

7th International Cloud Expo

Santa Clara, CA

November 2nd, 2010

Enterprise Usage of OpenNebula

Ignacio M. Llorente and Rubén S. Montero

DSA-Research.org

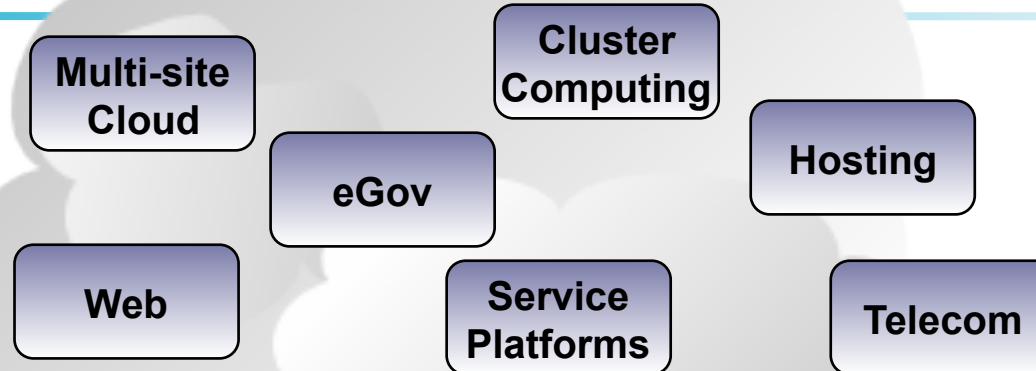
Distributed Systems Architecture Research Group

Universidad Complutense de Madrid

Acknowledgments



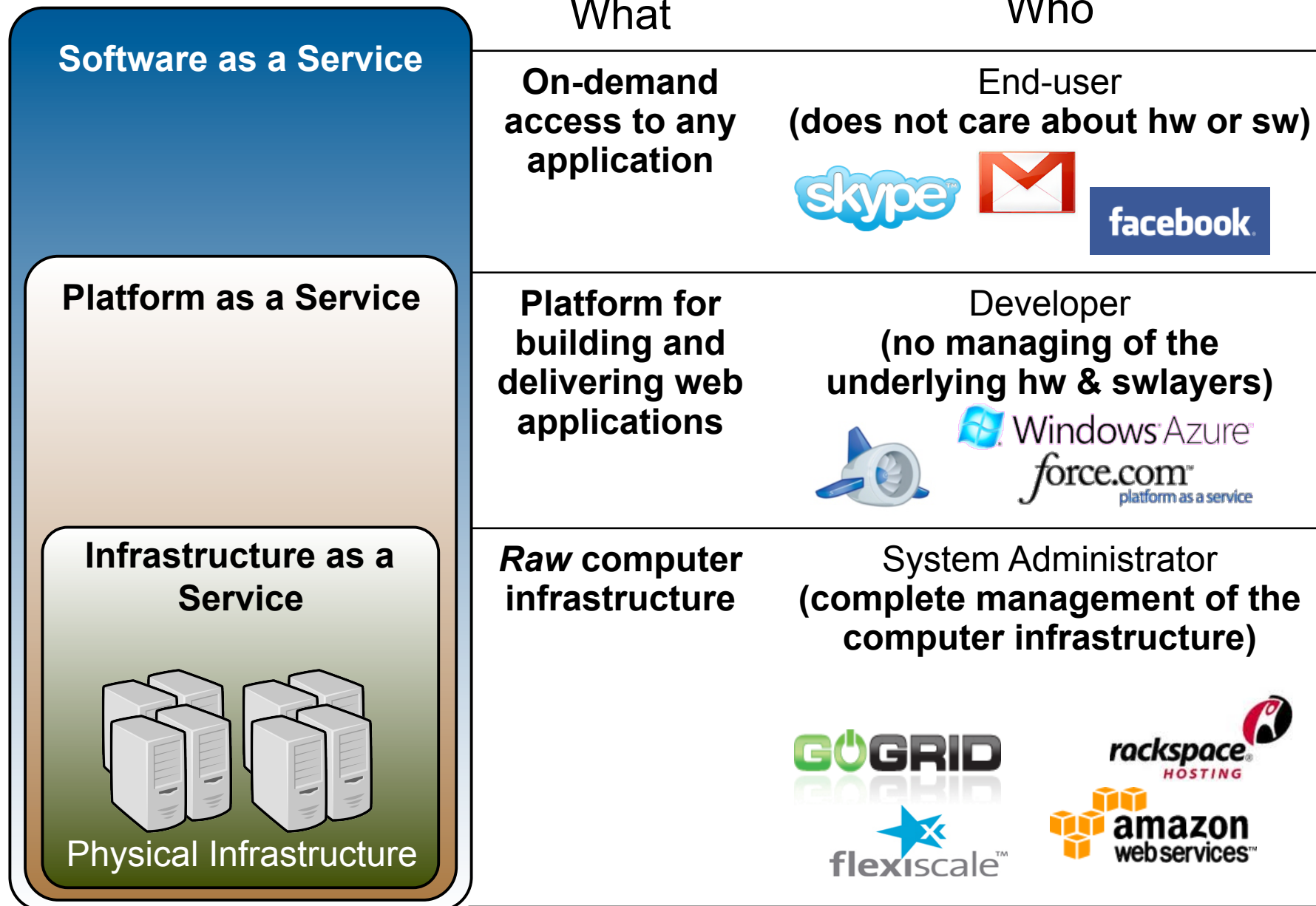
The research leading to these results has received funding from the European Union's Seventh Framework Programme ([FP7/2007-2013]) under grant agreement n° 215605 (RESERVOIR Project)



