Crash Course in Open Source Cloud Computing

David Nalley
CloudStack Community Manager
Twitter/identi.ca: @ke4qqq
Email: david.nalley@cloudstack.org
Agenda

1. Introduction
2. Quick Cloud Computing Overview
3. Open Source Building Blocks for Cloud Computing
4. Open Source Tools for Cloud Management
5. Questions
Cloudstack Community Manager
Joined Citrix via Cloud.com acquisition July 2011
Recovering Sysadmin
Fedora Project Contributor including:
  • Packaging
  • Serving on the Fedora Project Board
  • Writing Documentation
Contributor to a number of other projects:
  • Zenoss
  • OpenGroupware
  • Sahana
  • Cobbler
Sometimes Author and Blogger at
  OpenSource.com/Linux Pro Magazine
Quick Cloud Computing Overview:
Or the Obligatory
“What is the Cloud?” Slides
Some things 'the cloud' is not:

- Magical
- A solution to all your problems
- A Pony Farm (http://www.flickr.com/photos/edenpictures/4914241241/in/photostream/ CC-BY photo)
Five Characteristics of Clouds

1. On-Demand Self-Service
2. Broad Network Access
3. Resource Pooling
4. Rapid Elasticity
5. Measured Service
Cloud Computing Service Models

**USER CLOUD** a.k.a. SOFTWARE AS A SERVICE

Single application, multi-tenancy, network-based, one-to-many delivery of applications, all users have same access to features.

*Examples: Salesforce.com, Google Docs, Picasa, SugarCRM*

**DEVELOPMENT CLOUD** a.k.a. PLATFORM-AS-A-SERVICE

Application developer model, Application deployed to an elastic service that autoscales, low administrative overhead. No concept of virtual machines or operating system. Code it and deploy it.

*Examples: Google AppEngine, Windows Azure, Rackspace Site, Red Hat Makara/OpenShift, CloudFoundry*

**SYSTEMS CLOUD** a.k.a INFRASTRUCTURE-AS-A-SERVICE

Servers and storage are made available in a scalable way over a network.

*Examples: EC2, Rackspace CloudFiles, OpenStack, CloudStack, Eucalyptus, Ubuntu Enterprise Cloud, OpenNebula*
Deployment Models
Public, Private & Hybrid Clouds
Cloud Still Requires Architectural Design

Cloud Computing isn’t a *magical solution*

Design your architecture with *the end in mind*

Make your infrastructure easily *replicable*
Building Compute Clouds with Open Source Software
Why Open Source?

User-Driven Solutions to Real Problems
Lower barrier to participation
Larger user base, users helping users
Aggressive release cycles stay current with the state-of-the-art
Open data, Open standards, Open APIs
Avoids vendor lock-in
Principles of Open Cloud

Interoperability (the ability to exchange and use information) between cloud computing products and services is required for unfettered competition between vendors and unrestricted choice for users.

Users must be able to come (no barriers to entry) and go (no barriers to exit) regardless of who they are (no discrimination) and what systems they use (technological neutrality).

Supporting vendors must therefore cooperate on standards, implementing those that exist (where applicable) and collaborating via an open process to develop those that don't, with a view to competing fairly on quality.
Open Virtual Machine Formats

Open Virtualization Format (OVF) is an open standard for packaging and distributing virtual appliances or more generally software to be run in virtual machines.

Formats for hypervisors/cloud technologies:

- Amazon - AMI
- KVM – QCOW2
- VMware – VMDK
- Xen – IMG
Sourcing OSS VMs and Cloud Appliances

BUILT WITH

cloudstack
Open Source Hypervisors

**Open Source**
Xen, Xen Cloud Platform (XCP)
KVM – Kernel-based Virtualization
VirtualBox* - Oracle supported Virtualization Solutions
OpenVZ* - Container-based, Similar to Solaris Containers or BSD Zones
LXC – User Space chrooted installs

**Proprietary**
VMware
Citrix Xenserver
Microsoft Hyper-V
OracleVM (Based on OS Xen)
## Open Source Compute Clouds

<table>
<thead>
<tr>
<th>Year Started</th>
<th>License</th>
<th>Hypervisors Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>GPL</td>
<td>Xenserver, XCP, KVM, Vmware, OVM, Hyper-V</td>
</tr>
<tr>
<td>2006</td>
<td>GPL</td>
<td>Xen, KVM, VMware</td>
</tr>
<tr>
<td>2010</td>
<td>Apache</td>
<td>VMware ESX and ESXi, Microsoft Hyper-V, Xen, KVM and Virtual Box and more</td>
</tr>
</tbody>
</table>

(Developed by NASA by Anso Labs previously)

Other open source compute software include Abiquo, Red Hat’s CloudForms (Aeolus) and OpenNebula.

