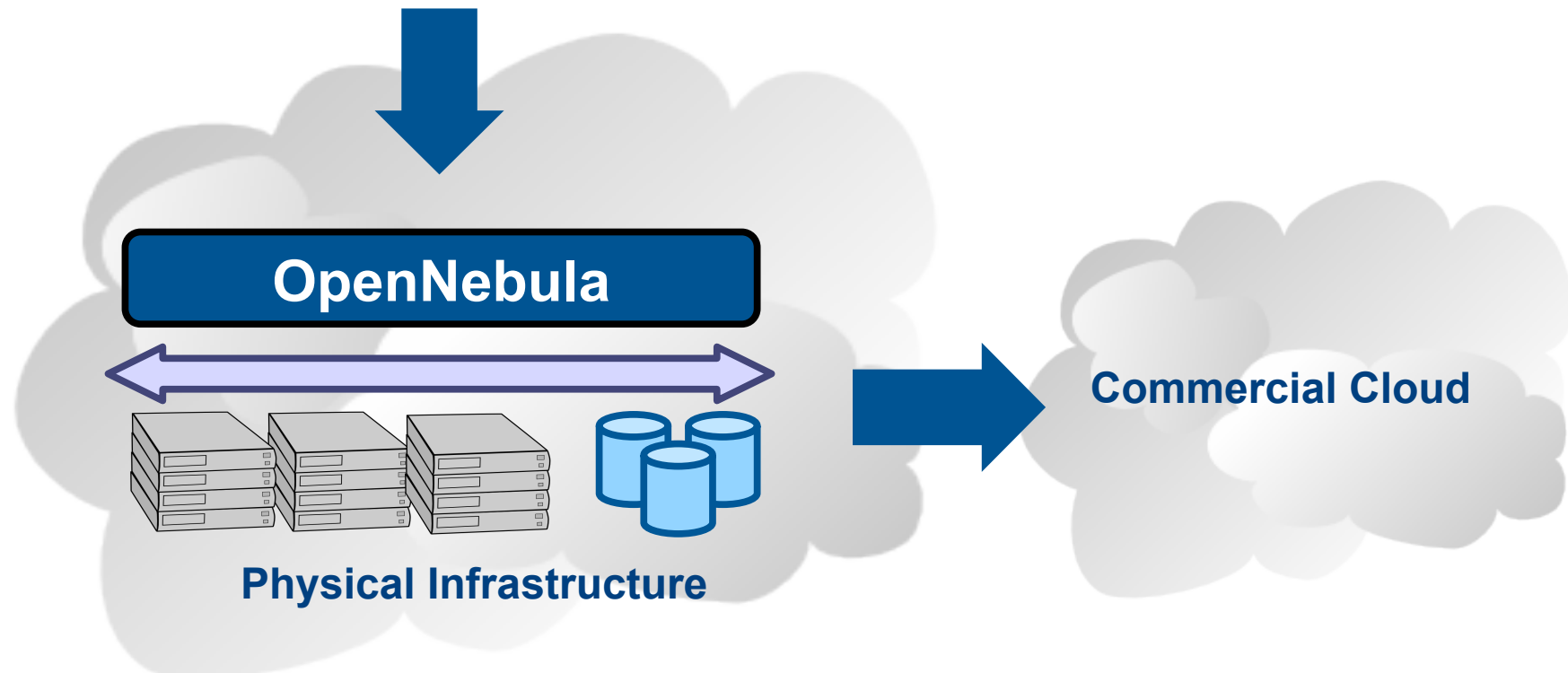
Cloud Manager to Orchestrate the Complexity of a Datacenter

Building a Cloud: The OpenNebula Toolkit

OpenNebula.org

Flagship International Projects in Cloud Computing
Result of many years of research and development in efficient and scalable management of virtual machines on large-scale distributed infrastructures.

Open-source Toolkit
Open platform for innovation to research the challenges that arise in cloud management, and production-ready tool in both academia and industry

- **Started in 2005, first release in march 2008, and ONE 2.0 RC is available**

- **Open-source** released under Apache v2.0, packaged for main Linux distributions

- Mailing lists for **best-effort support** and **open development framework**

- Development and roadmap definition **driven by the community and projects**

- Active and engaged **open community and ecosystem**

- > **3,000 downloads/month** (not including code repository and Ubuntu)

- Used in many **production environments**, distributed in **commercial solutions** and availability of **commercial professional support by C12G Labs**

- **Long-term sustainability** ensured by project funding and commercial sponsors

Building a Cloud: Why OpenNebula?