OpenNebula Toolkit
Enterprise-class open source toolkit to build IaaS clouds

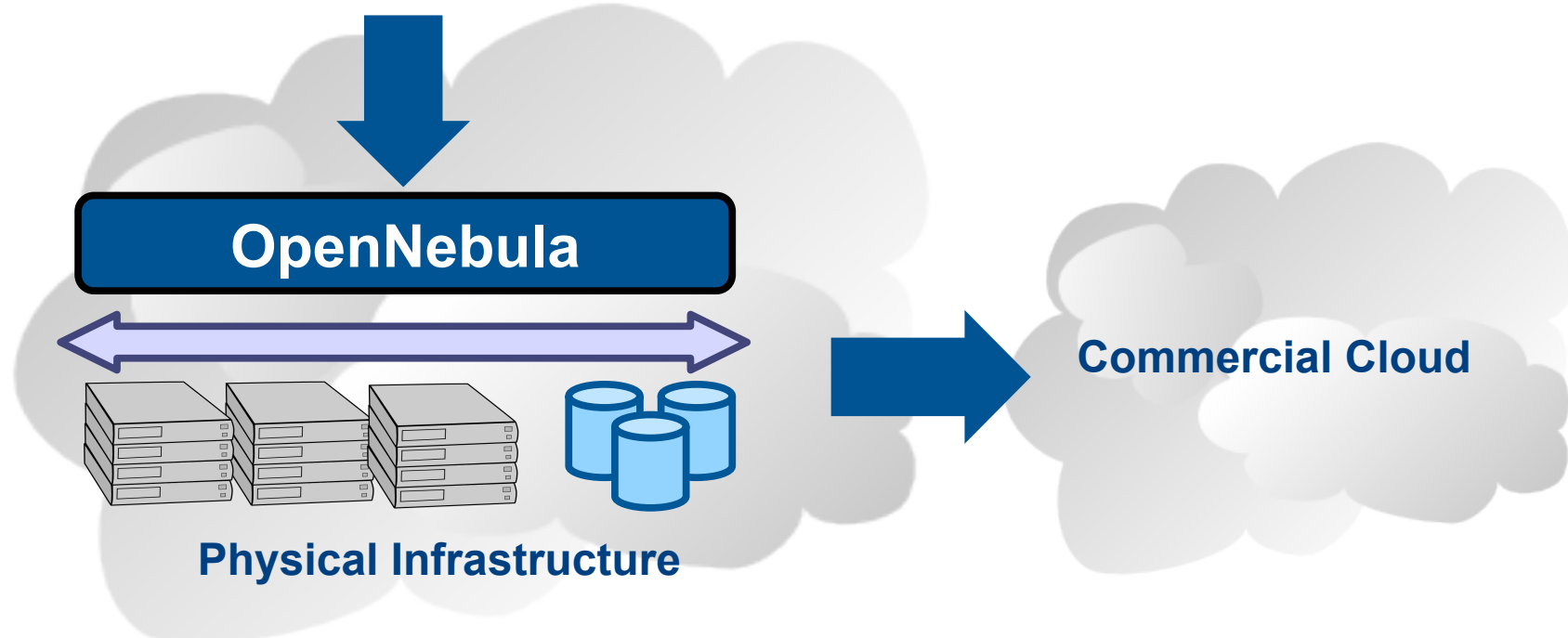
Cloud as an Evolution of the Data Center
Addressing the constraints of your infrastructure environment and the requirements of your business use cases

Cloud Computing Case Studies
Examples of cloud infrastructures and large projects using OpenNebula as cloud management tool



Private Cloud Computing => A “Public Cloud behind the firewall”

- Simplify and optimize internal operations
- Service flexibility and elasticity
- Higher utilization & operational savings
- Security concerns



Hybrid Cloud Computing => Utility Computing dream made a reality!

- Supplement the capacity of the Private Cloud

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 just released**
- **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

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 OCCl and VMware vCloud

Fully Open Source Cloud Software

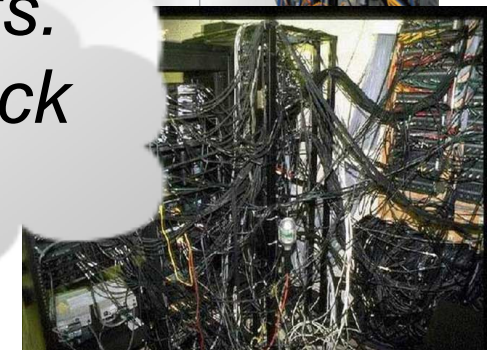
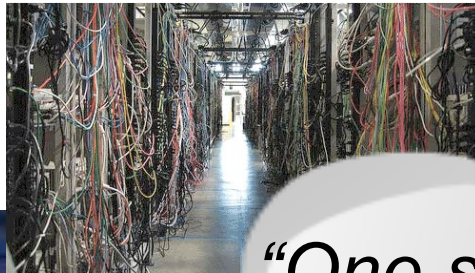
OpenNebula is NOT a feature or performance limited edition of an Enterprise version.
OpenNebula is truly open, and not open core.