Numerous companies are building cloud software on OpenStack including Nebula, Piston Inc.
<table>
<thead>
<tr>
<th>Year Started</th>
<th>Sponsors</th>
<th>Platforms Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>VMware</td>
<td>Spring, Rails, Node.js</td>
</tr>
<tr>
<td>2011</td>
<td>Joyent</td>
<td>Node.js</td>
</tr>
<tr>
<td>2011</td>
<td>Red Hat</td>
<td>Express – Ruby, Php and Python</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flex – JBoss, Java EE6</td>
</tr>
<tr>
<td>2010</td>
<td>WSO2</td>
<td>JBoss, Java EE6</td>
</tr>
</tbody>
</table>
Open Source
Cloud Computing Storage

**GlusterFS** – Scale Out NAS system aggregating storage over Ethernet or Infiniband

**Ceph** – Distributed file storage system developed by DreamHost

**OpenStack Object Storage (Swift)** – Long-term storage object storage system

**Sheepdog** – Distributed storage for KVM hypervisors

**NFS** – Old standby, tried and true, not designed for cloud scale or performance, but NFS 4.1 with pNFS might make things interesting.
Cloud APIs Aren’t Created Equal
Open Source Abstractions

jclouds
libcloud
deltacloud
fog
ec2
Managing Clouds with Open Source Tools
Automation Unlocks the Potential of the Cloud

- MeatCloud, Can’t Keep up with Cloud Computing
- Devops & Agile IT Philosophy
- Script Repetitive Tasks
- Automate, Automate, Automate
4 Types of Management Tools

**Provisioning**
Installation of operating systems and other software

**Configuration Management**
Sets the parameters for servers, can specify installation parameters

**Orchestration/Automation**
Automate tasks across systems

**Monitoring**
Records errors and health of IT infrastructure
## Open Source Provisioning Tools

<table>
<thead>
<tr>
<th>Tool</th>
<th>Year Started</th>
<th>Language</th>
<th>License</th>
<th>Installation Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cobbler</td>
<td>2007</td>
<td>Python</td>
<td>GPLv2</td>
<td>Red Hat, OpenSUSE, Fedora, Debian, Ubuntu</td>
</tr>
<tr>
<td>BoxGrinder</td>
<td>2010</td>
<td>Ruby</td>
<td>LGPL</td>
<td>Fedora/RHEL/ CentOS</td>
</tr>
<tr>
<td>Spacewalk</td>
<td>2008</td>
<td>Perl, Python, Java</td>
<td>GPLv2</td>
<td>Fedora, Centos, RHEL</td>
</tr>
<tr>
<td>Crowbar</td>
<td>2011</td>
<td>Ruby</td>
<td>Apache</td>
<td>(Bare metal provisioning)</td>
</tr>
</tbody>
</table>
# Open Source Configuration Management Tools

<table>
<thead>
<tr>
<th>Tool</th>
<th>Year Started</th>
<th>Language</th>
<th>License</th>
<th>Client/Server</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cfengine</td>
<td>1993</td>
<td>C</td>
<td>Apache</td>
<td>Yes</td>
</tr>
<tr>
<td>Chef</td>
<td>2009</td>
<td>Ruby</td>
<td>Apache</td>
<td>Chef Solo – No Chef Server</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Puppet</td>
<td>2004</td>
<td>Ruby</td>
<td>Apache</td>
<td>yes</td>
</tr>
</tbody>
</table>
## Open Source Monitoring Tools

<table>
<thead>
<tr>
<th>Tool</th>
<th>License</th>
<th>Type of Monitoring</th>
<th>Collection Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cacti / RRDTool</td>
<td>GPL</td>
<td>Performance</td>
<td>SNMP, syslog</td>
</tr>
<tr>
<td>Nagios</td>
<td>GPL</td>
<td>Availability</td>
<td>SNMP, TCP, ICMP, IPMI, syslog</td>
</tr>
<tr>
<td>Zabbix</td>
<td>GPL</td>
<td>Availability/Performance and more</td>
<td>SNMP, TCP/ICMP, IPMI, Synthetic Transactions</td>
</tr>
<tr>
<td>Zenoss</td>
<td>GPL</td>
<td>Availability, Performance, Event</td>
<td>SNMP, ICMP, SSH, syslog, WMI</td>
</tr>
</tbody>
</table>
# Open Source Automation/Orchestration Tools

<table>
<thead>
<tr>
<th>Year Started</th>
<th>Language</th>
<th>License</th>
<th>Client/Server</th>
<th>Support Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capistrano</td>
<td>Ruby</td>
<td>MIT</td>
<td>Yes</td>
<td>None</td>
</tr>
<tr>
<td>RunDeck</td>
<td>Java</td>
<td>Apache</td>
<td>Yes</td>
<td>DTO Solutions</td>
</tr>
<tr>
<td>Func</td>
<td>Python</td>
<td>GPL</td>
<td>Yes</td>
<td>Fedora Project</td>
</tr>
<tr>
<td>MCollective</td>
<td>Ruby</td>
<td>Apache</td>
<td>Yes</td>
<td>PuppetLabs</td>
</tr>
</tbody>
</table>
Conceptual Automated Toolchain

BootStrapped Image
CloudStack
OpenStack
Eucalyptus

Provision
Cobbler
Kickstart

Configuration
Puppet
Chef

Monitoring
Nagios
Zenoss
Cacti

Start/Stop Services
RunDeck
Capistrano
MCollective
Questions?

Slides Can be Viewed and Downloaded at:

http://ke4qqq.fedorapeople.org/miloss.odp
http://ke4qqq.fedorapeople.org/miloss.pdf
Contact Me

david.nalley@cloudstack.org

Professional: 864.990.1252

Professional: http://www.cloudstack.org
Personal: http://ke4qqq.wordpress.com
Twitter/identi.ca: @ke4qqq