BITS Pilani

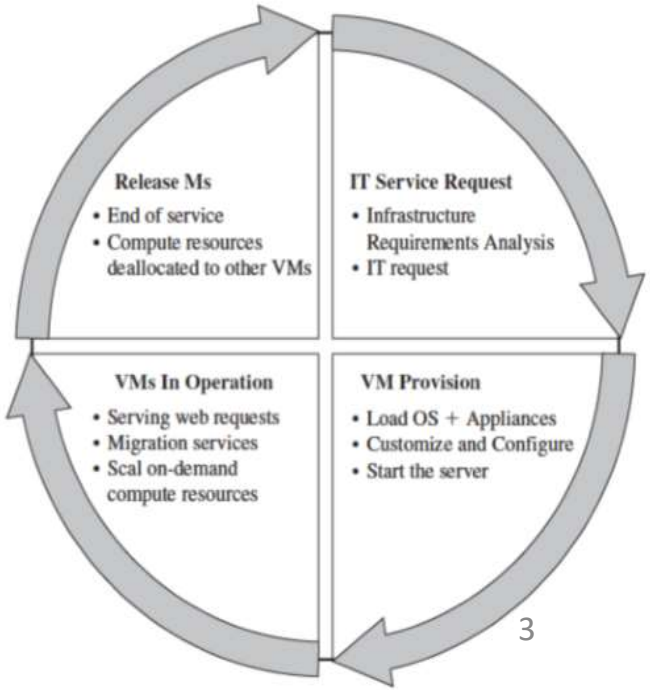
Cloud Computing

VM Provisioning and Migration

Virtual Machine Provisioning and Manageability Life Cycle

- The cycle starts by a request delivered to the IT department, stating the requirement for creating a new server for a particular service.
- This request is being processed by the IT administration to start seeing the servers' resource pool, matching these resources with requirements
- Starting the provision of the needed virtual machine.
- Once it provisioned and started, it is ready to provide the required service according to an SLA(Service Level agreement).
- Virtual is being released; and free resources.

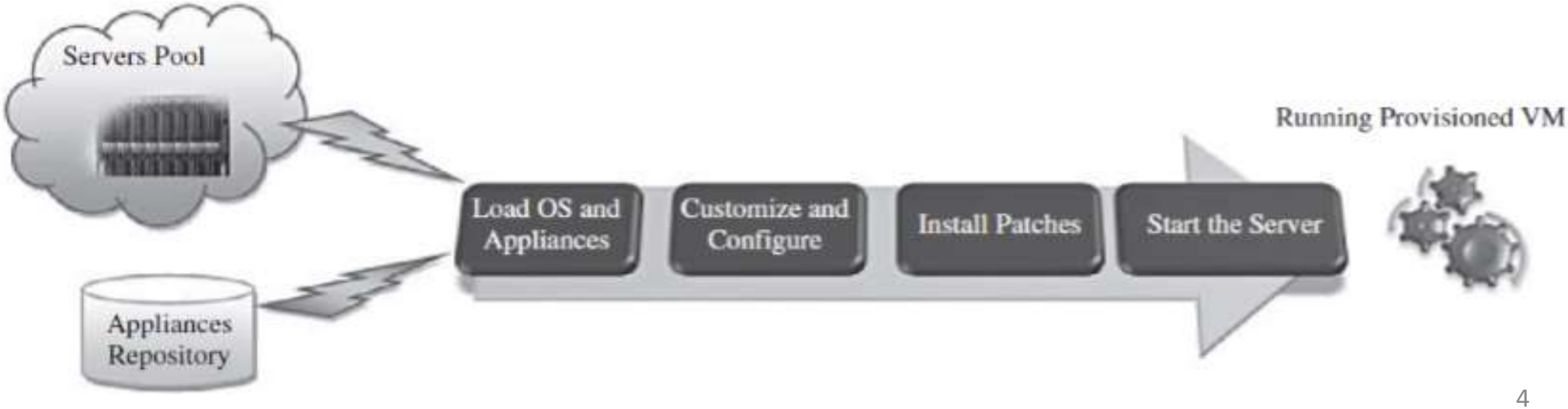
Virtual Machine Life Cycle



VM Provisioning Process

Steps to Provision VM –

- Select a server from a pool of available servers along with the appropriate OS template you need to provision the virtual machine.
- Load the appropriate software.
- Customize and configure the machine (e.g., IP address, Gateway) to an associated network and storage resources.
- Finally, the virtual server is ready to start with its newly loaded S/W.



VM Provisioning

- Server provisioning is defining server's configuration based on the organization requirements, a H/W, and S/W component (processor, RAM, storage, networking, operating system, applications, etc.).

VMs can be provisioned by

- Manually installing an OS,
- Using a preconfigured VM template,
- Cloning an existing VM, or importing a physical server or a
- Server from another hosting platform.
- Physical servers can also be virtualized and provisioned using P2V (Physical to Virtual)

Windows PowerShell

```
S C:\Users\BITS9\Vagrant\lamp> vagrant box add precise32 http://files.vagrantup.com/precise32.box
```

Windows PowerShell

```
PS C:\Users\BITS9\Vagrant\lamp> vagrant init precise32
```

Windows PowerShell

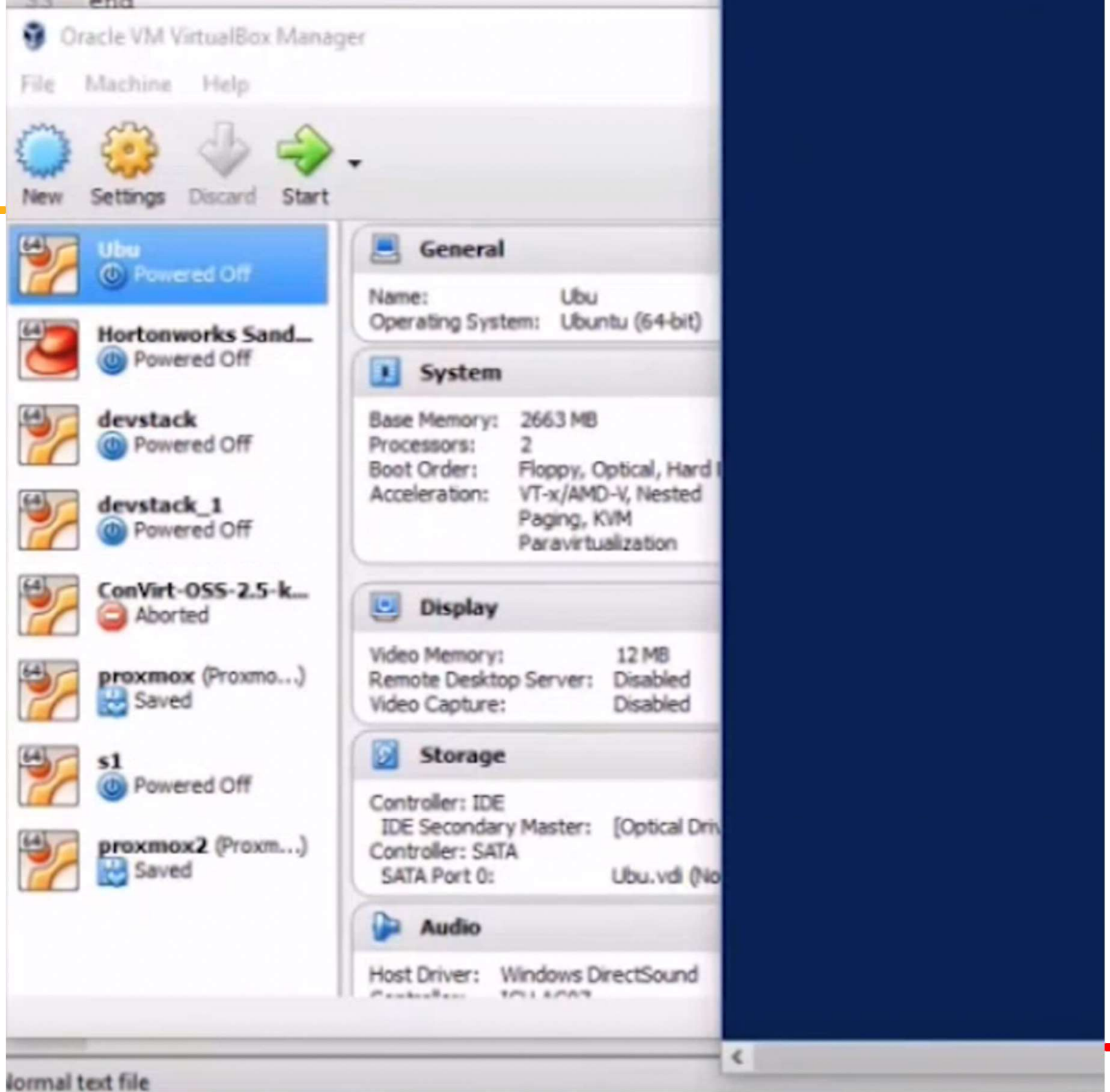
```
PS C:\Users\BITS9\Vagrant\lamp> vagrant init precise32
A `Vagrantfile` has been placed in this directory. You are now
ready to `vagrant up` your first virtual environment! Please read
the comments in the Vagrantfile as well as documentation on
`vagrantup.com` for more information on using Vagrant.
PS C:\Users\BITS9\Vagrant\lamp> ls


    Directory: C:\Users\BITS9\Vagrant\lamp


Mode                LastWriteTime         Length Name
----                -------------         ------ ----
d-----        30-12-2015     02:04                .vagrant
-a----        30-12-2015     02:34            647 script.sh
-a----        30-12-2015     04:27           3092 Vagrantfile


PS C:\Users\BITS9\Vagrant\lamp> note
```

Vagrantfile - Notepad

File Edit Format View Help

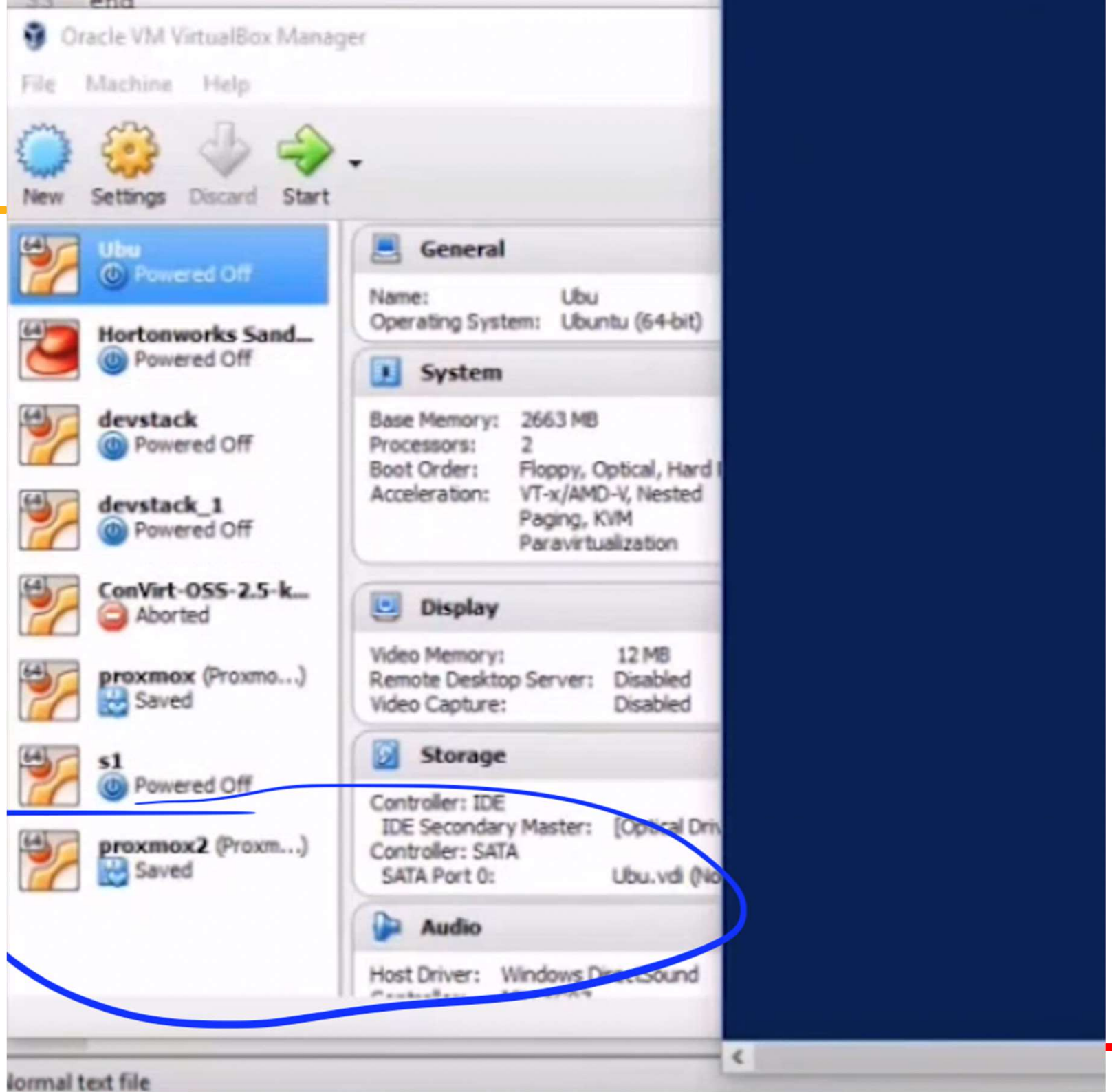
```
Vagrant.configure(2) do |config|
config.vm.box = "precise32"
# Mentioning the SSH Username/Password:
config.ssh.username = "vagrant"
config.ssh.password = "vagrant"
# Begin Configuring
config.vm.define "lamp" do|lamp|
lamp.vm.hostname = "lamp" # Setting up hostname
lamp.vm.network "public_network", bridge: [
  "en1: Wi-Fi (AirPort)",
  "en6: Broadcom NetXtreme Gigabit Ethernet Controller",
]
lamp.vm.provision :shell, path: "script.sh" # Provisioning with script.sh
end
# End Configuring
end
```

```
PS C:\Users\BITS9\Vagrant\lamp> notepad.exe .\Vagrantfile
PS C:\Users\BITS9\Vagrant\lamp> cat .\script.sh
#!/bin/bash

# Updating repository

sudo apt-get -y update

# Installing Apache

sudo apt-get -y install apache2

# Installing MySQL and it's dependencies, Also, setting up root password for MySQL as it w

sudo debconf-set-selections <<< 'mysql-server-5.5 mysql-server/root_password password root
sudo debconf-set-selections <<< 'mysql-server-5.5 mysql-server/root_password_again passwor
sudo apt-get -y install mysql-server libapache2-mod-auth-mysql php5-mysql

# Installing PHP and it's dependencies
sudo apt-get -y install php5 libapache2-mod-php5 php5-mcrypt
PS C:\Users\BITS9\Vagrant\lamp>
```


Oracle VM VirtualBox Manager
File
Machine
Help
New
Settings
Discard
Start
Ubu
Powered Off
Hortonworks Sand...
Powered Off
devstack
Powered Off
devstack_1
Powered Off
ConVirt-OSS-2.5-k...
Aborted
proxmox (Proxmo...)
Saved
s1
Powered Off
proxmox2 (Proxm...)
Saved
General
Name: Ubu
Operating System: Ubuntu (64-bit)
System
Base Memory: 2663 MB
Processors: 2
Boot Order: Floppy, Optical, Hard
Acceleration: VT-x/AMD-V, Nested Paging, KVM Paravirtualization
Display
Video Memory: 12 MB
Remote Desktop Server: Disabled
Video Capture: Disabled
Storage
Controller: IDE
IDE Secondary Master: [Optical Dri
Controller: SATA
SATA Port 0: Ubu.vdi (No
Audio
Host Driver: Windows DirectSound
ormal text file

Windows PowerShell

```
PS C:\Users\BITS9\Vagrant\lamp> vagrant up
Bringing machine 'lamp' up with 'virtualbox' provider...
==> lamp: Importing base box 'precise32'...
==> lamp: Matching MAC address for NAT networking...
==> lamp: Setting the name of the VM: lamp_lamp_1451473296902_90408
```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Powered Off
devstack_1
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ConVirt-OSS-2.5-k...
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proxmox (Proxmo...)
Saved
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Powered Off
proxmox2 (Proxm...)
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General
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Boot Order: Floppy, Optical, Hard
Acceleration: VT-x/AMD-V, Nested Paging, KVM Paravirtualization
Display
Video Memory: 12 MB
Remote Desktop Server: Disabled
Video Capture: Disabled
Storage
Controller: IDE
IDE Secondary Master:
Controller: SATA
SATA Port 0: Ubu.vdi
Audio
Host Driver: Windows
normal text file

Windows PowerShell

```
PS C:\Users\BITS9\Vagrant\lamp> vagrant up
Bringing machine 'lamp' up with 'virtualbox' provider...
==> lamp: Importing base box 'precise32'...
==> lamp: Matching MAC address for NAT networking...
==> lamp: Setting the name of the VM: lamp_lamp_1451473296902_90408
==> lamp: Clearing any previously set network interfaces...
==> lamp: Specific bridge '["en1: Wi-Fi (AirPort)", "en6: Broadcom NetXtreme Gigabit Ethernet Controlle
==> lamp: which network to bridge to.
==> lamp: Available bridged network interfaces:
1) The Broadcom 802.11 Network Adapter provides wireless local area networking.
2) VMware Virtual Ethernet Adapter for VMnet1
3) VMware Virtual Ethernet Adapter for VMnet8
==> lamp: When choosing an interface, it is usually the one that is
==> lamp: being used to connect to the internet.
    lamp: Which interface should the network bridge to? 1
==> lamp: Preparing network interfaces based on configuration...
    lamp: Adapter 1: nat
    lamp: Adapter 2: bridged
==> lamp: Forwarding ports...
    lamp: 22 => 2222 (adapter 1)
==> lamp: Booting VM...
==> lamp: Waiting for machine to boot. This may take a few minutes...
    lamp: SSH address: 127.0.0.1:2222
    lamp: SSH username: vagrant
    lamp: SSH auth method: password
    lamp:
    lamp: Inserting generated public key within guest...
    lamp: Removing insecure key from the guest if it's present...
    lamp: Key inserted! Disconnecting and reconnecting using new SSH key...
==> lamp: Machine booted and ready!
```

*new 4 - Notepad++

File Edit Search View Encoding Language Settings Macro

```
30  lamp.vm.provision :shell, path: "script.sh
31  end
32  # End Configuring
33  end
```

Oracle VM VirtualBox Manager

File Machine Help

New Settings Discard Show

- Ubu — Powered Off
- Hortonworks Sand... — Powered Off
- devstack — Powered Off
- devstack_1 — Powered Off
- ConVirt-OSS-2.5-k... — Aborted
- proxmox (Proxmo...) — Saved
- s1 — Powered Off
- proxmox2 (Proxm...) — Saved
- lamp_lamp_14514... — Running

General

Name: lamp_lamp_1451 296902_90408
Operating System: Ubuntu (32-bit)

System

Base Memory: 384 MB
Boot Order: Hard Disk, Optical
Acceleration: VT-x/AMD-V, Nested Paging, PAE/NX

Display

Video Memory: 8 MB
Remote Desktop Server: Disabled
Video Capture: Disabled

Storage

Controller: IDE Controller
IDE Primary Master: [Optical
IDE Secondary Master: [Optical
Controller: SATA Controller
SATA Port 0: box-disk