Feature	Requirements of Enterprise Clouds
Workload Profile	Management of multi-tier services with security levels, placement constraints and automatic configuration
Administration Interface	Complete CLI to manage VMs, images, users, accounting, clusters, virtual networks, physical resources...
Cloud Interfaces	Support standard and most popular cloud interfaces
Cloudbursting	Combine local capacity with remote cloud resources
Adaptability	APIs and modular architecture to integrate with existing processes and management tools in the data center
Scalability	Efficient Management of hundreds of thousands of VMs and multiple physical clusters
Stability & Robustness	Production-ready thoroughly tested and mature technology
Security	Multi-tenancy, isolation and integration with security mechanisms and policies
Openness and Standards	Open interfaces and architecture, fully open-source code, and adopt and implement standards
Interoperability and Portability	Provide with choice across most popular cloud interfaces, hypervisors and public clouds and with a flexible software that can be installed in any hardware and software combination
Cloud Administration	Monitoring, accounting and logging
Site Policy Enforcement	Scheduling and user quota management

- Cloud Computing is an **evolution of existing data centers**
- One solution can not fit all data-center and user requirements and constraints

Constraints from Existing Infrastructure and Processes

Requirements from Usage and Deployment Scenarios



“One solution does not fit all requirements and constraints. There cannot be turnkey quick cloud solutions”

