

Vera Karakoleva ID 2232348

by Vera Karakoleva

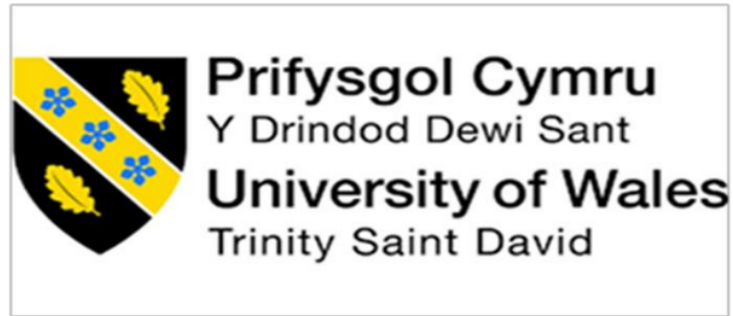
Submission date: 25-Jul-2023 10:34PM (UTC+0100)

Submission ID: 210678435

File name: 43828_Vera_Karakoleva_Vera_Karakoleva_ID_2232348_503754_187101193.docx (2.07M)

Word count: 3198

Character count: 19208



Computing Skills for the Workplace

Assessment 2

Operating System

Vera Karakoleva

Student number:2232348

**Computer Architecture & Operating
Systems (ACCA4022_ BIRM)**

Md Shantanu Islam

¹Table of Contents

Introduction.....	3
1.Operating system and their key functions	4
First Generation (1945-1955)	6
Second Generation (1955-1965).....	7
Third Generation (1965-1980)	8
Fourth Generation (1980-Now)	8
2.Use of CLI commands in a Mindows/Mac OS.....	15
3. Use of CLI commands in a Linux OS	19
4.Use of Batch scripts in aWindows /Mac OS	21
5 Use of Bash scripts in a Linux OS	24
Conclusion	26
Reference.....	27

Introduction

¹¹
This report will define what an operating system is, the different types of operating systems, and the main functions of modern operating systems. The use of the Command Line Interface in Windows, Mac OS and Linux OS will be covered, as well as the features of Batch Scripts in Windows and Mac OS and Bash Scripts in Linux OS, all of which will be illustrated with concrete examples.



(Officepertutti, 2022)

Operating System

1. Operating system and their key functions

The operating system acts as a bridge that connects the computer to the user. It is software that acts as an intermediary between hardware and software. Operating system (OS) the basic unit of a computer system that provides basic services and controls various hardware units, such as the processor, memory, storage, and input/output devices. (Ince, 2013).

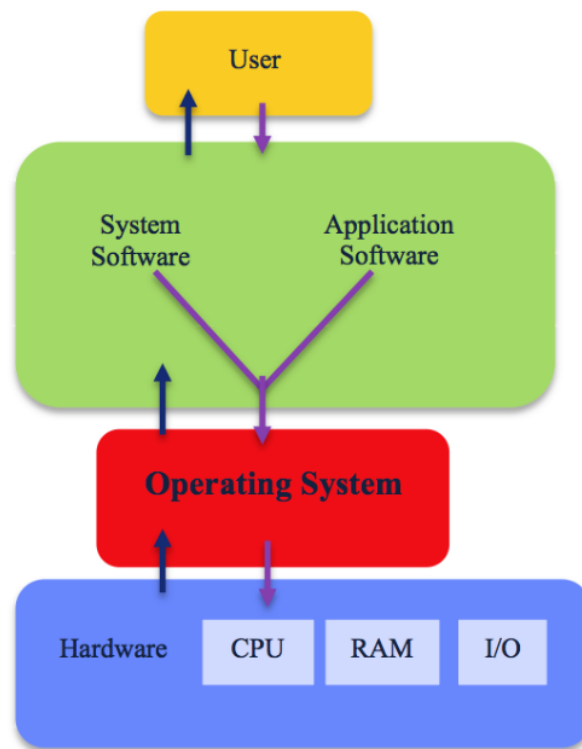


(Flamiano, 2017)

The operating system governs peripheral devices, facilitates program storage and retrieval, interacts with users, implements security measures like password protection and restricted access, and overall handles disk operations. In the case of large computer systems, specialized operating systems are often employed to optimize the utilization of costly hardware resources (Butterfield & Szymanski, 2018).

Multiple applications or programs typically run concurrently, requiring access to the computer's CPU, memory, and storage resources. The operating system manages the coordination to ensure that each application or program receives the necessary resources it requires.

This image shows the user's interaction with the system and application software, which, in turn, interfaces with the hardware. These interfaces involve two-way transactions, with data being sent and received between each component (*Understanding Operating Systems* 2023)



(Understanding Operating Systems 2023)

Over time, operating systems have advanced from sluggish and costly systems to the current technology, which offers significantly enhanced computing power at relatively affordable prices.