Capabilities for Cloud Management
Most advanced open-source toolkit offering unique features to administer the complexity of large-scale distributed infrastructures

Capabilities for Integration
Open, flexible and extensible architecture, interfaces and components that fit into any existing data center

Capabilities for Production Environments
Scalability and performance tested on very large-scale infrastructures consisting of thousands of cores, with the security and fault tolerance levels required in production

Leverage the Vibrant Cloud Ecosystems
Leverage the ecosystems being built around OpenNebula and the most common cloud interfaces, Amazon AWS, OGC OCCI and VMware vCloud

Fully Open Source Cloud Software
OpenNebula is NOT a feature or performance limited edition of an Enterprise version. OpenNebula is truly open, and not open core.

Building a Cloud: Interoperability

Openness

- Open architectures
- Open interfaces
- Open code

Adaptability

- Modular architectures

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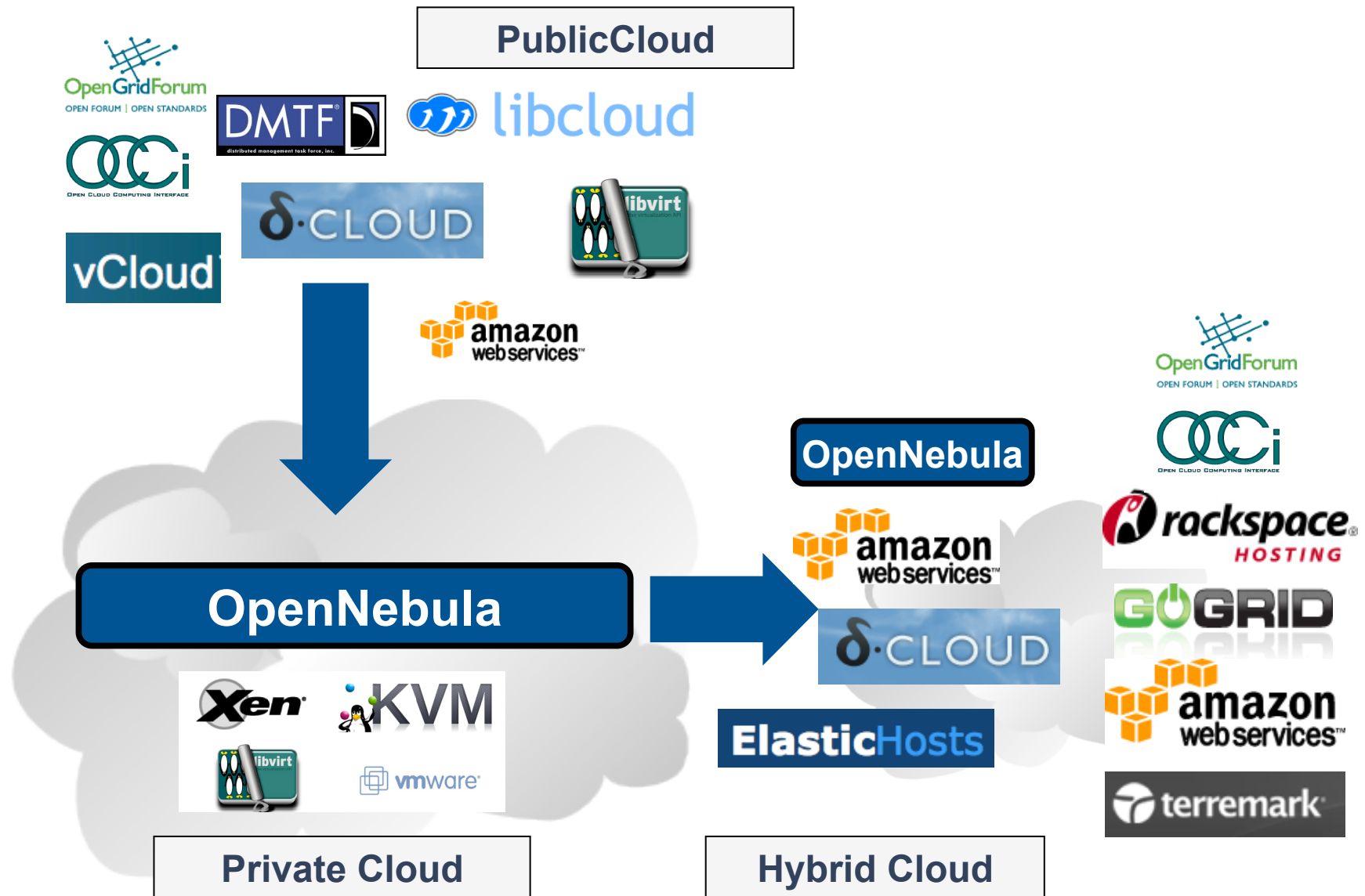
Standardization