Openness

- Open architectures
- Open interfaces
- Open code

Adaptability

- Modular architectures



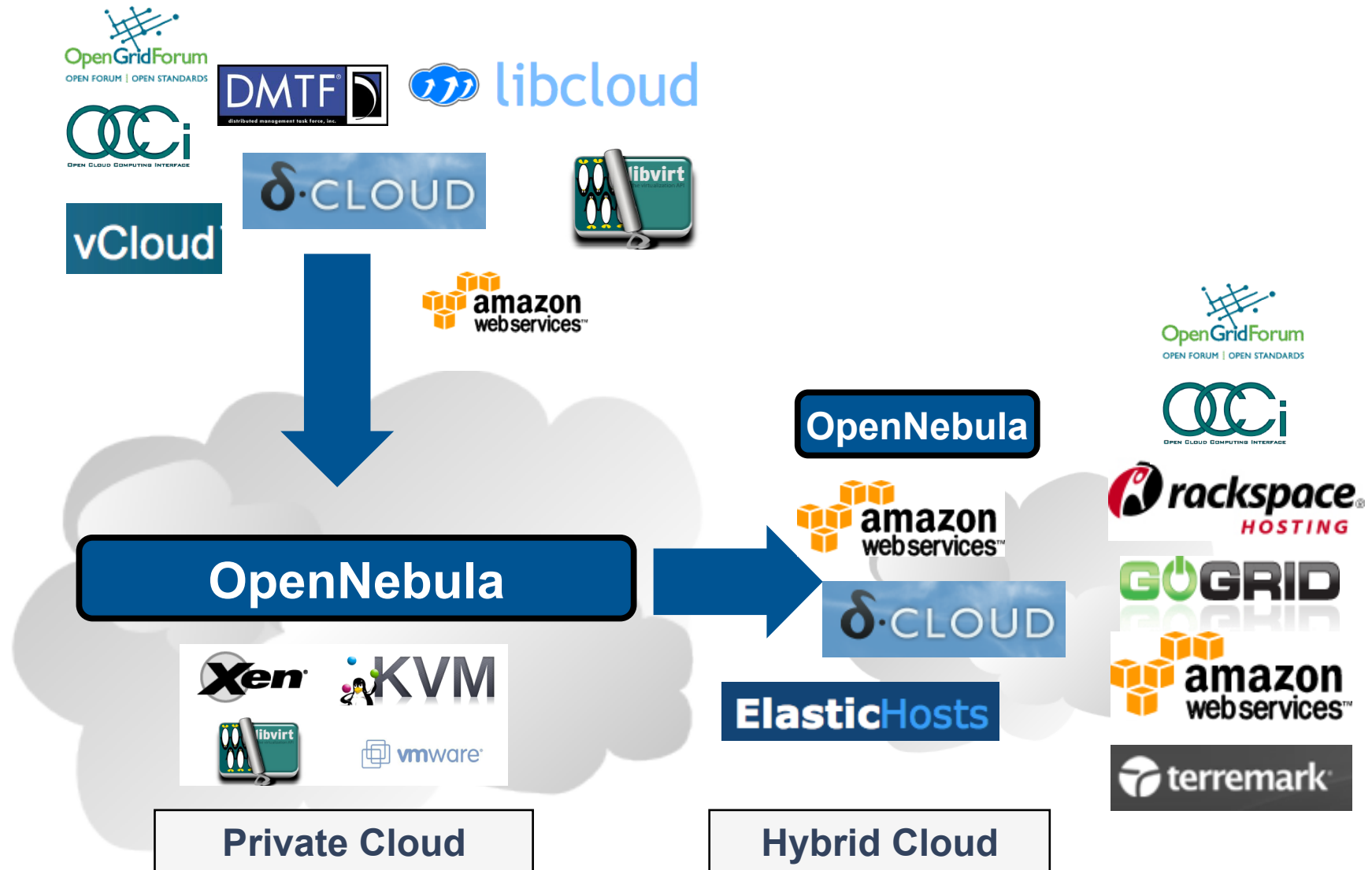
OpenNebula.org

Standardization

- Use standards
- Implement standards

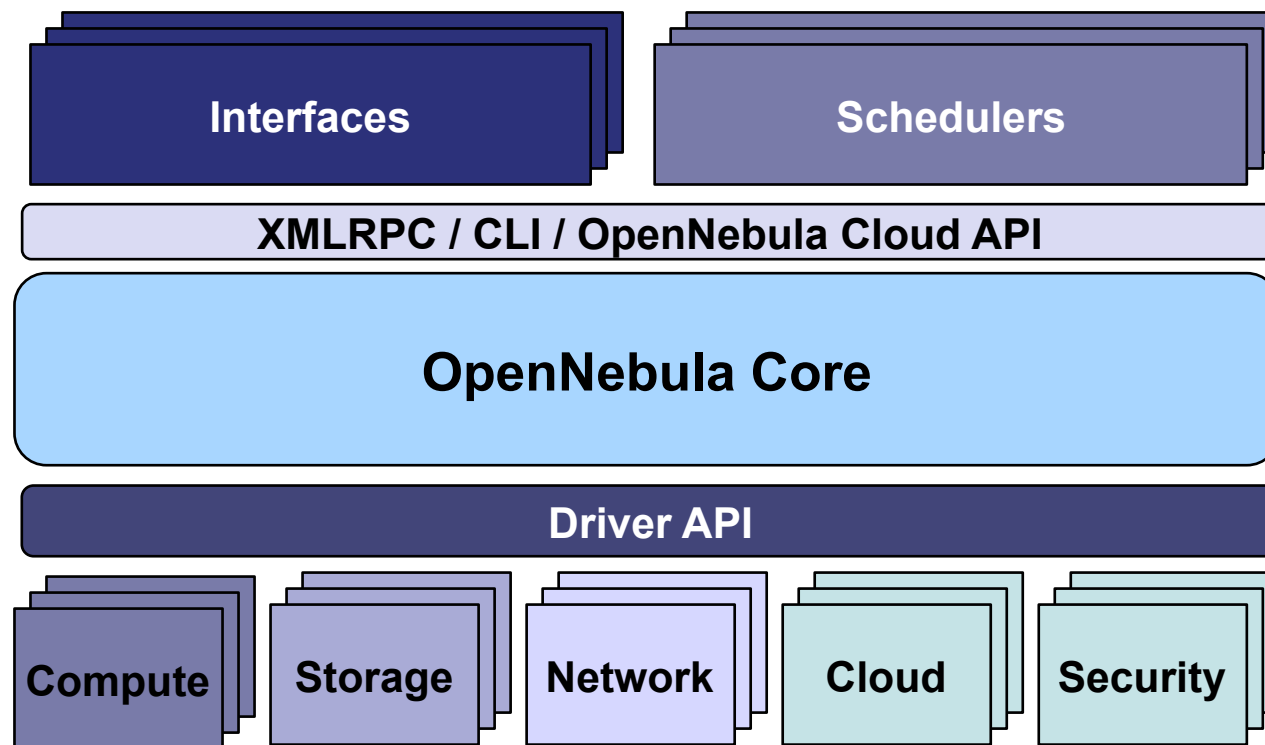
Portability

- It can be installed in any hardware and software

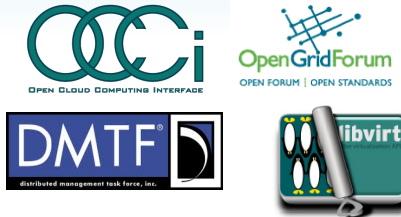


A Highly Modular Architecture to Fit into any Existing Datacenter

- 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 replaceable by others



Adopt Standards



Open Source Community

- Open architecture and interfaces
- Open code and liberal license
- Open community and ecosystem