Windows PowerShell

```
==> lamp: which network to bridge to.
==> lamp: Available bridged network interfaces:
1) The Broadcom 802.11 Network Adapter provides wireless local area ne
2) VMware Virtual Ethernet Adapter for VMnet1
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==> lamp: When choosing an interface, it is usually the one that is
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    lamp: Which interface should the network bridge to? 1
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    lamp: Adapter 2: bridged
==> lamp: Forwarding ports...
    lamp: 22 => 2222 (adapter 1)
==> lamp: Booting VM...
==> lamp: Waiting for machine to boot. This may take a few minutes...
    lamp: SSH address: 127.0.0.1:2222
    lamp: SSH username: vagrant
    lamp: SSH auth method: password
    lamp:
    lamp: Inserting generated public key within guest...
    lamp: Removing insecure key from the guest if it's present...
    lamp: Key inserted! Disconnecting and reconnecting using new SSH k
==> lamp: Machine booted and ready!
GuestAdditions versions on your host (5.0.10) and guest (4.2.0) do not
stdin: is not a tty
Reading package lists...
Building dependency tree...
Reading state information...
The following extra packages will be installed:
  fakeroot linux-headers-3.2.0-23 make patch
Suggested packages:
  make-doc diffutils-doc
Recommended packages:
  linux-headers-generic-pae linux-headers-686-pae linux-headers-amd64
  linux-headers-generic linux-headers
The following NEW packages will be installed:
  dkms fakeroot linux-headers-3.2.0-23 linux-headers-3.2.0-23-generic-
  patch
0 upgraded, 6 newly installed, 0 to remove and 66 not upgraded.
Need to get 12.7 MB of archives.
After this operation, 68.5 MB of additional disk space will be used.
Get:1 http://us.archive.ubuntu.com/ubuntu/ precise/main make i386 3.81
Get:2 http://us.archive.ubuntu.com/ubuntu/ precise/main patch i386 2.6
Get:3 http://us.archive.ubuntu.com/ubuntu/ precise/main dkms all 2.2.0
Get:4 http://us.archive.ubuntu.com/ubuntu/ precise/main fakeroot i386
Get:5 http://us.archive.ubuntu.com/ubuntu/ precise/main linux-headers-
```

*new 4 - Notepad++

File Edit Search View Encoding Language Settings Macro

```
30  lamp.vm.provision :shell, path: "script.sh
31  end
32  # End Configuring
33  end
```

Oracle VM VirtualBox Manager

File Machine Help

New Settings Discard Show

- Ubu — Powered Off
- Hortonworks Sand... — Powered Off
- devstack — Powered Off
- devstack_1 — Powered Off
- ConVirt-OSS-2.5-k... — Aborted
- proxmox (Proxmo...) — Saved
- s1 — Powered Off
- proxmox2 (Proxm...) — Saved
- lamp_lamp_14514... — Running

General

Name: lamp_lamp_1451 296902_90408
Operating System: Ubuntu (32-bit)

System

Base Memory: 384 MB
Boot Order: Hard Disk, Optical
Acceleration: VT-x/AMD-V, Nested Paging, PAE/NX

Display

Video Memory: 8 MB
Remote Desktop Server: Disabled
Video Capture: Disabled

Storage

Controller: IDE Controller
IDE Primary Master: [Optical D
IDE Secondary Master: [Optical D
Controller: SATA Controller
SATA Port 0: box-disk1

Windows PowerShell

```
  dkms fakeroot linux-headers-3.2.0-23 linux-headers-3.2.0-23-generic-pae make
  patch
0 upgraded, 6 newly installed, 0 to remove and 66 not upgraded.
Need to get 12.7 MB of archives.
After this operation, 68.5 MB of additional disk space will be used.
Get:1 http://us.archive.ubuntu.com/ubuntu/ precise/main make i386 3.81-8.1ubuntu1
Get:2 http://us.archive.ubuntu.com/ubuntu/ precise/main patch i386 2.6.1-3 [86.0 k
Get:3 http://us.archive.ubuntu.com/ubuntu/ precise/main dkms all 2.2.0.3-1ubuntu3
Get:4 http://us.archive.ubuntu.com/ubuntu/ precise/main fakeroot i386 1.18.2-1 [87
Get:5 http://us.archive.ubuntu.com/ubuntu/ precise/main linux-headers-3.2.0-23 all
Get:6 http://us.archive.ubuntu.com/ubuntu/ precise/main linux-headers-3.2.0-23-gene
dpkg-preconfigure: unable to re-open stdin: No such file or directory
Fetched 12.7 MB in 1min 7s (190 kB/s)
Selecting previously unselected package make.
(Reading database ... 29361 files and directories currently installed.)
Unpacking make (from .../make_3.81-8.1ubuntu1_i386.deb) ...
Selecting previously unselected package patch.
Unpacking patch (from .../patch_2.6.1-3_i386.deb) ...
Selecting previously unselected package dkms.
Unpacking dkms (from .../dkms_2.2.0.3-1ubuntu3_all.deb) ...
Selecting previously unselected package fakeroot.
Unpacking fakeroot (from .../fakeroot_1.18.2-1_i386.deb) ...
Selecting previously unselected package linux-headers-3.2.0-23.
Unpacking linux-headers-3.2.0-23 (from .../linux-headers-3.2.0-23_3.2.0-23.36_all.
Selecting previously unselected package linux-headers-3.2.0-23-generic-pae.
Unpacking linux-headers-3.2.0-23-generic-pae (from .../linux-headers-3.2.0-23-gener
Processing triggers for man-db ...
Setting up make (3.81-8.1ubuntu1) ...
Setting up patch (2.6.1-3) ...
Setting up dkms (2.2.0.3-1ubuntu3) ...
Setting up fakeroot (1.18.2-1) ...
update-alternatives: using /usr/bin/fakeroot-sysv to provide /usr/bin/fakeroot (fa
Setting up linux-headers-3.2.0-23 (3.2.0-23.36) ...
Setting up linux-headers-3.2.0-23-generic-pae (3.2.0-23.36) ...
Examining /etc/kernel/header_postinst.d.
run-parts: executing /etc/kernel/header_postinst.d/dkms 3.2.0-23-generic-pae /boot/
Copy iso file C:\Program Files\Oracle\VirtualBox\VBoxGuestAdditions.iso into the b
stdin: is not a tty
mount: warning: /mnt seems to be mounted read-only.
Installing Virtualbox Guest Additions 5.0.10 - guest version is 4.2.0
stdin: is not a tty
Verifying archive integrity... All good.
Uncompressing VirtualBox 5.0.10 Guest Additions for Linux.............
VirtualBox Guest Additions installer
Removing installed version 4.2.0 of VirtualBox Guest Additions...
Copying additional installer modules ...
```

*new 4 - Notepad++

File Edit Search View Encoding Language Settings Macro

devstack_local_conf.txt | wordpress.yaml | server-with-vol.yaml

```
30  lamp.vm.provision :shell, path: "script.sh
31  end
32  # End Configuring
33  end
34
35  #3- Let us now start provisioning the LAMP
36  vim.tiny script.sh
37  #!/bin/bash
38
39  # Updating repository
40
41  sudo apt-get -y update
42
43  # Installing Apache
44
45  sudo apt-get -y install apache2
46
47  # Installing MySQL and it's dependencies,
48
49  sudo debconf-set-selections <<< 'mysql-ser
50  sudo debconf-set-selections <<< 'mysql-ser
51  sudo apt-get -y install mysql-server libap
52
53  # Installing PHP and it's dependencies
54  sudo apt-get -y install php5 libapache2-mo
55
56  #4- After saving the script.sh, run:
57  vagrant up
58
59  #5- Now after the vagrant is done with ins
60  vagrant ssh
61
62  #6- Verify the installations by:
63  dpkg -l | grep "apache2\|mysql-server-5.5\
```

Windows PowerShell

```
==> lamp:   Package apache2-mpm-itk is not installed.
==> lamp: (Reading database ...
==> lamp: 52878 files and directories currently installed.)
==> lamp: Removing apache2-mpm-worker ...
==> lamp:  * Stopping web server apache2
==> lamp: apache2: Could not reliably determine the server's fully qualified doma
==> lamp:  ... waiting
==> lamp:    ...done.
==> lamp: Selecting previously unselected package apache2-mpm-prefork.
==> lamp: (Reading database ...
==> lamp: 52873 files and directories currently installed.)
==> lamp: Unpacking apache2-mpm-prefork (from .../apache2-mpm-prefork_2.2.22-1ubu
==> lamp: Setting up apache2-mpm-prefork (2.2.22-1ubuntu1.10) ...
==> lamp:  * Starting web server apache2
==> lamp: apache2: Could not reliably determine the server's fully qualified doma
==> lamp:    ...done.
==> lamp: Selecting previously unselected package libapache2-mod-php5.
==> lamp: (Reading database ...
==> lamp: 52878 files and directories currently installed.)
==> lamp: Unpacking libapache2-mod-php5 (from .../libapache2-mod-php5_5.3.10-1ubu
==> lamp: Selecting previously unselected package libmcrypt4.
==> lamp: Unpacking libmcrypt4 (from .../libmcrypt4_2.5.8-3.1_i386.deb) ...
==> lamp: Selecting previously unselected package php5.
==> lamp: Unpacking php5 (from .../php5_5.3.10-1ubuntu3.21_all.deb) ...
==> lamp: Selecting previously unselected package php5-cli.
==> lamp: Unpacking php5-cli (from .../php5-cli_5.3.10-1ubuntu3.21_i386.deb) ...
==> lamp: Selecting previously unselected package php5-mcrypt.
==> lamp: Unpacking php5-mcrypt (from .../php5-mcrypt_5.3.5-0ubuntu1_i386.deb) ...
==> lamp: Processing triggers for man-db ...
==> lamp: Setting up libapache2-mod-php5 (5.3.10-1ubuntu3.21) ...
==> lamp: Creating config file /etc/php5/apache2/php.ini with new version
==> lamp:  * Restarting web server apache2
==> lamp: apache2: Could not reliably determine the server's fully qualified doma
==> lamp:  ... waiting
==> lamp: apache2: Could not reliably determine the server's fully qualified doma
==> lamp:    ...done.
==> lamp: Setting up libmcrypt4 (2.5.8-3.1) ...
==> lamp: Setting up php5 (5.3.10-1ubuntu3.21) ...
==> lamp: Setting up php5-cli (5.3.10-1ubuntu3.21) ...
==> lamp: Creating config file /etc/php5/cli/php.ini with new version
==> lamp: update-alternatives:
==> lamp: using /usr/bin/php5 to provide /usr/bin/php (php) in auto mode.
==> lamp: Setting up php5-mcrypt (5.3.5-0ubuntu1) ...
==> lamp: Processing triggers for libc-bin ...
==> lamp: ldconfig deferred processing now taking place
PS C:\Users\BITS9\Vagrant\lamp> vagrant ssh
```

```
PS C:\Users\BITS9\Vagrant\lamp> vagrant ssh
`ssh` executable not found in any directories in the %PATH% variable. Is an
SSH client installed? Try installing Cygwin, MinGW or Git, all of which
contain an SSH client. Or use your favorite SSH client with the following
authentication information shown below:

Host: 127.0.0.1
Port: 2222
Username: vagrant
Private key: C:/Users/BITS9/Vagrant/lamp/.vagrant/machines/lamp/virtualbox/
PS C:\Users\BITS9\Vagrant\lamp>
```

*new 4 - Notepad++

File Edit Search View Encoding Language Settings Macro

```
lamp
end
# En
end

#3-
vim.
#!/b

# Up

sudo

# In

sudo

# In

sudo
sudo
sudo

# Installing PHP and it's dependencies
sudo apt-get -y install php5 libapache2-mo

#4- After saving the script.sh, run:
vagrant up

#5- Now after the vagrant is done with ins
vagrant ssh

#6- Verify the installations by:
dpkg -l | grep "apache2\|mysql-server-5.5\
```

vagrant@lamp: ~

```
login as: vagrant
Authenticating with public key "imported-openssh-key"
Welcome to Ubuntu 12.04 LTS (GNU/Linux 3.2.0-23-generic-pae i686)

 * Documentation:  https://help.ubuntu.com/
New release '14.04.3 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

Welcome to your Vagrant-built virtual machine.
Last login: Fri Sep 14 06:22:31 2012 from 10.0.2.2
vagrant@lamp:~$
```

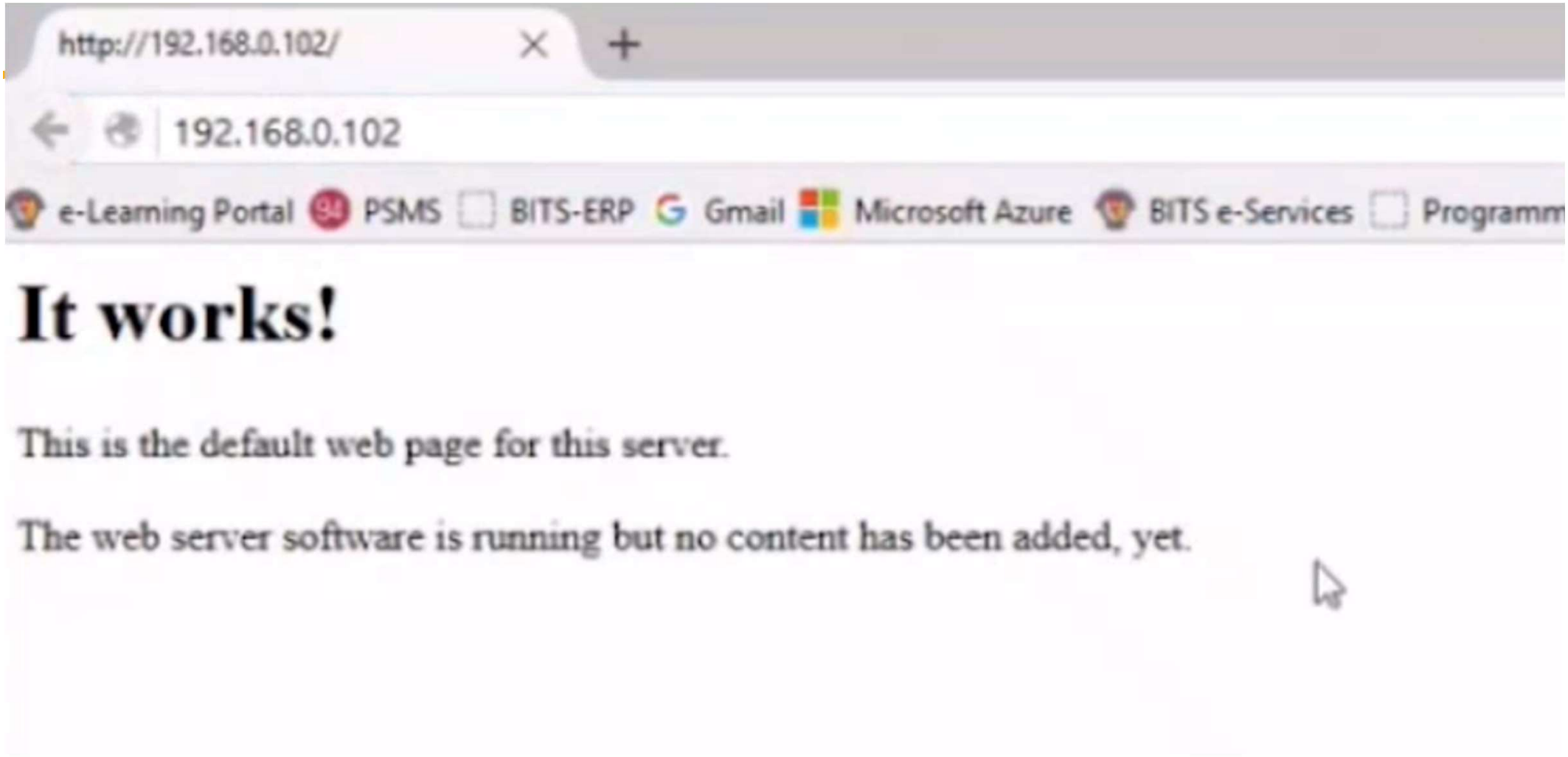
Windows PowerShell

```
==> lamp: (Reading database ...
==> lamp: 52873 files and directories currently installed.)
==> lamp: Unpacking apache2-mpm-prefork (from .../apache2-mpm-prefork_2.2.22-1ubuntu1.10_i
.22-1ubuntu1.10) ...

ne the server's fully qualified domain name,

kage libapache2-mod-php5.

ly installed.)
.../libapache2-mod-php5_5.3.10-1ubuntu3.21_i
kage libmcrypt4.
crypt4_2.5.8-3.1_i386.deb) ...
kage php5.
0-1ubuntu3.21_all.deb) ...
kage php5-cli.
li_5.3.10-1ubuntu3.21_i386.deb) ...
kage php5-mcrypt.
5-mcrypt_5.3.5-0ubuntu1_i386.deb) ...

.10-1ubuntu3.21) ...
he2/php.ini with new version

ne the server's fully qualified domain name,

ne the server's fully qualified domain name,

..
) ...
3.21) ...
php.ini with new version

/bin/php (php) in auto mode.
==> lamp: Setting up php5-mcrypt (5.3.5-0ubuntu1) ...
==> lamp: Processing triggers for libc-bin ...
==> lamp: ldconfig deferred processing now taking place
PS C:\Users\BITS9\Vagrant\lamp> vagrant ssh
'ssh' executable not found in any directories in the %PATH% variable. Is an
SSH client installed? Try installing Cygwin, MinGW or Git, all of which
contain an SSH client. Or use your favorite SSH client with the following
authentication information shown below:

Host: 127.0.0.1
Port: 2222
Username: vagrant
Private key: C:/Users/BITS9/Vagrant/lamp/.vagrant/machines/lamp/virtualbox/private_key
PS C:\Users\BITS9\Vagrant\lamp>
```

vagrant@lamp: ~

```
or packages built from the php5 source
ii  php5-fpm                          5.3.10-1ubuntu3.21          server-side, H
TML-embedded scripting language (FPM-CGI binary)
ii  php5-mcrypt                       5.3.5-0ubuntu1              MCrypt module
for php5
ii  php5-mysql                        5.3.10-1ubuntu3.21          MySQL module f
or php5
vagrant@lamp:~$ ifconfig
eth0      Link encap:Ethernet  HWaddr 08:00:27:12:96:98
          inet addr:10.0.2.15  Bcast:10.0.2.255  Mask:255.255.255.0
          inet6 addr: fe80::a00:27ff:fe12:9698/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:52075 errors:0 dropped:0 overruns:0 frame:0
          TX packets:26649 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:45399861 (45.3 MB)  TX bytes:1545138 (1.5 MB)

eth1      Link encap:Ethernet  HWaddr 08:00:27:32:c1:57
          inet addr:192.168.0.102  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::a00:27ff:fe32:c157/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:82 errors:0 dropped:0 overruns:0 frame:0
          TX packets:8 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
```

```
lamp
end
# En
end

#3-
vim.
#!/b

# Up

sudo

# In

sudo

# In

sudo
sudo
sudo

# Installing PHP and it's dependencies
sudo apt-get -y install php5 libapache2-mod-php5 php5-mcrypt

#4- After saving the script.sh, run:
vagrant up
```


http://192.168.0.102/
192.168.0.102
e-Learning Portal
PSMS
BITS-ERP
Gmail
Microsoft Azure
BITS e-Services
It works!
This is the default web page for this server.
The web server software is running but no content has been added, yet.

*F:\BITS-Pilani\BITS-WILP\Subjects\CloudComputing\SW\heat-templates\cirros_2instances.yaml - Notepad++

File Edit Search View Encoding Language Settings Macro Run Plugins Window ?

devstack_local_conf.txt | wordpress.yaml | server-with-vol.yaml | new 3 | Openstack-Commands.txt | Devstack_screen_tut.txt | new 6 | cirros_2instances.yaml

```yaml
heat_template_version: 2015-12-16
description: A simple server.
resources:
  server1:
    type: OS::Nova::Server
    properties:
      block_device_mapping:
        - device_name: vda
          delete_on_termination: true
          volume_id: { get_resource: volume1 }
      flavor: m1.nano
      networks:
        - network: private
  volume1:
    type: OS::Cinder::Volume
    properties:
      image: 'cirros-0.3.4-x86_64-uec'
      size: 1
  server2:
    type: OS::Nova::Server
    properties:
      block_device_mapping:
        - device_name: vda
          delete_on_termination: true
          volume_id: { get_resource: volume2 }
      flavor: m1.nano
      networks:
        - network: private
  volume2:
    type: OS::Cinder::Volume
    properties:
      image: 'cirros-0.3.4-x86_64-uec'
      size: 1
```

02:36

Stack Details - OpenStack

192.168.0.103/project/stacks/stack/81b9f21d-a335-4b77-91f2-7678c3b83def/

Apps | Gmail | PSMS | Guest Faculty | OS | The Nutanix Bible - ... | Docker Tutorial Seri...

