

CIRCLE Cloud

Cloud Infrastructure for Education

Sándor Guba, Máté Őry, Imre Szeberényi

`{guba.sandor,ory.mate,szeberenyi.imre}@circlecloud.org`

Budapest University of Technology and Economics
Center of Information Technology

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Motivation

- ▶ Education demands dynamic environment
- ▶ Different trainings have different software requirements
- ▶ Difficult to maintain complex software dependencies on heterogenous physical machines
- ▶ Need for multi-host environments
- ▶ Infrastructure for small projects

IaaS clouds in general

Benefits

- ▶ Multiple virtual environments on a single physical machine
- ▶ Dynamic load balancing (live migrations)
- ▶ Management tasks delegated to users
- ▶ More efficient resource use

Difficulties

- ▶ Template (image) creation needs special knowledge
- ▶ Unused machines waste resources (and also a security risk)
- ▶ Network zone administration needs expertise and high permissions



Cloud Infrastructure for Research
Computing and Laboratory Environment

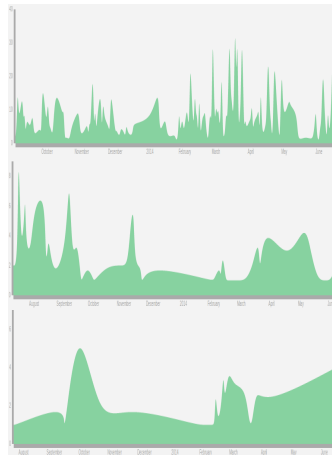
<http://circlecloud.org/>

What is CIRCLE?

- ▶ Open source IaaS cloud manager
- ▶ Complete system ready to deploy
- ▶ Easy-to-use web interface even for non-IT users
- ▶ User-friendly interface for template customization
- ▶ Scalable
- ▶ Advanced networking
- ▶ All modules written in Python
- ▶ Easy to install with Puppet

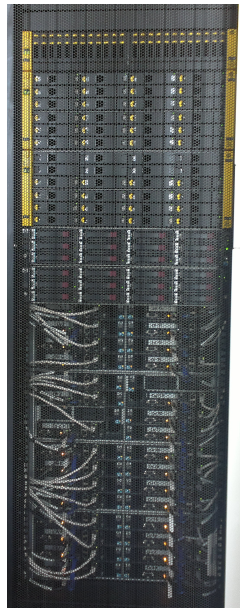
Modules

- Storage** store virtual images
- Network** manage complex network infrastructures
- Node** supervise virtual machine instances
- Portal** manager and web-interface for the cloud



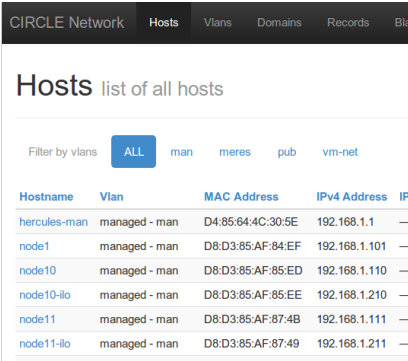
Storage

- ▶ NAS based image management
- ▶ We use NFS over InfiniBand
- ▶ Any other shared storage can be used
- ▶ ISO and QCoW2 image type support



Network

- ▶ Complete networking solution
- ▶ Manage complex architecture
- ▶ Simple zone (vlan) management
- ▶ DHCP and DNS services
- ▶ Linux netfilter (firewall)
- ▶ IPv6 support
- ▶ Blacklisting interface (for IDS)
- ▶ Flow rules
- ▶ WEB management interface



The screenshot shows the 'Hosts' management page in the CIRCLE Network interface. The top navigation bar includes 'CIRCLE Network', 'Hosts', 'Vlans', 'Domains', 'Records', and 'Bl'. The main heading is 'Hosts list of all hosts'. Below this, there is a filter section 'Filter by vlans' with buttons for 'ALL', 'man', 'meres', 'pub', and 'vm-net'. The 'ALL' button is currently selected. The table below lists several hosts with columns for Hostname, Vlan, MAC Address, IPv4 Address, and IP.

Hostname	Vlan	MAC Address	IPv4 Address	IP
hercules-man	managed - man	D4:85:64:4C:30:5E	192.168.1.1	—
node1	managed - man	D8:D3:85:AF:84:EF	192.168.1.101	—
node10	managed - man	D8:D3:85:AF:85:ED	192.168.1.110	—
node10-ilo	managed - man	D8:D3:85:AF:85:EE	192.168.1.210	—
node11	managed - man	D8:D3:85:AF:87:4B	192.168.1.111	—
node11-ilo	managed - man	D8:D3:85:AF:87:49	192.168.1.211	—

Node

- ▶ Deploying and Destroying virtual machines
- ▶ Using KVM and libvirt for virtualization
- ▶ Manage Open vSwitch and Flow rules
- ▶ Monitor virtual machines
- ▶ Provide agent service

Contextualization

- ▶ Python agent
- ▶ Communication through virtual serial port
- ▶ Works with Linux and Windows

Features:

