What is OpenNebula?

Multi-tenancy, Elasticity and Automatic Provision on Virtualized Environments

I’m using virtualization/cloud, and plan a private Cloud (BUT’s)

Where do/did I put my web server VM?
**Monitoring & Scheduling**

How do I provision a new VM?
**Image Management & Context**

Who have access to cloud (and What)?
**User & Role Management**

How do I create a new disk?
**Storage**

How do I set up networking for a multitier service?
**Network & VLANs**

Can I use hypervisor X?
**Virtualization**

How can I manage the distributed infrastructure?
**Interfaces & APIs**

Uniform management layer that orchestrates multiple technologies

OpenNebula
What is OpenNebula?

Open Cloud Solution for Building and Managing Virtualized Data Centers

- Fully Open-source
- Interoperable
- Adaptable
- Proven
- Infrastructure Agnostic
- Flexible
Different Perspectives of the Cloud

Different Aims and Needs

Cloud Consumer

Cloud Provider

Cloud Integrator
The Cloud Consumer Perspective

Setting up and Managing Virtual Infrastructure

Network Management
- Network catalog management
- Public & elastic IPs
- Private isolated networks
- Simple firewall rules

Remote Connection
- SSH
- VNC
- Remote desktop

Usage Data
- Accounting info

Storage Management
- Image catalog management
- Prepared on-site & uploaded
- Pre-defined appliances
- OS and Data types (persistent)

VM Management
- VM template catalog
- Life-cycle management
- Contextualization
The Cloud Consumer Perspective

How Can I Manage my Virtual Infrastructure?

… standards (*de facto* and *de jure*) Cloud APIs to leverage existing ecosystems and ensure portability across providers and self-service portal ….
The Cloud Provider Perspective

What are the Main Components to Build a Cloud Infrastructure?

Instance Networks
- Guests
- Public and private networks

Front-end
- Authentication
- Authorization
- ACLs, roles, groups...
- Accounting
- Logging
- Resource quotas

Service Networks
- Monitoring, control...
- Live migration...
- Storage access...

Hosts
- Multiple hypervisors
- Up to 500 hosts
- Automatic failover and HA
- Resource pools
- Automatic resource allocation

Datastores
- VM image storage
- Multiple datastores
- Heterogeneous configurations
- Shared or non-shared
The Cloud Provider Perspective

Broad Commodity and Enterprise Platform Support

Instance Network
- VLAN per user (layer2)
- Open vSwitch, 802.1q
- Ebtables

Front-end
- X509, LDAP, ssh keys
- ACLs, roles, groups...

Hosts
- VMware,
- Xen
- KVM

Service Network
- Ganglia/Nagios
- Additional monitor agents

Internet

Datastores
- DFS: NFS, Gluster, GlusterFS...
- SAN: Fibre Channel, iSCSI, LVM...
- BitTorrent, ssh...
The Cloud Provider Perspective

Clustering the Physical Resources

Clusters

- Pools of hosts that share datastores and networks
- Used for load balancing, high availability, and high performance computing

Multiple Datastores per Cluster

- Balance I/O operations between storage servers
- Define different SLA policies (e.g. backup) and performance features for different VM types or users
The Cloud Provider Perspective

Centralized Management of Multiple OpenNebula Instances (Zones)

- Federation of Clouds
  - Multi-tier architecture
  - Scalability
  - Isolation
  - Multiple-site support

- oZones Server
  - Portal
  - Cloud API (EC2, OCCI)
  - Global AuthN

Cloud Consumer

OpenNebula

OpenNebula
The Cloud Provider Perspective

On-demand Provision of Virtual Data Centers

Virtual Private Cloud Computing
- Typical scenario in large organizations and cloud providers
- On-demand provision of fully-configurable and isolated VDC with full control and capacity to administer its users and resources

OpenNebula – Architecture for Cloud Data Centers
The Cloud Provider Perspective

Hybrid Cloud Computing

- Extension of the local private infrastructure with resources from remote clouds
- Cloud bursting to meet peak or fluctuating demands

Cloud Consumer

OpenNebula

Cloud Provider
The Cloud Provider Perspective

How Can I Operate my Cloud Infrastructure?

... programming APIs (create new tools and integrate), web interfaces (simplify operation), and command lined interface (create scripts)...

OpenNebula Sunstone

CLI

API
- XML-RPC
- OCA (Ruby, Java, Python)
... truly open (fully open-source, Apache license) and adaptable (modular and extensible)... because no two data centers are the same
The Cloud Integrator Perspective

Seamless Integration with Existing Applications and Services

Custom Applications
- Accounting & Billing
- New self-service portal

Virtualization & Monitoring
- Tune hypervisor interaction
- New hypervisors
- Hybrid configurations
- Information systems
- Monitoring probes

Image & Storage
- Integrate with SAN/NAS solutions
- Tune storage operations
- Use of external repositories

Interfaces
- CLI (local/remote)
- REST APIs
- API (java, ruby bindings)
- Plug-ins

Users & Roles
- Integrate with Active Directory
- Tune ACL
- Custom authentication

OpenNebula – Architecture for Cloud Data Centers
The Cloud Integrator Perspective

The Ecosystem

Standards
- Open Grid Forum
- SNIA
- DMTF
- VMware
- DMTF
- CDMI
- OVF
- vCloud
- CIMI

Adapters
- OpenNebula
- libcloud
- jclouds

Virtualization Drivers
- OpenVZ
- Cloud
- Windows Server 2008

Configuration
- puppet labs
- Chef
- BitTorrent

Storage
- openstack
What is OpenNebula?

A Project Aimed at Building the Industry Standard Open Cloud Management Tool

**OpenNebula.org**

- Develop & innovate
- Support the community
- Collaborate

Third party scalability tests: 16,000 VMs

Commercial Support

C12G

**v1.0** **v1.2** **v1.4** **v2.0** **v2.2** **v3.0** **v3.2** **v3.4**


ds.a group doing research...

**European Funding**

OpenNebula – Architecture for Cloud Data Centers
What is OpenNebula?

A Quickly Growing Community More than Doubling Each Year

- **Downloads**
  - 2008: 1,865
  - 2009: 4,861
  - 2010: 12,828
  - 2011: 25,200
  - 140% Annual Growth
  - 900 downloads in the last week
  - Linux distro and code repo

- **Site Visits**
  - 2008: 35,842
  - 2009: 111,541
  - 2010: 254,186
  - 2011: 579,571
  - 150% Annual Growth
  - 15,300 visits and 194,000 page views in the last week

- **Mails**
  - 2008: 227
  - 2009: 1,141
  - 2010: 2,293
  - 2011: 4,341
  - 170% Annual Growth
  - 800 registered users at present

Date: November 7th, 2011
Who Uses OpenNebula?

Open Cloud Enabler in the ICT Industry

Enabling Hosting Companies and Telcos to Offer Cloud Services

Enabling Technology Companies to Offer Cloud Products

Enabling Service Companies to Offer Cloud Consulting and Integration
Who Uses OpenNebula?

Open Cloud Enabler for Building and Operating Virtualized Data Centers

**Industry**

- MONTE DEI PASCHI DE SIENA
- BCG
- SAP
- PIM

**Supercomputing Centers**

- NCHE
- SARA
- CESGA
- CESCA

**Research Centers**

- IPB
- ESA
- KISTI
- CERN
- DESY
- NIKHEF
Who Uses OpenNebula?

Open Cloud Enabler for Building and Research and Innovation

Distributed Computing Infrastructures

Research Projects
We Will Be Happy to Answer Any Question