Network

Object Store

Orchestration

Stacks

Resource Types

Database

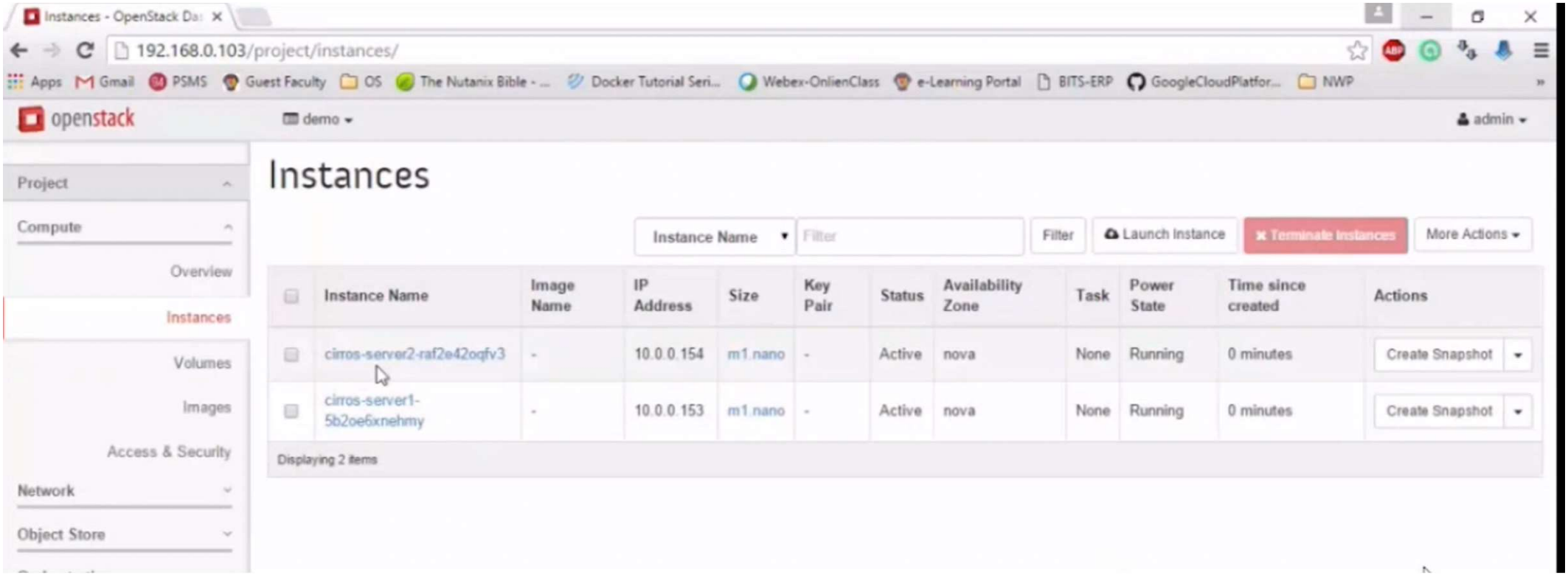
Admin

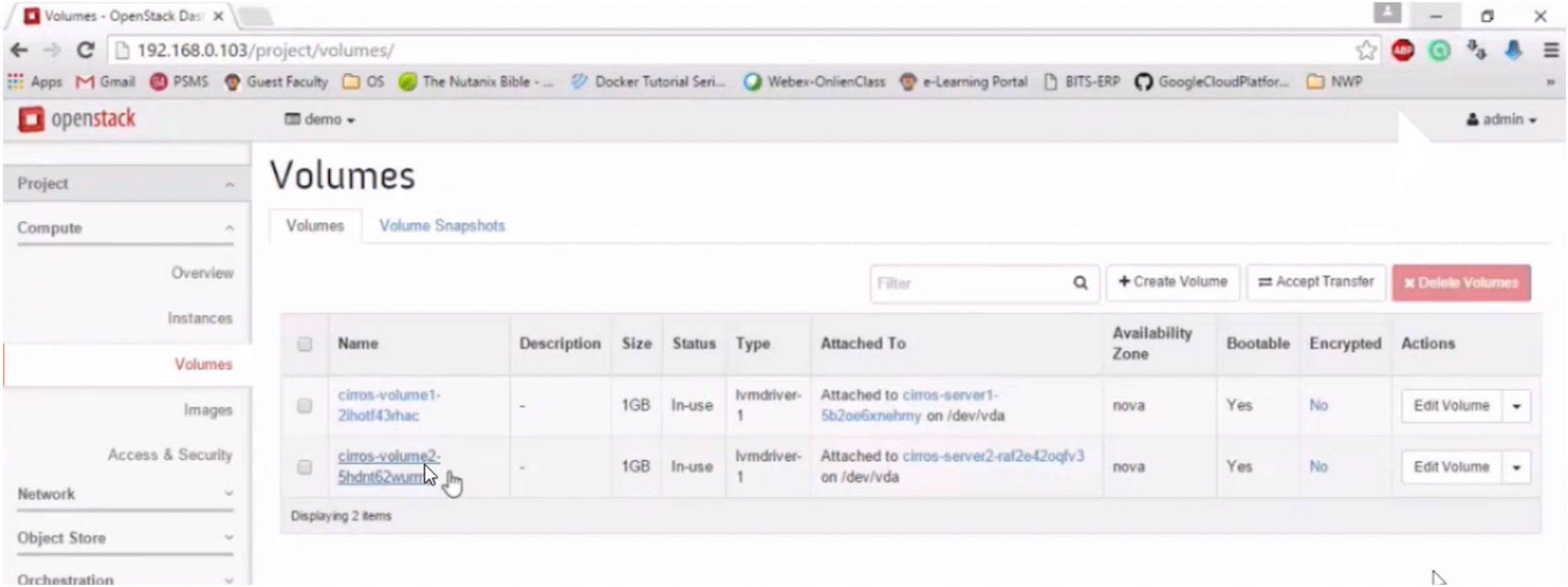
Identity

Topology | Overview | Resources | Events | Template

Stack Template

```
description: A simple server.
heat_template_version: '2014-10-16'
resources:
  server1:
    properties:
      block_device_mapping:
      - delete_on_termination: true
        device_name: vda
        volume_id: {get_resource: volume1}
      flavor: m1.nano
      networks:
      - {network: private}
    type: OS::Nova::Server
  server2:
    properties:
      block_device_mapping:
      - delete_on_termination: true
        device_name: vda
        volume_id: {get_resource: volume2}
      flavor: m1.nano
      networks:
      - {network: private}
    type: OS::Nova::Server
  volume1:
    properties: {image: cirros-0.3.4-x86_64-uec, size: 1}
    type: OS::Cinder::Volume
  volume2:
    properties: {image: cirros-0.3.4-x86_64-uec, size: 1}
    type: OS::Cinder::Volume
```


Instances - OpenStack Da
192.168.0.103/project/instances/
Apps Gmail PSMS Guest Faculty OS The Nutanix Bible - ... Docker Tutorial Seri... Webex-OnlienClass e-Learning Portal BITS-ERP GoogleCloudPlatfor... NWP
openstack
demo
admin
Project
Compute
Overview
Instances
Volumes
Images
Access & Security
Network
Object Store
Instances
Instance Name
Filter
Filter
Launch Instance
Terminate Instances
More Actions
Instance Name
Image Name
IP Address
Size
Key Pair
Status
Availability Zone
Task
Power State
Time since created
Actions
cirros-server2-raf2e42oqfv3
-
10.0.0.154
m1.nano
-
Active
nova
None
Running
0 minutes
Create Snapshot
cirros-server1-5b2oe6xnehmy
-
10.0.0.153
m1.nano
-
Active
nova
None
Running
0 minutes
Create Snapshot
Displaying 2 items


Volumes - OpenStack Das
192.168.0.103/project/volumes/
Apps Gmail PSMS Guest Faculty OS The Nutanix Bible - ... Docker Tutorial Seri... Webex-OnlienClass e-Learning Portal BITS-ERP GoogleCloudPlatfor... NWP
openstack
demo
admin
Project
Compute
Overview
Instances
Volumes
Images
Access & Security
Network
Object Store
Orchestration
Volumes
Volumes
Volume Snapshots
Filter
+ Create Volume
Accept Transfer
Delete Volumes
Name
Description
Size
Status
Type
Attached To
Availability Zone
Bootable
Encrypted
Actions
cirros-volume1-2ihotf43rhac
-
1GB
In-use
lvmdriver-1
Attached to cirros-server1-5b2oe6xnehmy on /dev/vda
nova
Yes
No
Edit Volume
cirros-volume2-5hdnt62wum
-
1GB
In-use
lvmdriver-1
Attached to cirros-server2-raf2e42oqfv3 on /dev/vda
nova
Yes
No
Edit Volume
Displaying 2 items

VM Provisioning using templates

- Provisioning from a template reduces the time required to create a new virtual machine.
- Administrators can create different templates for different purposes.

  For example –
- Vagrant provision tool using VagrantFile (template file) (demo)
- Heat – Orchestration Tool of openstack (Heat template in YAML format)

(demo – Instance creation in cloud, Load balancer in cloud)

This enables the administrator to quickly provision a correctly configured virtual server on demand.

Virtual Machine Migration Services

Migration service -

The process of moving a virtual machine from one host server or storage location to another;

There are different techniques of VM migration-

- Hot/live migration,
- Cold/regular migration, and

In this process, all key machines' components, such as CPU, storage disks, networking, and memory, are completely virtualized, thereby facilitating the entire state of a virtual machine to be captured by a set of easily moved data files.

Why Live VM Migration?

Why Migrate?

- Load Balancing
  - Move VMs from highly loaded servers to lightly loaded servers
- Server maintenance
  - When server needs to be upgraded
- Energy savings
  - Move out VMs before shutting down servers to reduce energy usage

Cold/regular migration

Cold migration is the migration of a powered-off virtual machine and is done in the following tasks:

- If the option to move to a different datastore was chosen, the configuration files, including the NVRAM file (BIOS settings), and log files are moved from the source host to the destination host's associated storage area. If you chose to move the virtual machine's disks, these are also moved.
- The virtual machine is registered with the new host.
- After the migration is completed, the old version of the virtual machine is deleted from the source host if the option to move to a different datastore was chosen.

Live/Hot migration Technique

Why live?

- To keep long-running jobs alive
- To keep network connections alive
- Broadly, to avoid disruptions to users of VM

Why VM?

- Why not migrate individual processes?
- Process migration may leave residual dependencies (state) at source host
- E.g.
  - system call redirection,
  - shared memory,
  - open files,
  - inter-processcommunication, etc.

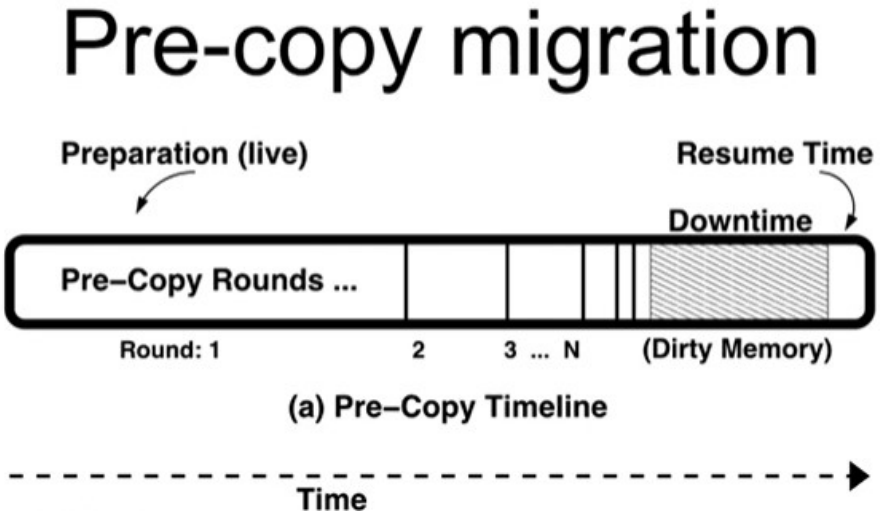
Performance Goals in Live Migration

- Minimizing Downtime
- Reducing total migration time
- Avoiding interference with normal system activity
- Minimizing network activity

Migrating Memory

- Pure stop-and-copy
  - Freeze VM at source
  - Copy the VM''s pseudo-physical memory contents to target
  - Restart VM at target
  - Long downtime
  - Minimal total migration time = downtime
- Pure Demand Paging:
  - Freeze VM at source
  - Copy minimal execution context to target
  - PC, Registers, non-pageable memory
  - Restart VM at target
  - Pull memory contents form source as and when needed
  - Smaller downtime
  - Slow warm-up phase at target during page-faults across network

Pre-copy migration



DON'T freeze VM at source

- Let the VM continue to run

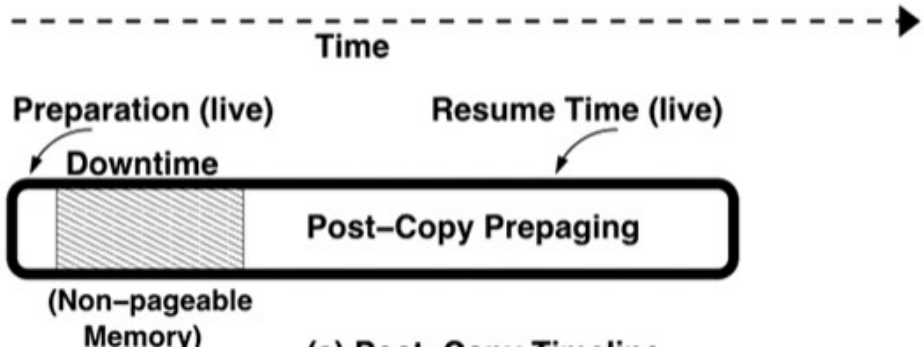
Copy VM's pseudo-physical memory contents to target over multiple iterations

- First iteration →copy all pages.
- Each subsequent iteration→ copy pages that were dirtied by the VM during the previous iteration
- Do a short stop-and-copy when number of dirty pages is "small enough".
- But what if number of dirty pages never converges to a small enough number?
  - After a fixed number of iterations, give up and stop-and-copy.

How do we track dirtied pages?

- Mark the VM's memory pages as read-only after each iteration.
- Trap write operations via hypervisor to xend and track dirtied pages.
- Reset after each iteration
- Works well as long as writes are infrequent

Post-copy migration

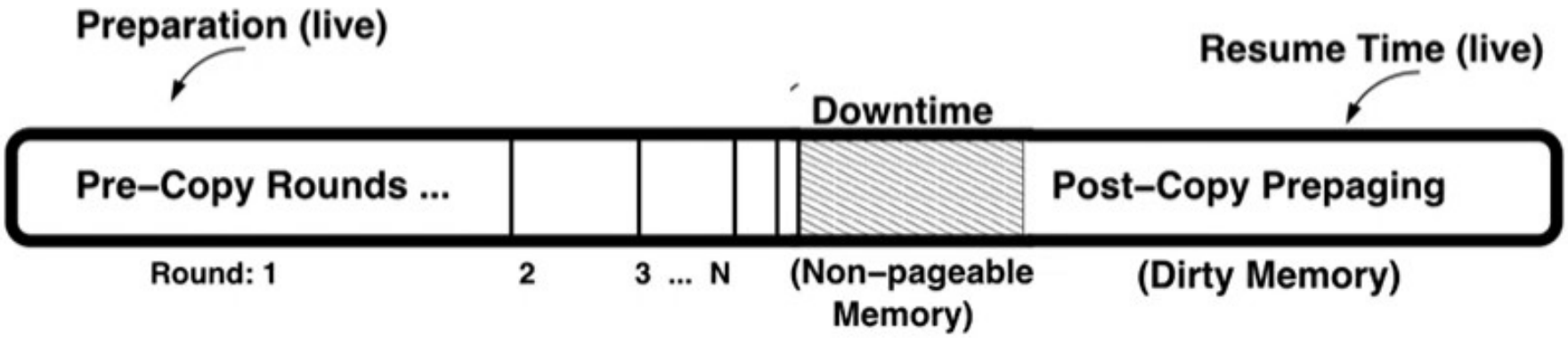


Freeze the VM first
Migrate CPU state and minimum state to destination
Start VM at the target, but without its memory!
Transfer memory by concurrently doing the following

- Demand paging over network
- Actively pushing from source
- Hopefully most pages will be pushed BEFORE they are demand paged.

Advantage:
  Each page transferred over the network only once.
  Deterministic total migration time
Disadvantage:
  Cold start penalty at the destination
  If migration fails, then VM is lost.

Hybrid pre/post-copy



combines the benefits & drawbacks of both

1. Perform one or more rounds of live pre-copy rounds
2. Pause VM and transfer execution state
3. Use post-copy to transfer any remaining dirty pages from source

Migrating Network Connections

Within a LAN

- the migrated VM carries its IP address, MAC address, and all protocol state, including any open sockets

Backward (re)learning delay at the network switches

- Switches needs to re-learn the new location of migrated VM's MAC address
- Solution: Send an unsolicited ARP reply from the target host.
- Intermediate switches will re-learn automatically.
- Few in-flight packets might get lost.

Across a WAN (wide-area network)

- Source and destination subnets may have different IP addresses.
- Active network connections may need to be tunneled via VPN or similar mechanisms.

Storage Migration

Many gigabytes of local disk image to migrate

For LAN

- Assume the storage is over the network and remains accessible from the new target machine.
- E.g. Network File System (NFS), or Network Block Device(NBD), or iSCSI etc.

For WAN

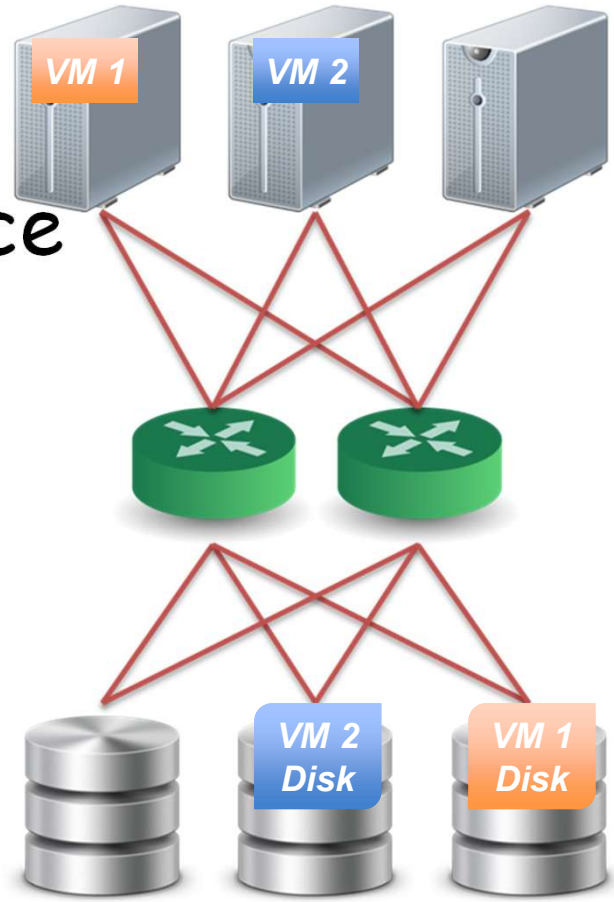
Disk image may need to be transferred.

- Can use pre-copy or post-copy for disk images
- Combined bandwidth saving optimizations such as compression, and/or de-duplication.

