

## CS 4740 Programming Assignment 2

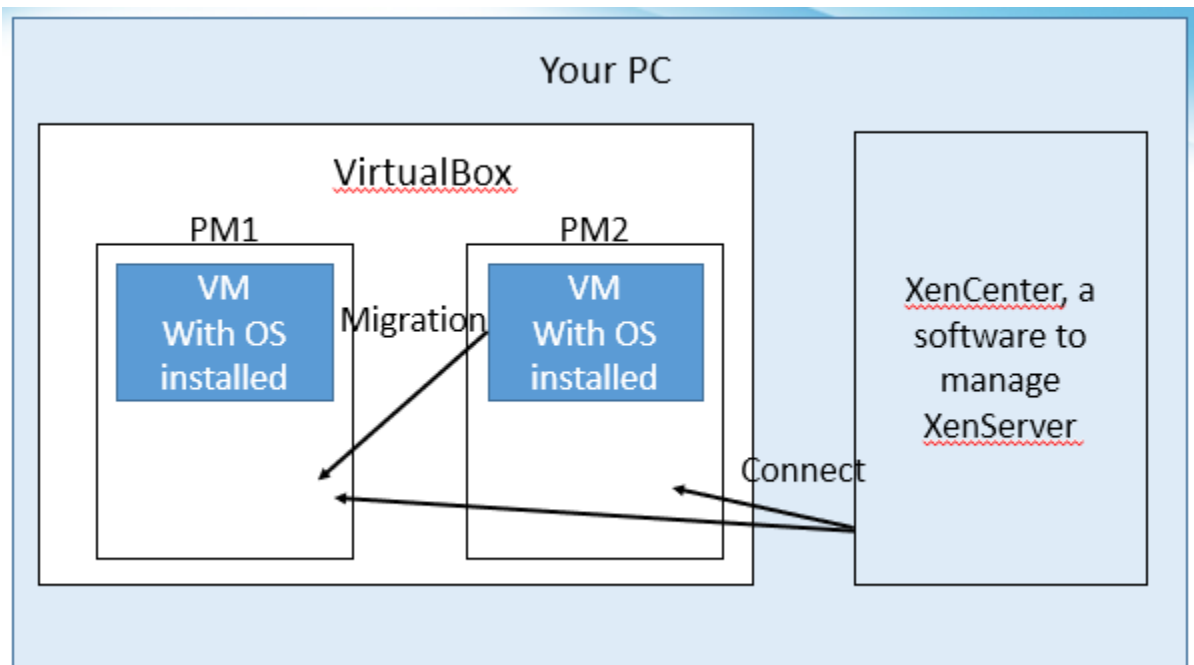
### Introduction

In this assignment, we are going to show how to install the XenServer, create VMs and perform VM migration. XenServer is the leading open source virtualization platform, powered by the Xen Project hypervisor. Xen is the type-1 hypervisor (bare-metal hypervisor).

To perform a VM migration, we need to have 2 PMs. Since most students do not have 2 PMs, we are going to use the VirtualBox tool only for the demonstration and tutorial purpose. VirtualBox is a free and open-source hypervisor for x86 computers.

\*\*\*\*\***There is no reason in practice that you install one hypervisor on top of a VM.**

Please prepare at least 160GB hard disk space on your PC (external USB drive is also fine). The infrastructure of this assignment is shown in the figure below.



### Group assignment:

This assignment requires the students to have a PC (or remote instance on EC2) with Windows OS installed. Therefore, **the PA2 is a group assignment**. Each group can have up to 3 students and only one student needs to submit the final PDF.

