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Session 4
Hybrid Cloud Computing

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European Commission
Information Society
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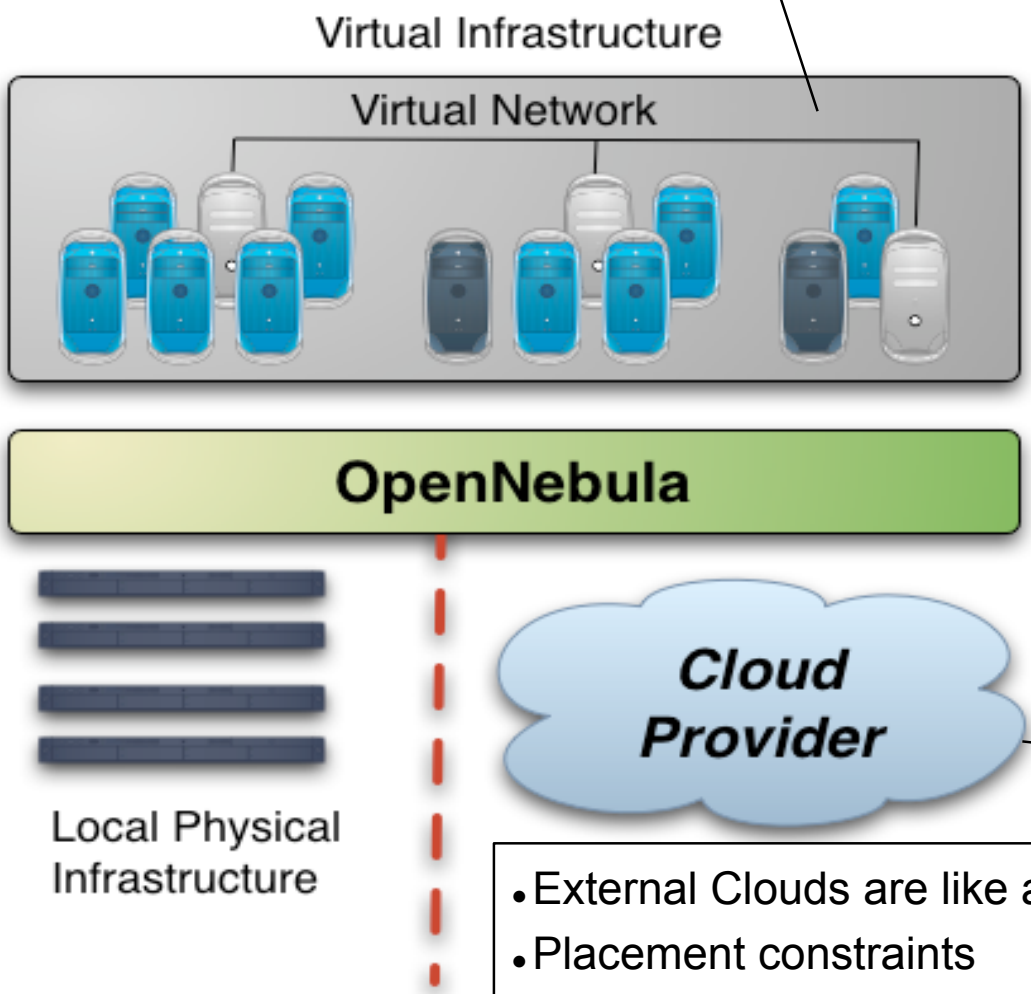
Hybrid Cloud Computing: Overview

- VMs can be local or remote
- VM connectivity has to be configured, usually VPNs



- External Clouds are like any other host
- Placement constraints
- OpenNebula distribution includes drivers to interact with Amazon EC2 and Elastic Hosts

Installing the Hybrid Cloud Components

Additional requirements:

- EC2 libraries and tools.
  - Grab the EC2 tools from /automount/share/reservoir/opennebula/ec2/tools

```
fe$ unzip ec2-api-tools.zip
fe$ cd ec2-api-tools-1.3-62308/

fe$ export EC2_HOME=`pwd`
fe$ export PATH=$EC2_HOME/bin:$PATH
```