Live Migration Technique

Pre-assumption :

- We assume that all storage resources are separated from computing resources.
- Storage devices of VMs are attached from network :
  - **NAS**: NFS, CIFS
  - **SAN**: Fibre Channel
  - **iSCSI**, network block device
  - **drdb** network RAID
- Require high quality network connection
  - Common L2 network (LAN)
  - L3 re-routing



Live Migration Technique

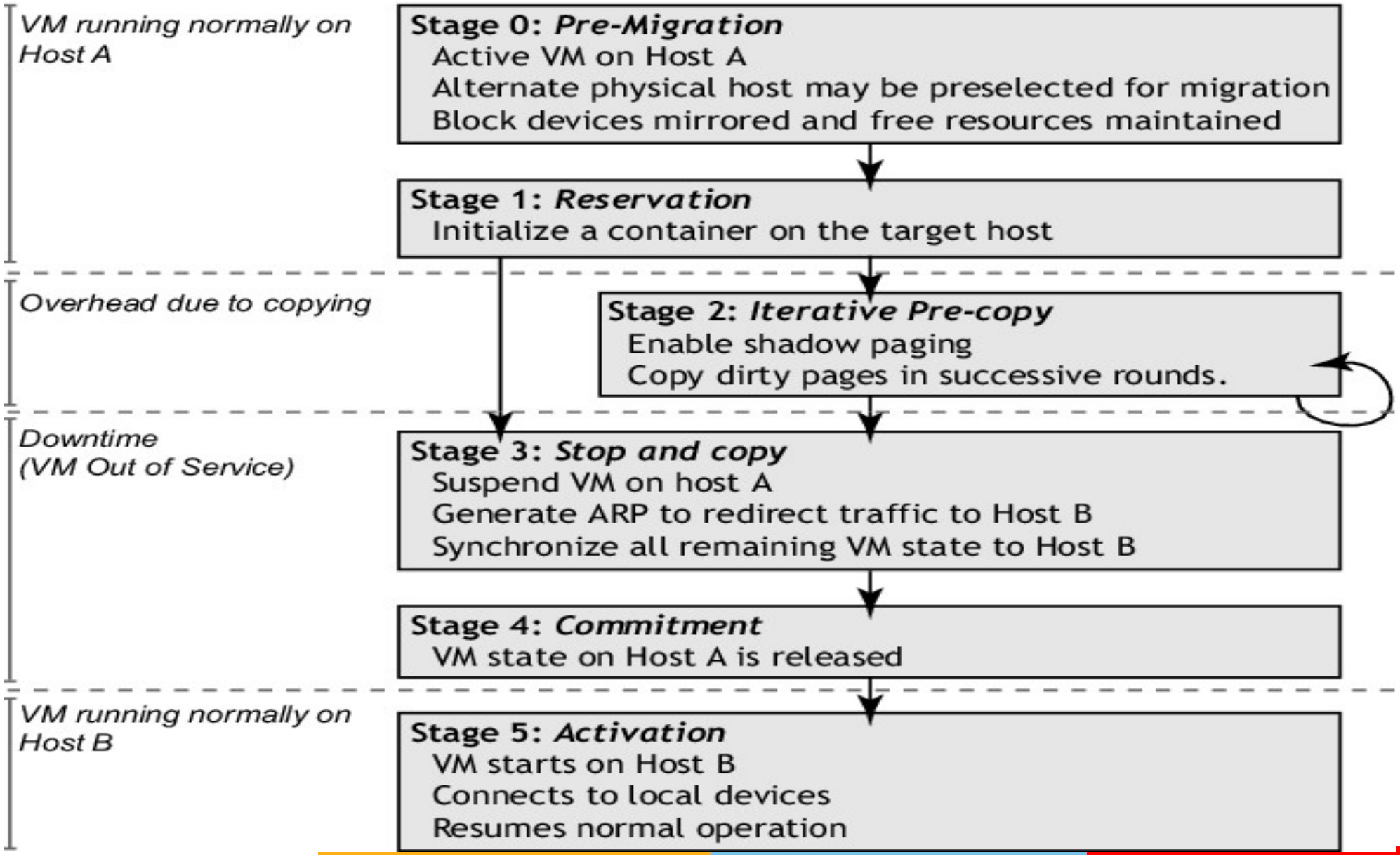
Challenges of live migration :

- VMs have lots of state in memory
- Some VMs have soft real-time requirements :
  - For examples, web servers, databases and game servers, ...etc.
  - Need to minimize down-time

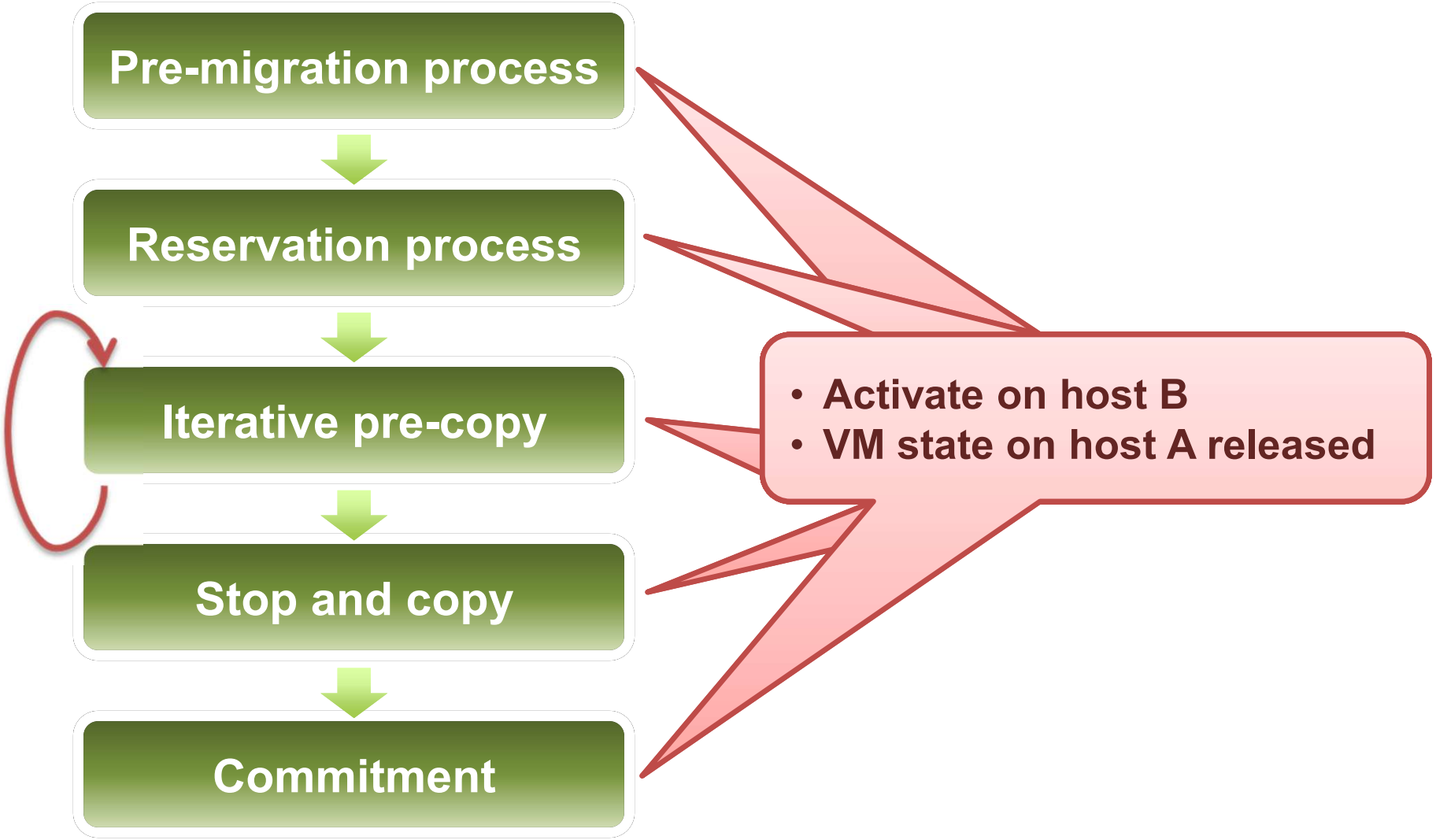
Relocation strategy :

1. Pre-migration process
2. Reservation process
3. Iterative pre-copy
4. Stop and copy
5. Commitment

Live Migration Technique



Live Migration Technique

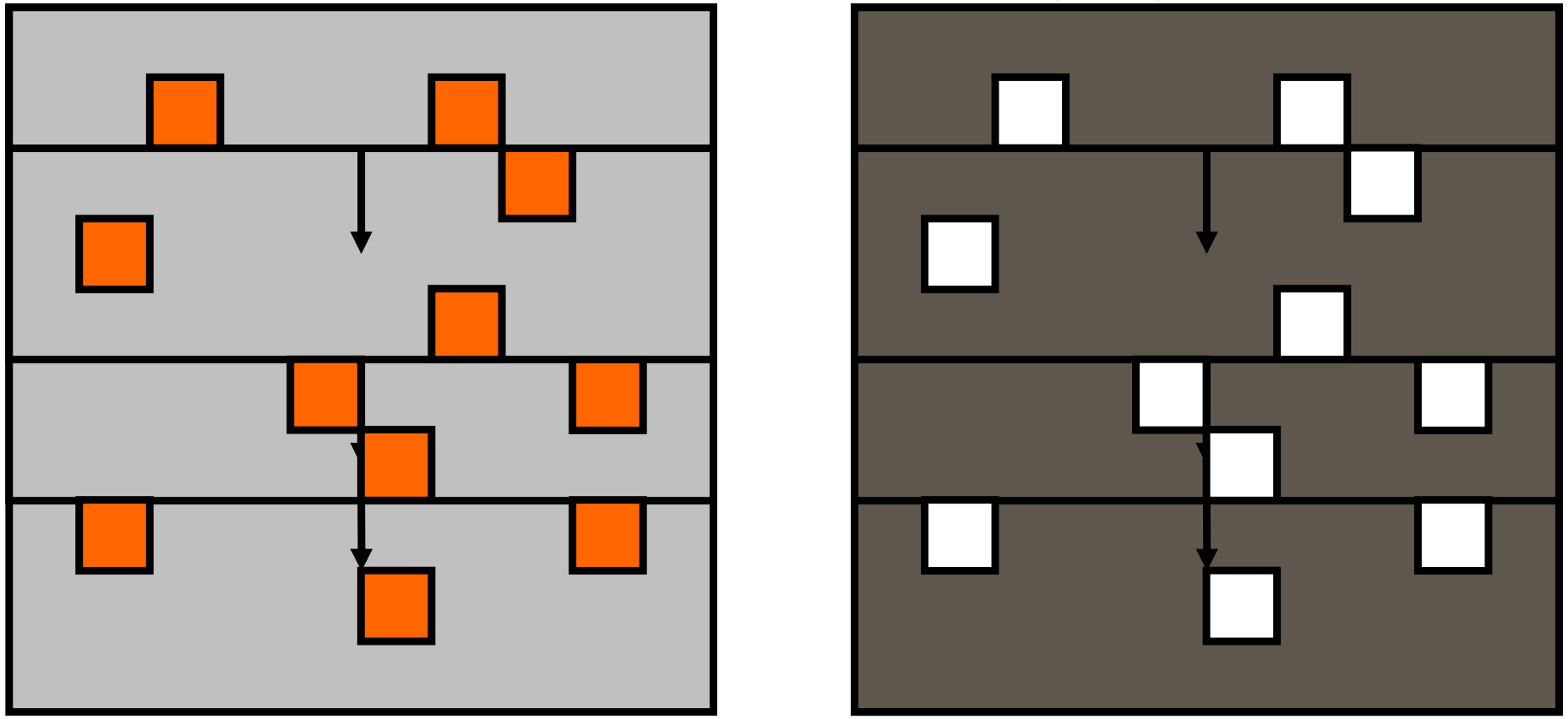


Live Migration Technique

Live migration process :

Pre-copy migration : Round 1,

Enable Shadow Paging

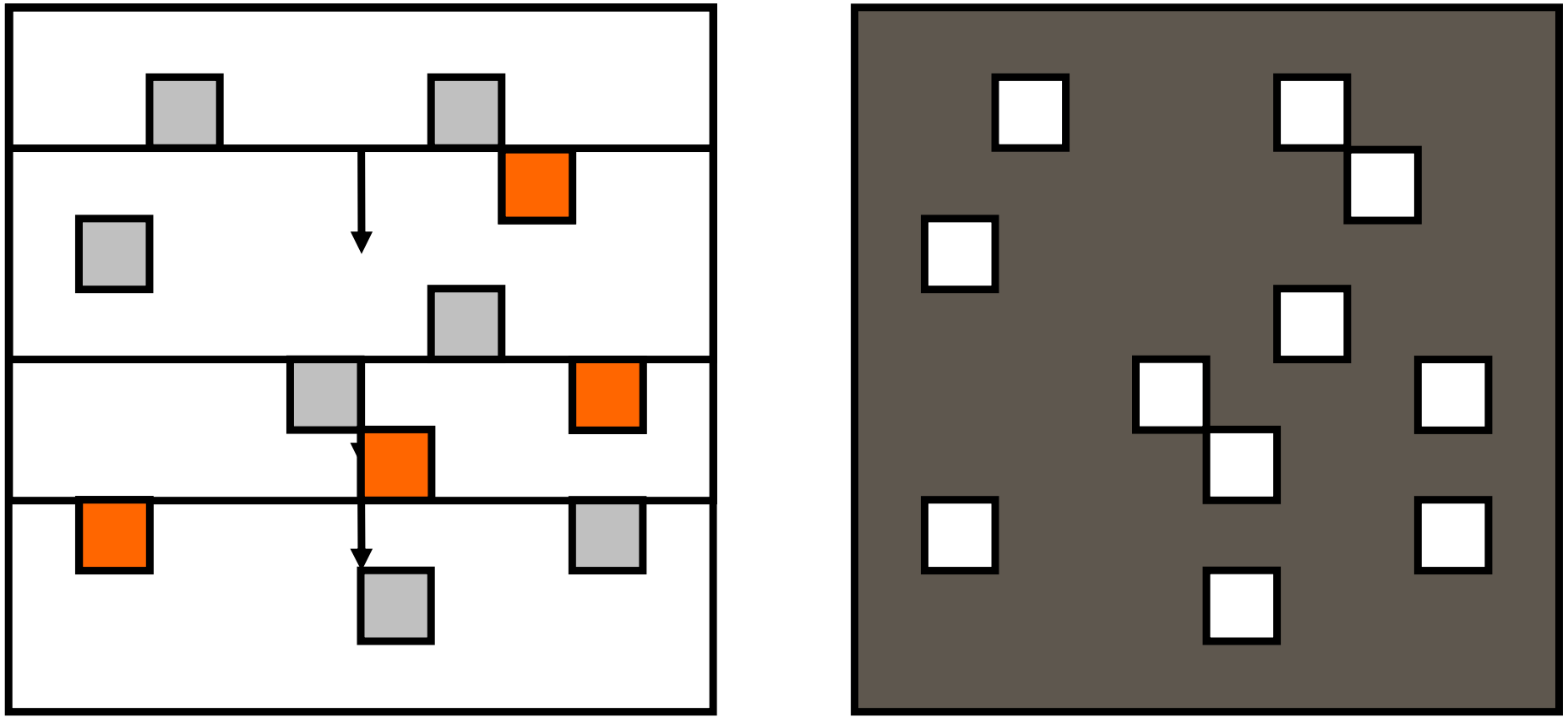


Host A ***Host B***

Live Migration Technique

Live migration process :

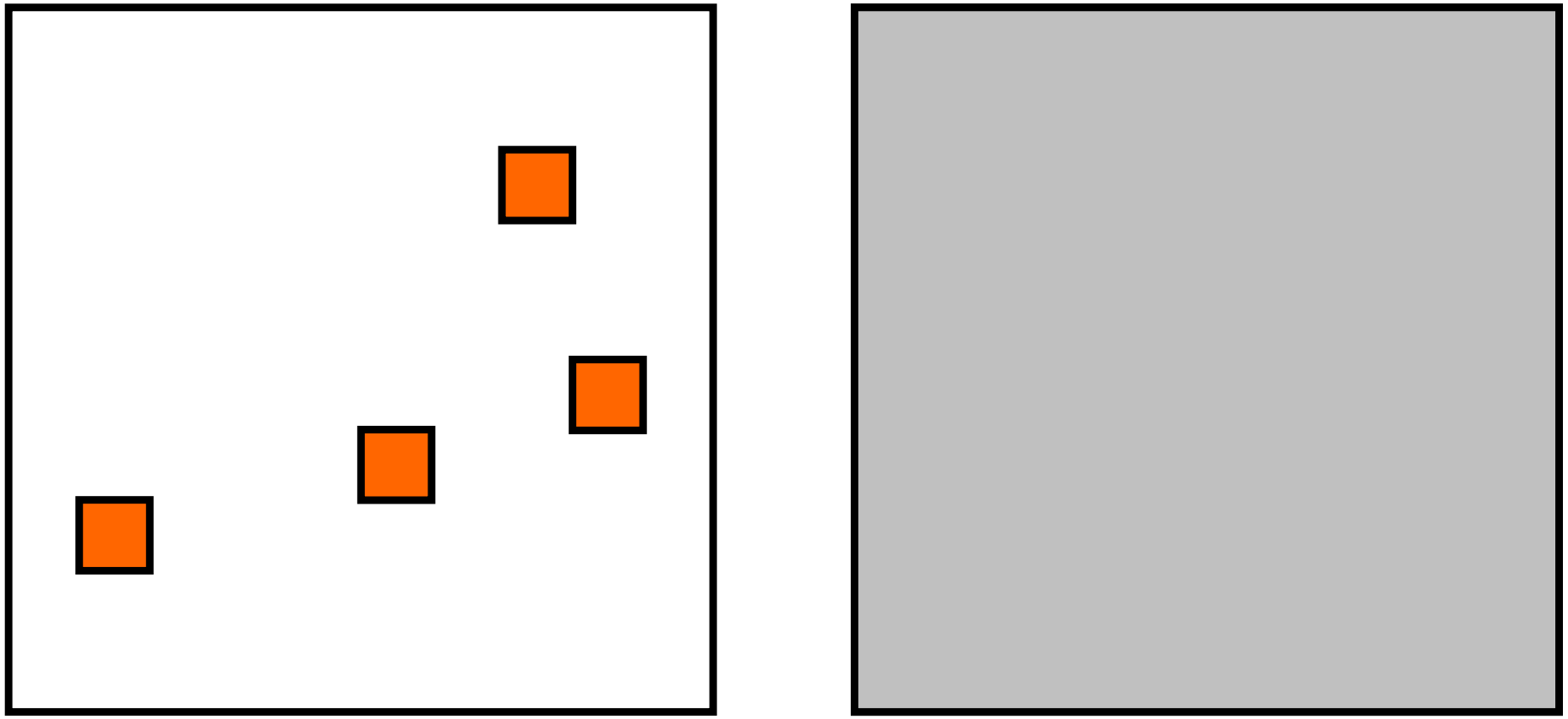
Pre-copy migration : Round 2



Live Migration Technique

Live migration process :

Stop and copy : Final Round



Proxmox Intro

- Using Proxmox deployment tool
- It is an Open Source Tool

proxmox1 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

```
root@bits:~# pvecm create mycluster
Corosync Cluster Engine Authentication key generator.
Gathering 1024 bits for key from /dev/urandom.
Writing corosync key to /etc/corosync/authkey.
```

```
root@bits:~# pvecm status
Quorum information
------------------
Date:             Thu Dec 31 23:50:57 2015
Quorum provider:  corosync_votequorum
Nodes:            1
Node ID:          0x00000001
Ring ID:          4
Quorate:          Yes

Votequorum information
----------------------
Expected votes:   1
Highest expected: 1
Total votes:      1
Quorum:           1
Flags:            Quorate

Membership information
----------------------
    Nodeid      Votes Name
0x00000001          1 192.168.0.102 (local)
root@bits:~# _
```

proxmox1 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

```
Gathering 1024 bits for key from /dev/urandom.
Writing corosync key to /etc/corosync/authkey.
root@bits:~# pvecm status
Quorum information
------------------
Date:             Thu Dec 31 23:50:57 2015
Quorum provider:  corosync_votequorum
Nodes:            1
Node ID:          0x00000001
Ring ID
Quorate

Votequo
-------
Expecte
Highest
Total v
Quorum:
Flags:

Members
-------
    Nod
0x00000
root@bi
```

proxmox2 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

```
root@bits2:~# pvecm add 192.168.0.102
The authenticity of host '192.168.0.102 (192.168.0.102)' can't be estab
ECDSA key fingerprint is 80:cc:71:70:2e:0b:76:97:9d:f1:e2:7c:5e:db:49:e
Are you sure you want to continue connecting (yes/no)? _
```

proxmox1 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

```
athering 1024 bits for key from /dev/urandom.
riting corosync key to /etc/corosync/authkey.
oot@bits:~# pvecm status
uorum information
---------------------
ate:             Thu Dec 31 23:50:57 2015
uorum provider:  corosync_votequorum
odes:            1
ode ID:          0x00000001
ing ID
uorate

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ighest
otal v
uorum:
lags:

embers
------
   Mod
x00000
oot@bi
```

proxmox2 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

```
root@bits2:~# pvecm add 192.168.0.102
The authenticity of host '192.168.0.102 (192.168.0.102)' can't be establ
ECDSA key fingerprint is 80:cc:71:70:2e:0b:76:97:9d:f1:e2:7c:5e:db:49:e0
Are you sure you want to continue connecting (yes/no)? yes
root@192.168.0.102's password:
copy corosync auth key
stopping pve-cluster service
backup old database
waiting for quorum...OK
generating node certificates
merge known_hosts file
restart services
successfully added node 'bits2' to cluster.
root@bits2:~# _
```

proxmox1 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

```
Gathering 1024 bits for key from /dev/urandom.
Writing corosync key to /etc/corosync/authkey.
root@bits:~# pvecm status
Quorum information
------------------
Date:             Thu Dec 31 23:50:57 2015
Quorum provider:  corosync_votequorum
Nodes:            1
Node ID:          0x00000001
Ring ID
Quorate

Votequo
-------
Expecte
Highest
Total v
Quorum:
Flags:

Members
-------
    Nod
0x00000
root@bi
```

proxmox2 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

```
successfully added node 'bits2' to cluster.
root@bits2:~# pvecm status
Quorum information
------------------
Date:             Thu Dec 31 23:52:05 2015
Quorum provider:  corosync_votequorum
Nodes:            2
Node ID:          0x00000002
Ring ID:          8
Quorate:          Yes

Votequorum information
----------------------
Expected votes:   2
Highest expected: 2
Total votes:      2
Quorum:           2
Flags:            Quorate

Membership information
----------------------
    Nodeid      Votes Name
0x00000001          1 192.168.0.102
0x00000002          1 192.168.0.103 (local)
root@bits2:~#
```