- Use standards
- Implement standards

Portability

- It can be installed in a variety hardware and software

Building a Cloud: Interoperability

PublicCloud

OpenNebula

Private Cloud

Hybrid Cloud

Building a Cloud: Interoperability

A Highly Modular Architecture to Fit into any Existing Datacenter

- Cloud Computing is an **evolution of existing data centers**

- One solution can not fit all data-center and user requirements and constraints

- Open, flexible and extensible architecture

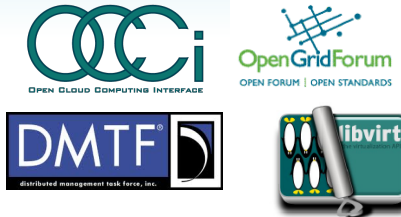- Provide basic components, but allow them to be easily replaceble by others

OpenNebula: *Open Source Toolkit for Cloud Computing*

OpenNebula in Cross-Domain Federation
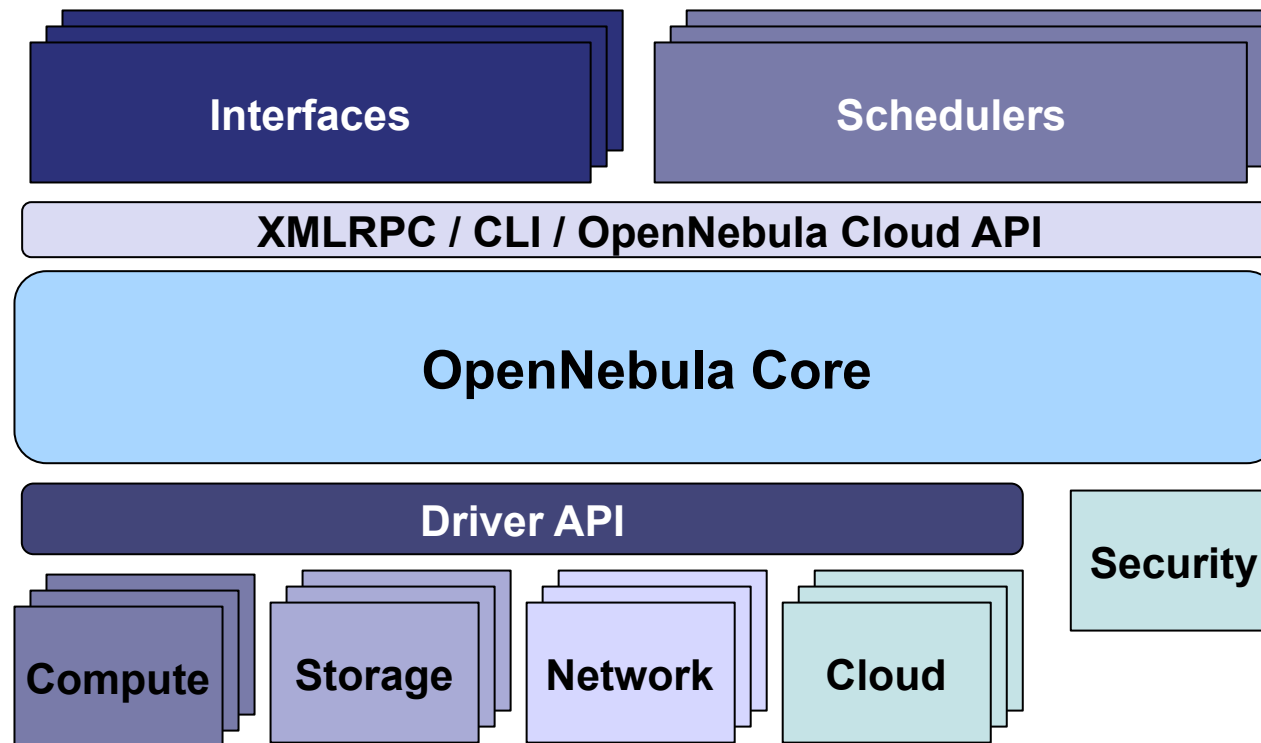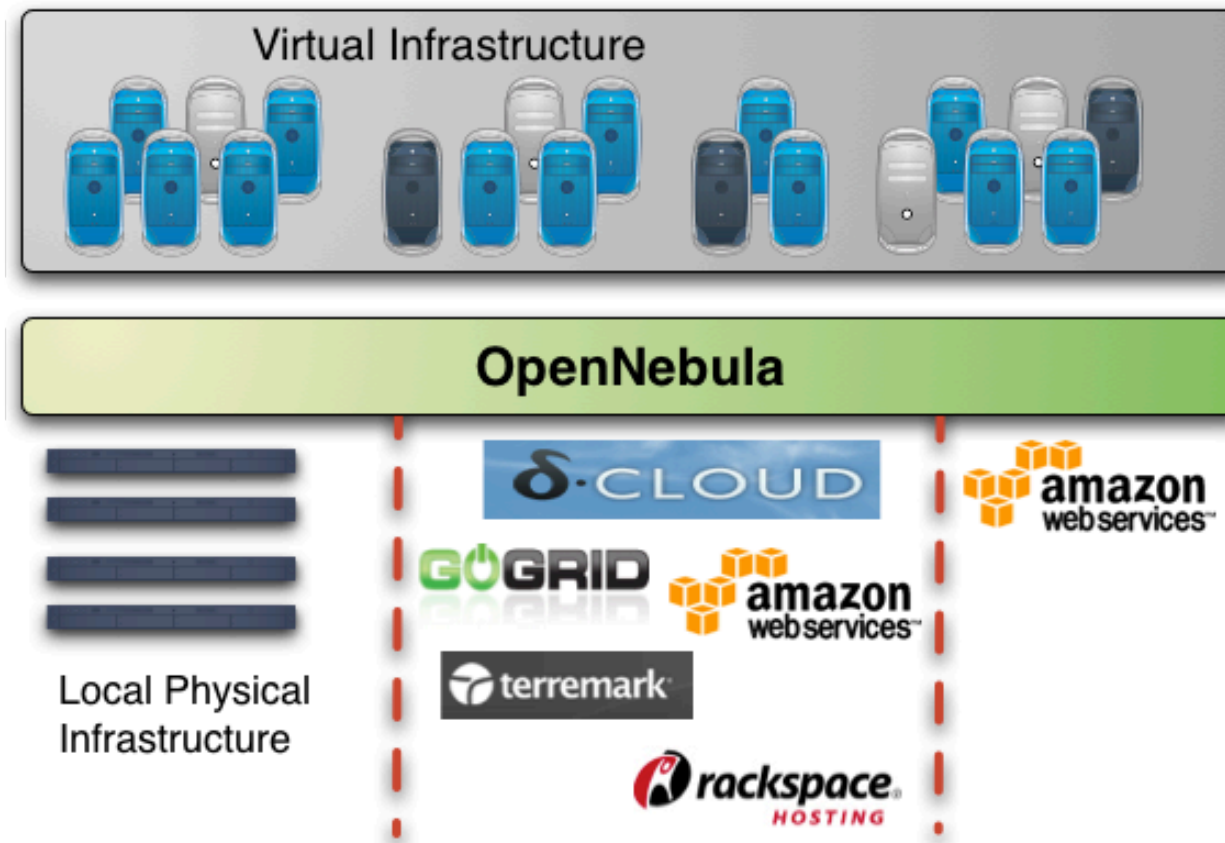
- **OpenNebula features cloudbursting (EC2, δcloud)**
- **Higher coupled federation with other RESERVOIR components**
  - **Federation agreement is needed**
  - **Different federation types defined and implemented**