- EC2 tools credentials:
  - Grab the EC2 credentials from /automount/share/reservoir/opennebula/ec2/certs

```
fe$ export EC2_PRIVATE_KEY=/srv/cloud/one/ec2/certs/pk.pem
fe$ export EC2_CERT=/srv/cloud/one/ec2/certs/cert.pem
```

Installing the Hybrid Cloud Components

- Hands on... try the EC2 tools (`ec2-*`)
  - **`ec2-describe-images`**: List and describe registered AMIs and AMIs you have launch permissions for.
  - **`ec2-describe-instances`**: List and describe your instances

```
$ ec2-describe-images
IMAGE   ami-0742a66e    /rubensm-amis.s3.amazonaws.com/
image.manifest.xml      418314910487    available       private
i386    machine
IMAGE   ami-e142a688    rubensm-amis.s3.amazonaws.com/
image.manifest.xml      418314910487    available       private
i386    machine
```

- If you have problems with JAVA:

```
# yum install java-1.6.0-openjdk-devel-1.6.0.0-1.16.b17.el5
# export JAVA_HOME=/opt/jdk
```

Configuring the EC2 Hybrid Cloud Driver

- Hands on... Add the following drivers to oned.conf

```
IM_MAD = [
  name        = "im_ec2",
  executable = "one_im_ec2",
  arguments  = "im_ec2/im_ec2.conf" ] # No. of instances of each type

VM_MAD = [
  name        = "vmm_ec2",
  executable = "one_vmm_ec2",
  arguments  = "vmm_ec2/vmm_ec2.conf", # Defaults, e.g. keypair
  type        = "xml" ]

TM_MAD = [  #No actual transfers are made by OpenNebula to EC2
    name        = "tm_dummy",
    executable = "one_tm",
    arguments  = "tm_dummy/tm_dummy.conf" ]
```

Configuring the EC2 Hybrid Cloud Driver

- Hands on... Configure the account to be used with Amazon EC2

```
$ vim $ONE_LOCATION/etc/vmm_ec2/vmm_ec2rc
#-------------------------------------------------------------------
# EC2 API TOOLS Configuration.
#-------------------------------------------------------------------
EC2_HOME=/srv/cloud/one/ec2/tools
EC2_PRIVATE_KEY="/srv/cloud/one/ec2/certs/pk.pem"
EC2_CERT="/srv/cloud/one/ec2/certs/cert.pem"
```

- Hands on... You can limit the use of EC2 instances by modifying the IM file

```
$ vim $ONE_LOCATION/etc/im_ec2/im_ec2.conf
#-------------------------------------------------------------------
# Max number of instances that can be launched into EC2
#-------------------------------------------------------------------
SMALL_INSTANCES=5
LARGE_INSTANCES=
EXTRALARGE_INSTANCES=
```

Configuring the EC2 Hybrid Cloud Driver

- Amazon EC2 cloud is managed by OpenNebula as any other cluster node. Restart the oned, and check that the new drivers are loaded

```
$ one stop; one start
$ more $ONE_LOCATION/var/oned.log
Fri Jan 15 18:16:46 2010 [VMM][I]: Loading Virtual Machine Manager driv
Fri Jan 15 18:16:46 2010 [VMM][I]:      Loading driver: vmm_xen (XEN)
Fri Jan 15 18:16:47 2010 [VMM][I]:      Driver vmm_kvm loaded.
Fri Jan 15 18:16:47 2010 [VMM][I]:      Loading driver: vmm_ec2 (XML)
Fri Jan 15 00:16:47 2010 [InM][I]: Loading Information Manager drivers.
Fri Jan 15 00:16:47 2010 [InM][I]:      Loading driver: im_xen
Fri Jan 15 00:16:47 2010 [InM][I]:      Driver im_kvm loaded
Fri Jan 15 00:16:47 2010 [InM][I]:      Loading driver: im_ec2
```

