LS Lab Assignment:
VM Migration[*]

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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 KVM 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?

    Hint: `https://libvirt.org/migration.html` and `https://developers.redhat.com/blog/2015/03/24/live-migrating-qemu-kvm-virtual-machines`

2. What are the technical requirements to be able to coldly migrate VMs, and why?

3. There are two primary options when live migrating, using shared storage or copying the disks. What are the technical requirements of each 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, use qcow2. 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.

    Hint: Make sure the details match when migration e.g.

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1. The storage pool, use identical names/pool based on a directory.

2. access to the disks, qemu user will require access to the storage pool location/directory on disk.

3. parameters/capabilities are available on the remote node e.g. machine type.

4. The guest does not use hardware attributes that cannot be migrated e.g. cloud-init cdrom. Hint: virsh change-media –eject.

5. `https://libvirt.org/formatdomain.html`

Alternatively you can provide a modified domain.xml definition file when doing the migration to provide modified options/locations. This is more advanced!

7. Perform live migrations including copying the storage as part of the live migration with your partner, and measure the downtime. Compute mean and median of your chosen metric.

8. What would be the difference(s) when doing a live migration with shared storage?

9. Optional: Perform live migrations using shared storage with your partner, and measure the downtime. Compute mean and median of your chosen metric. *Hint: set up NFS, if you struggle with this contact the labteachers.*

2   Optional: 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.

10. What are the most important differences between NFS and SMB? Explain in approximately 200 words.

11. 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.

12. 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.*

Besides NFS and SMB, there are several other means to shared storage. All have their unique characteristics, so not all are suitable to store VM disk images on.

13. List two other approaches to implement shared storage. Compare them to NFS and SMB and tell why they can (or cannot) be used to store VM disk images on.

3   Optional: UNTESTED for KVM - Migrating to Amazon

Only consider this part of the lab if you have the time. It is currently still untested for KVM.

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 a later lab.

14. 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?

15. Create a new virtual machine with 6500 MB of disk space. Make sure Apache is installed and is serving a web page. Document the steps you take.

16. 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` *reportedly works only on expensive types (m3.medium and up)).*

17. 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?