OpenNebula.org

Management Tool



Innovation Tool



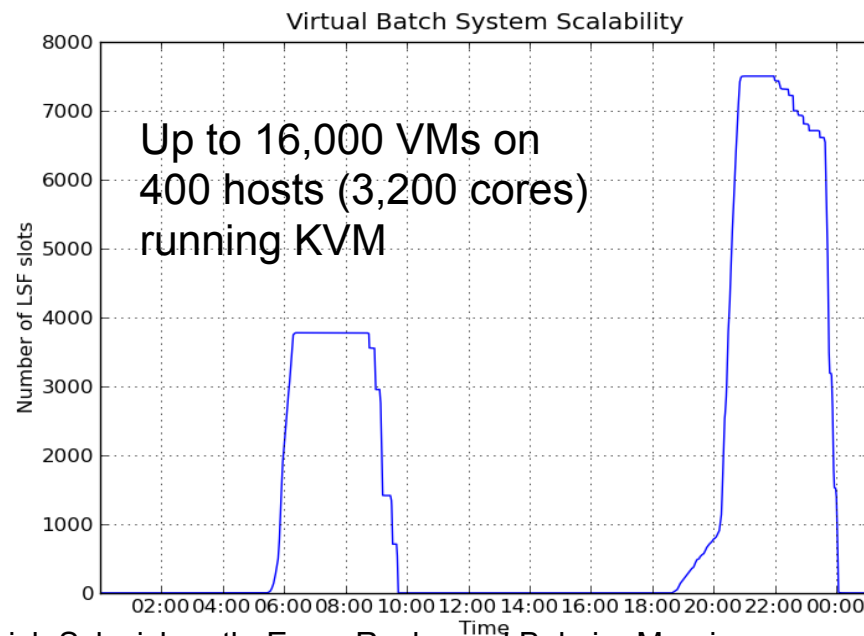
Model	Definition	Cloud Cases
Private	Infrastructure is owned by a single organization and made available only to the organization	<ul style="list-style-type: none">• Optimize and simplify internal operation• SaaS/PaaS support• IT consolidation within large organizations (Government Clouds, University Clouds...)
Public	Infrastructure is owned by a single organization and made available to other organizations	<ul style="list-style-type: none">• Commercial cloud providers• Science public clouds by ICT service centers to enable scientific and educational projects to experiment with cloud computing• Special purpose clouds with dedicated capabilities (HPC Clouds..)
Hybrid	Infrastructure is a composition of two or more clouds	<ul style="list-style-type: none">• Cloudbursting to address peak demands• Cloud Federation to share infrastructure with partners• Cloud Aggregation to provide a larger resource infrastructure



- **Goal:** Easier management and new computing models in the batch farm
- **Example of Integration with Existing Infrastructure Environment**
 - **Configuration Management:** Quattor with lifecycle management and “self-notification” in OpenNebula
 - **Network Management:** Adapted to address network infrastructure requirements regarding fixed IP/MAC leases in each box
 - **Storage Management:** New LVM transfer scripts and a very fast parallel scp to push images to all the hosts



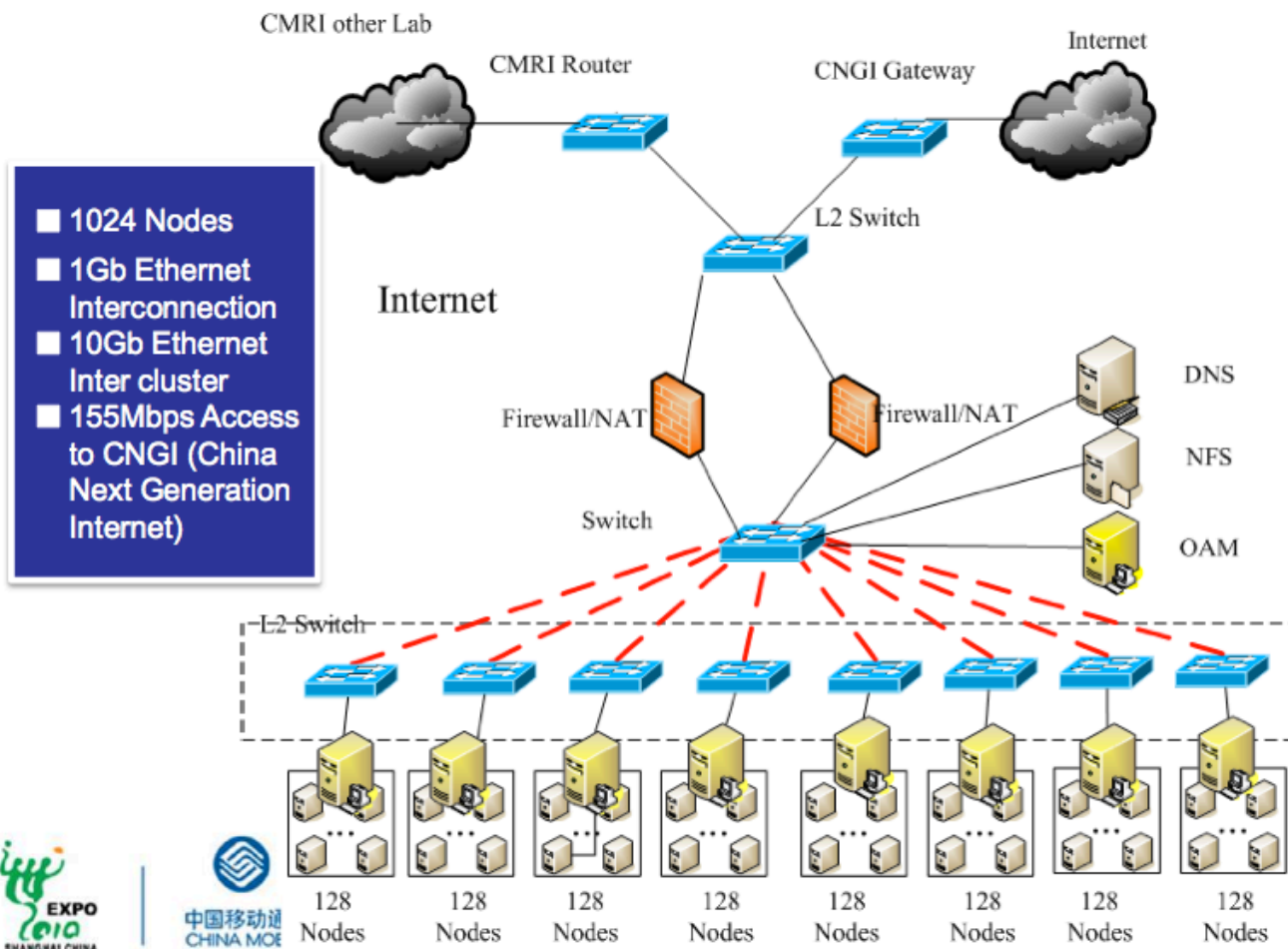
Source: CERN IT-PES/PS Group: Sebastien Goasguen, Ulrich Schwickerath, Ewan Roche and Belmiro Moreira