- Hands on... Create your EC2 hybrid cloud by adding a new host

```
$ onehost create ec2 im_ec2 vmm_ec2 tm_dummy

$ onehost list
  ID NAME                RVM   TCPU   FCPU   ACPU    TMEM    FMEM STAT
   0 host01                0    200    200    200 2017004 1667080   on
   1 host02                1    200    200    200 2017004 1681676   on
   2 ec2                   0    500    500    500 8912896 8912896   on
```

Configuring the EC2 Hybrid Cloud Driver

- You can use **several accounts** by adding a driver for each account (use the arguments attribute, -k and –c options). Then create a host that uses the driver

```
VM_MAD = [
  name        = "vmm_ec2_new",
  executable = "one_vmm_ec2",
  arguments   = "vmm_ec2/vmm_ec2.conf -k /srv/cloud/...",
  type        = "xml" ]
```

- You can use **multiple EC2 zones**, add a driver for each zone (use the arguments attribute, -u option). Then create a host that uses the driver

```
VM_MAD = [
  name        = "vmm_ec2_new",
  executable = "one_vmm_ec2",
  arguments   = "vmm_ec2/vmm_ec2.conf -u http://...",
  type        = "xml" ]
```

Using the EC2 Hybrid Cloud

- Virtual Machines can be instantiated locally or in EC2
  - The template must provide a description for both instantiation methods.
  - The EC2 counterpart of your VM (`AMI_ID`) must be available for the driver account
  - The EC2 VM template attribute:

```
EC2 = [
  AMI               = "ami_id for this VM",
  KEYPAIR           = "the keypair to use the instance",
  AUTHORIZED_PORTS  = "ports to access the instance",
  INSTANCETYPE      = "m1.small...",
  ELASTICIP         = "the elastic ip for this instance",
  CLOUD             = "host (EC2 cloud) to use this description with"
]
```