**\*\*\*\*\*Please start this PA as early as possible and don't leave it to the last minute. Otherwise, you won't have enough time. It will take more than 4 hours to finish.**

### **Tutorial video for this PA:**

<https://drive.google.com/drive/folders/1aeDgBBsE9un8hgRN5ShiN4Q0P6d6ml93?usp=sharing>

### **Prerequisites:**

1. Download VirtualBox to your PC.
2. Download XenServer ISO online to your PC,  
[https://drive.google.com/file/d/1knesJKDx8KoyZfiLm9LgFqs\\_9ACBx\\_C/view?usp=sharing](https://drive.google.com/file/d/1knesJKDx8KoyZfiLm9LgFqs_9ACBx_C/view?usp=sharing). **We call it as XenServer.iso later.**
3. Download Debian Wheezy 7.0 ISO online to your PC,  
<http://cdimage.debian.org/cdimage/archive/7.11.0/amd64/iso-dvd/debian-7.11.0-amd64-DVD-1.iso>.  
**We call it as Debian.iso later.**
4. Download XenCenter to your PC, <https://drive.google.com/file/d/1n8EvEw3MOksNzR-UGKyt4yCU4I9bSuwf/view?usp=sharing>

XenCenter only works for Windows.

### **Procedures:**

1. Install VirtualBox on Windows.
2. Open VirtualBox, create two new VMs ---- here we use the two new VMs to emulate two PMs.
3. When you create VMs on VirtualBox, you will need to specify the name of your VM. Let's call them PM1 and PM2, respectively.

#### Steps for creation

New -> Default OS (I used win 7 64bit) -> Specify the memory size. **Recommendation: 2GB** -> Create a virtual hard disk now -> VDI format -> Specify the storage type: fixed size -> size of storage: **MUST BE HIGHER than 80GB to perform the migration** -> create

4. After you create PM1 and PM2, right click and choose setting for them. In the "Storage" tab, you can see an empty drive. Load the **XenServer.iso** into the drive. Then, in the "Network" tab, select the "Bridge Adapter". After the configuration, start PM1 and PM2. This will lead you to the XenServer installation.

5. Follow the instructions on the screen to install XenServer. For the network, choose "Automatic configuration (DHCP)".

Specify the host names as “your UVa Computing ID + 1” and “your UVa Computing ID + 2” for grading purpose.

For network time protocol (NTP), select manually time entry. Generally, in practice, it is important to specify the server, as maintaining a single time of the whole cluster is important. However, in this tutorial, we do not have to.

6. After the installation, you will enter the XenServer interface. You will be able to see IP address on the “Status Display” tab. You can use the Local Command Shell to create and migrate VMs. However, XenServer also provides another simpler way -- XenCenter, to perform these operations.

7. Install XenCenter on your PC.

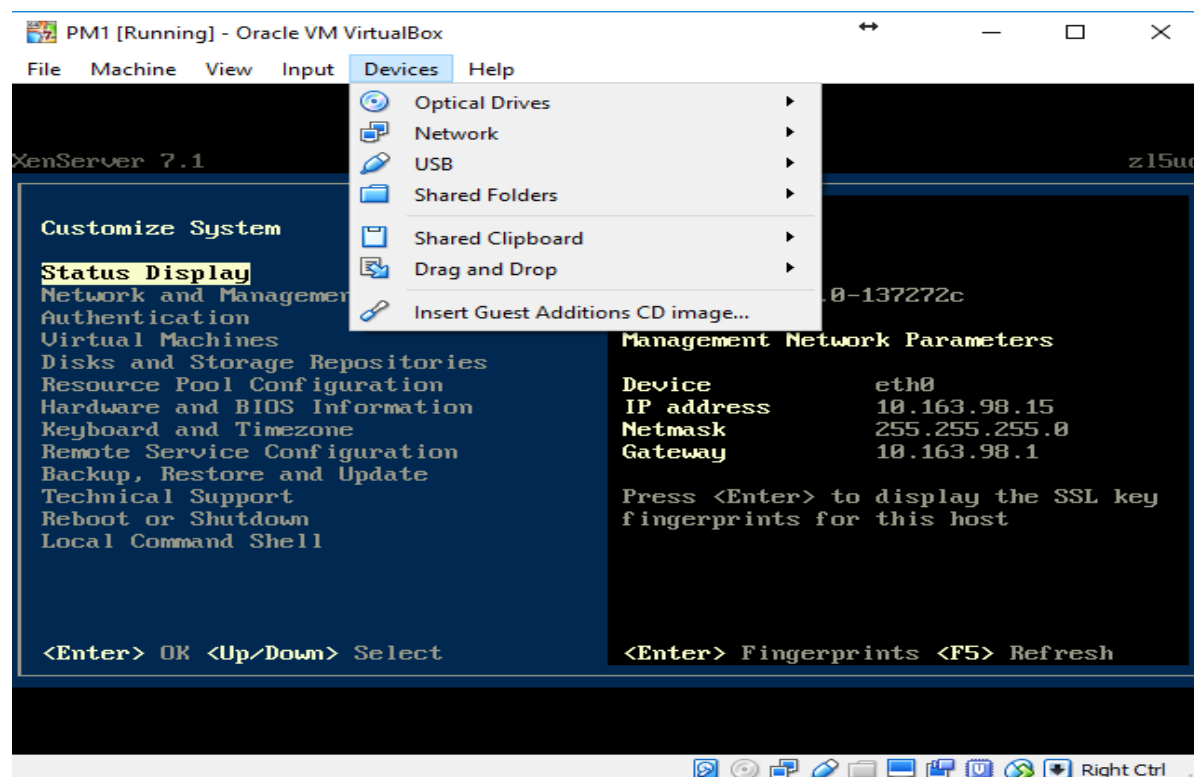
**ATTENTION: please do not install XenCenter on PM1 or PM2. Install it on your PC with Windows OS.**

