

computer architecture and operating systems assignment

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Computer Architecture and Operating Systems (ACCA4022_BIRM)

¹⁴

What is an Operating System

An operating system is a software programme that facilitates communication (acts as an interface) between the user and the computer hardware while also running applications which in layman's terms means that it is the most significant programme that a computer can run. It controls the memory, operations, software, and hardware of the computer and it enables you to talk with the computer without having any prior knowledge of its language which essentially means that the operating system (OS) on your computer controls all of the hardware and software on it

The majority of the time, multiple computer programmes are active at once, all of which require access to the CPU, RAM, and storage of your computer. All of this is orchestrated by the operating system to guarantee that each programme receives the resources it requires.

¹⁵An operating system's main responsibility is to distribute ²¹services and resources, such as hardware, memory, processors, and data which means a computer is worthless without an operating system in place [8].

Evolution of operating systems

Operating systems are changing quickly as computers are now used in almost every activity, from children's games to the most advanced planning tools for governments [1].

¹¹The operating system is divided into four generations:

First Generation (1945-1955), which introduced electronic computing systems, introduced batch processing systems, and developed multi-user and multiprogramming.

Second Generation (1955-1965) introduced batch systems, while Third Generation (1965-1980) focused on multi-user and multiprogramming.

Fourth Generation (1980-Now) uses graphical user interfaces and distributed computing, with wearable devices like Smart Watches and VR Gears increasing the demand for conventional operating systems. Personal computers are the most common type of operating system and devices used in this generation.

Types of operating systems

¹³Over time, various operating systems (OS) with various features ²⁰and functionalities have emerged. Users choose the OS to install on their computers based on an understanding of each OS's functions [3].

4

Any computer you buy often comes pre-loaded with an operating system. The default operating system that comes with computers is used by the majority of users, however it is possible to update or even switch operating systems [4].

Microsoft Windows, macOS, and Linux are the three most popular operating systems for personal computers [2].

A graphical user interface, or GUI (pronounced gooey), is used by modern operating systems. Using a combination of visuals and text, a GUI makes it possible for you to use your mouse to click on icons, buttons, and menu items that are all clearly shown on the screen.

The graphical user interface (GUI) of every operating system differs in appearance and feel, so switching to a new operating system may seem strange at first but the fundamental concepts are the same in most modern operating systems, which are created to be user-friendly.

Microsoft windows

4

Midway through the 1980s, Microsoft introduced the Windows operating system. Windows has been issued in a variety of versions over the years, the most recent being Windows 10 (which was released in 2015), followed by Windows 8 (2012), Windows 7 (2009), and Windows Vista (2007). The fact that Windows is pre-installed on most new computers contributes to its status as the most widely used operating system worldwide.

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MacOS

Apple produces a series of operating systems under the name macOS (formerly known as OS X). All Mac computers, sometimes known as Macs, already have it installed. Mojave (issued in 2018), High Sierra (launched in 2017), and Sierra (released in 2016) are a few of the particular versions.

MacOS users make up fewer than 10% of all operating systems worldwide which is a far lower percentage than Windows users, who make up more than 80%. This is due to Apple computers' inclination towards higher prices however many individuals do prefer to choose macOS's interface over Windows'.

Linux

6

An open-source operating system family, Linux (pronounced LINN-ux), allows for worldwide distribution and modification. This differs from proprietary software like Windows, which can only be altered by the corporation that owns it. There are many different distributions—or versions—of Linux to select from, and it is free [5]. Over the following several years, the number of Linux-based networks will increase significantly [7].

Since many threats target the operating system, network security and OS-level security are equally crucial for businesses [6].

3

Use of CLI commands in a Windows / Mac OS.

The command line is the ultimate seat of power on a computer, allowing users to perform wizardry at speed. It is a place where commands are typed to the computer, which is its obedient servant, however the computer does not speak English, so learning its language is necessary to give commands.

The command line has risks, as it can instruct the computer to do anything it can, such as erasing data, therefore it is crucial to understand the command's purpose before running it.

