![cloud.com logo]

Crash Course in Open Source Cloud Computing

Build and manage clouds with free and open source tools

Mark R. Hinkle
VP of Community
Cloud.com
mrhinkle@cloud.com
mrhinkle@gmail.com
Twitter: @mrhinkle

%whoami

- Responsible for Driving Adoption of CloudStack Open Source Cloud Computing Software
- Former manager of Zenoss Open Source project 100,000 users, 1.5 million downloads
- Former Linux Desktop Advocate (Zealot?)
- Former LinuxWorld Magazine Editor-in-Chief
- Open Management Consortium Conspirator
- Open Desktop Consortium Instigator
- Author - "Windows to Linux Business Desktop Migration" - Thomson
- NetDirector Project - Open Source Configuration Management Project
- Sometimes Author and Blogger at SocializedSoftware.com/NetworkWorld
- Start-up junkie, Glutton for punishment
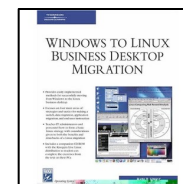
Cloud Computing Adoption

- 365,000 web sites are running on Amazon EC2 - Netcraft May 2010

- £76 billion spent on Cloud Computing in the U.K. in 2010 - IT Candor

- Cloud Computing will be a $126 billion market by 2012 - IBM

- 20% of Businesses won't have IT Assets by 2012 - Gartner

Bottom Line: A large portion of our infrastructure no longer lives in our data center... but we gotta manage it.

cloud.com

Open Source Cloud Adoption

- 41 of users *prefer to deploy servers virtually*, 29.3% use virtualization *whenever possible*

- Xen is 2nd most popular virtualization technology after VMware followed by Linux Kernel-Based Virtual Machines (KVM) was fourth with 21.3%

- 49.2% of respondents indicated they planed to deploy hosted Linux servers in 2010 while 32.6% indicated that they would be deploying hosted Microsoft Windows.

- 50.8% indicated they used no specific management tools for cloud computing, 33.3% indicated using tools provided by their hosting provider

Source: Zenoss Cloud Computing State of the Union - http://www.zenoss.com/in/virtualization_survey.html

cloud.com
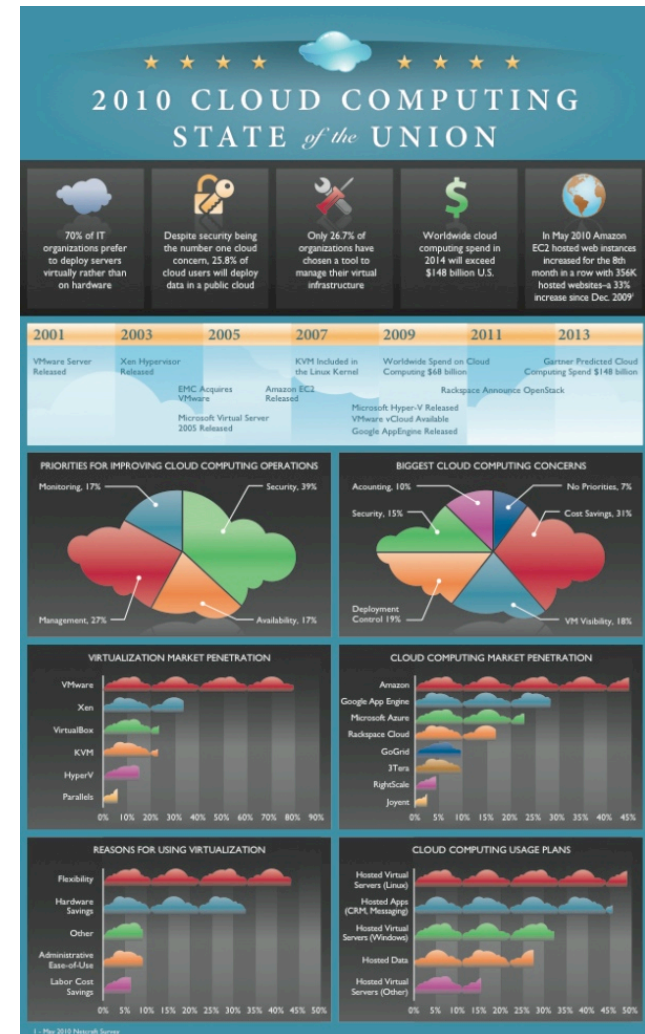
Five Characteristics of Clouds

- On-demand self-service
- Broad network access
- Resource pooling
- Rapid Elasticity
- Measured Service

cloud.com

Three Types of "Clouds"

