Cloud Interoperability with the OpenNebula Toolkit

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Cloud Computing in a Nutshell

Cloud Interoperability with the OpenNebula Toolkit

<table>
<thead>
<tr>
<th>What</th>
<th>Who</th>
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</thead>
<tbody>
<tr>
<td><strong>Software as a Service</strong></td>
<td><strong>End-user</strong></td>
</tr>
<tr>
<td>On-demand access to any application</td>
<td>(does not care about hw or sw)</td>
</tr>
<tr>
<td></td>
<td>![skype], ![email], ![facebook]</td>
</tr>
<tr>
<td><strong>Platform as a Service</strong></td>
<td><strong>Developer</strong></td>
</tr>
<tr>
<td>Platform for building and delivering web applications</td>
<td>(no managing of the underlying hw &amp; swlayers)</td>
</tr>
<tr>
<td></td>
<td>![Windows Azure], ![Salesforce.com]</td>
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OpenNebula.org

Innovative open, flexible and scalable technology to build IaaS clouds
What is OpenNebula?

Cloud Interoperability with the OpenNebula Toolkit

Innovations
Designed to address the technology challenges in cloud computing management

Open-source Toolkit
OpenNebula v1.4

- Support to build new cloud interfaces
- **Open and flexible tool** to fit into any datacenter and integrate with any ecosystem component
- Private, public and hybrid clouds
- Based on **standards**
- Support **federation** of infrastructures
- Efficient and scalable management of the cloud
A Toolkit for System Integrators

Cloud Interoperability with the OpenNebula Toolkit

One Size does not Fit All: Tailoring the Tool to Fit your Needs

- Open, modular and extensible architecture
- Easy to enhance and embed
- Minimal installation requirements (distributed in Ubuntu)
- Open Source – Apache 2

Interfaces

Schedulers

OpenNebula API

Virtual and Physical Resource Management

Driver API

Compute

Storage

Network

Cloud
Interoperability in the OpenNebula Toolkit

Interoperation from Different Perspectives

1. Cloud Interface

2. Infrastructure services for virtualization, storage and networking

3. Cloud Federation

OpenNebula

Physical Infrastructure

Remote Cloud

ElasticHosts

Amazon Web Services
Interoperability: Infrastructure Use

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Cloud Interface for the Management of Virtualized Services

- Cloud Restful interface and CLI to manage virtual machines, network and storage (OGF OCCI API)
- Implementation of other popular interfaces (Amazon EC2)
- Support to build any other cloud interface (vCloud API, Sun Cloud API…)

Service End-Users

Web Server (Load Balancer)

App Server

App Server

App Server

DBs (storage)

Network
Interoperability: Infrastructure Management

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Integration with Infrastructure and Management Services

- **Administration interface** for the centralized monitoring and management of the infrastructure (CLI, XML-RPC and **libvirt**)
- Support for the definition of workload and resource-aware **allocation policies** such as consolidation (energy efficiency), load balancing, affinity-aware, capacity reservation…

Flexible back-end
- Virtualization
- Storage
- Networking
- Security

Integration with existing management tools in the data center

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Physical Infrastructure
Interoperability: Infrastructure Federation

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Hybrid Cloud Computing and Federation

• *Cloud bursting* at infrastructure layer, fully transparent to users
• Scale-out decisions are taken by infrastructure administrators according to business policies

Two levels of Collaboration

• Extend the private cloud using both partner and commercial clouds
• Create a federation of clouds
The Community: Users

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Users (Different Levels of Use: From Experimental to Production)

Projects
Cloud Interoperability with the OpenNebula Toolkit

The Community: Active Ecosystem

Components around OpenNebula

• Haizea Lease Manager (University of Chicago): Advance reservation of capacity and queuing of best effort requests

• RESERVOIR Policy Engine (IBM Haifa/Elsag Datamat): Policy-driven probabilistic admission control and dynamic placement optimization to satisfy site level management policies

• VM Consolidation Scheduler (UCM): Periodic re-placement of VMs for server consolidation and suspension/resume of physical resources

• Virtual Cluster Tool (CRS4 Distributed Computing Group): Atomic virtual cluster management with versioning and multiple transport protocols.

• Nephele (Telefonica I+D): SLA-driven automatic service management

• Under Development: SUN Cloud API, vCloud API, VirtualBox plugin, dashboard for infrastructure management, new schedulers, SLA and security framework, Grid service manager, LVM and SAN support,…

• …
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More info, downloads, mailing lists, and cloud at www.OpenNebula.org

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![RESERVOIR logo](reservoir-fp7.eu/)

References

- 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)

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