First Generation (1945-1955)

The evolution of operating systems commenced with serial processing, marking the emergence of electronic computing systems as alternatives to mechanical computers. Due to the limitations and errors in mechanical computing devices, humans' calculation speed was restricted, prompting the need for more advanced solutions. The main difficulties lie in scheduling and setup time. When users log in for machine time, they experience computational delays. Setup time is necessary for tasks such as loading the

compiler, saving the compiled program and source code, linking, and buffering. If an intermediate error occurs, the process needs to be restarted (Nogendra, 2023)

During his research to solve linear equations, Bulgarian John Vincent Atanasoff, a physics professor at Iowa State University, envisioned the first digital all-electronic computing device. This device featured an electronic circuit with a scanning mechanical memory that utilized capacitors (The first generation, 2023).



(The first generation, 2023)

Second Generation (1955-1965)

Batch System

During this generation, computer systems did not have a dedicated operating system, but they incorporated functionalities akin to operating systems, like FMS and IBSYS. Jobs were scheduled and submitted on cards and tapes and then they were sequentially executed on monitors using Job Control Language. The software is initially written on punch cards and subsequently transferred to the tape's processing unit. As soon as the computer completes one job, it promptly proceeds to the next item on the tape for execution.

Third Generation (1965-1980)

Multi-Programmed Batched System

During the third generation, the operating system was developed to efficiently handle multiple users concurrently. The operating system in this context enables users to interact with the computer through online terminals, effectively making it a multi-user and multiprogramming system. Job scheduling algorithms are utilized by the processor to determine the sequence of programs to be executed.

Windows and iOS are both instances of multi-programmed batch operating systems.

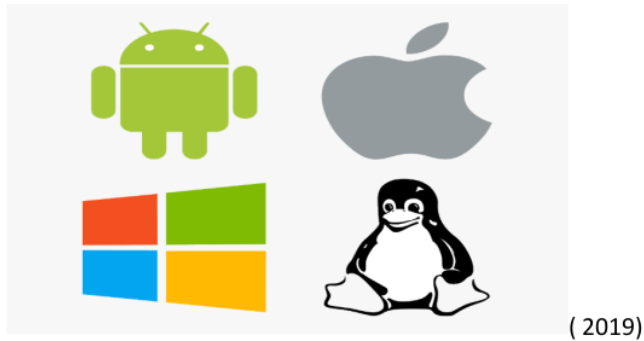
Fourth Generation (1980-Now)

In the fourth generation, time-sharing operating systems and the Macintosh operating system were introduced. Several users can concurrently access the system through terminals, and the processor's time is distributed among them. The user interacts with the computer directly through printing ports, resembling an electric teletype. Only a small number of users shared the computer simultaneously, and each task was swiftly completed before moving on to the next one.

The Operating System serves as an illustration of a time-sharing OS.

Due to significant advancements in massive computers and hardware, the Macintosh became commercially and economically feasible, overcoming various research challenges.

Most common and popular OS use today are Microsoft 365, Linux, Android, Apple macOS



(2019)

Types of Operating System

There are a few types of operating systems cater to a broad spectrum of requirements and purposes. Examples include:

16

Network operating systems

10

A network operating system (NOS) is a dedicated operating system designed for network devices like routers, switches, or firewalls (*Network Operating System* 2023).

Mobile operating systems

20

A mobile operating system is software that facilitates the execution of application software on mobile devices. It shares similarities with well-known computer operating systems like Linux and Windows but is optimized to be lightweight and straightforward for mobile usage (Javatpoint, 2021).

22

General-purpose operating systems

A General-Purpose Operating System (GPOS) is a fundamental element found in various devices such as mobile devices, servers, and computers. Its primary role is to manage and execute all the applications installed on the system. Examples of GPOS include Linux, Windows, and Mac OS (Kiril, 2022).

¹³ Real-time operating system

A real-time operating system (RTOS) is specifically designed for real-time computing applications, handling data and events with crucially defined time constraints. It differs from time-sharing operating systems like Unix in its focus on meeting strict timing requirements. (¹⁰Real-time operating system 2023).