Proxmox Virtual Environm

https://192.168.0.102:8006/#v1:0:18:4::::

Apps | Gmail | PSMS | Guest Faculty | OS | The Nutanix Bible - ... | Docker Tutorial Seri... | Webex-OnlienClass | e-Learning Portal | BITS-

PROXMOX

Proxmox Virtual Environment
Version: 4.1-1/2f9650d4

Server View

- Datacenter
  - bits
    - local (bits)
  - bits2

Datacenter

Search | Summary | Options | Storage | Backup | Users | Groups | Pools | Permissions | Roles | Authentication

Type	Description	Disk usage	Memory usage	CPU usage	Uptime
node	bits	18.7%	20.0%	1.6% of 1CPU	00:32:36
node	bits2	23.7%	18.8%	1.1% of 1CPU	00:03:10
storage	local (bits)	0.3%			-
storage	local (bits2)	0.3%			-

Tasks | Cluster log

Start Time	End Time	Node	User name	Description
Dec 31 23:49:39	Dec 31 23:49:39	bits2	root@pam	Start all VMs and Containers
Dec 31 23:20:12	Dec 31 23:20:12	bits	root@pam	Start all VMs and Containers

proxmox1 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

```
root@bits:~# apt-get update
Ign http://ftp.debian.org jessie InRelease
Get:1 http://ftp.debian.org jessie Release.gpg [2,373 B]
Get:2 http://security.debian.org jessie/updates InRelease [63.1 kB]
Get:3 http://ftp.debian.org jessie Release [148 kB]
Get:4 http://security.debian.org jessie/updates/main amd64 Packages
Get:5 http://ftp.debian.org jessie/main amd64 Packages [6,764 kB]
Get:6 http://security.debian.org jessie/updates/contrib amd64 Packag
Get:7 http://security.debian.org jessie/updates/contrib Translation-
Get:8 http://security.debian.org jessie/updates/main Translation-en
Get:9 https://enterprise.proxmox.com jessie InRelease [401 B]
Ign https://enterprise.proxmox.com jessie InRelease
Get:10 https://enterprise.proxmox.com jessie Release.gpg [401 B]
Ign https://enterprise.proxmox.com jessie Release.gpg
Get:11 https://enterprise.proxmox.com jessie Release [401 B]
Ign https://enterprise.proxmox.com jessie Release
Get:12 https://enterprise.proxmox.com jessie/pve-enterprise amd64 Pa
B]
Get:13 https://enterprise.proxmox.com jessie/pve-enterprise Translat
01 B]
Get:14 https://enterprise.proxmox.com jessie/pve-enterprise Translat
B]
Get:15 https://enterprise.proxmox.com jessie/pve-enterprise amd64 Pa
B]
26% [5 Packages 1,435 kB/6,764 kB 21%] [15 Packages 0 B/401 B 0%]_
```

Installing the NFS-Kernel-Server

proxmox1 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

```
root@bits:~# apt-get install nfs-kernel-server
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  nfs-kernel-server
0 upgraded, 1 newly installed, 0 to remove and 36 not upgraded.
Need to get 115 kB of archives.
After this operation, 515 kB of additional disk space will be used.
0% [Working]_
```

proxmox1 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

```
Get:1 http://ftp.debian.org/debian/ jessie/main nfs-kernel-server amd64
9 [115 kB]
Fetched 115 kB in 0s (125 kB/s)
Selecting previously unselected package nfs-kernel-server.
(Reading database ... 37624 files and directories currently installed.)
Preparing to unpack .../nfs-kernel-server_1%3a1.2.8-9_amd64.deb ...
Unpacking nfs-kernel-server (1:1.2.8-9) ...
Processing triggers for man-db (2.7.0.2-5) ...
Processing triggers for systemd (215-17+deb8u2) ...
[ 2121.750782] systemd-sysv-generator[3219]: Ignoring creation of an al
iscsi.service for itself
Setting up nfs-kernel-server (1:1.2.8-9) ...

Creating config file /etc/exports with new version

Creating config file /etc/default/nfs-kernel-server with new version
[ 2123.435552] systemd-sysv-generator[3411]: Ignoring creation of an al
iscsi.service for itself
[ 2123.576314] systemd-sysv-generator[3441]: Ignoring creation of an al
iscsi.service for itself
Processing triggers for systemd (215-17+deb8u2) ...
[ 2123.721913] systemd-sysv-generator[3462]: Ignoring creation of an al
iscsi.service for itself
root@bits:~# cp -a /etc/exports /etc/exports.backup
root@bits:~# vim.tiny /etc/exports_
```

proxmox1 [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

```
# /etc/exports: the access control list for filesystems which may be exported
#               to NFS clients.  See exports(5).
#
# Example for NFSv2 and NFSv3:
# /srv/homes       hostname1(rw,sync,no_subtree_check) hostname2(ro,sync,no_su
ree_check)
#
# Example for NFSv4:
# /srv/nfs4        gss/krb5i(rw,sync,fsid=0,crossmnt,no_subtree_check)
# /srv/nfs4/homes  gss/krb5i(rw,sync,no_subtree_check)
#
~
~
```

Creating a VM at Server-1

Proxmox Virtual Environm

https://192.168.0.102:8006/#v1:2:=storage%2Fbits%2Fnfs1:4:5:19:::2

Apps | Gmail | PSMS | Guest Faculty | OS | The Nutanix Bible - ... | Docker Tutorial Seri... | Webex-OnlienClass | e-Learning Portal | BITS-ERP

PROXMOX

Proxmox Virtual Environment
Version: 4.1-1/2f9650d4

Storage View

- Datacenter
  - bits
    - local (bits)
    - nfs1 (bits)
  - bits2
    - local (bits2)
    - nfs1 (bits2)

Storage 'nfs1' on node 'bits'