SaaS

Application 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, Red Hat Network/RHEL

PaaS

Compute 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

## IaaS

Compute 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

cloud.com

Use Cases for Cloud Computing

- Offer Software-as-a-Service
- Development/Test Labs
- Resell Hosting Services
- Mimic Public Cloud Computing Behind a Firewall
- High Performance Computing (HPC)

cloud.com

Anatomy of the Cloud
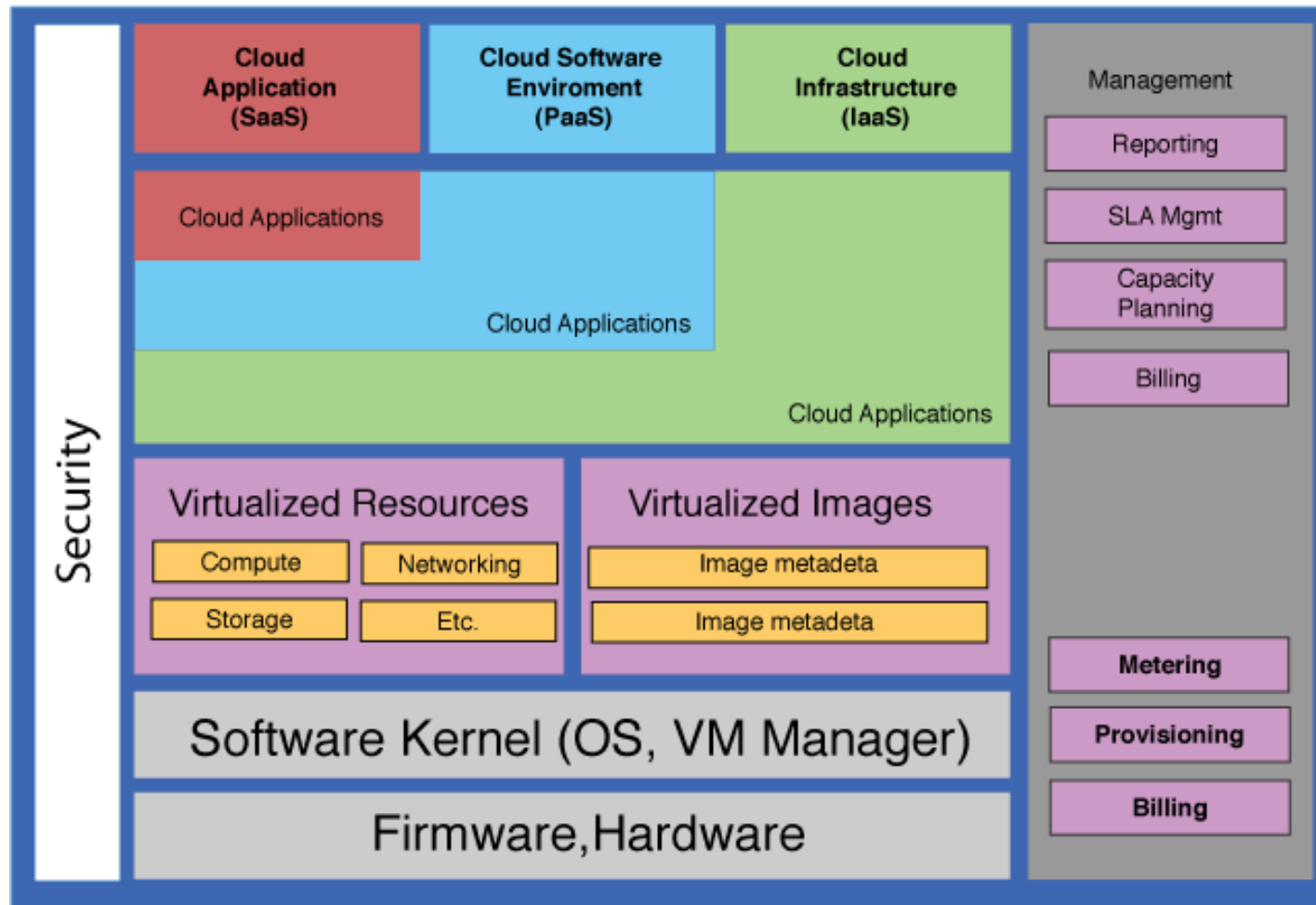
Hypervisors

Open Source

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

Proprietary

- VMware
- Citrix Xenserver
- Microsoft Hyper-V

Virtual Machine Formats

VM Format	Abbreviation	Summary
Open **V**irtualization **F**ormat	OVF	Evolving Standard, meta
Virtual **M**achine **D**is**k**	VMDK	Encodes a single disk, specific to VMware
QEMU **C**opy-**o**n-**W**rite	QCOW2	Allows you to do RAW disk with snapshotting and provisioning utilities used by KVM
Virtual **H**ard **D**isk	VHD	Virtual Hard disk format was pioneered by Microsoft but adopted by many virtualization including Xen and Virtual Box
Amazon **M**achine **I**mage	AMI	Amazon's virtual machine format