Components of Real Time Operating System

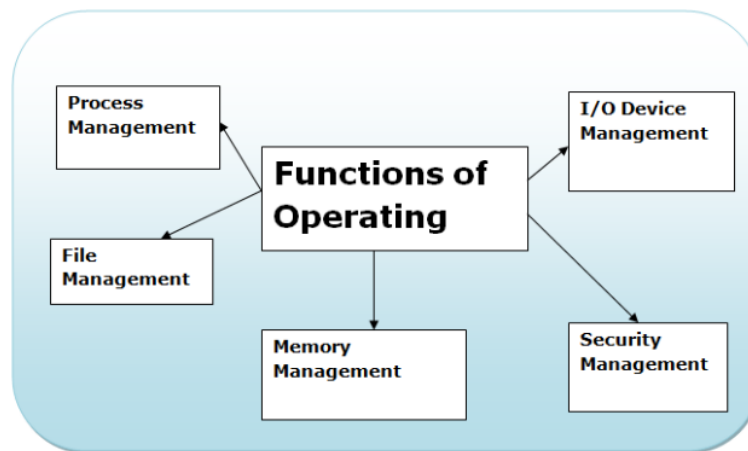


(Williams, 2023)

Embedded operating systems

Embedded operating systems typically run on hardware with very limited resources. These systems are tailored to specific tasks and designed to meet the constraints of the available resources, which are notably lower compared to non-embedded systems.

1 Introduce and analyse the key and common functions of modern general Operating Systems

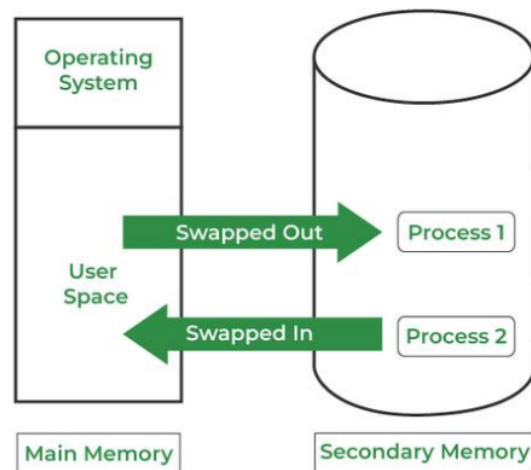


(What are **the** functions of **an** Operating System? 2021)

The fundamental functions of any operating system can be summarized as follows:

Process & Memory Management

Memory management involves the control and coordination of a computer's main memory, ensuring efficient allocation and management of memory blocks. This enables the operating system (OS), applications, and running processes to access the required memory space for their operations (Sheldon, 2022).



(varshachoudhary, 2023)

App. / Application Management

This functionality encompasses tasks such as accessing files, networks, and registries, as well as managing diagnostics logs and events (Cephalin, 2023).

Device Management

The Input-Output Device Management Function employed by the operating system is responsible for handling user-generated I/O activities. The operating system receives input from input devices, stores it in the main memory, instructs the processor to execute the input, and ultimately delivers the results to the output devices (What are the functions of an Operating System? 2021).



(What are the functions of an Operating System? 2021)

File & Directory Management

A file management system is a crucial feature of an operating system that efficiently handles various types of file systems. The operating system utilizes secondary memory, such as SSD, HDD, USB drives, etc., to store information (What are the functions of an Operating System? 2021).

Security Management

Security management is a critical aspect of operating system management, given the numerous virus threats that can disrupt normal computer operations, potentially leading to severe consequences like system crashes or data loss (*What are the functions of an Operating System?* 2021).

2. Use of CLI commands in a Windows/Mac OS

¹ Command-Line Interface (CLI) commands in Windows are text-based commands that allow users to interact with the operating system and execute various tasks directly through the command prompt. The Windows CLI provides a powerful way to perform administrative tasks, manage files and directories, troubleshoot network issues, and more.

¹ CLIs remain popular among developers and system administrators. Because CLIs are text-based interfaces, they are often considered affordable alternatives to some other software tools that use coding. CLIs are an important tool for system administrators and developers. Through the CLI, custom workflows can be created using scripts. Most major cloud providers offer a CLI to their users (Sampath et al., 2021).

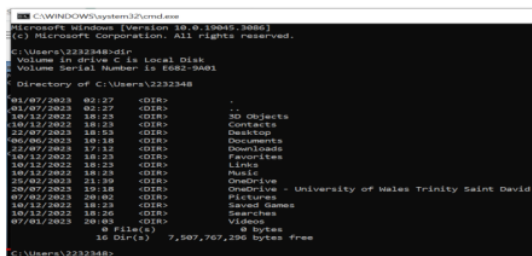
Below are some common commands used in the Windows :

```
dir      cd      cd\    cd..   copy   move  type  mkdir or md
rmdir or rd  cls    exit   help command  tasklist  systeminfo
%PATH%    doskey /history del  rename  ping    ipconfig  dir .txt dir /a
```

There just a few examples using some of these commands:

Command “dir”