Building a Cloud: An Open Cloud Ecosystem

Examples of Components in the Ecosystem

Cloud Case Studies: Enabling your Cloud
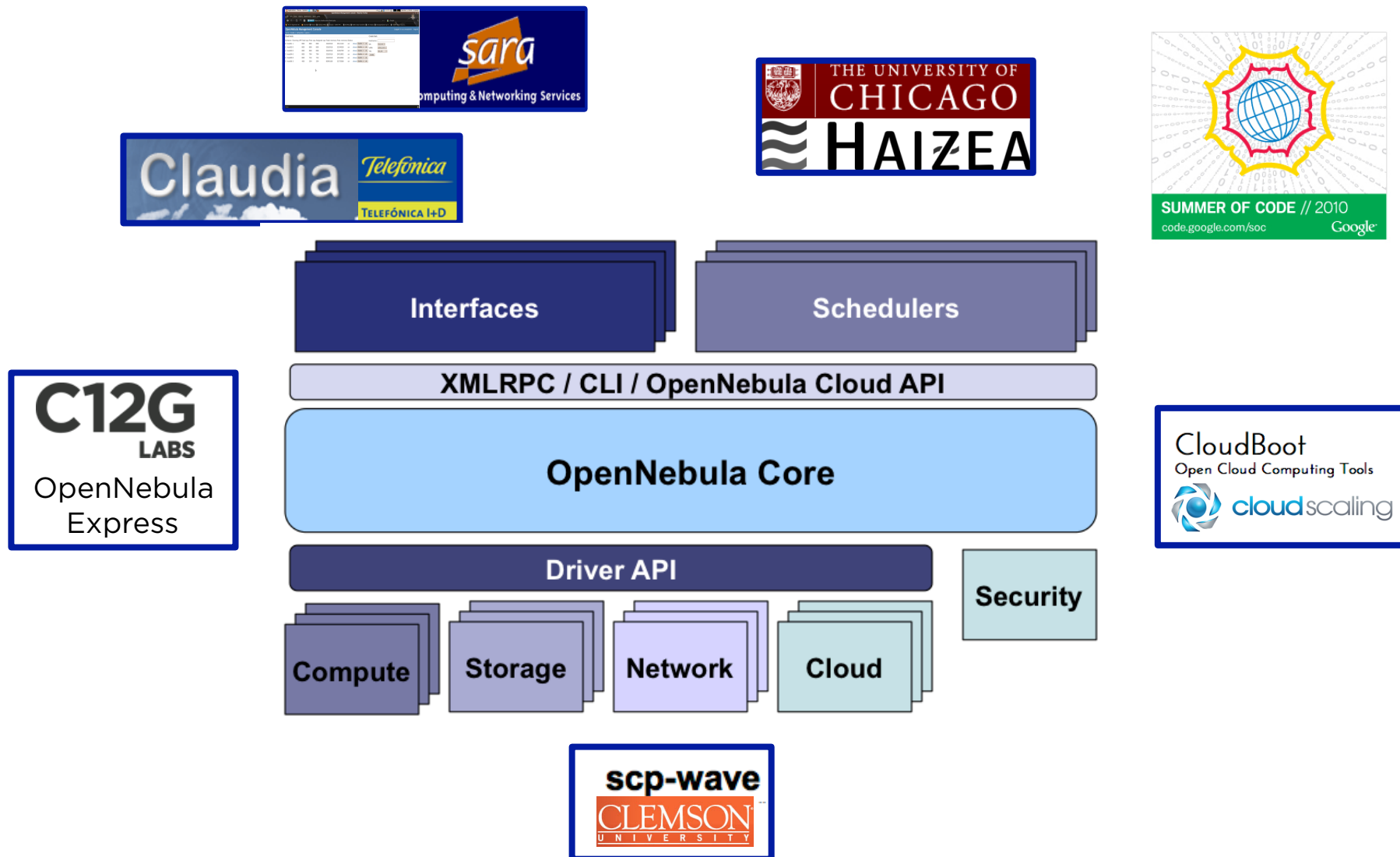
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Adopt Standards

Open Source Community
- Open architecture and interfaces
- Open code abd liberal license
- Open community and ecosystem

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Management Tool

Innovation Tool

OpenNebula: *Open Source Toolkit for Cloud Computing*

Get Involved in the OpenNebula Community!

Use the Technology and Give us Feedback

- Support through several mailing lists
- Report bugs and make feature requests
- Describe your use case in our blog
- Participate in the OpenNebula Technology Days

Spread our Word

- Spread the word about OpenNebula and open source cloud computing

Contribute to the Development

- Open development infrastructure
- Provide patches for bug fixes or enhancements

Contribute to the Quickly Growing Ecosystem

- Submit a new tool or extension to the OpenNebula ecosystem

Sponsor the Community

- Provide funds or resources to support development or to organize workshops or tutorials

More info, downloads, mailing lists at

Research References

- B. Rochwerger, J. Caceres, R.S. Montero, D. Breitgand, E. Elmroth, A. Galis, E. Levy,I.M. Llorente, K. Nagin, Y. Wolfsthal, *"The RESERVOIR Model and Architecture for Open Federated Cloud Computing"*, **IBM Systems Journal**, Vol. 53, No. 4. (2009)
- B. Sotomayor, R. S. Montero, I. M. Llorente and I. Foster, *"Virtual Infrastructure Management in Private and Hybrid Clouds"*, **IEEE Internet Computing**, September/ October 2009 (vol. 13 no. 5)