

opening the clouds

qualitative overview of the state-of-the-art
open source cloud management platforms.

ACM, middleware 2009 conference

Orange Labs, San Francisco

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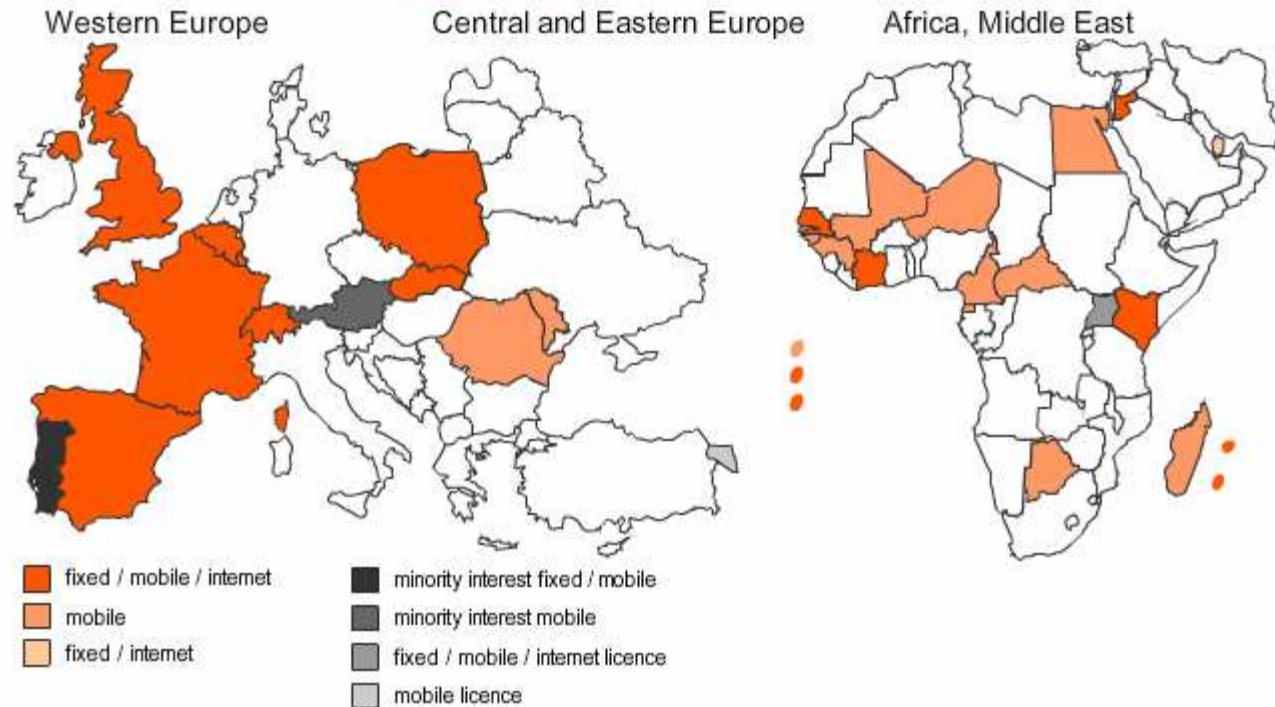


agenda

- context and goals
- open source virtualization technologies and scope
- open source cloud management platforms