⁹ This command provides a directory listing, including files and subdirectories. When used without additional parameters, it shows the volume label and serial number of the disk, followed by a comprehensive list of directories and files. For files, the command presents ⁸ their name extension and size in bytes. Furthermore, it also reveals the total count of listed files and directories, their cumulative size, and the amount of free space (in bytes) available on the disk (Robinharwood, 2023).



```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows [Version 10.0.19045.3696]
(c) Microsoft Corporation. All rights reserved.

C:\Users\2232348>dir
Volume in drive C is Local Disk
Volume Serial Number is E682-9A01

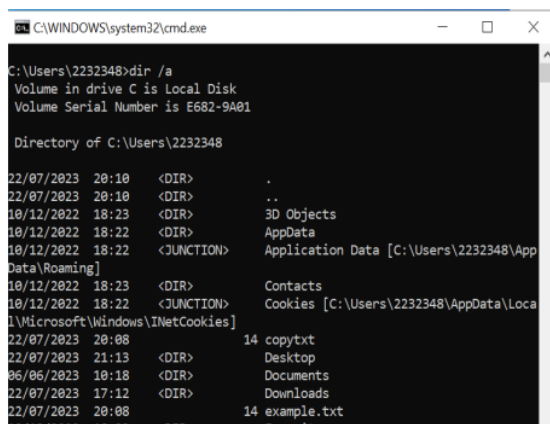
Directory of C:\Users\2232348

01/07/2023  02:27    <DIR>          .
01/07/2023  02:27    <DIR>          ..
10/12/2022  18:25    <DIR>          3D Objects
10/12/2022  18:25    <DIR>          Contacts
22/07/2023  18:25    <DIR>          Desktop
06/06/2023  19:18    <DIR>          Documents
22/07/2023  17:12    <DIR>          Downloads
10/12/2022  18:25    <DIR>          Favorites
10/12/2022  18:25    <DIR>          Links
10/12/2022  18:25    <DIR>          Music
25/02/2023  21:39    <DIR>          OneDrive
20/07/2023  19:18    <DIR>          OneDrive - University of Wales Trinity Saint David
07/02/2023  20:02    <DIR>          Pictures
10/12/2022  18:25    <DIR>          Saved Games
10/12/2022  18:26    <DIR>          Searches
07/01/2023  20:03    <DIR>          Videos
               0 File(s)            0 bytes
               10 Dir(s)      7,507,767,296 bytes free

C:\Users\2232348>
```

Command “dir /a”

The command "dir /a" in the Command-Line Interface (CLI) is used to list files and directories, including hidden and system files, in the current directory. The "/a" switch stands for "all," and it instructs the "dir" command to display all files, including the hidden and system files, along with the regular files and directories.



```

C:\WINDOWS\system32\cmd.exe
C:\Users\2232348>dir /a
Volume in drive C is Local Disk
Volume Serial Number is E682-9A01

Directory of C:\Users\2232348

22/07/2023  20:10  <DIR>          .
22/07/2023  20:10  <DIR>          ..
10/12/2022  18:23  <DIR>          3D Objects
10/12/2022  18:22  <DIR>          AppData
10/12/2022  18:22  <JUNCTION>    Application Data [C:\Users\2232348\AppData\Roaming]
10/12/2022  18:23  <DIR>          Contacts
10/12/2022  18:22  <JUNCTION>    Cookies [C:\Users\2232348\AppData\Local\Microsoft\Windows\INetCookies]
22/07/2023  20:08                14 copy.txt
22/07/2023  21:13  <DIR>          Desktop
06/06/2023  10:18  <DIR>          Documents
22/07/2023  17:12  <DIR>          Downloads
22/07/2023  20:08                14 example.txt

```

Command “doskey /history”

The command "doskey /history" in the Command-Line Interface (CLI) is used to display a list of the recently executed commands in the current session. It allows users to view the command history, which includes all the commands entered in the current Command Prompt session, up to a certain limit.

```

C:\WINDOWS\system32\cmd.exe
C:\Users\2232348>doskey /history
cd Desktop
cd ..
cd Desktop\Videos
cd ..
cd Desktop/Videos
cd Desktop
cd ..
cd Desktop\RecycleBin
dir
cd Desktop\Documents
cls
dir/a
cls
"example.txt"
echo Hello,World!>example.txt
cls
copy example.txt copytxt
rename "copy.txt"to"newfile.txt"
cls
cls
rename copy.txt newfile.txt
cls
delcopy.txt
cls
doskey /history
C:\Users\2232348>

```

Command “ping”