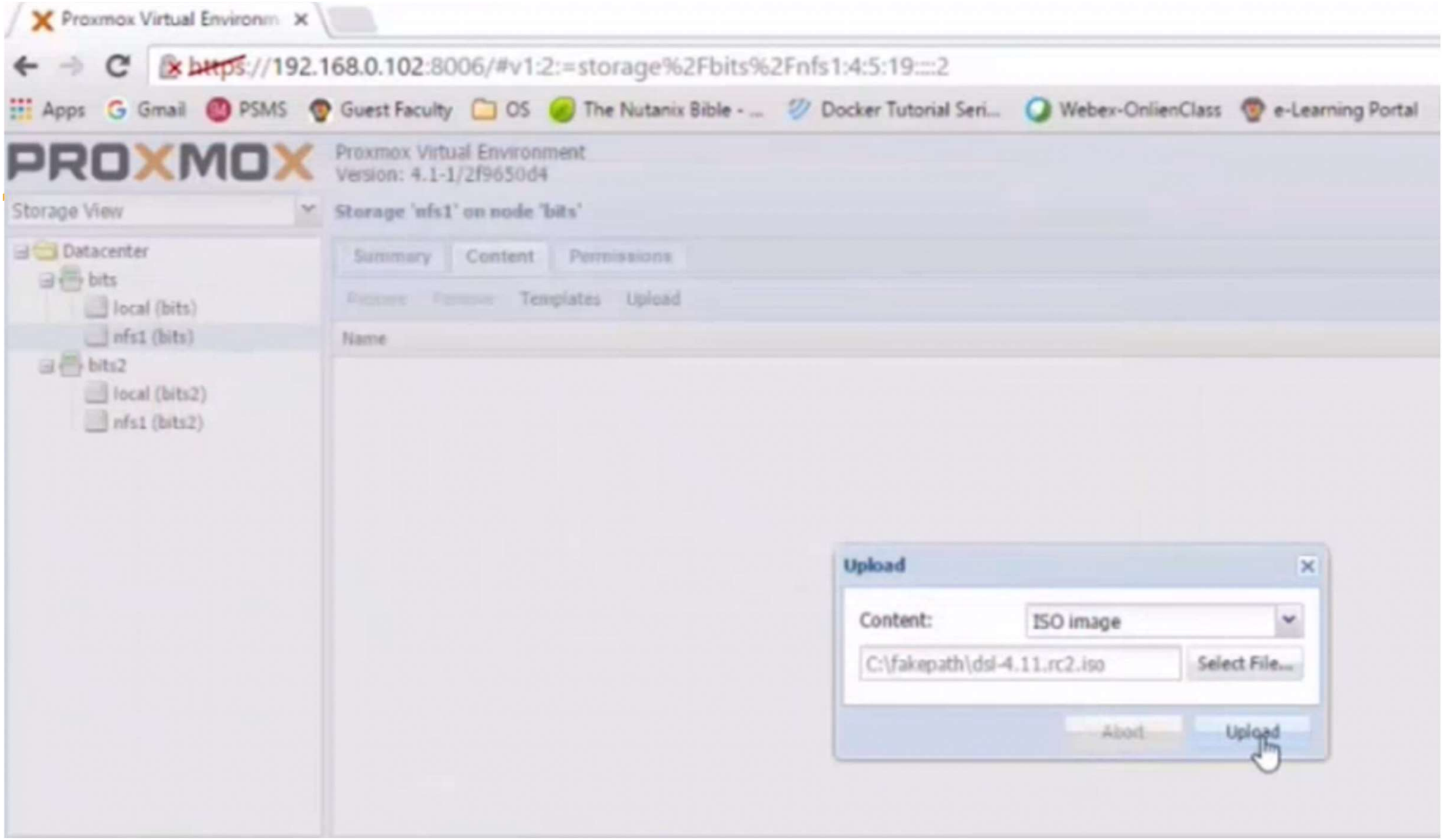
Summary | Content | Permissions

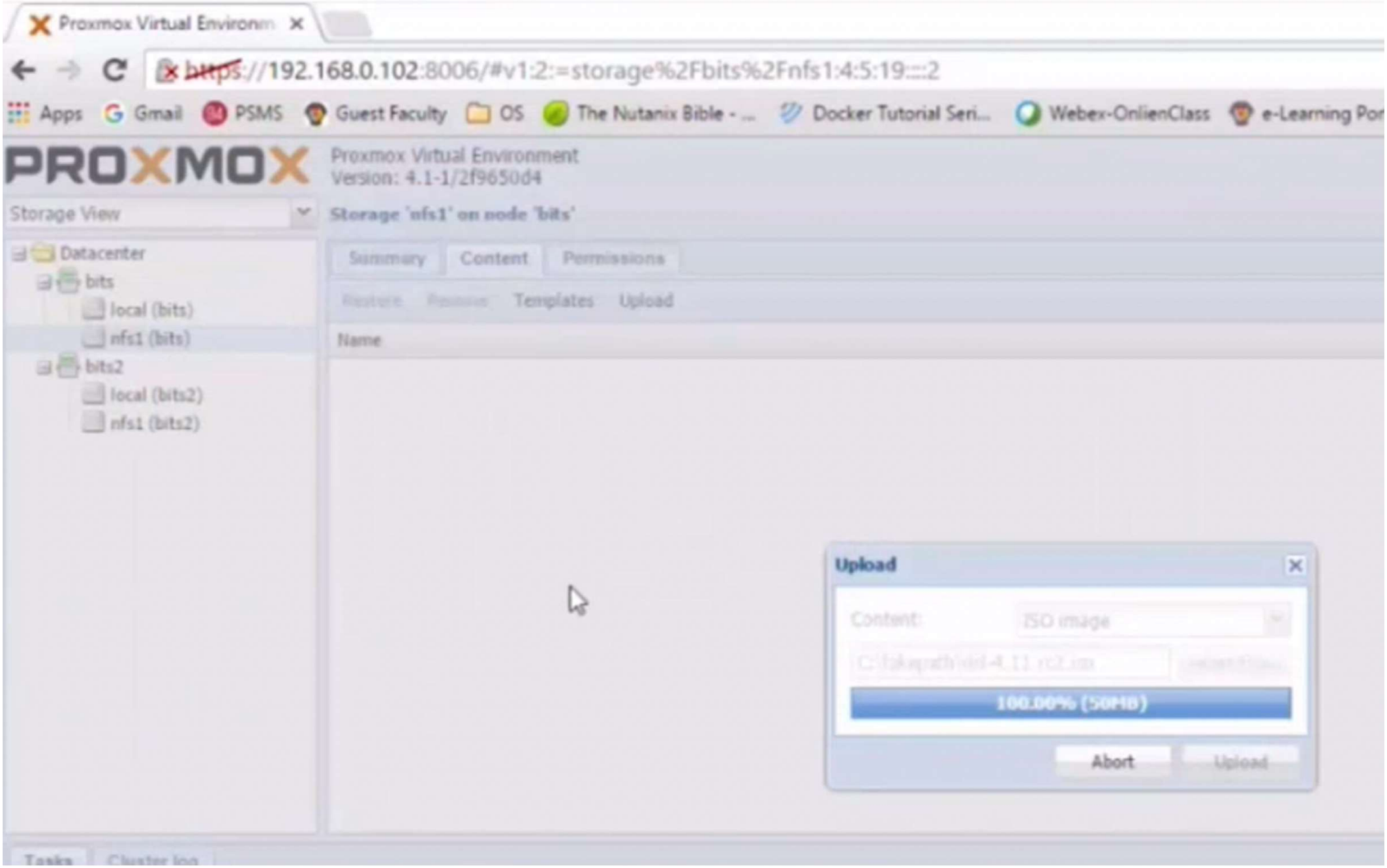
Restore | Remove | Templates | Upload

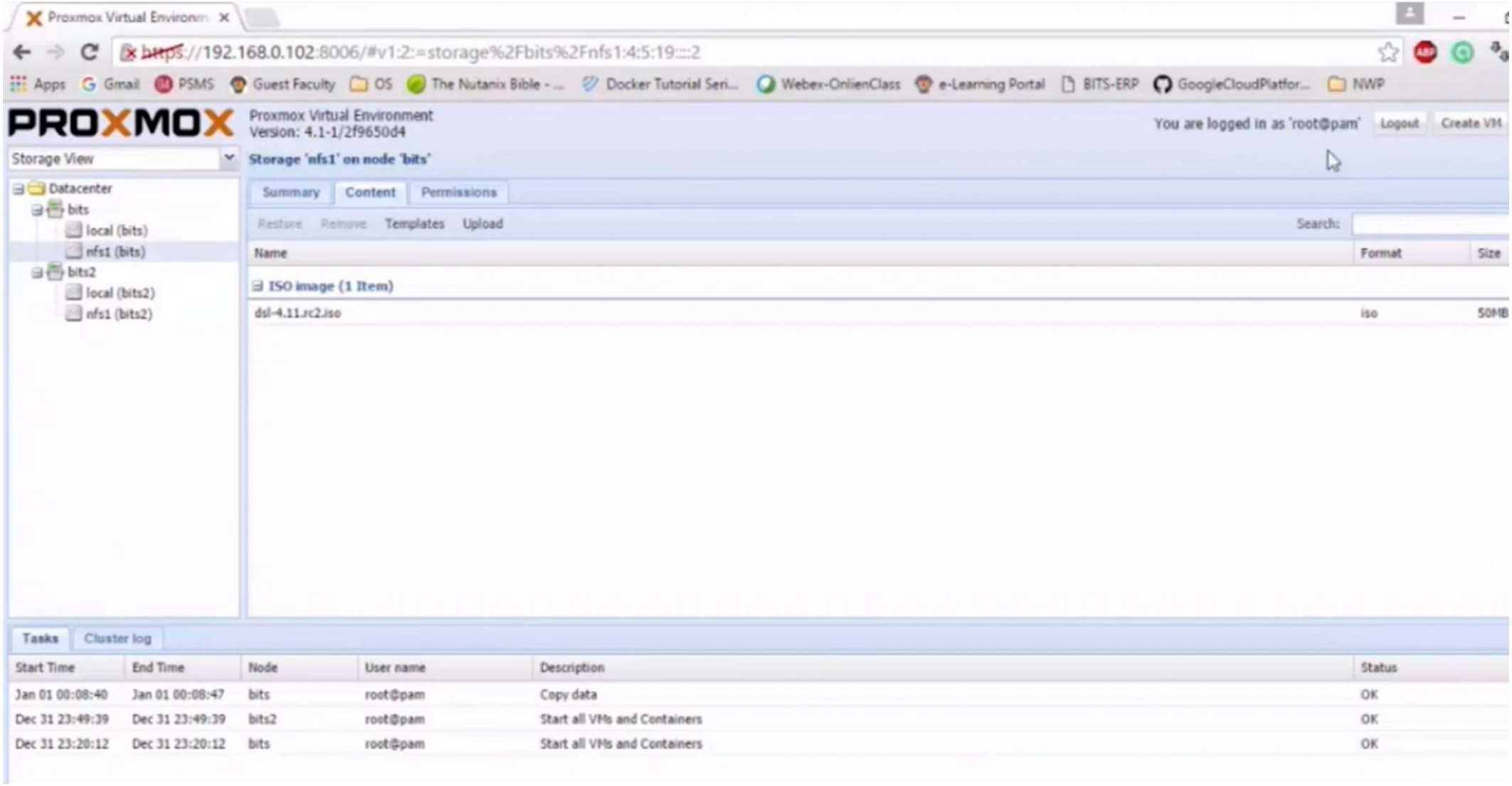
Name

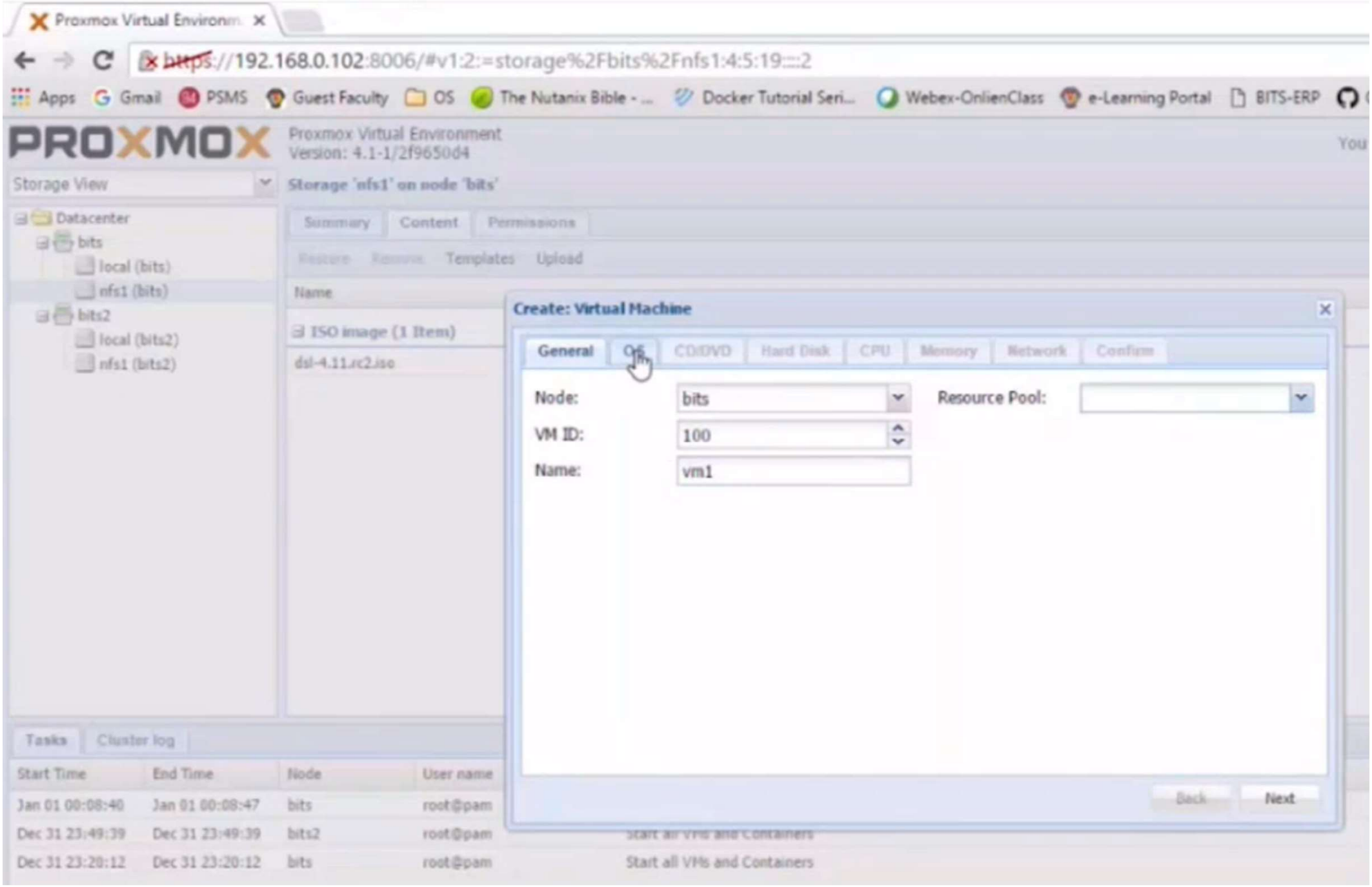
Tasks | Cluster log

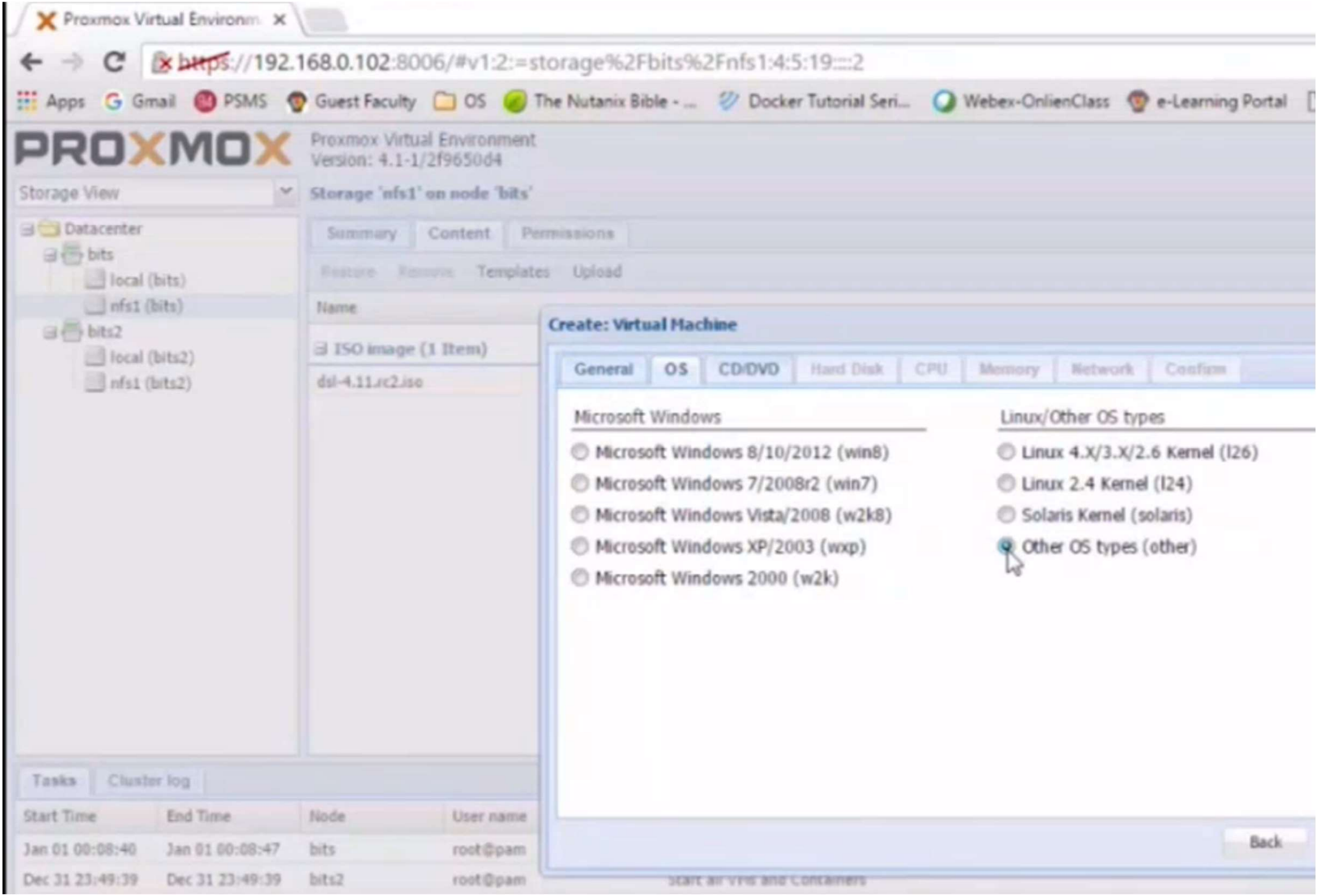
Start Time	End Time	Node	User name	Description
Dec 31 23:49:39	Dec 31 23:49:39	bits2	root@pam	Start all VMs and Containers
Dec 31 23:20:12	Dec 31 23:20:12	bits	root@pam	Start all VMs and Containers


Proxmox Virtual Environm
https://192.168.0.102:8006/#v1:2:=storage%2Fbits%2Fnfs1:4:5:19:::2
Apps
Gmail
PSMS
Guest Faculty
OS
The Nutanix Bible - ...
Docker Tutorial Seri...
Webex-OnlienClass
e-Learning Portal
PROXMOX
Proxmox Virtual Environment
Version: 4.1-1/2f9650d4
Storage View
Storage 'nfs1' on node 'bits'
Datacenter
bits
local (bits)
nfs1 (bits)
bits2
local (bits2)
nfs1 (bits2)
Summary
Content
Permissions
Templates
Upload
Name
Upload
Content:
ISO image
C:\fakepath\dsl-4.11.rc2.iso
Select File...
Abort
Upload


Proxmox Virtual Environm
https://192.168.0.102:8006/#v1:2:=storage%2Fbits%2Fnfs1:4:5:19:::2
Apps
Gmail
PSMS
Guest Faculty
OS
The Nutanix Bible - ...
Docker Tutorial Seri...
Webex-OnlienClass
e-Learning Por
PROXMOX
Proxmox Virtual Environment
Version: 4.1-1/2f9650d4
Storage View
Storage 'nfs1' on node 'bits'
Datacenter
bits
local (bits)
nfs1 (bits)
bits2
local (bits2)
nfs1 (bits2)
Summary
Content
Permissions
Restore
Remove
Templates
Upload
Name
Upload
Content:
ISO image
100.00% (50MB)
Abort
Upload
Tasks
Cluster log


Proxmox Virtual Environm
https://192.168.0.102:8006/#v1:2:=storage%2Fbits%2Fnfs1:4:5:19:::2
Apps Gmail PSMS Guest Faculty OS The Nutanix Bible - ... Docker Tutorial Seri... Webex-OnlienClass e-Learning Portal BITS-ERP GoogleCloudPlatfor... NWP
PROXMOX
Proxmox Virtual Environment
Version: 4.1-1/2f9650d4
You are logged in as 'root@pam'
Logout
Create VM
Storage View
Storage 'nfs1' on node 'bits'
Datacenter
bits
local (bits)
nfs1 (bits)
bits2
local (bits2)
nfs1 (bits2)
Summary
Content
Permissions
Restore
Remove
Templates
Upload
Search:
Name
Format
Size
ISO image (1 Item)
dsl-4.11.rc2.iso
iso
50MB
Tasks
Cluster log
Start Time
End Time
Node
User name
Description
Status
Jan 01 00:08:40
Jan 01 00:08:47
bits
root@pam
Copy data
OK
Dec 31 23:49:39
Dec 31 23:49:39
bits2
root@pam
Start all VMs and Containers
OK
Dec 31 23:20:12
Dec 31 23:20:12
bits
root@pam
Start all VMs and Containers
OK


Proxmox Virtual Environm
https://192.168.0.102:8006/#v1:2:=storage%2Fbits%2Fnfs1:4:5:19:::2
Apps
Gmail
PSMS
Guest Faculty
OS
The Nutanix Bible - ...
Docker Tutorial Seri...
Webex-OnlienClass
e-Learning Portal
BITS-ERP
PROXMOX
Proxmox Virtual Environment
Version: 4.1-1/2f9650d4
Storage View
Storage 'nfs1' on node 'bits'
Datacenter
bits
local (bits)
nfs1 (bits)
bits2
local (bits2)
nfs1 (bits2)
Summary
Content
Permissions
Restore
Remove
Templates
Upload
Name
ISO image (1 Item)
dsl-4.11.rc2.iso
Create: Virtual Machine
General
OS
CD/DVD
Hard Disk
CPU
Memory
Network
Confirm
Node:
bits
Resource Pool:
VM ID:
100
Name:
vm1
Back
Next
Tasks
Cluster log
Start Time
End Time
Node
User name
Jan 01 00:08:40
Jan 01 00:08:47
bits
root@pam
Dec 31 23:49:39
Dec 31 23:49:39
bits2
root@pam
Dec 31 23:20:12
Dec 31 23:20:12
bits
root@pam
Start all VMs and Containers


Proxmox Virtual Environm
https://192.168.0.102:8006/#v1:2:=storage%2Fbits%2Fnfs1:4:5:19:::2
Apps
Gmail
PSMS
Guest Faculty
OS
The Nutanix Bible - ...
Docker Tutorial Seri...
Webex-OnlienClass
e-Learning Portal
PROXMOX
Proxmox Virtual Environment
Version: 4.1-1/2f9650d4
Storage View
Storage 'nfs1' on node 'bits'
Datacenter
bits
local (bits)
nfs1 (bits)
bits2
local (bits2)
nfs1 (bits2)
Summary
Content
Permissions
Templates
Upload
Name
ISO image (1 Item)
dsl-4.11.rc2.iso
Create: Virtual Machine
General
OS
CD/DVD
Hard Disk
CPU
Memory
Network
Confirm
Microsoft Windows
Microsoft Windows 8/10/2012 (win8)
Microsoft Windows 7/2008r2 (win7)
Microsoft Windows Vista/2008 (w2k8)
Microsoft Windows XP/2003 (wxp)
Microsoft Windows 2000 (w2k)
Linux/Other OS types
Linux 4.X/3.X/2.6 Kernel (l26)
Linux 2.4 Kernel (l24)
Solaris Kernel (solaris)
Other OS types (other)
Back
Tasks
Cluster log
Start Time
End Time
Node
User name
Jan 01 00:08:40
Jan 01 00:08:47
bits
root@pam
Dec 31 23:49:39
Dec 31 23:49:39
bits2
root@pam

Proxmox Virtual Environm

https://192.168.0.102:8006/#v1:2:=storage%2Fbits%2Fnfs1:4:5:19:::2

Apps | Gmail | PSMS | Guest Faculty | OS | The Nutanix Bible - ... | Docker Tutorial Seri... | Webex-OnlienClass | e-Learning

PROXMOX

Proxmox Virtual Environment
Version: 4.1-1/2f9650d4

Storage View

Datacenter
- bits
  - local (bits)
  - nfs1 (bits)
- bits2
  - local (bits2)
  - nfs1 (bits2)

Storage 'nfs1' on node 'bits'

Summary | Content | Permissions

Restore | Remove | Templates | Upload

Name

ISO image (1 Item)

dsl-4.11.rc2.iso

Create: Virtual Machine

General | OS | CD/DVD | Hard Disk | CPU | Memory | Network | Confirm

Use CD/DVD disc image file (iso)

Storage: nfs1

ISO Image: dsl-4.11.rc2.iso

Use physical CD/DVD Drive

Do not use any media

Tasks | Cluster log

Start Time	End Time	Node	User name
Jan 01 00:08:40	Jan 01 00:08:47	bits	root@pam
Dec 31 23:49:39	Dec 31 23:49:39	bits2	root@pam
Dec 31 23:20:12	Dec 31 23:20:12	bits	root@pam

Start all VMs and Containers

Start all VMs and Containers

Proxmox Virtual Environm

https://192.168.0.102:8006/#v1:2:=storage%2Fbits%2Fnfs1:4:5:19:::2

Apps | Gmail | PSMS | Guest Faculty | OS | The Nutanix Bible - ... | Docker Tutorial Seri... | Webex-OnlienClass | e-Learning Portal | BITS-ERP

PROXMOX

Proxmox Virtual Environment
Version: 4.1-1/2f9650d4

Storage View

- Datacenter
  - bits
    - local (bits)
    - nfs1 (bits)
  - bits2
    - local (bits2)
    - nfs1 (bits2)

Storage 'nfs1' on node 'bits'

Summary | Content | Permissions

Restore | Remove | Templates | Upload

Name

ISO image (1 Item)

dsl-4.11.rc2.iso

Tasks | Cluster log

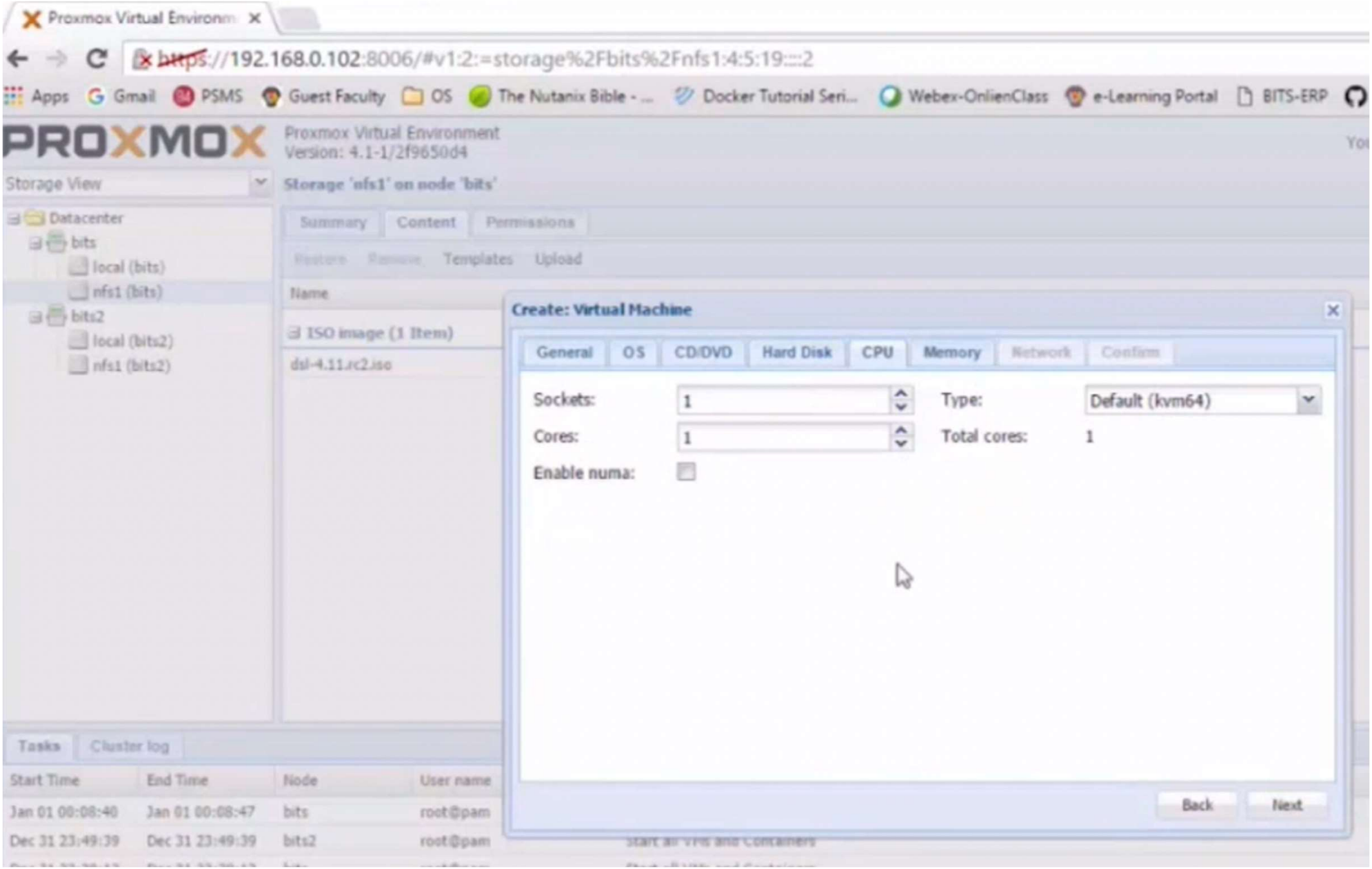
Start Time	End Time	Node	User name
Jan 01 00:08:40	Jan 01 00:08:47	bits	root@pam
Dec 31 23:49:39	Dec 31 23:49:39	bits2	root@pam

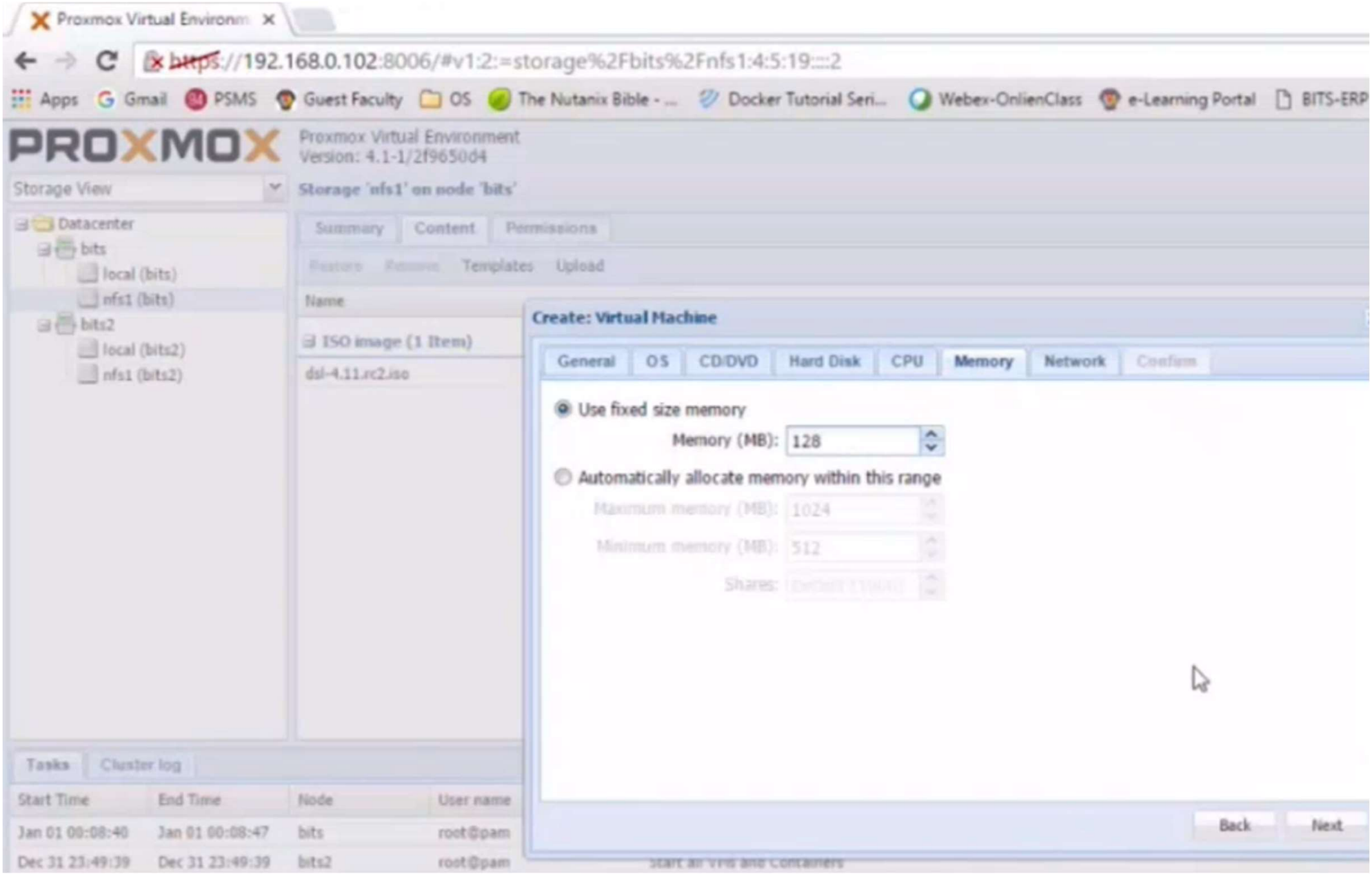
Create: Virtual Machine

General | OS | CD/DVD | Hard Disk | CPU | Memory | Network | Confirm

Bus/Device:	IDE 0	Cache:	Default (No cache)
Storage:	nfs1	No backup:	
Disk size (GB):	4	Discard:	
Format:	EMU image format (qcow2)	Iothread:	