*QEMU is a processor virtualization technology that also has a utility to convert VM formats. (qemu-img)

cloud.com

Public Cloud Services & Private Clouds

Popular Public Cloud Services
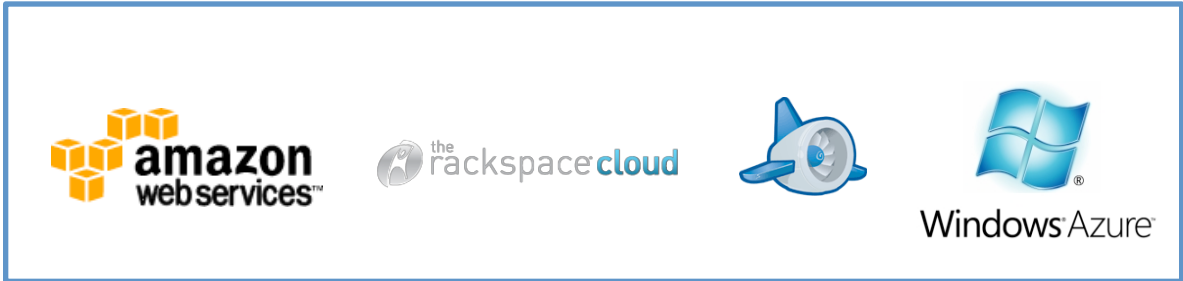
Open Source Cloud Computing Software

Open Source Cloud Computing

	Year Started	License	Hypervisors Supported
Cloudstack	2010	GPL	Xenserver, VMware, KVM, Hyper-V
Eucalyptus	2008	GPL	Xen, KVM, VMware
OpenStack	2010	Apache	Xen, KVM,VMware, LXC, Hyper-V
Ubuntu Enterprise Server (UEC)	2009 (Karmic Koala)	GPL	Xen,KVM,
Abiquo	2009 (Development 2006)		VMware, Hyper-V Citrix XenServer Virtual Box Xen KVM

cloud.com

Here an API, there an API, Everywhere an API

Every cloud has there own API, so how do you avoid lock-in migrate between clouds, libraries to write to and translate to different cloud APIs

- **jclouds** – Java, active development
- **libcloud** – Started by CloudKick, now an Apache incubator project
- **deltacloud** – started by Red Hat, now an Apache project
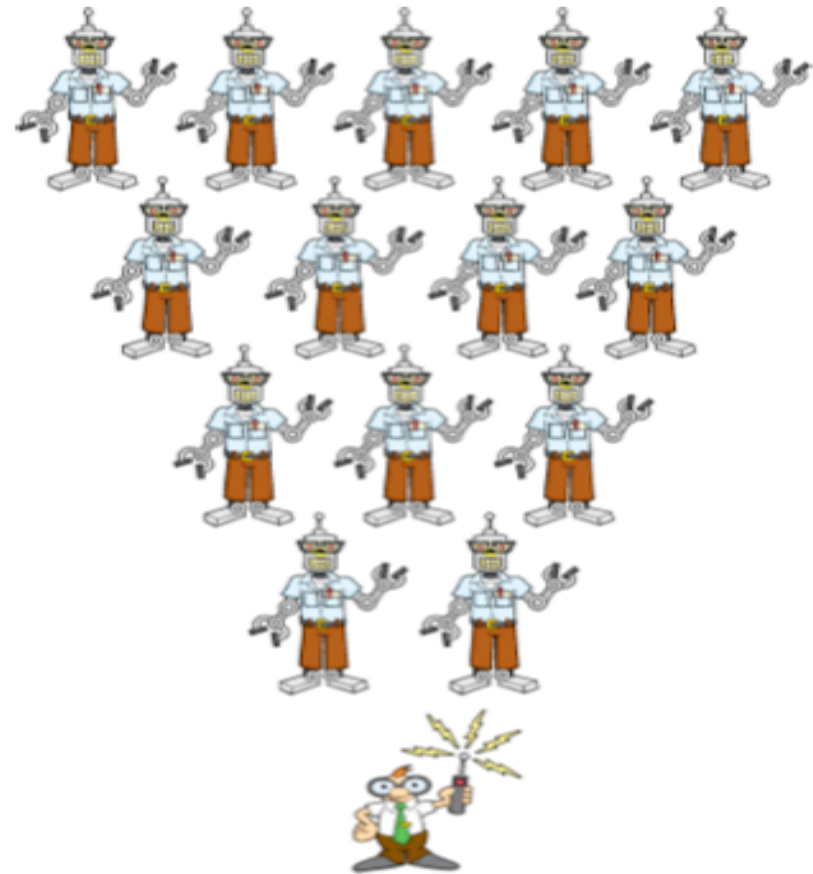
cloud.com