- ▶ Set hostname
- ▶ Configure network
- ▶ Change password
- ▶ Provide monitoring information
- ▶ Detect planned shutdown
- ▶ Set date and time

Portal

- ▶ User-friendly web interface
- ▶ Strongly coupled model and view
- ▶ Support SAML2 authentication (SSO)
- ▶ Role-based ACL
- ▶ Personal file store
- ▶ Notification about expiration times

Dashboard



Virtual machines




■ Ubuntu 12.04 v1 cloud-185

[list](#)[new](#)

Groups



 eduid hallgató

 eduid oktató

 unix


[list](#)[new](#)

Templates



 lo Ubuntu 12.04 LTS x86_64



 maskepp Ubuntu 12.04 LTS x86_64



circlecloud.org



Nodes



 node1

 node3

VM—Home

Ubuntu 12.04 cloud-202.demo.cloud.bme.hu


 **RUNNING**

Connection details


Protocol SSH

Host demo.cloud.bme.hu:13256

Username cloud

Password 

[Generate new password!](#)

Command `sshpass -p RKKQIA5WuE ssh -o StrictHostKeyChe` 



Home



Resources



Console



Access



Network



Activity

System:

 Ubuntu 12.04 LTS x86_64Name: 


Ubuntu 12.04

Description: 

Expiration

 renew

Suspended at:

 1 day, 22 hours

Destroyed at:

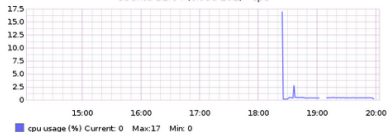
 1 week, 6 days

Tags

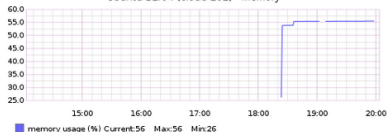
No tag added!

Add tag

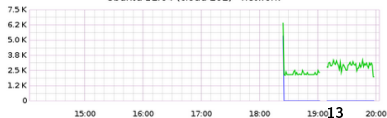
Ubuntu 12.04 (cloud-202) - cpu



Ubuntu 12.04 (cloud-202) - memory



Ubuntu 12.04 (cloud-202) - network



VM—Console

Ubuntu 12.04 v1 cloud-185.demo.cloud.bme.hu



Home



Resources



Console



Access



Network



Activity

Send Ctrl+Alt+Del

Type password

 Screenshot

Connected (encrypted) to: QEMU (cloud-185)

```
Ubuntu 12.04.4 LTS cloud-185 tty1
cloud-185 login: _
```

VM—ACL

Ubuntu 12.04 v1 cloud-185.demo.cloud.bme.hu


**▶ RUNNING**

Connection details

Protocol SSH

Host demo.cloud.bme.hu:5897

Username cloud

Password 

[Generate new password!](#)

Command `sshpass -p 1tme3gE0eG ssh -o StrictHostKeyChe` 



Home



Resources



Console



Access



Network






Activity

Owner

You are the current owner of this instance. [Transfer ownership...](#)

Permissions

Who	What	Remove
 Máté Őry (K2JL24)	<input type="text" value="user"/>	<input type="checkbox"/>
 Sándor Guba (TFDAZ6)	<input type="text" value="owner"/>	<input type="checkbox"/>
	<input type="text" value="Name of group or user"/>	<input type="text" value="user"/>

Save

VM—Network

Ubuntu 12.04 v1 cloud-185.demo.cloud.bme.hu

**▶ RUNNING**

Connection details

Protocol SSH
Host demo.cloud.bme.hu:5897
Username cloud
Password

[Generate new password!](#)

Command `sshpas -p 1tme3gE0eG ssh -o StrictHostKeyChe` 



Home



Resources



Console



Access



Network



Activity

Interfaces

[+ add interface](#) vmnet [remove](#)

IPv4 address:

10.9.0.56

IPv6 address:

None

DNS name:

cloud-185.demo.cloud.bme.hu

Groups:

Port access

[IPv4](#) [IPv6](#)

demo.cloud.bme.hu:5897

→ 22/tcp

[×](#)

/

tcp

[Add](#)

VM—Activity

Ubuntu 12.04 v1 cloud-185.demo.cloud.bme.hu


 **RUNNING**

Connection details


Protocol SSH

Host demo.cloud.bme.hu:5897

Username cloud

Password 

[Generate new password!](#)

Command `sshpass -p 1tme3gE0eG ssh -o StrictHostKeyChe` 



Home



Resources



Console



Access



Network



Activity

Activity

-  **Agent** 2014-06-15 18:29
 - Start access server – 18:29:49
 - Starting – 18:29:49
-  **Console-accessed** 2014-06-15 18:29, Sándor Guba (TFDAZ6)
-  **Deploy** 2014-06-15 18:28, Sándor Guba (TFDAZ6)
 - Renew – 18:28:57
 - Booting – 18:28:57
 - Deploying net – 18:28:57
 - Deploying vm – 18:28:56
 - Deploying disks – 18:28:55
-  **Notification about expiration** 2014-06-12 12:34
-  **Save as template** 2014-06-10 17:18, Sándor Guba (TFDAZ6)

