

# LS Lab Assignment: VM Migration\*

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Feedback deadline:  
November 13, 2017 10:00 CET

## Abstract

This lab assignment will introduce you to VM migration. We use the lab setup created in the first week of lab assignments. Topics covered are different forms of migration, how to measure downtime and performance and migration to a cloud service.

## 1 VM Migration Basics

Migrating VMs can be very useful, for instance, when the need to upgrade the hypervisor hardware or software arises. VM migration is also a key feature in cloud computing and green IT.

### Questions

1. Read about VM migration in Xen and
  - (a) Describe the differences between cold (or off-line) migration and live migration.
  - (b) What mechanism makes live migration almost instantaneous under light load?
2. What are the technical requirements to be able to coldly migrate VMs, and why?
3. What are the technical requirements to be able to live migrate VMs, and why?
4. Form a group of two and discuss how you are going to migrate VMs to each other's hypervisor. Set up your systems so you can do both cold and live migrations. Describe your setup in your logs. *Hint: Do not use LVM. Remember your eno2.*
5. Together think of a definition of the downtime of a VM, and how to best measure that downtime. Write down your definition and measurement method(s) for both
  - (a) Cold migration
  - (b) Live migration
6. Perform cold migrations with your partner, and measure the downtime. Do not take just a single measurement! Compute mean and median of your chosen metric.

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\*Based on an earlier document by N.P.H. Sijm, N.D. Jebessa. Version November 2, 2017.

7. Perform live migrations with your partner, and measure the downtime. Compute mean and median of your chosen metric.

## 2 Performance

There are various ways to set up shared storage for VM migration, for instance, using NFS and SMB, two protocols that allow you to mount remote filesystems.

8. What are the most important differences between NFS and SMB? Explain in approximately 200 words.
9. Together with your partner, design an experiment to compare the performance of NFS and SMB as VM shared storage. Distinguish between raw I/O performance and the performance under a realistic workload. E.g. what if the VM was running an Apache Web server? Discuss the design with a lab teacher.
10. Configure both NFS and SMB on your systems. Perform the experiment and show the results in your log. Try to explain any remarkable differences. *Hint: root is a nobody when it comes to NFS.*

## 3 Optional: Migrating to Amazon

It might be handy to migrate to the Amazon cloud when you run out of resources or just want to outsource the servers. Amazon provides a way to “import” virtual machines.

*Please ask a lab teacher for your Amazon account if you want to do this optional assignment, you will receive it in any case for Lab 3.*

11. Find out how the importing feature of Amazon works. In which case would it be easier to migrate a VM to Amazon instead of just creating a new one?
12. Create a new PV machine with 6500 MB of disk space. Make sure Apache is installed and is serving a web page. Convert this PV machine to a HVM machine. Document the steps you take. There are many ways to do the conversion, we provide a cheat sheet below if you don't want to get lost.
13. Now migrate the disk to the Amazon cloud and create an instance with your volume. Document which steps you took to get it to work. Please make sure you:
  - use the t2.micro instance,
  - name all volumes and snapshots you create (unnamed ones are subject to deletion)
  - delete all volumes and snapshots as soon as you are done.

This sounds draconic, but S3 Storage is extremely expensive! Last year we spent as much money on storage as on the whole of the Amazon lab. *Hint: EC2 CLI, EC2 volume upload (note ec2-instance-import is not working for us).*

14. Show the Amazon cloud serving the web page on your server. What are the differences between the imported VM against the VM running on your system?

## WARNING: PV to HVM Cheat Sheet

The crux of turning a PV into a HVM is to convert the root filesystem into a disk with an MBR, e.g. by following this guide by Tony Hoyle (end of <http://xen.1045712.n5.nabble.com/Best-way-to-convert-pv-to-hvm-td25770.html>). Be sure to save your `/etc/xen/GUEST.cfg` in between steps so you can easily get back to a previous config.

1. Power off the DomU.
2. Create a large disk file to hold the data.
3. Edit the `.cfg` file to add this to the DomU. *Hint: Remember this is a disk, not a partition*
4. Power on the DomU, and `fdisk/mkfs` on the new virtual disk.
5. Power off the DomU.
6. Mount the new partition and the old partition. *Hint: kpartx*
7. Do `rsync -av` between new and old.
8. Make any required `fstab` alterations.
9. Alter the `cfg` file to remove the old partions and just use the new file.
10. Power on the DomU. Make sure everything works.
11. Install `grub/kernel/etc`. *Hint: linux-virtual package, sshd*

Finally, edit the `/etc/xen/GUEST.cfg` to boot as a HVM.