Using the EC2 Hybrid Cloud

- Hands on... Add an EC2 counterpart to the ttylinux image

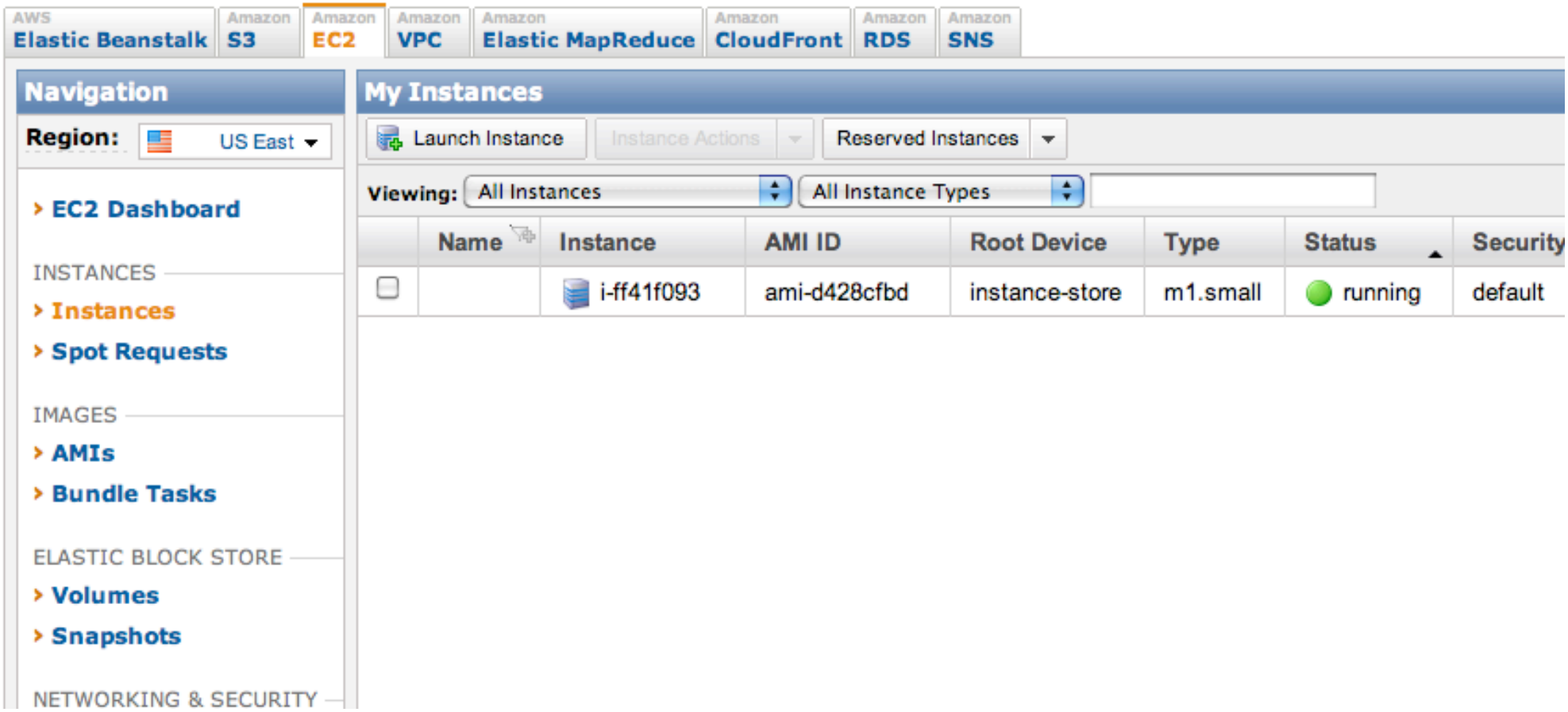
```
fe$ vi ttylinux.one
#EC2 template machine, this will be use wen submitting this VM to EC2
EC2 = [ AMI="ami-5e28d937",
        KEYPAIR=”td-keypair",
        AUTHORIZED_PORTS="22",
        INSTANCETYPE=m1.small]

#Add this if you want to use only EC2 cloud
REQUIREMENTS = "HOSTNAME = \"ec2\""
```

- Hands on... Create the VM and check progress

```
fe$ onevm create ttylinux.one
fe$ onevm list
  ID     USER     NAME STAT CPU     MEM         HOSTNAME         TIME
  16 oneadmin   one-16 runn   0       0              ec2 00 00:00:35
fe$ ec2-describe-instances
RESERVATION     r-5eff7536      418314910487    default
INSTANCE        i-bac3f0d2      ami-0572946c                    pending
keypair0        m1.small        2010-01-14T23:32:35+0000        us-
east-1a     aki-a71cf9ce     ari-a51cf9cc            monitoring-
disabled
```

Using the EC2 Hybrid Cloud

- Hands on... Check the Amazon Web Service for the new Virtual Machine created through OpenNebula.
  - https://console.aws.amazon.com/ec2/



Using the EC2 Hybrid Cloud

- Hands on... Log in the EC2 instance when running

```
fe$ onevm show 17
...
VIRTUAL MACHINE TEMPLATE
CPU=0.5
...
EC2=[
  AMI=ami-ccf615a5,
  AUTHORIZED_PORTS=22,
  INSTANCETYPE=m1.small,
  KEYPAIR=keypair ]
IP=ec2-72-44-62-194.compute-1.amazonaws.com
 ...
REQUIREMENTS=HOSTNAME = "ec2"
VMID=17

fe$ ssh -i keypair.pem root@ec2-72-44-62-194.compute-1.amazonaws.com
Linux ip-10-212-134-128 2.6.21.7-2.fc8xen-ec2-v1.0 #2 SMP Tue Sep 1
10:04:29 EDT 2009 i686
root@ip-10-212-134-128:~#

This costs money!
fe$ onevm shutdown 17
fe$ onehost disable ec2
fe$ onehost list
```