Open Source Cloud Storage

	Year Started	License
OpenStack Storage (Swift)	2010	GPL
Gluster	2008	GPL
Sheepdog (KVM and BTRFS only)	2009	GPL

cloud.com

Cloud Computing Changes Everything

- MeatCloud, Can't Keep up with Cloud Computing
- Devops & Agile IT Philosophy
- Script Repetitive Tasks
- Automate, Automate, Automate

cloud.com

This Guy doesn't Automate

DEVOPS
Cultural Changes to Help Cloud Adoption

Agile IT and **DevOps** movements mean **fast not loose**

- **Break down Silos within IT** - Operations and Developers should collaborate with each other to deliver excellent products

- Systems Administrators need to be come **Systems Engineers** building automated, fault tolerant systems not just maintaining infrastructure

- **More frequent changes**, more outages (albeit short) to rapidly improve IT products and services

- Process, version control, and automation **are important**

cloud.com
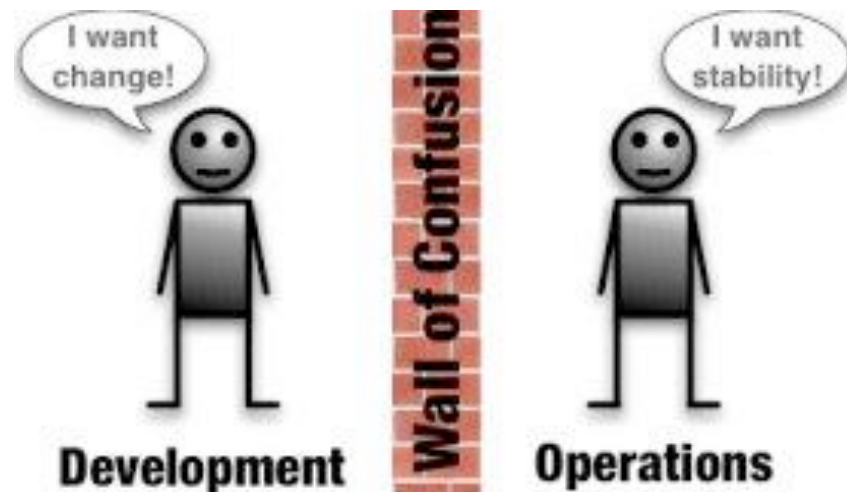
4 Core Types of Server Management Tools

```
[user@linux:~] yum install lynx
Gathering header information file(s) from server(s)
Server: Fedora Linux / stable for Red Hat Linux 9 (i386)
Server: Fedora Linux / testing for Red Hat Linux 9 (i386)
Server: Red Hat Linux 9 (i386)
Server: Red Hat Linux 9 (i386) updates
Finding updated packages
Downloading needed headers
getting /var/cache/yum/fedora-stable/headers/leafnode-0-1.9.43-
0.fdr.1.rh90.i386.hdr
getting /var/cache/yum/fedora-stable/headers/libzvt-devel-0-2.0.1-
0.fdr.5.rh90.i386.hdr
getting /var/cache/yum/fedora-stable/headers/mhash-devel-0-0.8.18-
0.fdr.1.rh90.i386.hdr
```
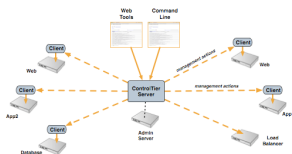
Provisioning
Installation of operating systems and other software
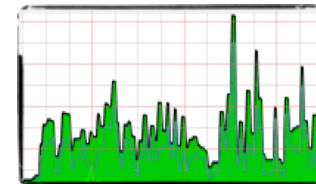
Configuration Management
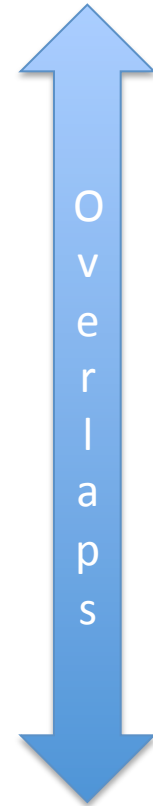Sets the parameters for servers, can specify installation parameters