Back | Next


Proxmox Virtual Environm
https://192.168.0.102:8006/#v1:2:=storage%2Fbits%2Fnfs1:4:5:19:::2
Apps
Gmail
PSMS
Guest Faculty
OS
The Nutanix Bible - ...
Docker Tutorial Seri...
Webex-OnlienClass
e-Learning Portal
BITS-ERP
PROXMOX
Proxmox Virtual Environment
Version: 4.1-1/2f9650d4
Storage View
Storage 'nfs1' on node 'bits'
Datacenter
bits
local (bits)
nfs1 (bits)
bits2
local (bits2)
nfs1 (bits2)
Summary
Content
Permissions
Restore
Remove
Templates
Upload
Name
ISO image (1 Item)
dsl-4.11.rc2.iso
Create: Virtual Machine
General
OS
CD/DVD
Hard Disk
CPU
Memory
Network
Confirm
Sockets:
1
Type:
Default (kvm64)
Cores:
1
Total cores:
1
Enable numa:
Back
Next
Tasks
Cluster log
Start Time
End Time
Node
User name
Jan 01 00:08:40
Jan 01 00:08:47
bits
root@pam
Dec 31 23:49:39
Dec 31 23:49:39
bits2
root@pam


Proxmox Virtual Environm
https://192.168.0.102:8006/#v1:2:=storage%2Fbits%2Fnfs1:4:5:19:::2
Apps
Gmail
PSMS
Guest Faculty
OS
The Nutanix Bible - ...
Docker Tutorial Seri...
Webex-OnlienClass
e-Learning Portal
BITS-ERP
PROXMOX
Proxmox Virtual Environment
Version: 4.1-1/2f9650d4
Storage View
Storage 'nfs1' on node 'bits'
Datacenter
bits
local (bits)
nfs1 (bits)
bits2
local (bits2)
nfs1 (bits2)
Summary
Content
Permissions
Templates
Upload
Name
ISO image (1 Item)
dsl-4.11.rc2.iso
Create: Virtual Machine
General
OS
CD/DVD
Hard Disk
CPU
Memory
Network
Confirm
Use fixed size memory
Memory (MB): 128
Automatically allocate memory within this range
Maximum memory (MB): 1024
Minimum memory (MB): 512
Shares:
Back
Next
Tasks
Cluster log
Start Time
End Time
Node
User name
Jan 01 00:08:40
Jan 01 00:08:47
bits
root@pam
Dec 31 23:49:39
Dec 31 23:49:39
bits2
root@pam

Proxmox Virtual Environm

https://192.168.0.102:8006/#v1:2:=storage%2Fbits%2Fnfs1:4:5:19:::2

Apps | Gmail | PSMS | Guest Faculty | OS | The Nutanix Bible - ... | Docker Tutorial Seri... | Webex-OnlienClass | e-Learning Portal | BITS-ERP

PROXMOX

Proxmox Virtual Environment
Version: 4.1-1/2f9650d4

Storage View

- Datacenter
  - bits
    - local (bits)
    - nfs1 (bits)
  - bits2
    - local (bits2)
    - nfs1 (bits2)

Storage 'nfs1' on node 'bits'

Summary | Content | Permissions

Restore | Remove | Templates | Upload

Name

ISO image (1 Item)

dsl-4.11.rc2.iso

Create: Virtual Machine

General | OS | CD/DVD | Hard Disk | CPU | Memory | Network | Confirm

- (•) Bridged mode
  - VLAN Tag: no VLAN
  - Bridge: vmbr0
  - Firewall: [ ]
- ( ) NAT mode
- ( ) No network device

Model: Intel E1000

MAC address: auto

Rate limit (MB/s): unlimited

Multiqueues:

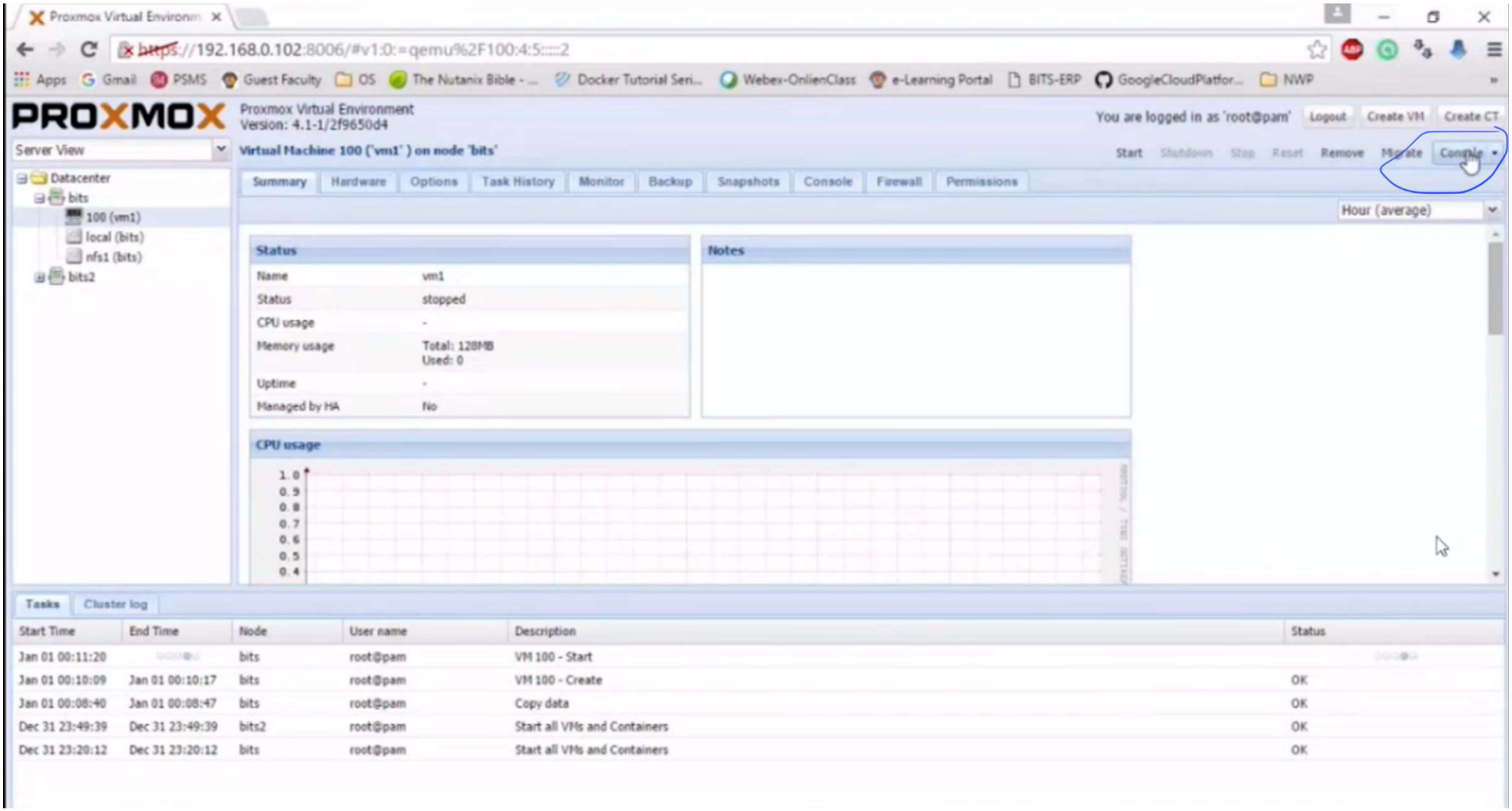
Disconnect: [ ]

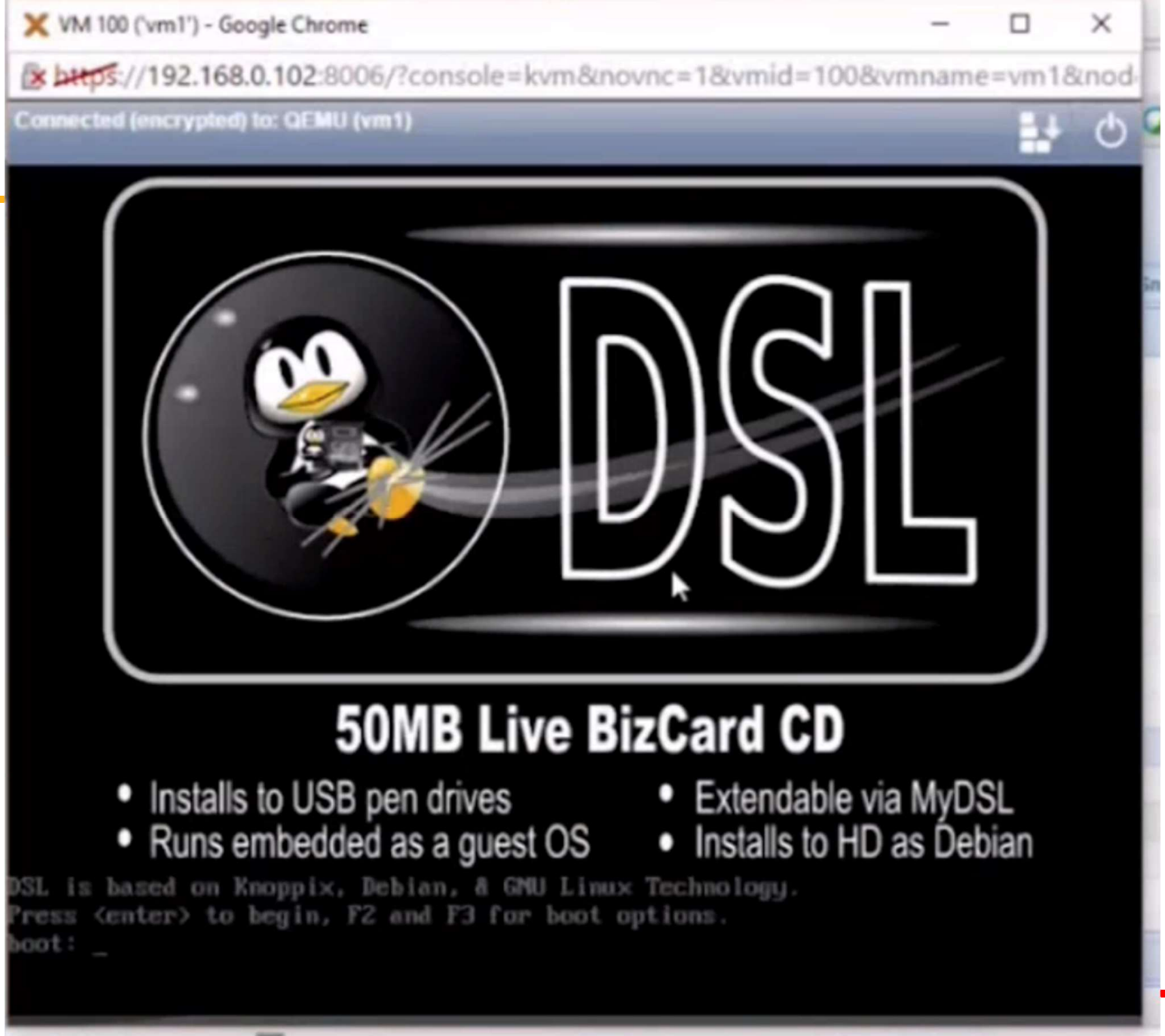
Back | Next

Tasks | Cluster log

Start Time	End Time	Node	User name	
Jan 01 00:08:40	Jan 01 00:08:47	bits	root@pam	
Dec 31 23:49:39	Dec 31 23:49:39	bits2	root@pam	Start all VMs and Containers
Dec 31 23:20:12	Dec 31 23:20:12	bits	root@pam	Start all VMs and Containers

Going to Console of VM (Created at Server-1)


Proxmox Virtual Environm
https://192.168.0.102:8006/#v1:0:=qemu%2F100:4:5::::2
Apps Gmail PSMS Guest Faculty OS The Nutanix Bible - ... Docker Tutorial Seri... Webex-OnlienClass e-Learning Portal BITS-ERP GoogleCloudPlatfor... NWP
PROXMOX
Proxmox Virtual Environment
Version: 4.1-1/2f9650d4
You are logged in as 'root@pam'
Logout
Create VM
Create CT
Server View
Virtual Machine 100 ('vm1') on node 'bits'
Start
Shutdown
Stop
Reset
Remove
Migrate
Console
Datacenter
bits
100 (vm1)
local (bits)
nfs1 (bits)
bits2
Summary
Hardware
Options
Task History
Monitor
Backup
Snapshots
Console
Firewall
Permissions
Hour (average)
Status
Name vm1
Status stopped
CPU usage -
Memory usage Total: 128MB Used: 0
Uptime -
Managed by HA No
Notes
CPU usage
1.0
0.9
0.8
0.7
0.6
0.5
0.4
Tasks
Cluster log
Start Time End Time Node User name Description Status
Jan 01 00:11:20 bits root@pam VM 100 - Start
Jan 01 00:10:09 Jan 01 00:10:17 bits root@pam VM 100 - Create OK
Jan 01 00:08:40 Jan 01 00:08:47 bits root@pam Copy data OK
Dec 31 23:49:39 Dec 31 23:49:39 bits2 root@pam Start all VMs and Containers OK
Dec 31 23:20:12 Dec 31 23:20:12 bits root@pam Start all VMs and Containers OK


VM 100 ('vm1') - Google Chrome
https://192.168.0.102:8006/?console=kvm&novnc=1&vmid=100&vmname=vm1&nod
Connected (encrypted) to: QEMU (vm1)
DSL
50MB Live BizCard CD
• Installs to USB pen drives
• Runs embedded as a guest OS
• Extendable via MyDSL
• Installs to HD as Debian
DSL is based on Knoppix, Debian, & GNU Linux Technology.
Press <enter> to begin, F2 and F3 for boot options.
boot: _

VM 100 ('vm1') - Google Chrome

https://192.168.0.102:8006/?console=kvm&novnc=1&vmid=100&vmname=vm1&node=bits

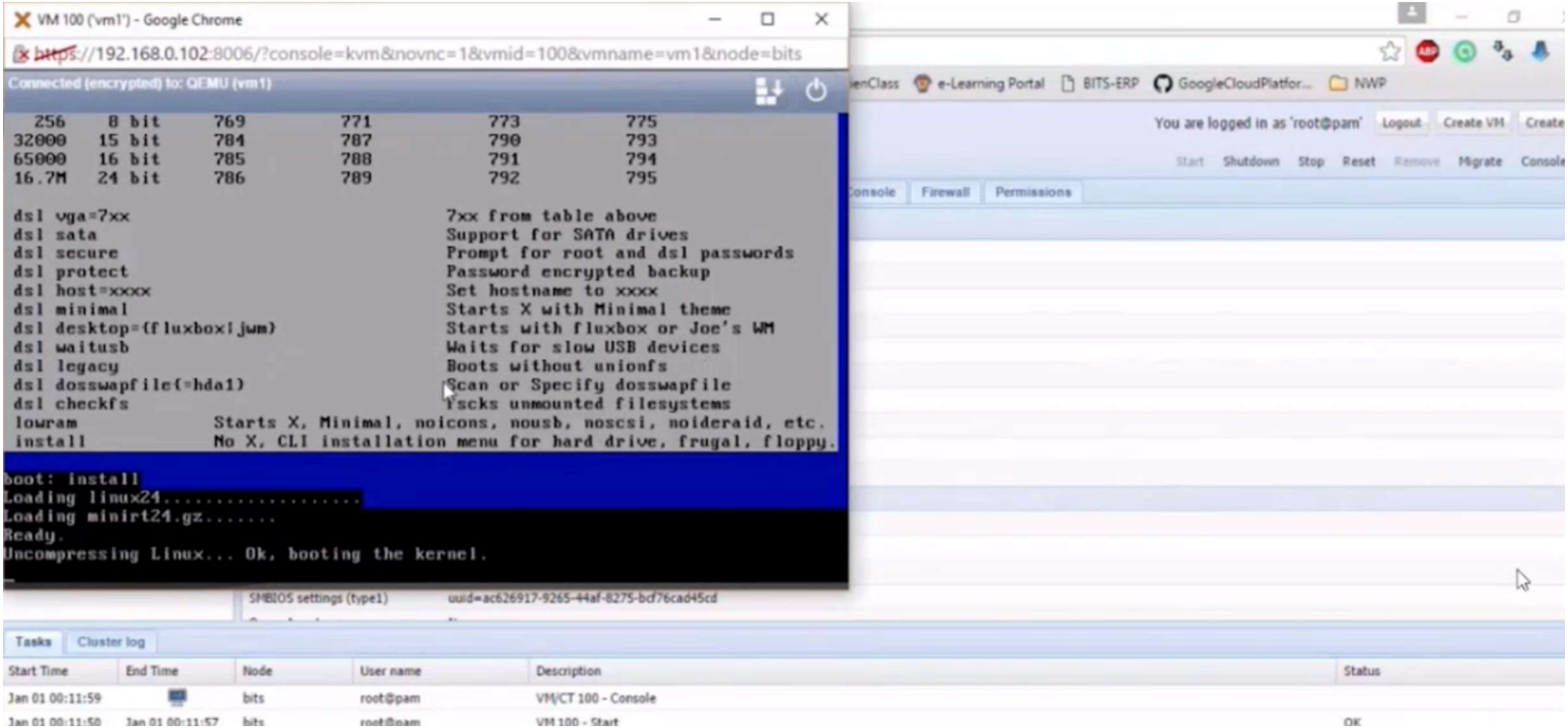
Connected (encrypted) to: QEMU (vm1)

```
DSL accepts the following boot time vga options:

Color              640x480     800x600     1024x768     1280x1024
  256     8 bit      769         771         773          775
32000    15 bit      784         787         790          793
65000    16 bit      785         788         791          794
16.7M    24 bit      786         789         792          795

dsl vga=7xx                                  7xx from table above
dsl sata                                     Support for SATA drives
dsl secure                                   Prompt for root and dsl passwords
dsl protect                                  Password encrypted backup
dsl host=xxxx                                Set hostname to xxxx
dsl minimal                                  Starts X with Minimal theme
dsl desktop=(fluxbox|jwm)                    Starts with fluxbox or Joe's WM
dsl waitusb                                  Waits for slow USB devices
dsl legacy                                   Boots without unionfs
dsl dosswapfile(=hda1)                       Scan or Specify dosswapfile
dsl checkfs                                  fscks unmounted filesystems
lowram          Starts X, Minimal, noicons, nousb, noscsi, noideraid, etc.
install         No X, CLI installation menu for hard drive, frugal, floppy.

boot:
```


VM 100 ('vm1') - Google Chrome
https://192.168.0.102:8006/?console=kvm&novnc=1&vmid=100&vmname=vm1&node=bits
Connected (encrypted) to: QEMU (vm1)
256 8 bit 769 771 773 775
32000 15 bit 784 787 790 793
65000 16 bit 785 788 791 794
16.7M 24 bit 786 789 792 795
dsl vga=7xx 7xx from table above
dsl sata Support for SATA drives
dsl secure Prompt for root and dsl passwords
dsl protect Password encrypted backup
dsl host=xxxx Set hostname to xxxx
dsl minimal Starts X with Minimal theme
dsl desktop=(fluxbox|jwm) Starts with fluxbox or Joe's WM
dsl waitusb Waits for slow USB devices
dsl legacy Boots without unionfs
dsl dosswapfile(=hda1) Scan or Specify dosswapfile
dsl checkfs fscks unmounted filesystems
lowram Starts X, Minimal, noicons, nousb, noscsi, noideraid, etc.
install No X, CLI installation menu for hard drive, frugal, floppy.
boot: install
Loading linux24.....
Loading minirt24.gz.....
Ready.
Uncompressing Linux... Ok, booting the kernel.
You are logged in as 'root@pam'
Logout
Create VM
Start
Shutdown
Stop
Reset
Remove
Migrate
Console
Firewall
Permissions
SMBIOS settings (type1)
uuid=ac626917-9265-44af-8275-bcf76cad45cd
Tasks
Cluster log
Start Time
End Time
Node
User name
Description
Status
Jan 01 00:11:59
bits
root@pam
VM/CT 100 - Console
Jan 01 00:11:50
Jan 01 00:11:57
bits
root@pam
VM 100 - Start
OK

VM 100 ('vm1') - Google Chrome

https://192.168.0.102:8006/?console=kvm&novnc=1&vmid=100&vmname=vm1&node=bits

Connected (encrypted) to: QEMU (vm1)

```
Type dslinstall to return to the installation menu.

root@tty1[tmp]# ifconfig
eth0      Link encap:Ethernet  HWaddr 36:62:30:66:64:37
          inet addr:192.168.0.104  Bcast:192.168.0.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:6 errors:0 dropped:0 overruns:0 frame:0
          TX packets:6 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
          Base address:0xe000 Memory:fea40000-fea60000

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:4 errors:0 dropped:0 overruns:0 frame:0
          TX packets:4 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:300 (300.0 B)  TX bytes:300 (300.0 B)

root@tty1[tmp]#
```

enClass | e-Learning Portal | BITS-ERP | GoogleCloudPlatfor...