Template—New

[Admin](#)[Network](#)

Customize an existing template or create a brand new one from scratch!

lo - Ubuntu 12.04 LTS x86_64 ☐

maskepp - Ubuntu 12.04 LTS x86_64 ☐

nem_looo - Ubuntu 12.04 LTS x86_64 ☐

Shiba Linux - Shiba Linux ☐

Ubuntu 12.04 - Ubuntu 12.04 LTS x86_64

Cores: 2 RAM: 1024



Ubuntu 12.04 v1 - Ubuntu 12.04 LTS x86_64 ☐

Windows 7 - Windows 7 x86_64 ☐

Template—Save as

This is the master vm of your new template

[▶ Start template tutorial](#)

1. Modify the virtual machine to suit your needs (**optional**)
 - Change the name and description
 - Change the resources (CPU and RAM)
 - Attach or detach disks
 - Add or remove network interfaces
2. Deploy the virtual machine
3. Connect to the machine
4. Do all the needed installations/customizations
5. Log off from the machine
6. Press the Save as template button
7. Delete this virtual machine (**optional**)

Ubuntu 12.04 cloud-207.demo.cloud.bme.hu



PENDING

Connection details

Protocol SSH
Host circlecloud.org
demo.cloud.bme.hu:13866



System:
^ Ubuntu 12.04 LTS x86_64

Template—Custom settings

Edit template

[Back](#)**Name***

Human readable name of template.

Resource configuration

Number of cores***Priority*****RAM size*****Architecture***

Virtual machine settings

Access method*

Manage access

Who**What****x** oktato1

owner

☐

+

user

[Save](#)

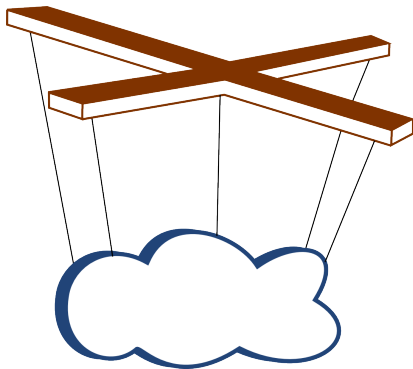
Disk list

 windows-x86_64 (#724) - 30.0GB☐

Create new disk

Easy install via Puppet

- ▶ Puppet recipe is available for each module
- ▶ Single-command installation
- ▶ Help install updates automatically

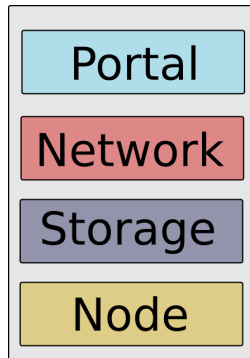


Deployment—stand-alone

- ▶ All components on a single node
- ▶ Even on a virtual machine (cloud in a cloud)

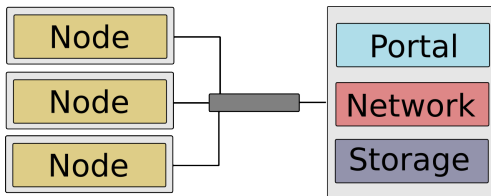
Typical uses

- ▶ Evaluating CIRCLE
- ▶ Self-hosted development



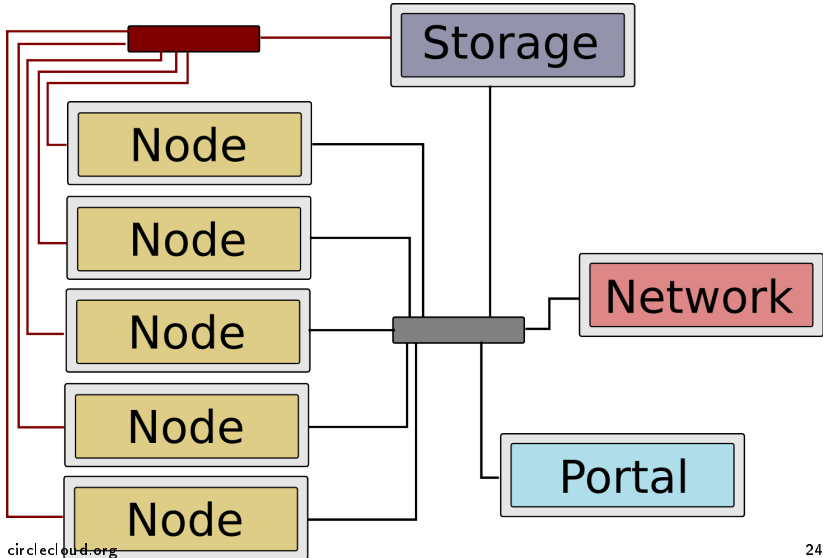
Deployment—cluster

- ▶ VM's run on a cluster, other services on a single head node
- ▶ Production-ready architecture
- ▶ No special hardware needed



Deployment—distributed

- ▶ VM's run on a cluster, all services on separate nodes



Do try it at home! It's free.



Feedback and contribution is always welcome.