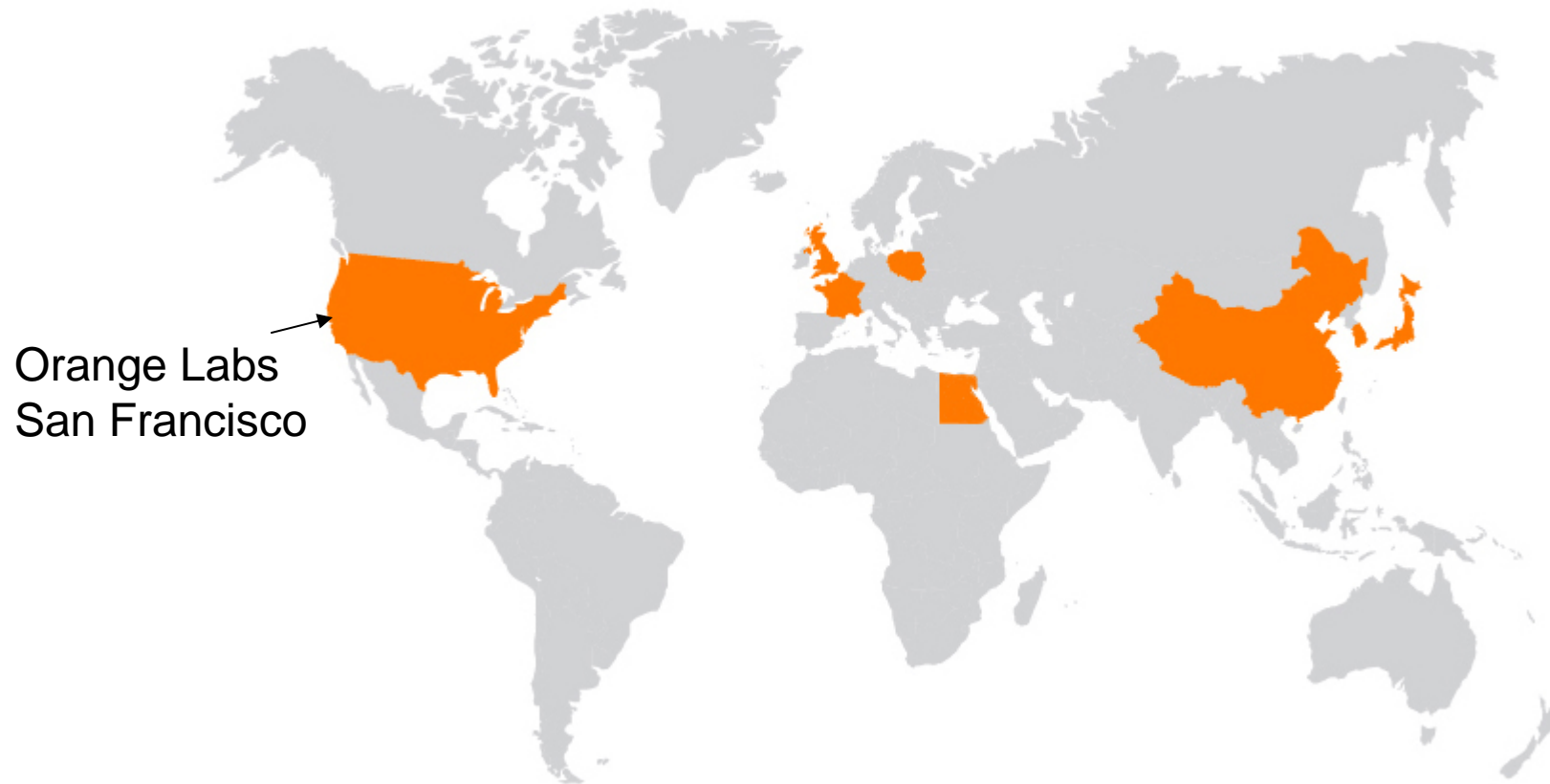
France Telecom Orange

an international group



- lines of business: home, mobile, content, audience/advertisement, e-health, enterprise
- 182M customers, 123M under the Orange brand (Internet, TV, mobile)
- number 3 mobile operator, number one broadband internet provider in Europe
- 51.5Bn euros revenue (2008)

