CIT 371 Lab 18: Partitions

This lab can be done with SSH/PuTTY or with the Web Console. See the Student VM Access document for information on accessing your VMs.

In this lab, we explore file system partitions and mounting/unmounting them. Log in to Coivcenter, start your VM and log in with your own account. Open a terminal window.

1. Inspecting partitions
   1. *df* reports file system space usage. Enter **df**, you should see several file systems listed. Look specifically at the file systems on sda (e.g., /dev/sda1). *Why do you have these specific file systems?* Type **df –a**, more file systems appear. *What does the –a option do? That is, what types of file systems appear here that did not appear with df?* Type **df –h**. *How does this differ from df?* The option –B allows you to specify the size of blocks rather than the default. Type **df –B 1K**. *Does this output differ from df?* Now try **df –B 1M** and **df –B 1G**. *How do these differ from –B 1K?* Recall from the last lab that ls –i displays items with their inode number. **df –i** displays file system usage by number of inodes. There are a preset number of inodes given the size of a partition. There is one inode per file stored (these include links, directories, domain sockets, etc) so there is little chance that you will run out of inodes although you could easily run out of disk space!
      1. **We have these specific file systems because these are the percentages of hard disk space used per item. -a means include all, which shows all files and usage of the partitions. The -h means that everything will be in human readable format. So this is easier to understand rather than just a df statement. This output does not differ but shows the same as df would for this case. These differ from -B 1K because this is showing different file sizes in different readable formats. They show smaller numbers due to the sizes asked for.**
   2. The file systems that make up our file space are made available by mounting them. Type **cat /etc/fstab** and **cat /etc/mtab**. These files store the file systems to mount at system boot (fstab) and those currently mounted (mtab). The outputs look very different with mtab having more. Near the bottom of mtab, you can find the *physically* mounted file systems (e.g., /boot). *There is one file system listed in fstab that is not in mtab, what is it?* mtab contains some file systems like /proc, /run and /sys which are stored in memory, not disk (that’s why these file systems are not /dev/sda…). In mtab, the file systems are listed as /dev, *but how are they listed in fstab?* That is, the physical locations are not specified as a directory but some other type of information. *What is it?* In looking at the physically mounted file systems in mtab, you might notice values like rw, xfs, inode64 and noquota. *What do all these values mean? Aside from rw, what other option is available?*
      1. **The one file system is called swap. In fstab they are listed by UUID first. The other type of information that isn’t the physical location is inodes. The value rw means read write mount, XFS is the common defualt Linux file system, inode64 is allowing XFS to create inodes at any location in the filesystem, lastly noquota means that there is no set limit** **of how much disk space a user or a group can use. Other options include just a read but mostly all of the information in the terminal reads as rw.**
2. Mounting and unmounting partitions using mount and umount
   1. Type **umount /home**. *What message do you get?* su to root and try again. *What message do you get?* If you have any open files in your Linux VM, **save** and **close** them before continuing. You cannot unmount a busy file system. /home is busy because there are users logged in. **telinit** allows you to change “runlevel”. In CentOS 7, there are no runlevels but the command is still available. Read telinit’s man page (DESCRIPTION section). *What does it tell you about runlevels and what this command does.* As root, type **telinit 1**. You may be asked to confirm this and you will be asked for root’s password. Changing to runlevel 1 stops many services. NOTE: while in this mode, to move your cursor outside your VM, type **ctnl+alt**, to move back to the VM, click your mouse in the VM window.
      1. **Umount: /home: umount failed: Operation not permitted. Umount: /home: target is busy. It gives the description of each runlevel such as 0 meaning power off and 6 meaning reboot. It tells us how runlevels can be used and changed and how you use telinit to do so.**
   2. From the command line prompt, type **df –k** and make a note of the device name for /home (probably /dev/sda5). Type **umount /home**. *What happens?* Confirm this worked through df –k and you will see it is missing. Type cat /etc/mtab and again, /home is missing. To remount the partition, use the mount command which has the syntax **mount *device mountpoint***. The mountpoint is /home and the device is whatever you noted earlier (probably /dev/sda5).
      1. **This should have allowed us to unattached the /home from our partition, which it did.**
   3. Remount /home by issuing the proper mount command. *What command did you enter?* Confirm it worked with another **df –k**. If you cannot get it to work, use **mount –a** which mounts all partitions specified in /etc/fstab. Type **exit** to return to the full GUI/multi-user mode. You will be at the login screen, log in and open a terminal window.
      1. **Mount /dev/sda5 /home.**
3. swap space is a part of your file system. Examine /etc/fstab; you will find its entry even though no entry appears in /etc/mtab. There are several commands that operate on the swap space.
   1. Type **swapon –s**. *What is the filename of your swap space? How much of it is used?* Type **swapoff –a**. This disables the swap spaces. Repeat **swapon –s**. *What do you see?* Type **swapon –a** to re-enable it. Repeat **swapon –s** to ensure it is available.
      1. **The filename is /dev/sda6. The size used of it is 7436. When we used swapon -s the command was run but no output.**
   2. Next, type **vmstat**. This command reports on virtual memory statistics. *How much of your memory is free? What would happen if this value dropped near 0? What values do you get for si and so? What do these two values represent (look this up in vmstat’s man page)? What conclusions can you draw on these results?* 
      1. **There is 849808 free memory. If your memory value dropped near zero, then usually your computer will start to run slower and overall be less affective and your computer will start to use hard drive space for virtual memory. We get both 0 and 0 for the values of so and si. Si meaning amount of memory swapped in from disk, and so meaning the amount of memory swapped to disk. The conclusion of these results is there was zero memory swapped to or from the disk, while understanding the amount of memory we have if we were to swap in or out.**

Shut down your VM if desired, disconnect from the VPN if you are using it, and submit your lab report.