OpenNebula/RESERVOIR Open-source Toolkit to Build Private, Hybrid and Public Clouds

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Objectives

First Scenario: Extended Cloud

• Very brief overview of Cloud deployments: The *Public*, the *Private* … and the *Hybrid*

• Learn how to use OpenNebula/RESERVOIR to build them
Cloud Computing in a Nutshell

<table>
<thead>
<tr>
<th>What</th>
<th>Who</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-demand access to any application</td>
<td>End-user (does not care about hw or sw)</td>
</tr>
<tr>
<td>Platform for building and delivering web applications</td>
<td>Developer (no managing of the underlying hw &amp; sw layers)</td>
</tr>
<tr>
<td>Delivery of a raw computer infrastructure</td>
<td>System Administrator (complete management of the computer infrastructure)</td>
</tr>
</tbody>
</table>

Software as a Service

Platform as a Service

Infrastructure as a Service

Physical Infrastructure

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The Public IaaS Cloud

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- Simple Web Interface
- Raw *Infrastructure* Resources
  - Total control of the resources
  - Capacity leased in the form of Vms
  - Complete Service-HW decoupling
- Pay-as-you-go (On-demand access)
  - A single user can not get all the resources
  - Multi-tenancy
- Elastic & “*infinite*” Capacity

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The Public IaaS Cloud

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Cloud Users

Cloud API

OpenNebula

Total control of the infrastructure

- Software Stack
- Type & Number of components
- Infrastructure Elasticity

<table>
<thead>
<tr>
<th>Feature</th>
<th>Function</th>
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</thead>
<tbody>
<tr>
<td>Cloud Interfaces for Users</td>
<td>• Implementation of a subset of the EC2 Query API and OGF - OCCI</td>
</tr>
<tr>
<td>Flexibility</td>
<td>• The Cloud Service allows the implementation of new Cloud interfaces</td>
</tr>
</tbody>
</table>
The Private IaaS Cloud

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A “Public Cloud behind the firewall”

- Security
- Flexible management (consolidation, adaptation, provisioning...)

The headaches...

- Orchestrate:
  - Virtualization
  - Networking
  - Admin Interfaces
  - VM placement
### OpenNebula/RESERVOIR Toolkit to Build Private, Hybrid and Public Clouds

**Features**

- Open and extensible architecture
- Minimum installation requirements
- Distributed with Ubuntu (Jaunty 9.04)
- Open Source – Apache 2

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<tr>
<td>Internal Interface</td>
<td>• Unix-like CLI for fully management of VM life-cycle and physical boxes</td>
</tr>
<tr>
<td></td>
<td>• XML-RPC API and libvirt virtualization API</td>
</tr>
<tr>
<td>Scheduler</td>
<td>• Requirement/rank matchmaker allowing the definition of workload and</td>
</tr>
<tr>
<td></td>
<td>resource-aware allocation policies</td>
</tr>
<tr>
<td></td>
<td>• Support for advance reservation of capacity through Haizea</td>
</tr>
<tr>
<td>Virtualization Management</td>
<td>• Xen, KVM, and VMware</td>
</tr>
<tr>
<td>Image Management</td>
<td>• General mechanisms to transfer and clone VM images</td>
</tr>
<tr>
<td>Network Management</td>
<td>• Definition of isolated virtual networks to interconnect VMs</td>
</tr>
<tr>
<td>Service Management and</td>
<td>• Support for multi-tier services consisting of groups of inter-connected</td>
</tr>
<tr>
<td>Contextualization</td>
<td>VMs, and their auto-configuration at boot time</td>
</tr>
</tbody>
</table>

**Diagram:**
- Cloud API
- Admin
- Scheduler
- OpenNebula
- Physical Infrastructure
The Hybrid IaaS Cloud

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- Supplement the capacity of the local infrastructure
- Transparent access to the resulting hybrid cloud

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<td>Cloud Plugins</td>
<td>• Amazon EC2 and ElasticHosts connectors</td>
</tr>
<tr>
<td>Federation</td>
<td>• Support for simultaneous access to several remote clouds</td>
</tr>
<tr>
<td>Flexibility</td>
<td>• Modular approach to develop new connectors</td>
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