Orange Labs



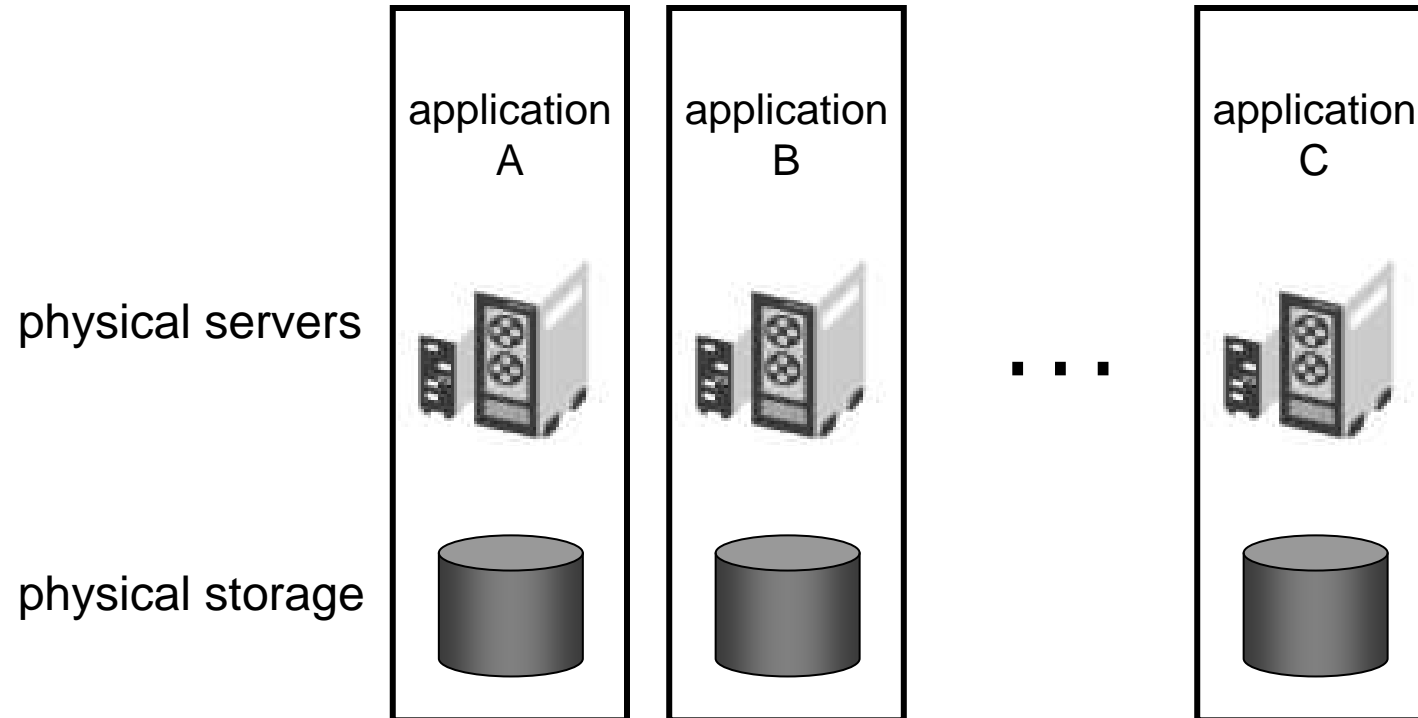
Orange Labs
San Francisco

5000 experts in 18 countries:
France, China, Japan, Korea, USA, UK, Poland, Jordan, Egypt.