The "ping" command in the Command-Line Interface (CLI) is used to test the connectivity and reachability of a remote network host or a website. It sends Internet Control Message Protocol (ICMP) echo request packets to the target host and waits for ICMP echo reply packets in response. By measuring the time it takes for the packets to travel to the target host and back, the command can determine the round-trip time (RTT) or latency between the source and destination.

```

C:\WINDOWS\system32\cmd.exe
C:\Users\2232348>ping

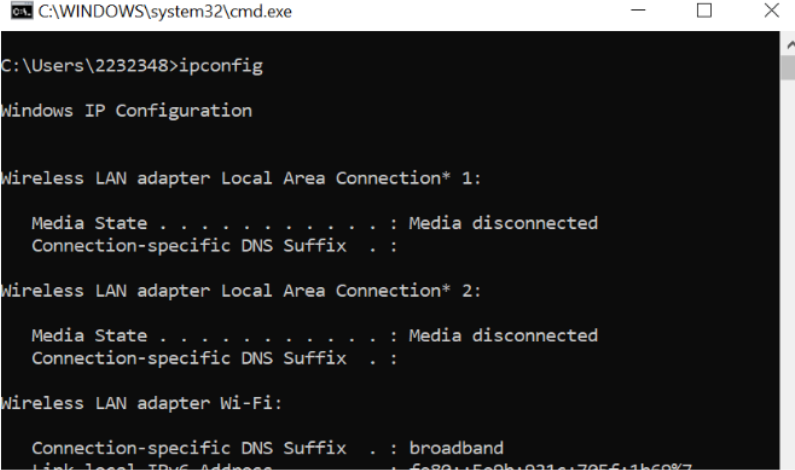
Usage: ping [-t] [-a] [-n count] [-l size] [-f] [-i TTL] [-v TOS]
           [-r count] [-s count] [[-j host-list] | [-k host-list]]
           [-w timeout] [-R] [-S srcaddr] [-c compartment] [-p]
           [-4] [-6] target_name

Options:
  -t           Ping the specified host until stopped.
               To see statistics and continue - type Control-Break;
               To stop - type Control-C.
  -a           Resolve addresses to hostnames.
  -n count     Number of echo requests to send.
  -l size      Send buffer size.
  -f           Set Don't Fragment flag in packet (IPv4-only).
  -i TTL       Time To Live.

```

Command “ipconfig”

The “ipconfig” command in the Command-Line Interface (CLI) is used to display the network configuration information for a Windows computer. When you run the “ipconfig” command in the CLI, it provides details about the network adapters installed on the computer, along with their IP addresses, subnet masks, default gateways, and other relevant network information.



```
C:\WINDOWS\system32\cmd.exe
C:\Users\2232348>ipconfig

Windows IP Configuration

Wireless LAN adapter Local Area Connection* 1:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Wireless LAN adapter Local Area Connection* 2:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix  . : broadband
    Link-local IPv6 Address . . . . . : fe80::5e9b:931e:7056:1b60%7
```

1 3. Use of CLI commands in a Linux OS

The Linux command, commonly referred to as Shell, Terminal, Console, Command Prompts. In a Linux operating system, the Command-Line Interface (CLI) offers a diverse set of commands that enable users to manage the system, execute tasks, and interact with the environment.

The command line interface is an amazing and very expressive way to communicate with a computer, in an almost identical way to the written word used by humans. Using the command line interface difficult tasks become possible (Shotts, 2019).

Below are some frequently used CLI commands in Linux:

pwd	ls	cat	file	cd	history	cp	mv
rm		ifconfig		ping	nano	mkdir	scp
	ssh		tar		top		

There just a few examples using some of these commands:

Command “ls --Help”

It is used to list ¹⁷ files and directories in the current directory or a specified location.

```
onworks@onworks-Standard-PC-I440FX-PIIX-1996: ~/Desktop
onworks@onworks-Standard-PC-I440FX-PIIX-1996:~/Desktop$ ls --help
Usage: ls [OPTION]... [FILE]...
List information about the FILES (the current directory by default).
Sort entries alphabetically if none of -cftuvSUX nor --sort is specified.

Mandatory arguments to long options are mandatory for short options too.
-a, --all                do not ignore entries starting with .
-A, --almost-all        do not list implied . and ..
--author                 with -l, print the author of each file
-b, --escape             print C-style escapes for nongraphic characters
--block-size=SIZE        with -l, scale sizes by SIZE when printing them;
                        e.g., '--block-size=M'; see SIZE format below
-B, --ignore-backups     do not list implied entries ending with ~
-c                       with -lt: sort by, and show, ctime (time of last
                        modification of file status information);
```

Command “cd “

It allows users to navigate through the directory structure of the Linux file system

```
onworks@onworks-Standard-PC-l440FX-PIIX-1996: ~/Desktop
onworks@onworks-Standard-PC-l440FX-PIIX-1996:~/Desktop$ cd Desktop
bash: cd: Desktop: No such file or directory
onworks@onworks-Standard-PC-l440FX-PIIX-1996:~/Desktop$
```

Command "ping"