8. Open XenCenter. Connect to PM1 and PM2 using the IP addresses.

9. Create a VM in each PM and install OS on the VMs using XenCenter. To create, simply select “NEW VM”.

(1) Select “Debian Wheezy 7.0 (64-bit)” as the template.

(2) You will need to specify the Debian OS ISO on PM1 and PM2. To do so, go to the screen of PM1 and PM2 on VirtualBox, select the “Device -> Optical drive” tab and load the **Debian.iso** (see figure below). Then go back to the screen of XenCenter, select DVD drive 0 on XXX (should be the default option).



(3) Specify the number of vCPU cores -- 1 is sufficient.

Specify the memory size (recommendation: 256-512MB), based on the memory size of the PM1 and PM2. You should not use more than half of the memory size of the PM1 and PM2, as we need to leave sufficient memory space for migration.

(4) Specify the storage space – default is sufficient.

10. After you create the VMs on PM1 and PM2, you can click the VMs and go to “Console”. Follow the instructions on the console to install Debian 7.0. Select the default options during installation.

**Please NOTE that do not turn off your PC or lose your internet connection when you are doing the following steps. Otherwise, you might need to install Debian again.**

11. To verify that the VMs are created correctly, please create some simple text files and run word count command (i.e., wc) on the VMs through the XenCenter console.

**Take screenshots on the XenCenter for the VMs to show that we can run commands on them successfully.**

**Please NOTE that do not turn off your PC or lose your internet connection when you are doing the following steps. Otherwise, you might need to start over from the beginning.**

12. To perform VM migration, you will need to first put both PM1 and PM2 in one pool. Just create a pool and put them inside the pool. You will need to turn off the VMs to put in one pool. After putting the PMs in one pool, remember to turn on the VMs again.

13. Now we can migrate the VM. Select one VM from one PM (say PM2) and right click, and migrate it to PM1. The process will take several minutes. You will see that the VM is still running during migration.

**Take screenshots on the XenCenter during migration. You will need to take screenshots of the network performance of both PM1 and PM2.**

