Operating Systems
COMS W4118
Extras 1

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Extra Questions

1. What is partitioning?

   Partitioning a hard drive allows one to logically divide the available space into sections that can be accessed independently of one another. It is the act of dividing a hard disk drive into multiple logical storage units refered to as *partitions*, to treat one physical disk drive as if it were multiple disks, so that a different file system can be used on each partition.

2. What is a file system?

   A *file system* is a means to organize data expected to be retained after a program terminates by providing procedures to store, retrieve and update data, as well as manage the available space on the device(s) which contain it. A file system organizes data in an efficient manner and is tuned to the specific characteristics of the device.

3. We chose ext4 file system. What other file systems are there?

   There are a number of different file systems. According to the Arch Linux wiki, the file systems are

   Btrfs "Better FS", is a **new filesystem with powerful features similar to Sun/Oracle's excellent ZFS**.

   exFAT **Microsoft file system optimized for flash drive**

   ext2 **Second Extended Filesystem** is an established, mature GNU/Linux filesystem that is very stable.

   ext3 **Third Extended Filesystem** is essentially the ext2 system with journaling support and write barriers.

   ext4 **Fourth Extended Filesystem** is a newer filesystem that is also compatible with ext2 and ext3. It provides support for volumes with sizes up to 1 exabyte and files sizes up to 16 terabytes.

F2FS Flash-Friendly File System is a flash file system created by Kim Jaegeuk at Samsung for the Linux operating system kernel.

JFS IBM's **Journaled File System** was the first filesystem to offer journaling.

NILFS2 New Implementation of a Log-structure File System was developed by NTT. It records all data in a continuous log-like format that is only append to and never overwritten.

NTFS File system used by Windows. NTFS has several technical improvements over FAT and HPFS (High Performance File System), such as improved support for metadata, and the use of advanced data structure to improve performance, reliability, and disk space utilization, plus additional extensions, such as security access control lists and file system journaling.

Reiser4 Successor to the ReiserFS file system, developed from scratch by Namesys and sponsored by DARPA as well as Linspire, it uses B*-trees in conjunction with the dancing tree balancing approach, in which underpopulated nodes will not be merged until a flush to disk except under memory pressure or when a transaction completes.

ReiserFS Hans Reiser's high-performance journaling FS (v3) uses a very interesting method of data throughput based on an unconventional and creative algorithm.

VFAT Virtual File Allocation Table is technically simple and supported by virtually all existing operating systems.

XFS Early journaling filesystem originally developed by Silicon Graphics for the IRIX operating system and ported to GNU/Linux. It provides very fast throughput on large files and filesystems and is very fast at formatting and mounting.

ZFS Combined file system and logical volume manager designed by Sun Microsystems

4. What is a swap partition or a swap file?

   Linux divides its physical RAM into chunks of memory called pages. Swapping is the process whereby a page of memory is copied to the preconfigured space on the hard disk, called swap space, to free up that page of memory. The combined sizes of the physical memory and the swap space is the amount of virtual memory available.

5. What's the difference between the two files?

   The swap partition is an independent section of the hard disk used solely for swapping; no other files can reside there. The swap file is a special file in the filesystem that resides amongst your system and data files.

6. What does mounting a file system mean?

The `mount` command instructs the operating system that a file system is ready for use, and associates it with a particular point in the overall file system hierarchy and sets options relating to its access. Mounting makes file systems, files, directories, devices, and special files available to the user.

7. What does `/etc/fstab` contain?

The `/etc/fstab` file can be used to define how disk partitions, various other block devices, or remote filesystems should be mounted into the filesystem.

Each filesystem is described in a separate line. These definitions will be converted into `systemd` mount units dynamically at boot, and when the configuration of the system manger is reloaded.

8. What is `chroot`?

`Chroot` is an operation that changes the apparent root directory for the current running process and their children. A program that is run in such a modified environment cannot access files and commands outside that environmental directory tree. This modified environment is called a *chroot jail*. Changing root is commonly done for performing system maintenance on systems where booting and/or logging in is no longer possible.

9. Why did the installation process have `chroot`?

The installation process has `chroot` because we were modifying the system without a root user or without any other users in the system. Thus, we needed a way to access the system directory without creating a root user. The system still did not have a bootloader installed.

10. Did you reboot before or after `chroot`?

Rebooted after the `chroot` once the bootloader was installed.

11. Can you describe how the installation works at a very high level in a few sentences?

Yes, first we set up an internet connection so we can download from our mirror sites during the installation process. Then, we prepare a storage device by partition the drive and attach our filesystem (ext4) to it. We then mount the disk image file system from the arch linux image onto our virtual machine. Next, we download the necessary packages from the base sites and customize the kernel with the necessary regional information. Finally, we download the bootloader and build it. We then reboot the system and eject the disk image.

12. What does `systemctl enable dhcpcd.service` do?

`systemctl` is the command run to control `systemd` (the service manager for Linux). By calling `systemctl enable dhcpcd.service`, we are enabling the dhcpcd.service unit at bootup of the virtual machine.

13. Does it have any immediate effects?

    No, it does not.

14. Does it set something up for the next reboot?

    Yes, the service will be enabled on reboot. More specifically the dhcpcd service will be enabled after reboot.

15. What is `sudo`?

    `sudo` ("substitute user do") allows a system administrator to delegate authority to give certain users (or groups of users) the ability to run some (or all) commands as root or another user while providing an audit trail of the commands and their arguments.

16. How does `sudo` work?:

    `sudo` enables root privileges only when needed as per the `setuid` command. It sets the effective user ID of the calling process.

17. How does the Arch Linux packaging system work?

18. When you install software through pacman, do you get the source code too? If not, how do you go about getting it?

19. What is an X server?

20. Can you describe the client-server architecture of the X window system?

21. What does startx or startxfce4 do?

22. What is a kernel module?

23. What kernel modules are you running?