The "ping" command in Linux ²⁷ is used to test the connectivity and reachability of a network host or IP address.

```
onworks@onworks-Standard-PC-l440FX-PIIX-1996: ~/Desktop
onworks@onworks-Standard-PC-l440FX-PIIX-1996:~/Desktop$ -ping
command '-ping' not found, did you mean:

command 'qping' from deb gridengine-client (8.1.9+dfsg-9build2)
command 'tping' from deb lan-runtime (7.1.4-6build2)
command 'nping' from deb nmap (7.80+dfsg1-2build1)
command 'ping' from deb iputils-ping (3:20190709-3)
command 'ping' from deb inetutils-ping (2:1.9.4-11ubuntu0.1)
command 'rping' from deb rdmactools (28.0-1ubuntu1)
command 'bping' from deb lon (3.2.1+dfsg-1.1)
command 'fping' from deb fping (4.2-1)
command 'aping' from deb ripe-atlas-tools (2.3.0-2)
command 'oping' from deb oping (1.10.0-2.1ubuntu2)
command '2ping' from deb 2ping (4.3-1)

try: sudo apt install <deb name>
onworks@onworks-Standard-PC-l440FX-PIIX-1996:~/Desktop$
```

Some more commands

- **cat**-print out the contents of a text file given as argument
- **pwd**-simply print the working directory
- **mv**- moves a file to a new location
- **rm**- remove, delete file
- **nano**-text editor for creating and editing files
- **mkdir**- create a new directory

¹4. Use of Batch scripts in a Windows /Mac OS

Batch Script is utilized to automate repetitive command sequences. Scripting offers a means to simplify and enhance shell tasks by automating these sequences. In many organizations, Batch Script is employed to automate various processes. These scripts are stored in plain text files, containing lines of commands executed sequentially, streamlining tasks and boosting productivity (Batch script, 2023).

Batch scripts are powerful tools used by System Administrators to automate various tasks and perform routine operations efficiently. They enable administrators to save time, streamline workflows, and ensure consistency in executing repetitive tasks.

Command “@echo off”

When the “@Echo off” command ⁴is used in a batch script, it prevents ¹the command prompt from displaying each line of the script it is executing before the output. By default, the “echo” command is set to “on,” which means the commands are shown at the prompt as they are executed. However, using “echo off” hides these commands, resulting in a cleaner Command-Line Interface (CLI) without the script lines cluttering the output.

Command “Pause”

The “PAUSE” command in a Windows batch file halts the execution and prevents the command prompt from closing automatically. Its purpose is to allow users to view the output on the prompt before it closes. It is only necessary when there is a need to observe the output within the command prompt.

Some more commands

- ²**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.

Examples of “BATCH” “with brief explanations and screenshots

Example 1:

⁶ This batch script, it will generate a file called "geeks_list.txt" in the C:\ directory, listing all file and folder names located in C:\Program Files. Another handy batch script that can be developed is for network diagnostics, which helps you evaluate the performance of your network and identify potential problems.

```

network check - Notepad
File Edit Format View Help
Echo off
IPCONFIG /all
PING geeksforgeeks.com
TRACERT geeksforgeeks.com
PAUSE

C:\WINDOWS\system32\cmd.exe
Connection-specific DNS Suffix Search List :
    broadband

Ethernet adapter Bluetooth Network Connection:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . . : 
    Description . . . . . : Bluetooth Device (Personal Area Network)
    Physical Address. . . . . : 08-B2-80-29-0E-72
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . : Yes

Pinging geeksforgeeks.com [199.59.243.224] with 32 bytes of data:
Reply from 199.59.243.224: bytes=32 time=9ms TTL=250
Reply from 199.59.243.224: bytes=32 time=9ms TTL=250
Reply from 199.59.243.224: bytes=32 time=9ms TTL=250
Reply from 199.59.243.224: bytes=32 time=9ms TTL=250

Ping statistics for 199.59.243.224:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 9ms, Maximum = 9ms, Average = 9ms

Tracing route to geeksforgeeks.com [199.59.243.224]
over a maximum of 30 hops:
  0  1 ms    1 ms    1 ms  Vodafone Broadband [192.168.1.1]
  1  6 ms    5 ms    5 ms  84.65.192.1
  2  10 ms   9 ms    9 ms  63.130.172.37
  3  10 ms   9 ms    9 ms

```

⁶ This script provides comprehensive details about the current network, including network configuration information. By utilizing "ipconfig /all," users can access network-related specifics. Additionally, the "ping" and "tracert" commands are employed to gather essential information about individual network packets, aiding in network diagnostics and troubleshooting.

Examples 2:

Create a BATCH file for HR department who need a simple program to help calculate the amount to pay a contractor. The contractors are on a fixed rate of £8.00 per hour. It should prompt for the contractor's name and how many hours they have worked that month. It should output the contractor's name and the amount to pay the contractor.