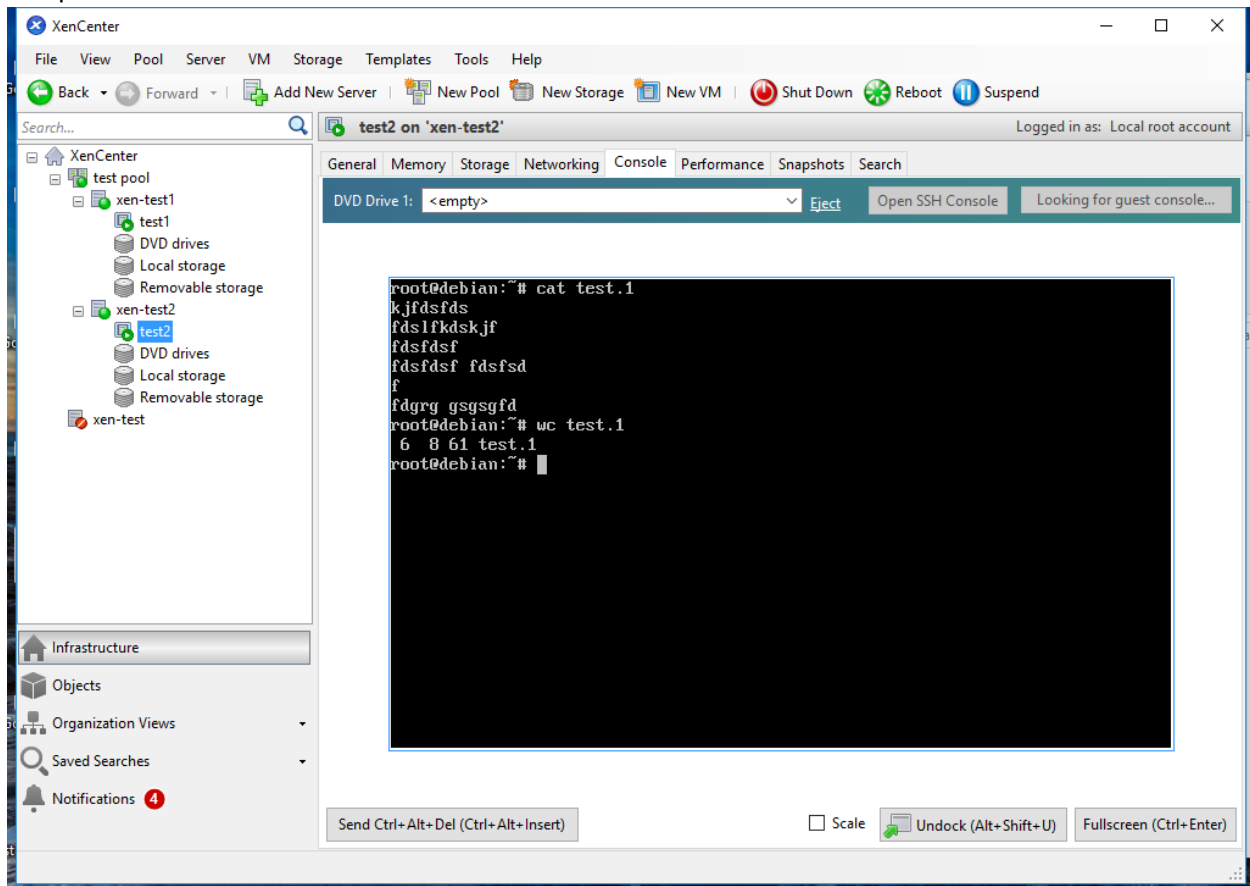
**Take another screenshot on the XenCenter after the completion of VM migration, which shows that the two VMs are on one PM.**