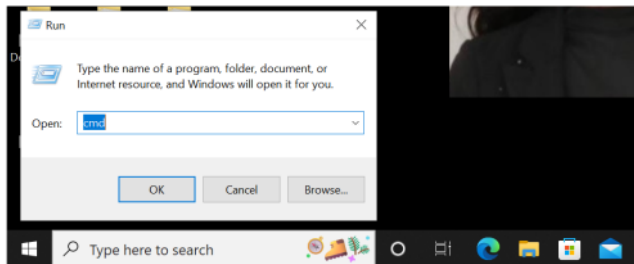
A single CLI command can be used to perform repetitive tasks like upgrading themes or removing spam comments [10].

3

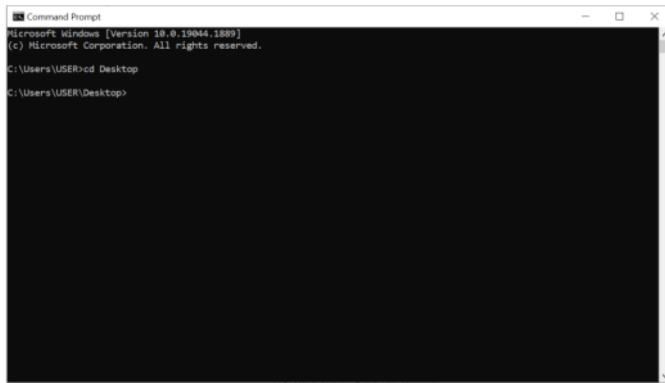
Windows

In Windows OS, you can use the programme directory or shortcut keys to open the command prompt. Go to your search bar (next to the Windows symbol) and enter cmd using the programme directory. A list of all the command prompts on your computer, including the default Windows cmd, will appear when you do this.

You could also press Windows + R on your keyboard to open a dialogue window, then type cmd in the box that appears [9].



Take the following actions to access the desktop: Type "cd Desktop" at the command prompt to access your desktop.



MacOS

You can access the CLI in a Mac OS by using the programme directory or a keyboard shortcut, just like in Windows. Locate the launchpad and type Terminal to use the programme directory. This will make it come up.

In order to use the keyboard shortcut, press the keys cmd and space. You can find the Mac OS Terminal here.



Each command has three components: the command itself, an argument specifying the resource it should use, and an option that changes the output. So, for instance, if you wanted to move a file on your Mac from one folder to another, you would use the "move" command (mv) and then specify the location of the item you wanted to move, along with the location you wanted it to go.

For example,

- Type `cd ~/Documents` then and press Return to navigate to your Home folder.
- Type `ls` then Return — you type Return after every command.



```
Terminal — zsh — 80x24
Last login: Fri Sep 3 14:26:40 on ttys000
$ cd ~/Documents
$ ls
CMH gifs
Safari .mov
Utilities .mov
Zoom
calibre books
$
```

The `ls` command, which lists files, should now provide a list of all the files in your Documents folder.

3 Use of CLI commands in a Linux OS.

Using the Gnome or KDE window manager will affect where the command line is located. (If you are using KDE, there should be a large K icon there; if not, you are using Gnome.) Click the K button, choose System, and then select Konsole if you're running KDE. Select System Tools, then click on Terminal if you're using Gnome by clicking the Applications button in the top left corner of the screen.

You may print the current working directory on your terminal by using the `pwd` command. It does its job quite effectively while being a fairly simple command.

```
root@ubuntu:/etc/network/if-pre-up.d# pwd
/etc/network/if-pre-up.d
```

Now, the whole directory ought to be available in your terminal prompt by default. However, if it isn't then you can quickly see the directory you're in by using this command. This command can also be used to find the directory where a script has been saved when writing scripts.

Moving between directories is more-so required when working in the terminal. You should be familiar with the Linux command "**cd**," which will enable you to traverse through directories. Simply enter the letters "cd" and "directory" as shown below.

```
root@ubuntu:~# cd <directory path>
```

```
root@ubuntu:~# pwd
/root
root@ubuntu:~# cd /etc/
root@ubuntu:/etc# pwd
/etc
root@ubuntu:/etc#
```

As you can see from the command above, I used the single command **cd** to navigate to the /etc directory. The **pwd** command was used to print the working directory.