<pre>Contractor Payment Calculator - Notepad File Edit Format View Help @Echo off Title Contractor Payment Calculator :: Prompt for contractor's name and hours worked set /p "contractorName=Enter contractor's name: " set /p "hoursWorked=Enter number of hours worked this month: " ::Calculate payment amount set /A "rate=8" set /A "payment=hoursWorked * rate" ::Display the payment amount Echo Contractor Name: %contractorName% Echo Amount to pay : £%payment% Pause</pre>	<pre>Contractor Payment Calculator Enter contractor's name: Vera Enter number of hours worked this month: 156 Contractor Name: Vera Amount to pay : £1248 Press any key to continue . . .</pre>
--	---

1 5 Use of Bash scripts in a Linux OS

Bash scripts are often used for system administration, software installation, data processing, and various other tasks in Linux.

Bash is an upgraded version of the Bourne shell, maintaining backward compatibility while incorporating the key benefits of the C shell and introducing some new functionalities (Newham & Rosenblatt, 2005).

Some commands:

'#' symbol is used for adding a single-line comment

Command "chmod"

The "chmod" command in Linux is used to change the permissions of files and directories. The term "chmod" stands for "change mode." It allows users to specify who can read, write, and execute a file or directory.

Command "read"

This command is used to read input from the user. It allows the script to wait for the user to enter data from the keyboard and store that input in a variable. This enables interaction with the user during the script execution.

Examples of "BASH" with brief explanations and screenshots

Example 1:

Create a solution for calculating the total amount to pay for items in a customer's shopping basket. In this problem, the customer wishes to purchase three items. Create a solution to prompt for the price of each item.

It should calculate the final, total price, which should include:

- The sum of all items.
- The standard VAT rate, 20%, which is not included as part of an item price.
- The delivery charge which is a flat rate of £3.99.

The program should output the price of each item, the VAT charged, the delivery charge and the final total price.

```

#function to calculate the vat amount
def calculate_vat():
    vat_rate = 0.20
    item_price = 100
    vat = item_price * vat_rate
    return vat

#function to calculate the total price
def calculate_total():
    item_price = 100
    vat = calculate_vat()
    total_price = item_price + vat
    return total_price

#function to calculate the delivery charge
def calculate_delivery_charge():
    delivery_charge = 5.00
    return delivery_charge

#function to calculate the final total price
def calculate_final_total():
    item_price = 100
    vat = calculate_vat()
    delivery_charge = calculate_delivery_charge()
    total_price = item_price + vat + delivery_charge
    return total_price

#main function
def main():
    print("The price of the item is: ", item_price)
    print("The VAT charged is: ", vat)
    print("The delivery charge is: ", delivery_charge)
    print("The final total price is: ", total_price)

if __name__ == '__main__':
    main()

```

Example 2:

Find if the input number is odd or even

```

def is_odd(number):
    if number % 2 == 0:
        return "The number is even"
    else:
        return "The number is odd"

def main():
    number = 10
    result = is_odd(number)
    print(result)

if __name__ == '__main__':
    main()

```

7 Conclusion

In conclusion, operating systems play a critical role in managing computer hardware and software resources. They provide a user-friendly interface, allowing users to interact with the computer system effectively.

Command-Line Interfaces (CLI) are essential components of operating systems, providing a powerful way for advanced users, developers, and system administrators to perform tasks efficiently. CLI is widely used in Windows, macOS, and Linux, offering similar capabilities in each platform but with some variations in commands and utilities.

Batch scripting in Windows and Bash scripting in Linux provide automation solutions for repetitive tasks, making system administration and application management more efficient. These scripts use commands and utilities in their respective environments to execute tasks and operations in a streamlined manner.

Reference

- Butterfield, A. and Szymanski, J.E. (2018) *A dictionary of electronics and electrical engineering*. New York, NY: Oxford University Press.
- Cephalin (2023) *Operating system functionality - azure app service, Operating system functionality - Azure App Service | Microsoft Learn*. Available at: <https://learn.microsoft.com/en-us/azure/app-service/operating-system-functionality> (Accessed: 25 July 2023).
- Hussain, B. (2017) *Operating system, its functions and characteristics, Medium*. Available at: <https://medium.com/computing-technology-with-it-fundamentals/operating-system-its-functions-and-characteristics-c0946e4215c6> (Accessed: 25 July 2023).
- Ince, D. (2013) *A dictionary of the internet*. Oxford: Oxford University Press.
- Kiril (2022) *What's the difference between an rtos and a GPOS?, WALT Labs*. Available at: <https://waltlabs.io/difference-in-a-rtos-and-a-gpos/#:~:text=A%20General%20Purpose%20Operating%20System,and%20Mac%20OS%20are%20GPOS> (Accessed: 25 July 2023).
- Mobile operating system - javatpoint* (2021) www.javatpoint.com. Available at: <https://www.javatpoint.com/mobile-operating-system> (Accessed: 25 July 2023).
- Network Operating System* (2023) *Wikipedia*. Available at: https://en.wikipedia.org/wiki/Network_operating_system (Accessed: 25 July 2023).
- Newham, C. and Rosenblatt, B. (2005) *Learning the bash shell*. Beijing: O'Reilly.
- Nogendra (2023) *Coding ninjas studio*. Available at: <https://www.codingninjas.com/studio/library/evolution-of-operating-system#:~:text=The%20evolution%20of%20operating%20systems%20began%20with%20serial%20processing,.are%20prone%20to%20making%20mistakes> (Accessed: 25 July 2023).
- Officepertutti, R. (2022) *Il Sistema Operativo: Che cos'è, come funziona e le tipologie, Office per tutti*. Available at: <https://officepertutti.com/sistema-operativo-a-cosa-serve-come-funziona-e-le-tipologie/> (Accessed: 25 July 2023).
- Real-time operating system* (2023) *Wikipedia*. Available at: https://en.wikipedia.org/wiki/Real-time_operating_system (Accessed: 25 July 2023).
- Robinharwood (2023) *Windows commands, Windows commands | Microsoft Learn*. Available at: <https://learn.microsoft.com/en-us/windows->