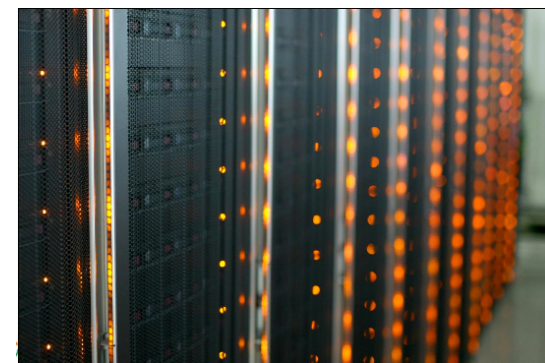
- **Goal:** Meet the growing demands for high performance, low cost, high scalability, high reliability of China Mobile IT Infrastructure (computing, storage); and the demands of China Mobile to deliver Internet business and services



- **Details:** 4,096 cores, Xen, Ganglia, and Hadoop



Legend
 — GbE
 - - - 10GbE



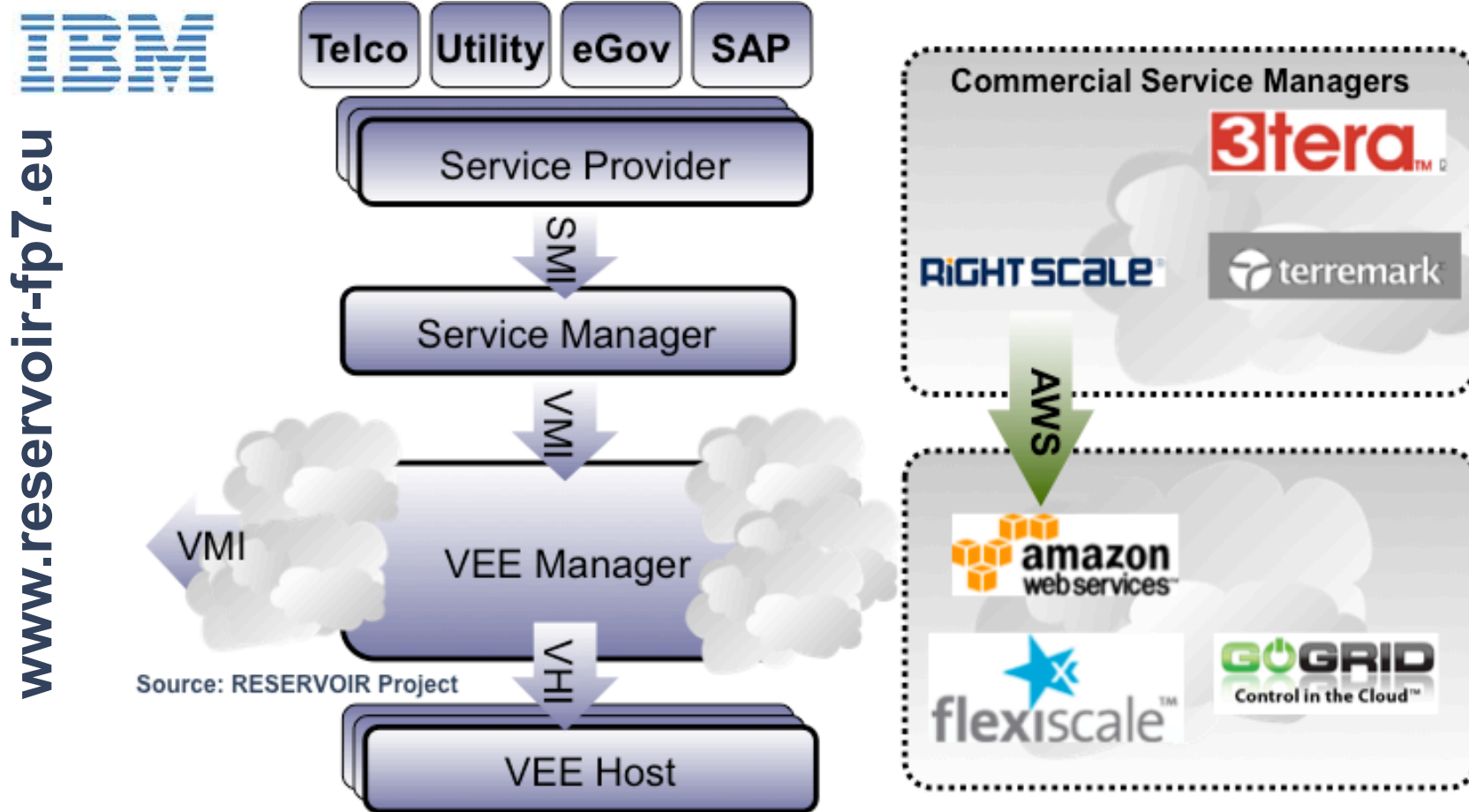
Source: China Mobile's Presentation at OpenCirrus Meeting