**After the migration, click “notification” -> “Events” on XenCenter. Take a screenshot of the list of events.**

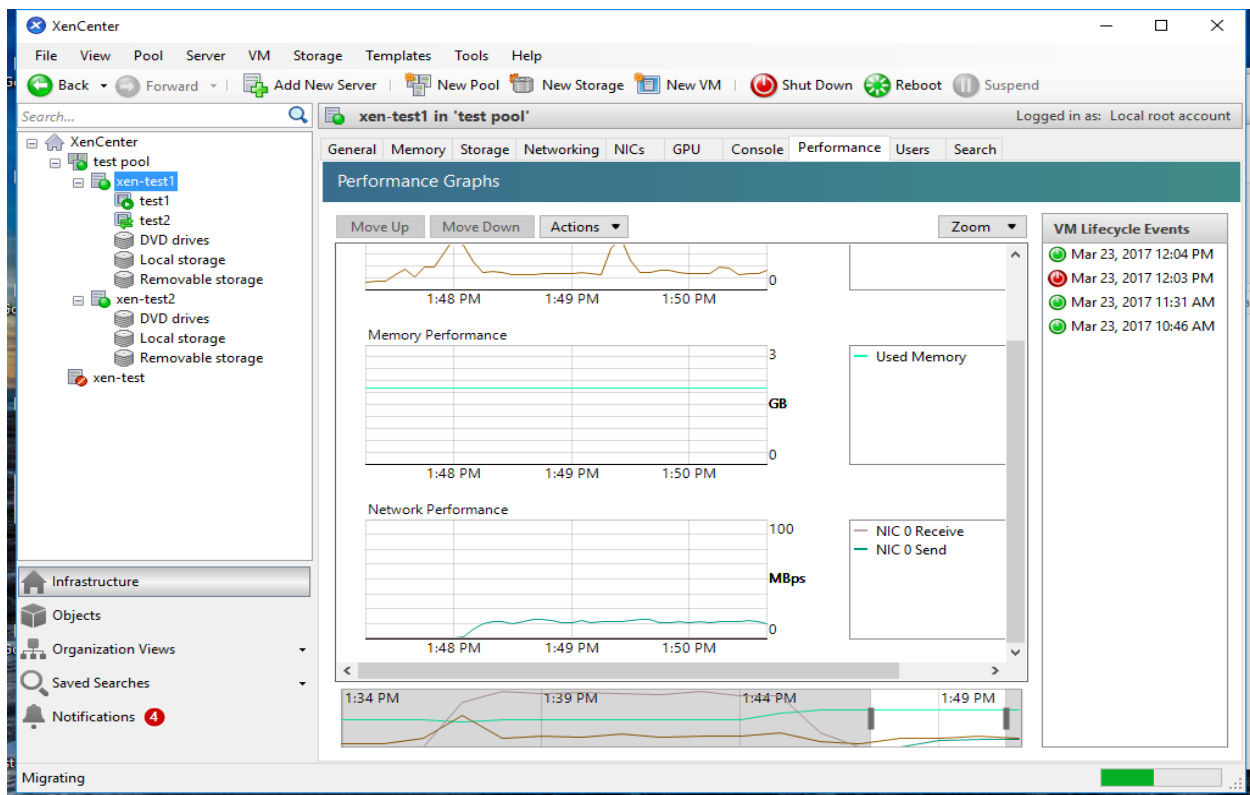
## **Submission:**

Submit all the screenshots in one PDF file for grading. Please remember that the screenshots should clearly show your UVA computing ID (host names of PM1 and PM2).