Orchestration/Automation
Automate tasks across systems
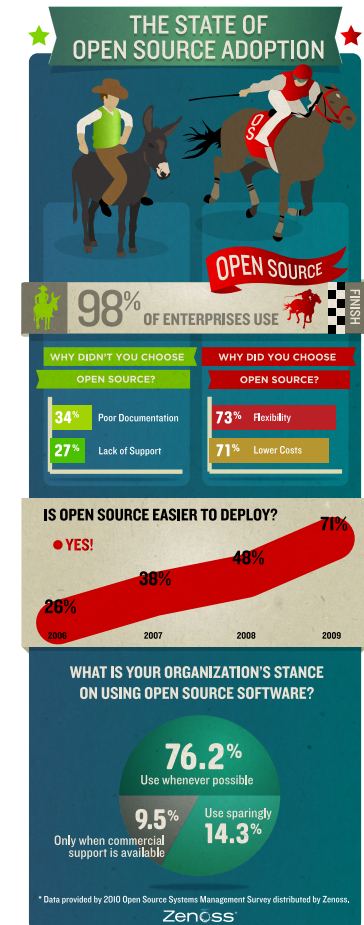
Monitoring
Records errors and health of IT infrastructure

Overlaps

cloud.com

Open Source Management Tools Adoption

- 98% of enterprises use open source systems management tools
- 76% indicate they prefer to use open source whenever possible
- Compelling factors for using open source is *flexibility* followed by cost savings
- 50% are already using some form of cloud technology including but not limited to hosted applications, Amazon Web services and/or hosted storage
- Top IT management priorities for 2010: *monitoring, configuration management, patching and provisioning and security*

THE STATE OF OPEN SOURCE ADOPTION

OPEN SOURCE

98% OF ENTERPRISES USE

WHY DIDN'T YOU CHOOSE OPEN SOURCE?	WHY DID YOU CHOOSE OPEN SOURCE?
34% Poor Documentation	73% Flexibility
27% Lack of Support	71% Lower Costs

IS OPEN SOURCE EASIER TO DEPLOY?
● YES!
71%
48%
38%
26%
2006 2007 2008 2009

WHAT IS YOUR ORGANIZATION'S STANCE ON USING OPEN SOURCE SOFTWARE?
76.2% Use whenever possible
9.5% Only when commercial support is available
14.3% Use sparingly

* Data provided by 2010 Open Source Systems Management Survey distributed by Zenoss.

Zenoss

cloud.com

Comparison of Provisioning Tools

	Year Started	Language	License	Installation Targets
Cobbler	2007	Python	GPL	Red Hat, OpenSUSE Fedora, Debian, Ubuntu
Fully Automatic Installation (FAI)	2000	Perl	GPL	Debian
Kickstart	?	Python	GPL	Most .deb and RPM based Linux distros
Spacewalk	2008	Perl, Python, Java	GPL	Fedora, Centos
Viper	2008	Perl	GPL	Debian

cloud.com

Comparison of Configuration Management Tools

	Year Started	Language	License	Client/Server
bcfg2	2003	Python	BSD	Yes
Cfengine	1993	C	Apache	Yes
Chef	2009	Ruby	Apache	Chef Solo – No Chef Server - Yes
Puppet	2004	Ruby	GPL	yes

cloud.com

Comparison of Open Source Monitoring Tools

	Year Started	License	Language	Type of Monitoring	Collection Methods
Cacti	2001	GPL	PHP	Performance	SNMP, syslog
Nagios	1999	GPL	C/PHP	Availability	SNMP,TCP, ICMP, IPMI, syslog
Zabbix	2001	GPL	C/PHP	Availability/ Performance and more	SNMP, TCP/ ICMP, IPMI, Synthetic Transactions
Zenoss	2005	GPL	Python	Availability, Performance, Event Management	SNMP, ICMP, SSH, syslog, WMI

cloud.com

Comparison of Open Source Automation/Orchestration Tools

	Year Started	Language	License	Client/Server	Support Organization
AutomateIT	2009	Ruby	GPL	No	None
Capistrano	2006	Ruby	MIT	Yes	None
Control Tier	2005	Java	Apache	Yes	DTO Solutions
Func	2007	Python	GPL	Yes	Fedora Project
RunDeck	2010	Java	Apache	Yes	DTO Solutions

cloud.com