[server/administration/windows-commands/windows-commands](#) (Accessed: 25 July 2023).

Sampath, H., Merrick, A. and Macvean, A. (2021) 'Accessibility of command line interfaces', Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems [Preprint]. doi:10.1145/3411764.3445544

Sheldon, R. (2022) *What is memory management in a computer environment?*, *WhatIs.com*. Available at: <https://www.techtarget.com/whatis/definition/memory-management#:~:text=Memory%20management%20is%20the%20process,to%20carry%20out%20their%20operations> (Accessed: 25 July 2023).

Shotts, W.E. (2019) *The Linux Command Line: A complete introduction*. San Francisco: No Starch Press.

The first generation (2023) *11.9.3.1 - the first generation (1940 – 1950)*. Available at: <http://www.fazano.pro.br/ing/indi153.html> (Accessed: 25 July 2023).

varshachoudhary (2023) *Memory management in operating system*, *GeeksforGeeks*. Available at: <https://www.geeksforgeeks.org/memory-management-in-operating-system/> (Accessed: 25 July 2023).

'What are the functions of an Operating System?' (2021).

Williams, L. (2023) *Real-time operating system (RTOS): Components, types, examples*, *Guru99*. Available at: <https://www.guru99.com/real-time-operating-system.html> (Accessed: 25 July 2023).

Windows linux mac Android, HD PNG download , transparent PNG image - pngitem (2019) *PNGitem.com*. Available at: https://www.pngitem.com/middle/iTwTbJJ_windows-linux-mac-android-hd-png-download/ (Accessed: 25 July 2023).

ORIGINALITY REPORT

26%

SIMILARITY INDEX

14%

INTERNET SOURCES

0%

PUBLICATIONS

19%

STUDENT PAPERS

PRIMARY SOURCES

1

Submitted to University of Wales, Lampeter

Student Paper

7%

2

origin.geeksforgeeks.org

Internet Source

2%

3

www.educba.com

Internet Source

1%

4

www.lifewire.com

Internet Source

1%

5

Submitted to Education Partnership North
East

Student Paper

1%

6

www.geeksforgeeks.org

Internet Source

1%

7

Submitted to INTI Universal Holdings SDM
BHD

Student Paper

1%

8

Submitted to Southern New Hampshire
University - Continuing Education

Student Paper

1%

9	Submitted to University of Glamorgan Student Paper	1 %
10	www.coursehero.com Internet Source	1 %
11	www.technobyte.org Internet Source	1 %
12	Submitted to University of Central Lancashire Student Paper	1 %
13	forums.theregister.com Internet Source	1 %
14	listenenglish.freevar.com Internet Source	1 %
15	Submitted to American College of the Middle East Student Paper	1 %
16	nou.edu.ng Internet Source	1 %
17	dokumen.pub Internet Source	1 %
18	Submitted to King's Own Institute Student Paper	<1 %
19	Submitted to Melbourne Institute of Technology Student Paper	<1 %

20	Submitted to Victoria University Student Paper	<1 %
21	Submitted to PSB Academy (ACP eSolutions) Student Paper	<1 %
22	www.freepatentsonline.com Internet Source	<1 %
23	Submitted to National School of Business Management NSBM, Sri Lanka Student Paper	<1 %
24	ebookreading.net Internet Source	<1 %
25	www.ibm.com Internet Source	<1 %
26	Submitted to Wentworth Institute Student Paper	<1 %
27	dissertations.mak.ac.ug Internet Source	<1 %
28	speedypaper.x10.mx Internet Source	<1 %

Exclude quotes Off

Exclude matches Off

Exclude bibliography On