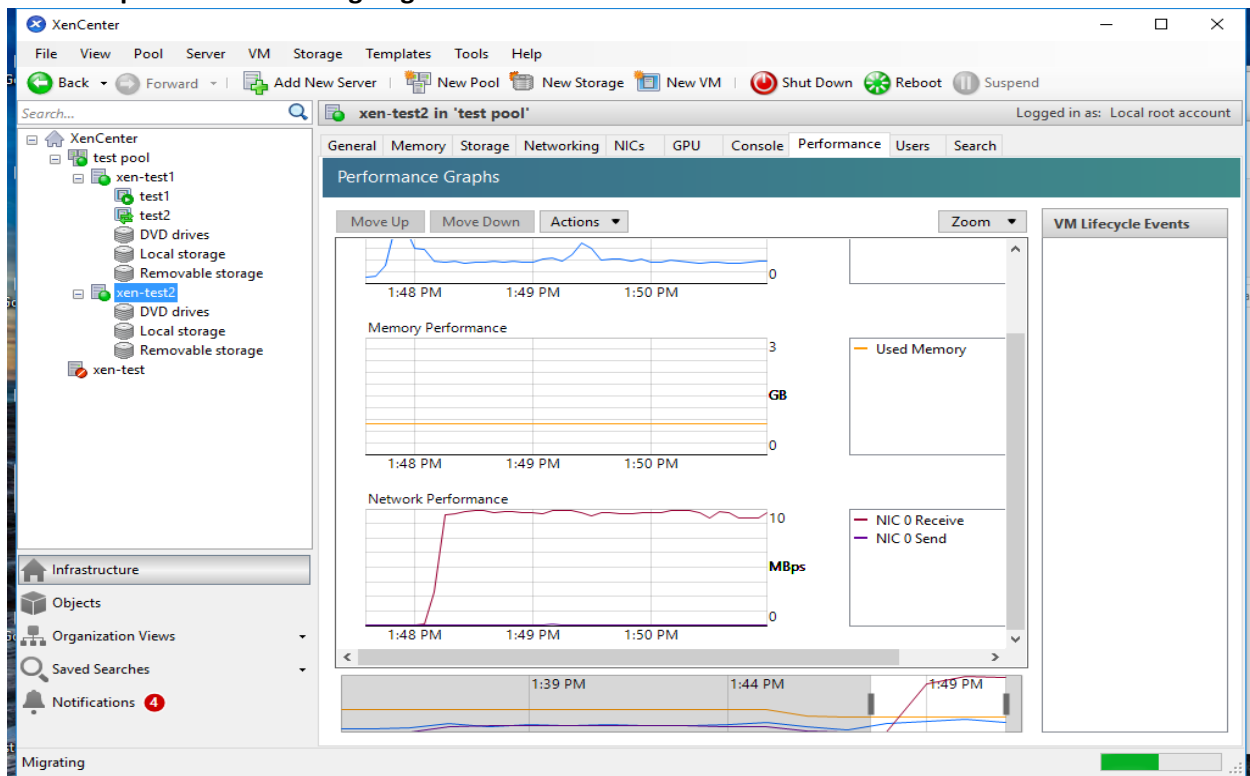
Sample screenshots:



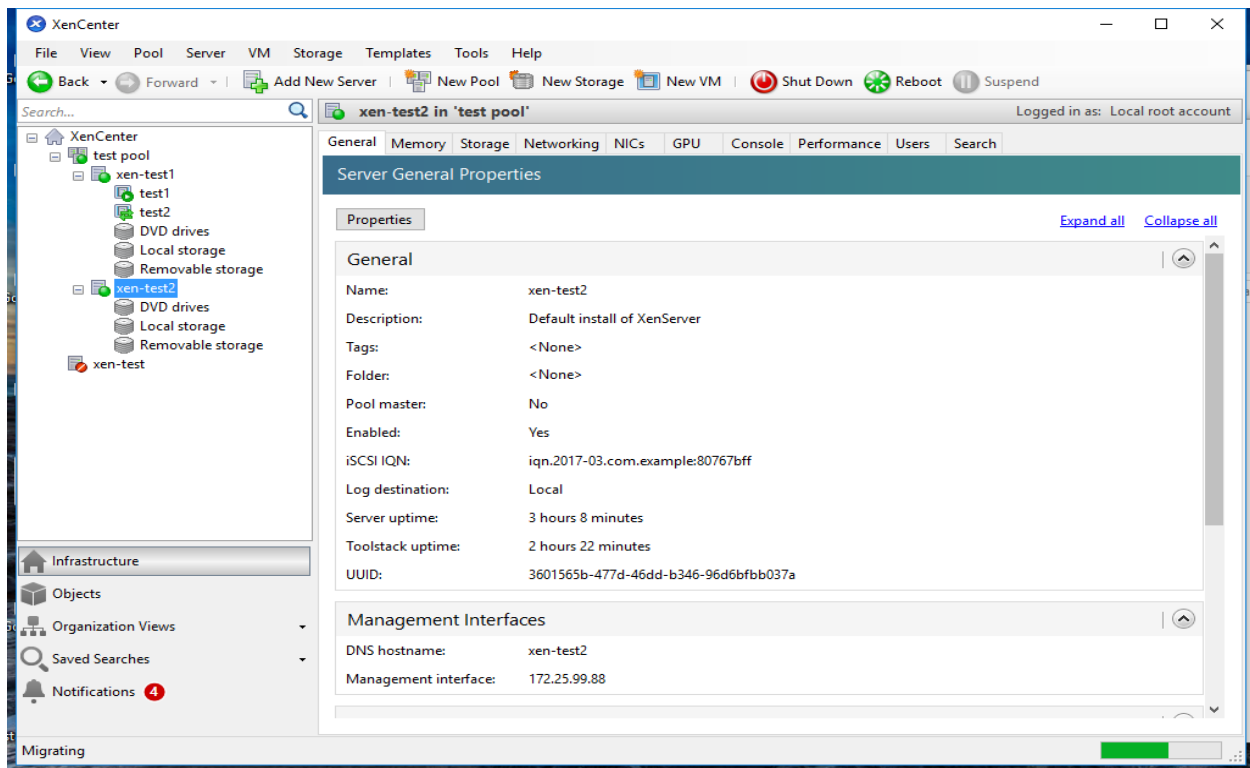
**wc command**



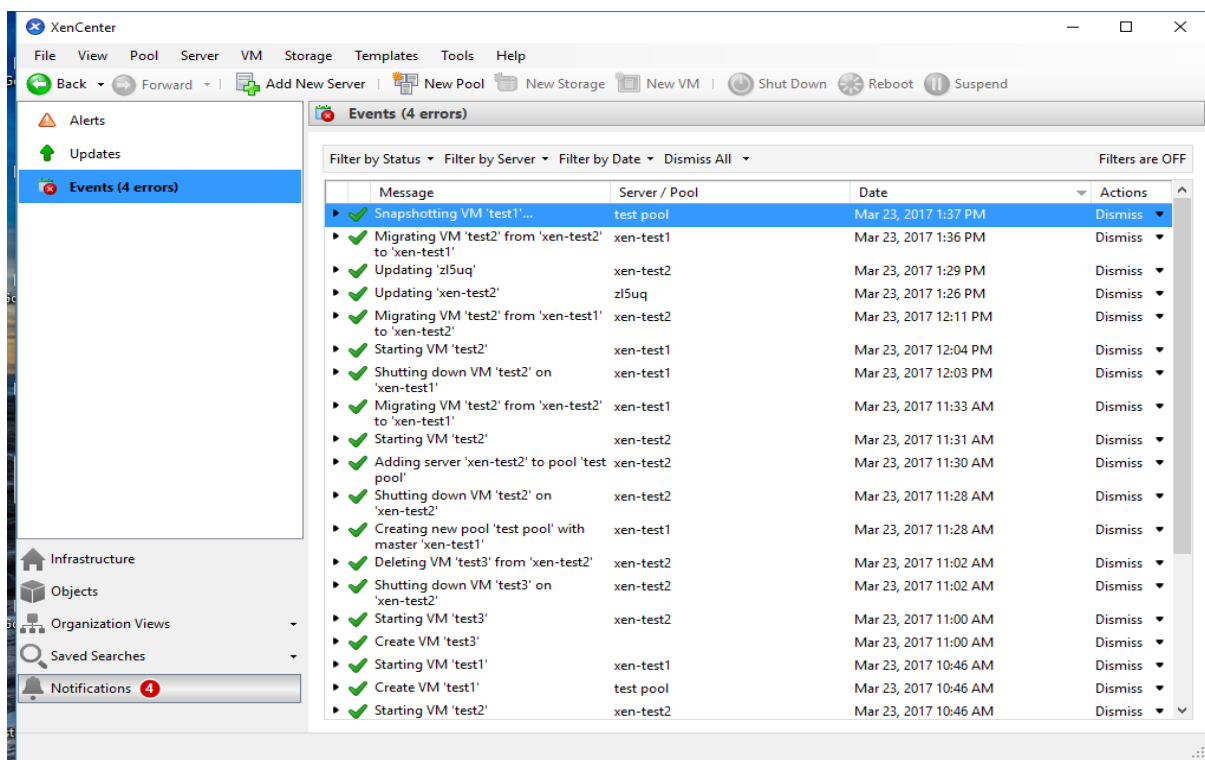
## Network performance during migration



## network performance during migration



## Two VMs on one 1 PM



## Event list