Agreement 215605 (2008-2011)
Service and Sw Architectures
and Infrastructures

Resources and Services Virtualization without Barriers

- Open source technology to enable deployment and management of complex IT services across different administrative domains





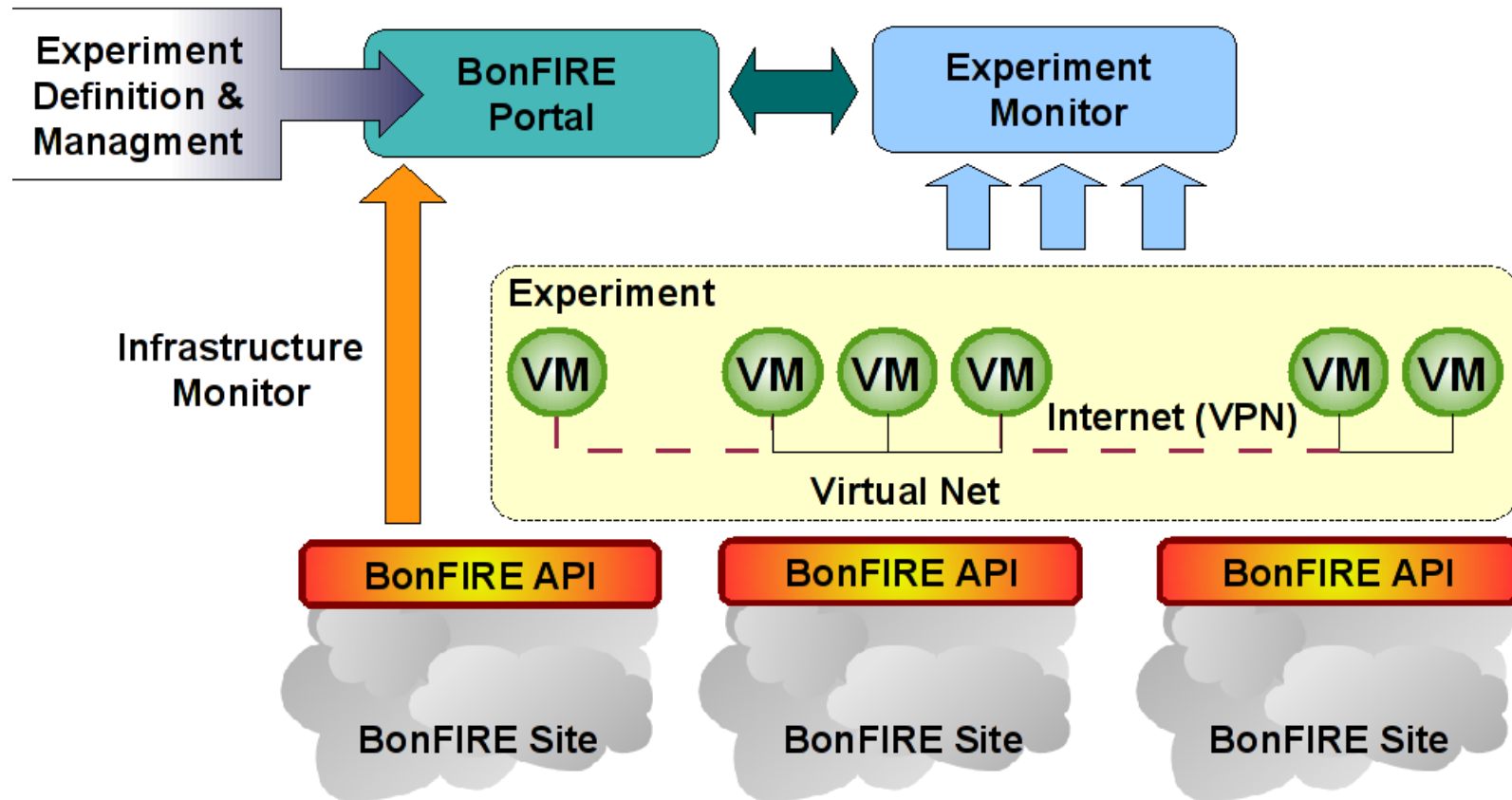
Agreement 257386 (2010-2013)
**New Infrastructure Paradigms
and Experimental Facilities**