context of the study

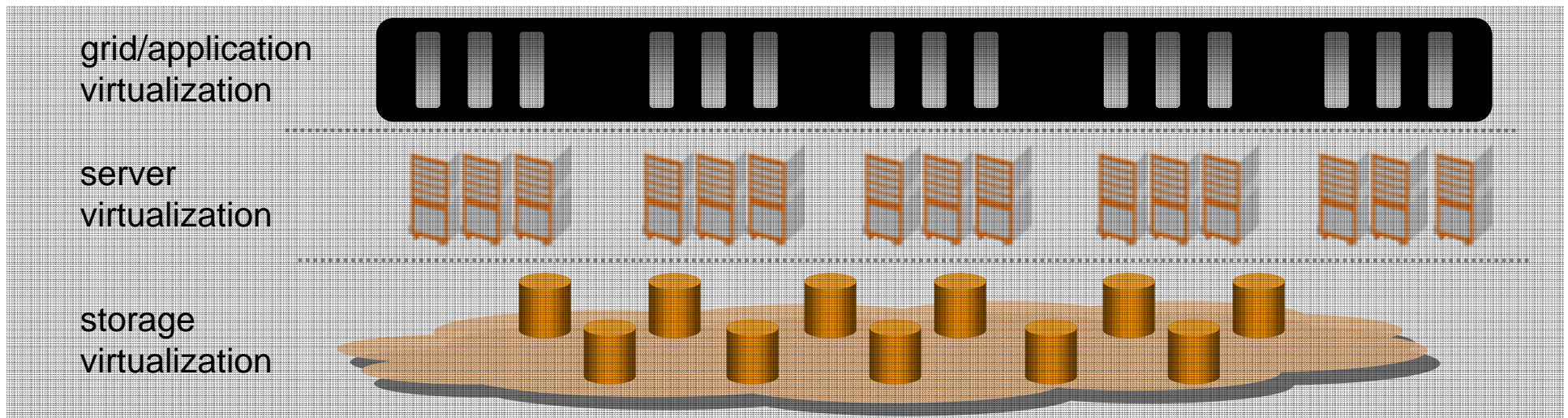
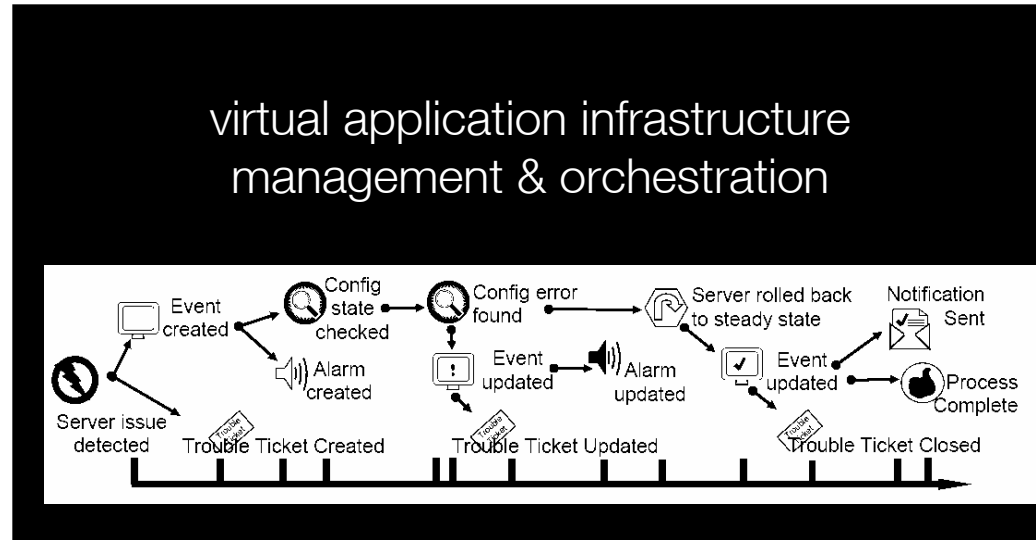
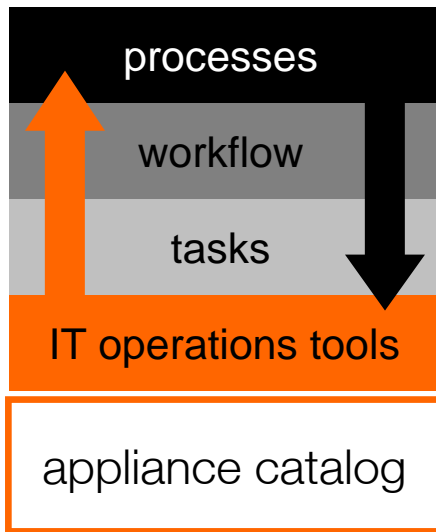
- vision of a shared, abstracted and layered infrastructure
- IT automation and optimization, and cloud computing activities

going from traditional data centers



siloes, dedicated infrastructure provisioning & management.

to dynamic, shared infrastructure



scope and use cases

- focusing on the technologies for IaaS (Infrastructure as a Service)
- example of use cases
 - > lease of resources
 - > development and debugging
 - > VM on-demand
 - > automatic scaling

open source virtualization technologies

- Orange is a heavy user of VMware technologies
- looking in this study at similar technologies in the open source world
 - > VM-based IT management style
 - > should run any guest OSES
 - not looking here at "container/jail" type of virtualization
 - > should be integrated with some management tools
- used in this study both Xen and KVM

