ComS 252 Homework 3: Buy a new disk

Group assignment (check syllabus for group penalty details)

Due September 19, 2023

1 Objectives

For this assignment, you will change disk partitions and move filesystems around.

2 Build a virtual machine

1. Download the ISO file to initialize the virtual machine for homework.
2. In VirtualBox, create a new virtual machine for this assignment. Create a virtual disk with a few GB of storage space, as usual. Then, under the storage settings, create a *second* virtual disk with a few GB of storage space. Figure 1 shows the required disk configuration.
3. Set the ISO file as the optical disk, and boot up the VM.
4. Select "Build Hw03 virtual machine" from the boot menu.
5. After installation completes, remove the ISO from the optical drive, and take a snapshot.
6. At first boot, the VM initializes itself by fetching and running a script from the server. This requires Internet access, and VPN access if you are off campus. The script will, among other things, create a user account with your ISU username, and accounts `alice`, `bob`, and `chuck`. All user accounts will initially have passwords that are the account name, followed by "`pw`".
7. When the VM shuts down after initialization, you are again encouraged to take a snapshot of the VM. That way, if you make a mistake and accidentally trash the user files, you can easily roll back to a freshly initialized VM.

3 Current configuration

After installation and initialization, the VM should have two disks. The first disk should contain the following partitions (not necessarily in this order).

- `/home`, for user files.
- `/`, the root partition, for all other files.
- swap, for virtual memory.

The second disk should be unused. The idea is, the second disk was recently "purchased" and attached to the system, to allow more disk space for user files.

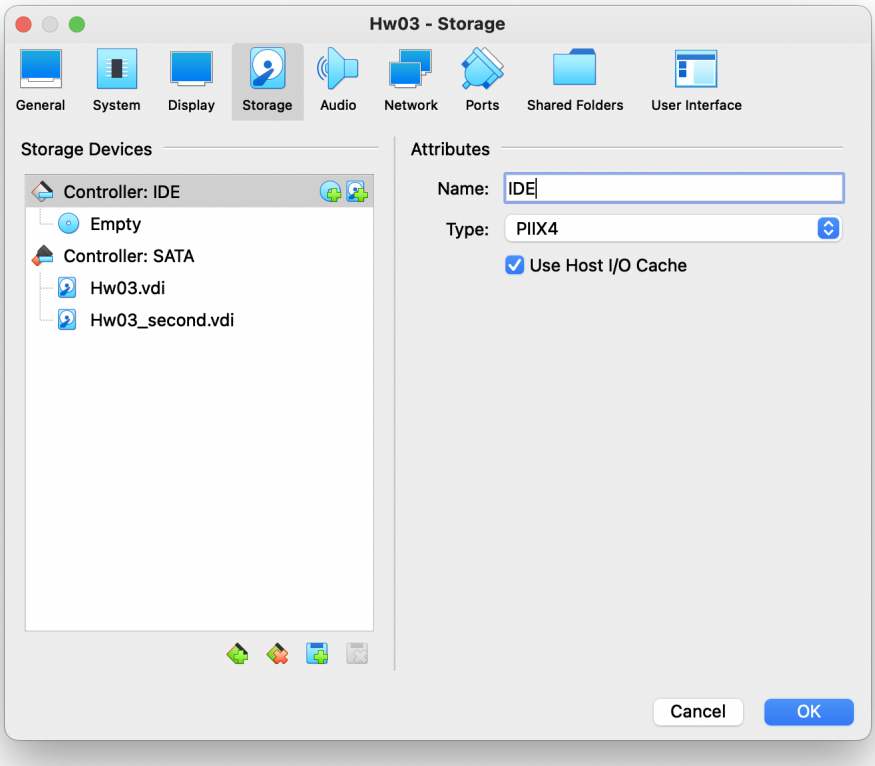

Figure 1: Required drives for this VM

4 Desired final configuration

The system should boot up into the following configuration. The first disk should contain the following partitions (not necessarily in this order).

- swap, for virtual memory, by combining the old swap and `/home` partitions. (The `top` utility will show the amount of virtual memory available.)
- `/`, the root partition, should be unchanged.

The second disk should contain the following partitions.

- `/home`, for user files.

Obviously, we want to do this without any loss of data and without having to reinstall Linux. When we have finished, the users should not notice any differences in their home directories: all files should still be there, with the same directory structure, file owners, groups, and permission settings.

5 Steps to perform

Roughly, you will need to do the following (or something similar).

1. Partition the new disk, with a single partition taking all available space.
2. Create an empty `ext4` or `xfs` filesystem on the partition.

3. Temporarily mount the new partition, and move (or copy) files from the old `/home` disk to the new one. Take care during this step, that the directory structure, file permissions, and owner and group of everything is preserved in the move/copy.

4. Reconfigure the system so that the new partition mounts to `/home` automatically at boot time, while the partition that previously was used for `/home` is not mounted anywhere.

5. Turn off swap space.

6. Repartition the old disk, merging the partitions that were used for `/home` and swap, taking care not to touch the partition used for `/`.

7. Format the new swap partition.

8. Activate the new swap partition.

9. Ensure that the system is configured so that the new swap partition is used automatically at boot time.

However, the steps listed above are (unfortunately) not always straightforward. In particular, note that it is possible to make mistakes that will wipe out an entire filesystem or cause your virtual machine to become unbootable. As such, in reality, you would want to back up your system before undertaking such a change. For the assignment, you are instead encouraged to take snapshots of the (shut down) VM frequently. The snapshots serve the same purpose as a backup: you can always (easily, in fact) revert to a working snapshot. Note that an external drive is unnecessary for this assignment, because it is possible to complete the assignment using only the drives already attached to the VM.

In addition to the file utilities that were covered in lecture, you may find the following to be useful. Consult your `man` pages for details.

- `mkfs`
- `mkswap` and `swaplabel`
- `swapoff`, `swapon`, and `free`
- `fdisk` or `parted`
- `fstab` (not a utility, but a useful `man` page entry)
- `blkid`

Note that you will need to run most of these utilities as superuser, which may be done by prefacing each command with `sudo`.

6 Troubleshooting

After making the changes, make sure each user can login. A common problem is that users can login, but cannot change to their home directories. If this happens, check the following.

1. First, make sure each user owns their home directory, and has read and execture permission. If this is not the case, then there was a problem preserving the owner/group/permissions attributes during the copy.

2. If the system does not let a user into their home directory when logging in, but running `cd` *does* take the user into their home directory, then the problem could be with SELinux. Try executing the following.

   `sudo restorecon -v` *dir*

   where *dir* is `/home` or the user's home directory.

7 Submitting your work

From your user account, run "`sudo Turnin`" to submit your work. Again, this requires Internet access (and VPN access, from off campus), as this will collect and upload your work to the homework server.

Feedback on your submission is collected in a text file, that you can view later using "`cat submit.log`" or "`less submit.log`".

To shutdown the VM cleanly, run "`poweroff`".