Building Service Testbeds on FIRE

- Design, build and operate a multi-site cloud-based facility to support research across applications, services and systems targeting services research community on Future Internet



www.BonFIRE-Project.eu



Source: BonFIRE Project



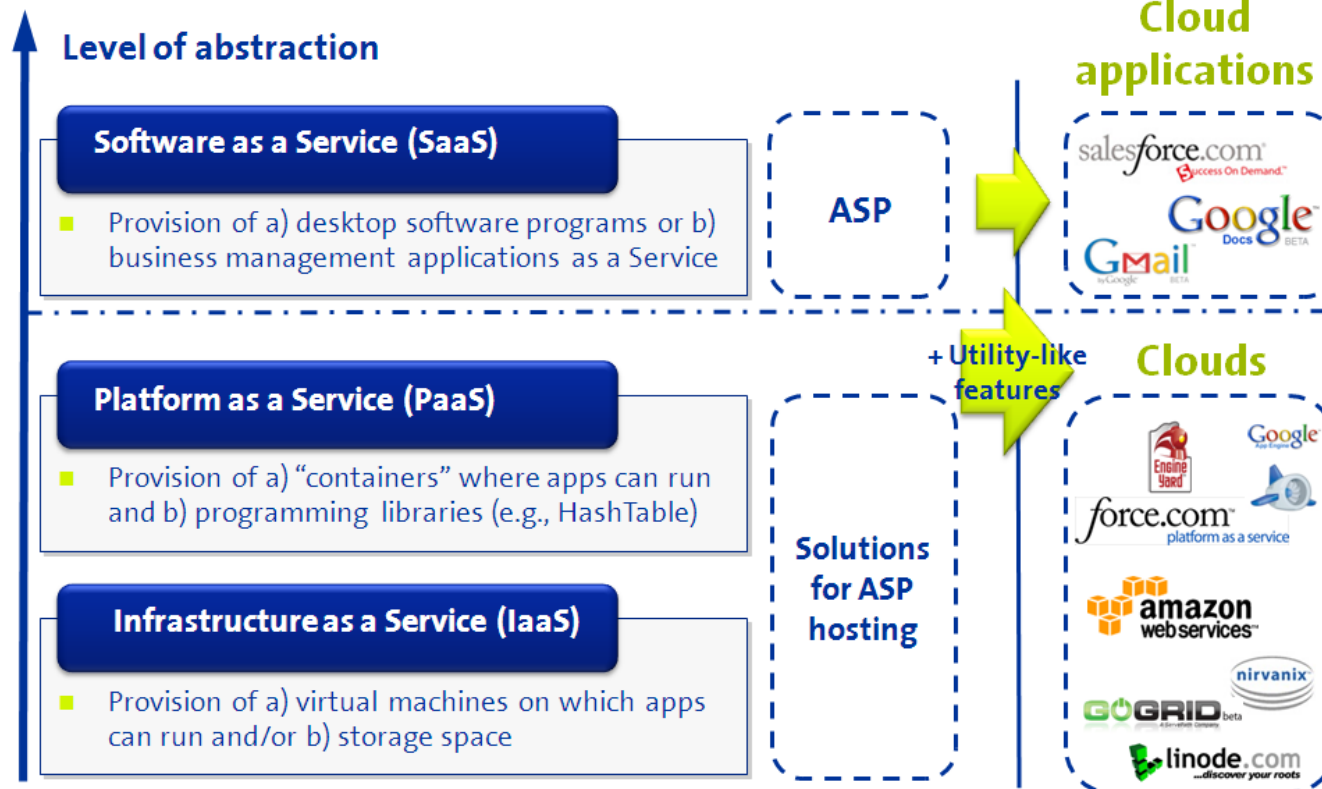
Agreement 258862 (2010-2013)
Service and Sw Architectures
and Infrastructures

Building the PaaS Cloud of the Future

- Create an advanced PaaS Cloud platform which supports the optimized and elastic hosting of Internet-scale multi-tier applications



4caast.morfeo-project.org



Source: 4CaaS Project

More info, downloads, mailing lists at

The screenshot shows the OpenNebula.org website. At the top, it says "OpenNebula.org" and "The Open Source Toolkit for Cloud Computing". Below that is a navigation menu with items like Home, About, Documentation, Software, Support, Community, Cloud, Dev, and Blog. The main content area features a section titled "The Truly Open-Source, Leading and Most Advanced Cloud Software" with a list of features and a "Try it now!" button. There is also a "Getting Started" section with a three-step process: 1. Download OpenNebula, 2. Read the Documentation, 3. En Co. The C12G LABS logo is visible on the right side of the screenshot.

The screenshot shows the C12G LABS website. At the top, it says "C12G LABS" and "OPENNEBULA FOR THE ENTERPRISE". Below that is a navigation menu with items like Home, Products, Services, Partners, Resources, and About Us. The main content area features a section titled "OpenNebula Enterprise Edition >" with a description: "Your Cloud Management Solution to build a custom Enterprise-ready Cloud Service, Product or Solution." There is a diagram showing "Your Solution", "Your Service", and "Your Product" all connected to "C12G OpenNebula". Below this is a "Getting Started" section with a three-step process: 1. Free Evaluation Program, 2. Low-cost Entry-level Program, 3. Comprehensive Services and Partner Programs. To the right is a "Contact Us" section with a list of contact information: Partnership: partners@c12g.com, Contact: contact@c12g.com, Skype: C12G_OpenNebula, USA: +1 650 6463820, Europe/UK: +44 20 71931748, Europe/ES: +34 91 1436132.

Added Value Serv