open source cloud management platform

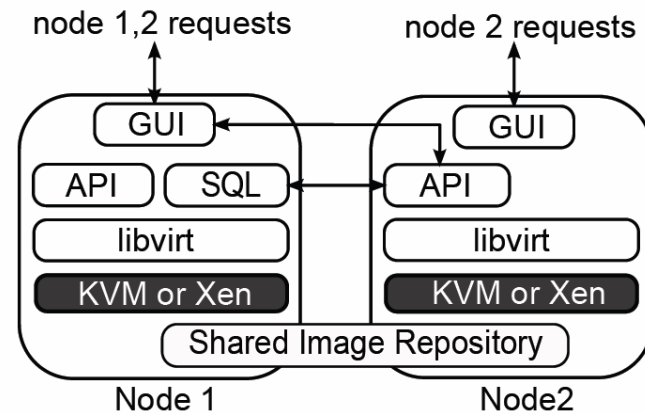
product	developer	Version	release date
Enomaly ECP	Enomaly, Inc	2.2.3	March 2009
Eucalyptus	Eucalyptus Systems, Inc	1.5	April 2009
Open Nebula	Universidad Complutense Madrid	1.2.1	July 2009
oVirt	Red Hat	0.100	July 2009

All conclusions here are based on those versions.

All platforms have since evolved to more recent versions that haven't been tested.

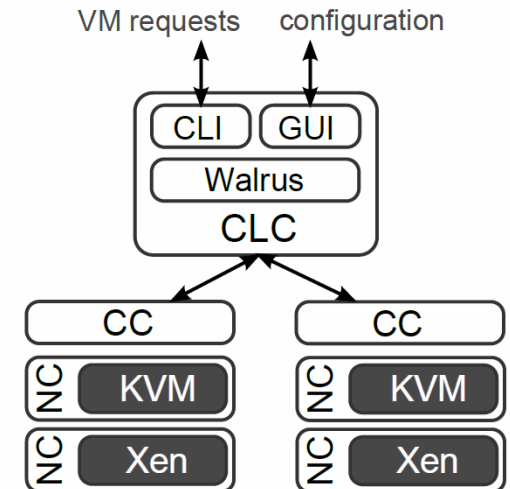
Enomaly ECP

- developed by Enomaly Inc.
- providing IT-cloud consulting
- ECP:
 - > first platform available
 - > web interface for libvirt
 - > image repository
 - > user administration
 - > module system
 - > auto-scaling
- community and commercial editions
- architecture: all nodes are equivalent, central database and shared repository



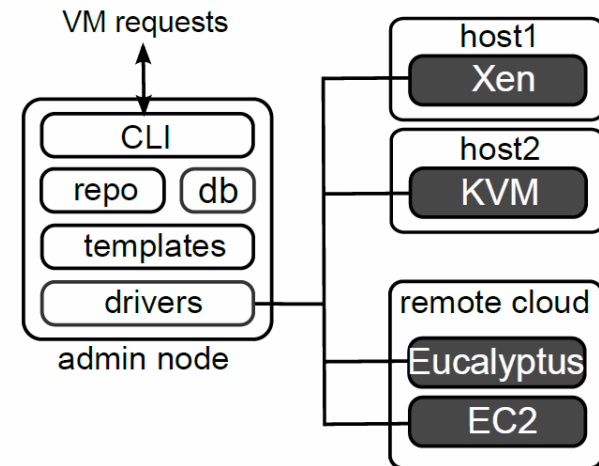
Eucalyptus

- initiated at the University of California at Santa Barbara
- first intended to provide scientists with a flexible architecture allowing them to make experiments on cloud-related software and infrastructure
- supported by Eucalyptus Systems, Inc
- part of Ubuntu Linux since 9.04
- replicating Amazon EC2 and S3 API in a private cluster
 - > can reuse well known tools for the management of VM
 - > integration with services like Rightscale for hybrid cloud scenario
- architecture: 3 components = Cloud Controller (CLC), Cluster Controller (CC), and Node Controller (NC)



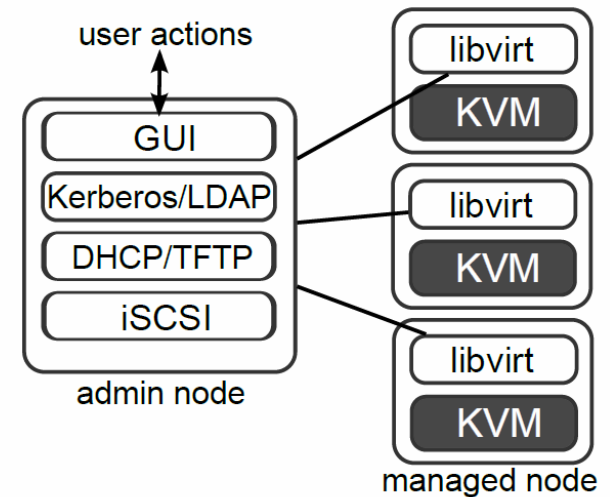
Open Nebula

- by the Universidad Complutense Madrid
- part of the European RESERVOIR initiative promoting virtualization to provide low cost remote computation services
- solution to manage multiple Xen/KVM hosts
- can create/control Amazon EC2 resources and therefore Eucalyptus
- command line only (when tested) and no user and image management
- architecture: admin node and cluster of Xen or KVM nodes



