

Embedded Linux 247-305VA

Fall 2020

Assignment 1

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1. Explain the following terms:

a. Operating system

*An operating system is system software that manages computer hardware, software resources, and provides common services for computer programs.*

-[https://en.wikipedia.org/wiki/Operating\\_system](https://en.wikipedia.org/wiki/Operating_system)

b. Kernel

*A kernel is a program that controls all computer operations, coordinates all executing utilities, ensures that executing utilities do not interfere with each other or consume all system resources and schedules and manages all system processes.*

-<https://www.thegeekdiary.com/unix-linux-what-is-a-shell-what-are-different-shells/>

c. Shell

*A Unix shell is a command-line interpreter or shell that provides a command line user interface for Unix-like operating systems. The shell is both an interactive command language and a scripting language, and is used by the operating system to control the execution of the system using shell scripts.*

-[https://en.wikipedia.org/wiki/Unix\\_shell](https://en.wikipedia.org/wiki/Unix_shell)

d. Virtual filesystem

*A virtual file system (VFS) or virtual filesystem switch is an abstract layer on top of a more concrete file system. The purpose of a VFS is to allow client applications to access different types of concrete file systems in a uniform way.*

- [https://en.wikipedia.org/wiki/Virtual\\_file\\_system](https://en.wikipedia.org/wiki/Virtual_file_system)

2. Name four Linux shells.

1) *The Bourne shell (sh).*

2) *The C shell (csh).*

3) *The Korn shell (ksh).*

4) *The GNU Bourne-again shell (bash).*

-<https://www.thegeekdiary.com/unix-linux-what-is-a-shell-what-are-different-shells/>

3. Compare input/output redirection with pipe

*Redirection is referring to I/O or input/output redirection. It is possible to redirect the input and output of various commands to and from files or to other commands in a process known as piping (pipes enable you to connect Linux commands together). One command "redirects" while the other "pipes".*

-<https://vegibit.com/linux-redirection-and-piping/>

-Exploring BeagleBone 2<sup>nd</sup> edition by Derek Molloy

4. Explain the following commands

- a. Grep: *is a Linux/Unix command-line tool used to search for a specific string of characters in a specified file.*

-<https://phoenixnap.com/kb/grep-command-linux-unix-examples>

- b. Fdisk: *is a command-line utility that provides disk-partitioning functions and other similar disk-oriented functions.*

-<https://en.wikipedia.org/wiki/Fdisk>

-<https://www.geeksforgeeks.org/fdisk-command-in-linux-with-examples/>

- c. Fd: *is a user-friendly alternative to the Linux find command. It colorizes the terminal output and can ignore hidden directories/files.*

-[https://linuxide.com/linux-how-to/fd-alternative-linux-find-](https://linuxide.com/linux-how-to/fd-alternative-linux-find-command/#:~:text=What%20is%20fd%20command%3F,the%20use%20of%20regular%20expressions.)

[command/#:~:text=What%20is%20fd%20command%3F,the%20use%20of%20regular%20expressions.](https://linuxide.com/linux-how-to/fd-alternative-linux-find-command/#:~:text=What%20is%20fd%20command%3F,the%20use%20of%20regular%20expressions.)

- d. Make: *is typically used to build executable programs and libraries from source code.*

<https://www.computerhope.com/unix/umake.htm#:~:text=make%20is%20typically%20used%20to,file%20to%20a%20target%20result.>

- e. Which: *is used to identify the location of a given executable that is executed when you type the executable name (command) in the terminal prompt.*

-<https://linuxize.com/post/linux-which-command/>

5. Read page 27-28 of the book Exploring BeagleBone and write down how to protect your BeagleBone.

How to protect your BeagleBone Black <b>Don't...</b>
<i>abruptly power-off the BBB (pull the plug). Follow the procedures to turn it off correctly.</i>
<i>place the BBB on conductive surfaces (like metal). The bottom side of the BBB has sensitive circuitry that can be easily damaged and cause problems for the BBB.</i>
<i>draw too much current off of the expansion headers. The maximum current the BBB can tolerate is around 4-6mA (and 8mA in certain situations).</i>
<i>power circuits that require 5V. The GPIO pins are 3.3V tolerant and most of the ADCs are 1.8V tolerant. You will destroy your board by doing so.</i>
<i>power circuits that apply power to the BBB's expansion headers while the board is turned on (you can, but follow the correct procedures to do so).</i>
<b>Do! always check your connections (PIN connections, wiring, etc.) and be sure to read through the BBB Service Reference Manual (SRM).</b>

- Exploring BeagleBone 2<sup>nd</sup> edition by Derek Molloy

6. Explain Ext4 and FAT filesystem

**ext4:**

*The ext4 journaling file system or fourth extended filesystem is a [journaling file system](#) for [Linux](#), developed as the successor to [ext3](#). ext4 was initially a series of [backward-compatible](#) extensions to ext3, many of them originally developed by Cluster File Systems for the [Lustre file system](#) between 2003 and 2006, meant to extend storage limits and add other performance improvements. The ext4 filesystem can support volumes with sizes up to 1 [exbibyte \(EiB\)](#) and single files with sizes up to 16 [tebibytes \(TiB\)](#) with the standard 4 [KiB block size](#). The maximum file, directory, and filesystem size limits grow at least proportionately with the filesystem block size up to the maximum 64 KiB block size available on [ARM](#) and [PowerPC/Power ISA](#) CPUs.*

- <https://en.wikipedia.org/wiki/Ext4>

**FAT:**

File Allocation Table (FAT) is a [file system](#) developed for personal computers. Originally developed in 1977 for use on [floppy disks](#), it was adapted for use on hard disks and other devices. It is often supported for compatibility reasons by current [operating systems](#) for personal computers and many [mobile devices](#) and [embedded systems](#), allowing interchange of data between disparate systems. The increase in disk drives capacity required three major variants: [FAT12](#), [FAT16](#) and [FAT32](#). The FAT standard has also been expanded in other ways while generally preserving backward compatibility with existing software. The file system uses an index table stored on the device to identify chains of data storage areas associated with a file, the [File Allocation Table](#) (FAT). The FAT is statically allocated at the time of formatting. The table is a [linked list](#) of entries for each [cluster](#), a contiguous area of disk storage. Each entry contains either the number of the next cluster in the file, or else a marker indicating the end of the file, unused disk space, or special reserved areas of the disk. The root directory of the disk contains the number of the first cluster of each file in that directory. The operating system can then traverse the FAT, looking up the cluster number of each successive part of the disk file as a cluster chain until the end of the file is reached. Sub-directories are implemented as special files containing the directory entries of their respective files. Each entry in the FAT linked list is a fixed number of bits: 12, 16 or 32. The maximum size of a file or a disk drive that can be accessed is the product of the largest number that can be stored in the entries (less a few values reserved to indicate unallocated space or the end of a list) and the size of the disk cluster. Even if only one byte of storage is needed to extend a file, an entire cluster must be allocated to it, so large clusters waste much disk space if there are large numbers of small files.

- [https://en.wikipedia.org/wiki/File\\_Allocation\\_Table](https://en.wikipedia.org/wiki/File_Allocation_Table)