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You can create directories from the terminal with the **mkdir** command. The directory name is followed by mkdir in the normal syntax.

```
root@ubuntu:~# mkdir <folder name>
```

```
root@ubuntu:~# ls
root@ubuntu:~# mkdir JournalDev
root@ubuntu:~# ls
JournalDev
root@ubuntu:~#
```

With just this one command, as shown in the screenshot above, the JournalDev directory was created [12].

3

Use of Batch scripts in a Windows / Mac OS.

A batch file is a script file that stores commands to be executed in a sequential order, automating routine tasks without user input or intervention. It is commonly used for loading programs, running multiple processes, or performing repetitive actions in a sequence. Batch files are

created in Notepad or other text editors and bundle a set of commands into a single file in serial order. They are created for command sequences when user needs a repetitive task. Batch files can be created using the .bat filename extension in Windows and other operating systems.

In the Disk Operating System (DOS), batch files like Autoexec.bat initialize the system at startup. In Unix operating systems, batch files can be run using the command prompt to run typical commands.

// The command prompt does not show up in the Command Prompt window when echo is disabled.

ECHO OFF

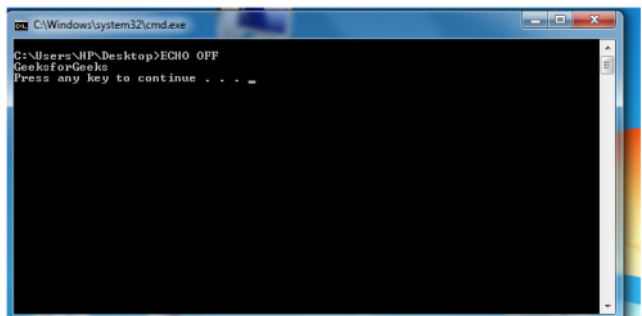
// The next command writes GeeksforGeeks to the console.

ECHO GeeksforGeeks

// The prompt is displayed and a batch program's processing is paused by the next command.

PAUSE

After saving it with a .bat extension launch the file and double-click it. It should print out as follows:



[1]

In the script above, ECHO off, clears the console by preventing commands from being written at the prompt. It then prints the word "GeeksforGeeks" to the screen and waits for the user to press a key to end the programme. Basic batch file commands include:

- **ECHO** – Prints out the input string. It can be ON or OFF, for ECHO to turn the echoing feature on or off. If ECHO is ON, the command prompt will display the command it is executing. ("Writing a Windows batch script - GeeksforGeeks")
- **CLS** – Clears the command prompt screen.

- **TITLE** – Changes the title text displayed on top of prompt window.
- **EXIT** – To exit the Command Prompt.
- **PAUSE** – Used to stop the execution of a Windows batch file.
- **::** – Add a comment in the batch file.
- **COPY** – Copy a file or files.

Types of "batch" files in Windows:

1. **INI** (*.ini) – Initialization file. These set the default variables in the system and programs.
2. **CFG** (*.cfg) – These are the configuration files.
3. **SYS** (*.sys) – System files, can sometimes be edited, mostly compiled machine code in new versions.
4. **COM** (*.com) – Command files. These are the executable files for all the DOS commands. In early versions there was a separate file for each command. Now, most are inside COMMAND.COM.
5. **CMD** (*.cmd) – These were the batch files used in NT operating systems

3 Use of Bash scripts in a Linux OS.

Bash (Bourne Again Shell) is a free and enhanced version of the Bourne shell, distributed with Linux and GNU operating systems. It includes command-line editing features and conforms to the shell standard specified as part of IEEE POSIX.

Bash is released under the GNU General Public License (GPL) and is compatible with Bourne shell programs.

A shell is a program that provides access to an operating system's components and defines the boundary between inside and outside.

There are two types of operating system shells: command-line interface (CLI) shells like bash and graphic user interface (GUI) shells like Windows and macOS.