You are logged in as 'root@pa

Start | Shutdown | Stop

Console | Firewall | Permissions

SMBIOS settings (type1) uuid=ac626917-9265-44af-8275-bcf76cad45cd

Tasks | Cluster log

Start Time	End Time	Node	User name	Description
Jan 01 00:11:59		bits	root@pam	VM/CT 100 - Console

C:\WINDOWS\system32\cmd.exe

```
Microsoft Windows [Version 10.0.10586]
(c) 2015 Microsoft Corporation. All rights reserved.

C:\Users\BITS9>ping 192.168.0.104

Pinging 192.168.0.104 with 32 bytes of data:
Reply from 192.168.0.104: bytes=32 time=2ms TTL=64
Reply from 192.168.0.104: bytes=32 time<1ms TTL=64
Reply from 192.168.0.104: bytes=32 time<1ms TTL=64
Reply from 192.168.0.104: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.0.104:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 2ms, Average = 0ms

C:\Users\BITS9>ping -192.168.0.104
```

VM Migration from Server-1 to Server-2

Proxmox Virtual Environm

https://192.168.0.102:8006/#v1:0:=qemu%2F100:4:5::9:2

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PROXMOX

Proxmox Virtual Environment
Version: 4.1-1/2f9650d4

You are logged in as 'root@pam' | Logout | Create VM

Server View

Virtual Machine 100 ('vm1') on node 'bits' | Start | Shutdown | Stop | Reset | Remove | Migrate

- Datacenter
  - bits
    - 100 (vm1)
    - local (bits)
    - nfs1 (bits)
  - bits2

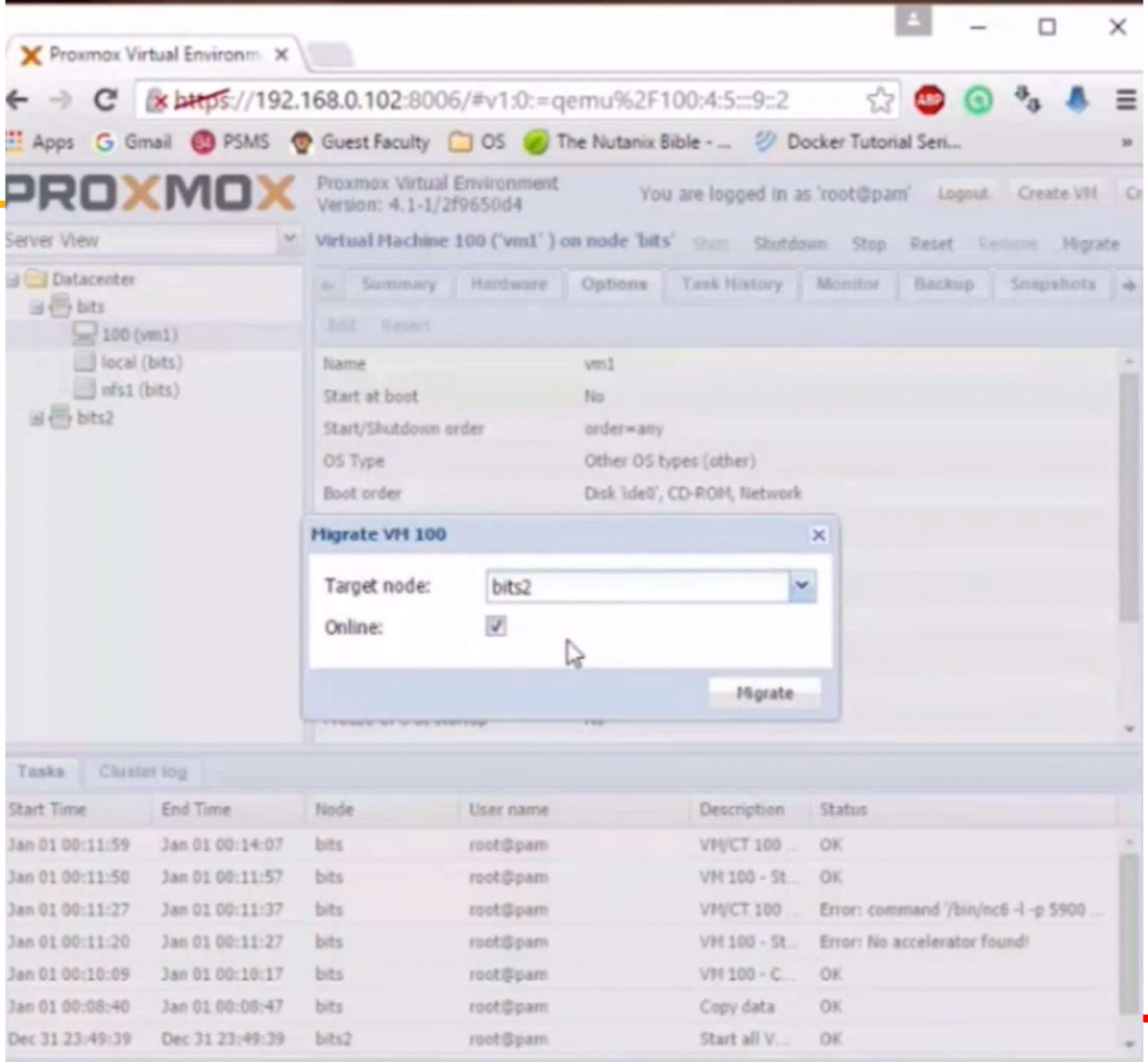
Summary | Hardware | Options | Task History | Monitor | Backup | Snapshots

Edit | Revert

Name	vm1
Start at boot	No
Start/Shutdown order	order=any
OS Type	Other OS types (other)
Boot order	Disk 'ide0', CD-ROM, Network
Use tablet for pointer	Yes
Hotplug	Disk, Network, USB
ACPI support	Yes
SCSI Controller Type	Default (LSI 53C895A)
BIOS	Default (SeaBIOS)
KVM hardware virtualization	No
Freeze CPU at startup	No

Tasks | Cluster log

Start Time	End Time	Node	User name	Description	Status
Jan 01 00:11:59	Jan 01 00:14:07	bits	root@pam	VM/CT 100 ...	OK
Jan 01 00:11:50	Jan 01 00:11:57	bits	root@pam	VM 100 - St...	OK
Jan 01 00:11:27	Jan 01 00:11:37	bits	root@pam	VM/CT 100 ...	Error: command '/bin/nc6 -l -p 5900 ...
Jan 01 00:11:20	Jan 01 00:11:27	bits	root@pam	VM 100 - St...	Error: No accelerator found!
Jan 01 00:10:09	Jan 01 00:10:17	bits	root@pam	VM 100 - C...	OK
Jan 01 00:08:40	Jan 01 00:08:47	bits	root@pam	Copy data	OK
Dec 31 23:49:39	Dec 31 23:49:39	bits2	root@pam	Start all V...	OK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Virtual Machine 100 ('vm1') on node 'bits'
Shutdown
Stop
Reset
Migrate
Datacenter
bits
100 (vm1)
local (bits)
nfs1 (bits)
bits2
Summary
Hardware
Options
Task History
Monitor
Backup
Snapshots
Name
vm1
Start at boot
No
Start/Shutdown order
order=any
OS Type
Other OS types (other)
Boot order
Disk 'ide0', CD-ROM, Network
Migrate VM 100
Target node:
bits2
Online:
Migrate
Tasks
Cluster log
Start Time
End Time
Node
User name
Description
Status
Jan 01 00:11:59
Jan 01 00:14:07
bits
root@pam
VM/CT 100 ...
OK
Jan 01 00:11:50
Jan 01 00:11:57
bits
root@pam
VM 100 - St...
OK
Jan 01 00:11:27
Jan 01 00:11:37
bits
root@pam
VM/CT 100 ...
Error: command '/bin/nc6 -l -p 5900 ...
Jan 01 00:11:20
Jan 01 00:11:27
bits
root@pam
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OK
Jan 01 00:08:40
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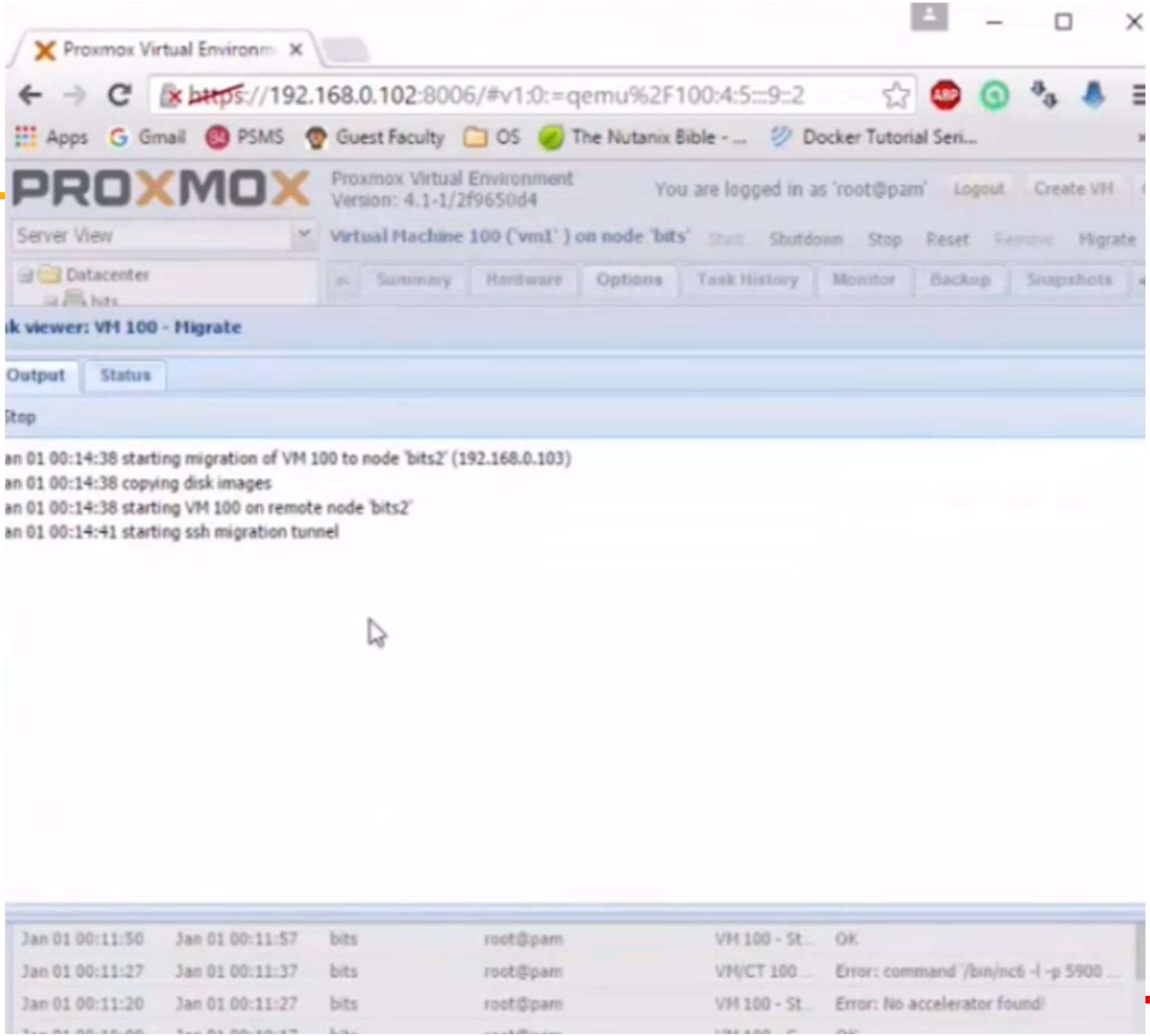
bits
root@pam
Copy data
OK
Dec 31 23:49:39
Dec 31 23:49:39
bits2
root@pam
Start all V...
OK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You are logged in as 'root@pam'
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Create VM
Server View
Virtual Machine 100 ('vm1') on node 'bits'
Shutdown
Stop
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Migrate
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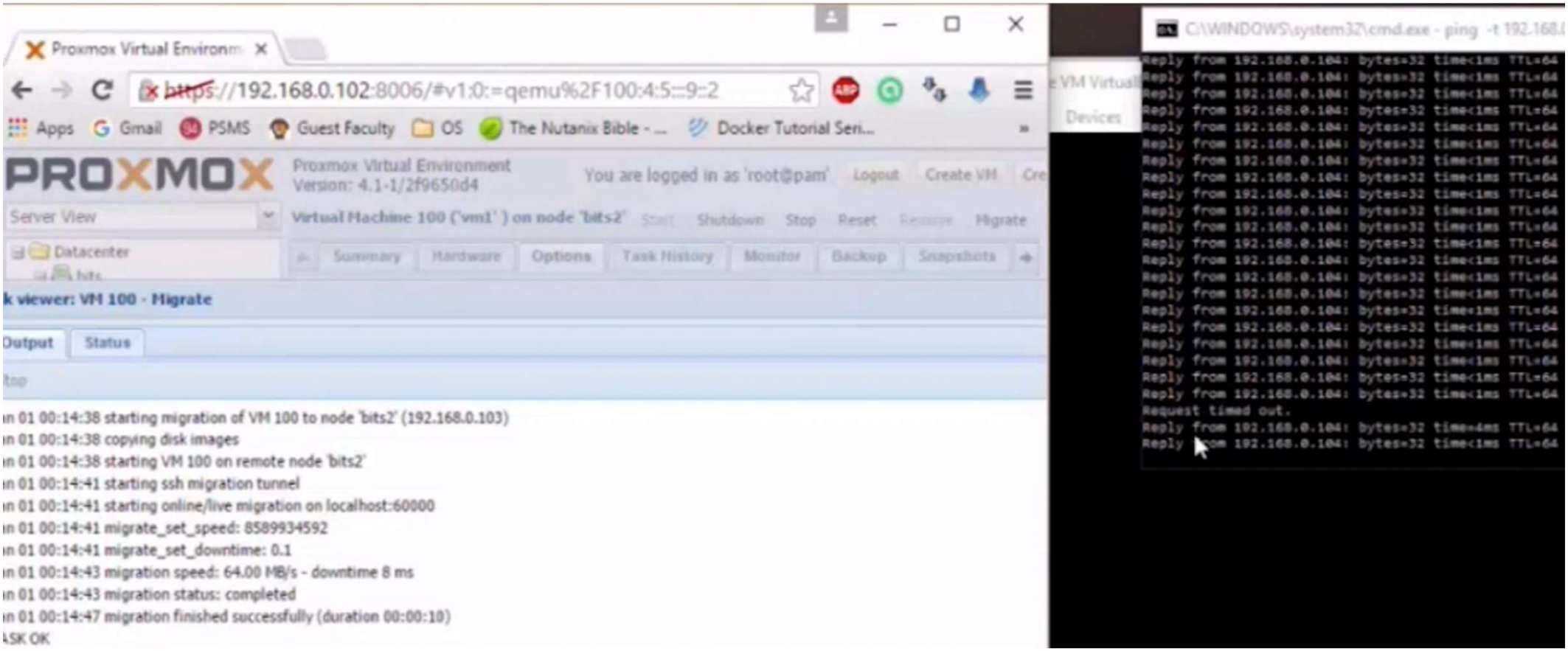
Snapshots
k viewer: VM 100 - Migrate
Output
Status
Stop
an 01 00:14:38 starting migration of VM 100 to node 'bits2' (192.168.0.103)
an 01 00:14:38 copying disk images
an 01 00:14:38 starting VM 100 on remote node 'bits2'
an 01 00:14:41 starting ssh migration tunnel
Jan 01 00:11:50
Jan 01 00:11:57
bits
root@pam
VM 100 - St...
OK
Jan 01 00:11:27
Jan 01 00:11:37
bits
root@pam
VM/CT 100 ...
Error: command '/bin/nc6 -l -p 5900 ...
Jan 01 00:11:20
Jan 01 00:11:27
bits
root@pam
VM 100 - St...
Error: No accelerator found!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Proxmox Virtual Environment
Version: 4.1-1/2f9650d4
You are logged in as 'root@pam' Logout Create VM
Server View
Virtual Machine 100 ('vm1') on node 'bits2' Start Shutdown Stop Reset Migrate
Datacenter
Summary Hardware Options Task History Monitor Backup Snapshots
k viewer: VM 100 - Migrate
Output Status
in 01 00:14:38 starting migration of VM 100 to node 'bits2' (192.168.0.103)
in 01 00:14:38 copying disk images
in 01 00:14:38 starting VM 100 on remote node 'bits2'
in 01 00:14:41 starting ssh migration tunnel
in 01 00:14:41 starting online/live migration on localhost:60000
in 01 00:14:41 migrate_set_speed: 8589934592
in 01 00:14:41 migrate_set_downtime: 0.1
in 01 00:14:43 migration speed: 64.00 MB/s - downtime 8 ms
in 01 00:14:43 migration status: completed
in 01 00:14:47 migration finished successfully (duration 00:00:10)
ASK OK
C:\WINDOWS\system32\cmd.exe - ping -t 192.168.
Reply from 192.168.0.104: bytes=32 time<1ms TTL=64
Request timed out.
Reply from 192.168.0.104: bytes=32 time=4ms TTL=64
Reply from 192.168.0.104: bytes=32 time<1ms TTL=64

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PROXMOX

Proxmox Virtual Environment
Version: 4.1-1/2f9650d4

Server View

- Datacenter
  - bits
    - local (bits)
    - nfs1 (bits)
  - bits2
    - 100 (vm1)
    - local (bits2)
    - nfs1 (bits2)

Virtual Machine 100 ('vm1') on node 'bits2'

Summary | Hardware | Options | Task History | Monitor | Backup | Snapshots

Edit | Revert

Name	vm1
Start at boot	No
Start/Shutdown order	order=any
OS Type	Other OS types (other)
Boot order	Disk 'ide0', CD-ROM, Network
Use tablet for pointer	Yes
Hotplug	Disk, Network, USB
ACPI support	Yes
SCSI Controller Type	Default (LSI 53C895A)
BIOS	Default (SeaBIOS)
KVM hardware virtualization	No
Freeze CPU at startup	No
Use local time for RTC	No
RTC start date	now
SMBIOS settings (type1)	uuid=ac626917-9265-44af-8275-bcf76cad45cd

Tasks | Cluster log

Start Time	End Time	Node	User name	Description
Jan 01 00:14:44	Jan 01 00:14:44	bits2	root@pam	VM 100 - Resume
Jan 01 00:14:39	Jan 01 00:14:41	bits2	root@pam	VM 100 - Start
Jan 01 00:14:37	Jan 01 00:14:57	bits	root@pam	VM 100 - Migrate
Jan 01 00:11:59	Jan 01 00:14:07	bits	root@pam	VM/CT 100 - Console
Jan 01 00:11:50	Jan 01 00:11:57	bits	root@pam	VM 100 - Start
Jan 01 00:11:27	Jan 01 00:11:37	bits	root@pam	VM/CT 100 - Console
Jan 01 00:11:20	Jan 01 00:11:27	bits	root@pam	VM 100 - Start

THANK YOU