oVirt

- initiated by RedHat
- most recent of the 4 solutions
- leveraging other RedHat tools:
KVM, Cobbler and libvirt
- PXE boot of the hardware nodes
- network management tools for private LAN
- architecture: admin node, UI, cluster of machines running libvirt



comparison : image management

- manage lifecycle of the VM image
 - > creation, storage, uploading to the host or copy, provisioning and running and finally powering off/deleting
- highlights:
 - > plus for Enomaly for the repository (external + internal)
 - > oVirt leveraging Cobbler and its automation of provisioning processes

	ECP	Eucalyptus	OpenNebula	oVirt
VM creation tool	Yes	No	No	Cobbler
VM repository	Shared folder	Walrus buckets (S3)	On admin node	N/A
Image storage	Zipped image + XML	EC2 bundles	Disk images	Cobbler profiles
Modify VM at boot	Yes (edit XML)	Instance type	Yes (edit template)	Yes
Uploading to host	N/A	HTTPs	SCP	Cobbler provisioning
Saving	Yes	Volume Snapshots	Yes	Yes
Choose host	Yes	No	Yes	Yes

comparison : instance management

- instance management includes:
 - > quota,
 - > user actions
 - > monitoring, SLA, auto-scaling
 - > external scalability/cloud bursting
 - > hardware management, network management

	ECP	Eucalyptus	OpenNebula	oVirt
Built-in Monitoring	VM state	VM state	basic variables	Advanced
Cluster Management				
Cluster limit	No Limit	1	1	No Limit
Adding nodes	Full Install	Node install	Node Install	PXE boot
Cloud Bursting	No	No	EC2, Eucalyptus	No
User Action				
User permissions	Fine grained	Admin, user	No	Admin, user, monitor
Default Interface	Web Interface	CLI	CLI	Web Interface
Instance connection	VNC	SSH keypairs	VNC	VNC (ovirt-viewer)
Control	GUI	CLI, Euca2ools and EC2 API	CLI, Java API	GUI

Pros	Cons
ECP	
<ul style="list-style-type: none"> Web Interface VM repository Fine Grained User Permissions Multiple clusters Embedded VM creator 	<ul style="list-style-type: none"> Cluster Hierarchy / Adding a node VM connection limited to VNC Limited Network Handling No advanced monitoring Unflexible provisioning
Eucalyptus	
<ul style="list-style-type: none"> EC2/Walrus implementation Basic user permissions Good handling of network VM types Rightscale compatible 	<ul style="list-style-type: none"> No VM Administration interface No advanced monitoring Limited to one cluster Unflexible definition of the VMs Basic Monitoring
ONE	
<ul style="list-style-type: none"> Highly configurable VM templates Scriptable through the drivers Cloud Bursting (EC2 management) Finely tunable configuration scripts 	<ul style="list-style-type: none"> Limited Network Handling Limited to 1 cluster No default VM connection enabled No GUI
oVirt	
<ul style="list-style-type: none"> iSCSI and Cobbler implementation Web interface Advanced monitoring Multiple clusters Basic user permissions 	<ul style="list-style-type: none"> No Xen support Cobbler only for initial provisioning Initial nsetwork setup

conclusions and future

- all projects were still at early stage (beside ECP)
- no out-of-the-box solution for everything. Requires important integration work. Still have to built your own "Cloud OS"
- no or very limited support of VMware
- open source virtualization layer is robust, especially Xen

- other open source projects coming up, to name a few:
 - > dotcloud
 - > Intel's Tashi
 - > HP Open Cirrus activities: large cluster management, automation and energy
 - > deltacloud: RedHat recent activities around interoperability
 - > appscale

- hot topics: hybrid cloud, open API, SLA, development lifecycle, scalable middleware



thank you