Bash is the most commonly used CLI shell for Unix-based OSes, including Linux.

Bash is used for various tasks, including system administrators, software developers, network engineers, computer science researchers, hobbyists, and power users.

Bash can be used to create shell scripts in addition to being frequently used interactively. A Bash script can be used to automate almost any computer task. Bash scripts can be run immediately or on a regular basis.

How is bash put to use?

At first glance, bash seems to be a straightforward command-and-response system in which users submit instructions and bash executes them and gives the results, but bash is also a

programming environment, allowing users to create applications that take input and output it using shell scripts.

8

ls, one of the most fundamental bash commands, lists the contents of a directory. Only the names of the files and subdirectories in the current working directory are listed by this command on its own.

```
peterloshin@penguin:/$ ls
bin boot dev etc home lib lib64 media mnt opt proc root run sbin srv sys  usr var
peterloshin@penguin:/$
```

Numerous parameters of the ls command affect how the output is displayed. The following are a few frequently used options for the ls command:

1

ls command-line arguments (parameters)	Purpose
-l	Use a longer, more detailed, listing format to include file permissions, file owner, group, size and date/time of creation.
-a	List all files and subdirectories, even those that are ordinarily intended to be hidden.
-s	Display the size of each file.
-h	Display file and subdirectory sizes in human-readable format using K, M, G and so on to indicate kilobytes, megabytes and gigabytes.
-R	Recursive listing of all files and subdirectories under the current working directory.

When combined, these parameters provide the user a much clearer idea of which files and subdirectories are present in a directory, as well as when and who last modified them [11].

```

peterloshin@penguin:/$ ls
bin boot dev etc home lib lib64 media mnt opt proc root run sbin srv sys usr var
peterloshin@penguin:/$ ls -lash
total 0
0 drwxrwxrwx 1 root root 132 Nov 30 11:08 .
0 drwxrwxrwx 1 root root 132 Nov 30 11:08 ..
0 drwxr-xr-x 1 root root 1.5K Aug 31 00:02 bin
0 drwxr-xr-x 1 root root 0 Jun 13 06:30 boot
0 drwxr-xr-x 12 root root 660 Nov 30 09:53 dev
0 drwxr-xr-x 1 root root 2.2K Nov 30 09:58 etc
0 drwxr-xr-x 1 root root 22 Nov 30 09:52 home
0 drwxr-xr-x 1 root root 126 Aug 31 00:02 lib
0 drwxr-xr-x 1 root root 40 Aug 30 14:52 lib64
0 drwxr-xr-x 1 root root 0 Aug 30 14:52 media
0 drwxr-xr-x 1 root root 32 Nov 30 09:52 mnt
0 drwxr-xr-x 1 root root 12 Nov 30 09:52 opt
0 dr-xr-xr-x 187 nobody nogroup 0 Nov 30 09:52 proc
0 drwx----- 1 root root 30 Aug 30 14:52 root
0 drwxr-xr-x 13 root root 400 Nov 30 11:19 run
0 drwxr-xr-x 1 root root 1.7K Aug 31 00:02 sbin
0 drwxr-xr-x 1 root root 0 Aug 30 14:52 srv
0 dr-xr-xr-x 12 nobody nogroup 0 Nov 30 09:52 sys
0 drwxrwxrwx 1 root root 94 Nov 30 11:20 usr
0 drwxr-xr-x 1 root root 80 Aug 31 00:03 var
0 drwxr-xr-x 1 root root 90 Aug 30 14:52 var
peterloshin@penguin:/$ ls -lash /home
total 0
0 drwxr-xr-x 1 root root 22 Nov 30 09:52 .
0 drwxrwxrwx 1 root root 132 Nov 30 11:08 ..
0 drwxr-xr-x 1 peterloshin peterloshin 192 Nov 30 11:08 peterloshin
peterloshin@penguin:/$ ls -lashR /home | grep "filename.txt"
4.0K -rw-r--r-- 1 peterloshin peterloshin 15 Nov 30 11:07 filename.txt
peterloshin@penguin:/$

```

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