

Operating Systems Assignment

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COMPUTING ARCHITECTURE AND OPERATING SYSTEMS



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Contents

Introduction	2
Key Functions of a General Operating System.....	3
Use of Windows OS CLI Commands.....	6
Use of Linux OS CLI Commands.....	16
Use of Windows OS Scripts.....	22
Use of Linux OS Scripts [8].....	25
Conclusion.....	27
References	28
Appendices	29

Introduction

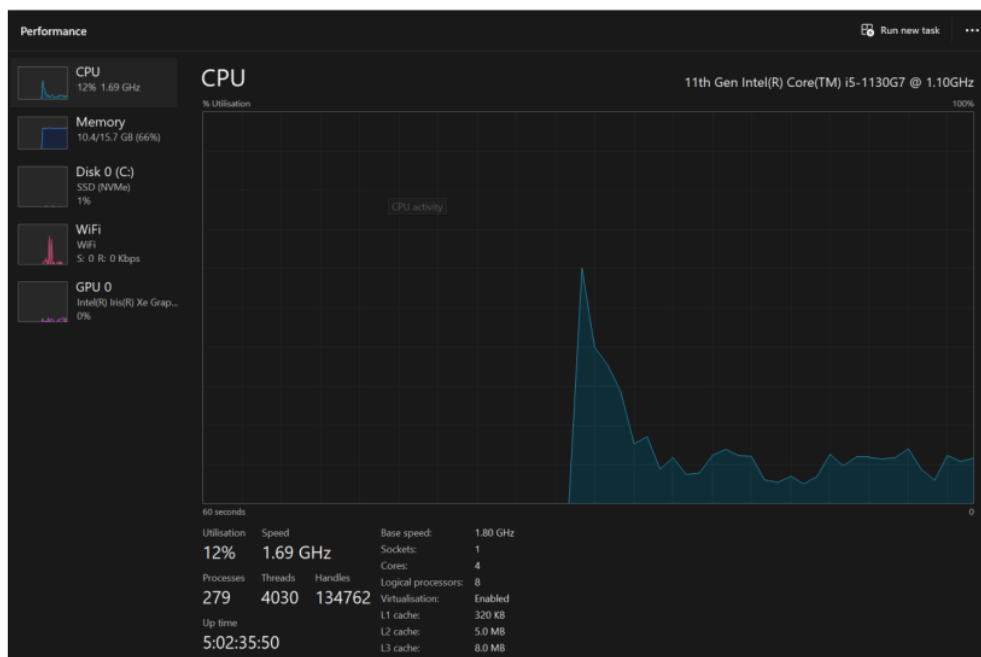
In this document, I'll explore the core functions of general-purpose operating systems, highlighting how they manage both hardware and software to keep everything running efficiently. I'll cover key areas like process management, file handling, security features, and user interfaces, while also exploring how these tasks are monitored and managed in popular operating systems such as Windows and Linux. Additionally, I'll look at how command-line interface (CLI) commands in both Windows and Linux are used in real-world scenarios, helping with system administration and troubleshooting.

Key Functions of a General Operating System

Operating systems are programs that are installed on computers via the boot program. The operating systems manages hardware resources, provides a graphical user interface (GUI) and runs several different tasks that are necessary for the computer to run effectively and efficiently. There are a number of different key functions that general operating systems have.

Process Management

In Windows operating systems, process management is responsible for overseeing the execution of programs to maintain optimal system performance. One of the main tools for this is Task Manager, which allows users to monitor and control active applications and processes. It provides details like CPU and memory usage, and lets users end tasks, adjust process priorities, and manage which applications start when the computer boots. [1]



File Management

File management in operating systems involves organising, storing, retrieving, and managing files on storage devices. It includes tasks such as creating, reading, updating, and deleting files, as well as controlling access permissions and file naming conventions. [2]

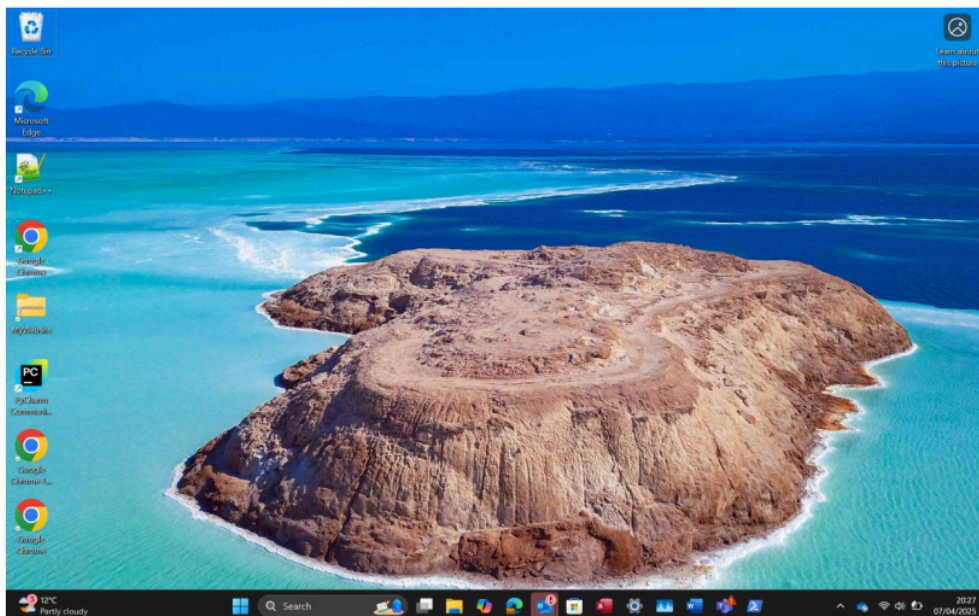
Security and Access Control

Security and Access Control features within operating systems are vital to their operations. It is the fundamentals behind all operating systems. Prevention from unauthorised access is managed using this. This can be done in many different ways. Passwords are used to hinder illegal attempts into authorised systems/accounts. Access control can be monitored in different ways. An example of this is when using Active Directory. Using this, users can be given different levels of access. These are:

- Read Only – the user will only be able to view the document that they're given access to.
- Read and Write – the user will be able to view and edit the document that they're given access to.
- Admin – admin permissions allows the user to edit the documents, as well as delete and/or restore documents. [3]

User Interface

The user interface is a set of programmes that allows the user to interact with the device. The most common type of interface is the Graphical User Interface (GUI). [4] This displays as a desktop with a number of different applications which can be accessed from here. There are a number of different menus of which these can be accessed from. Below is the Windows User Interface.



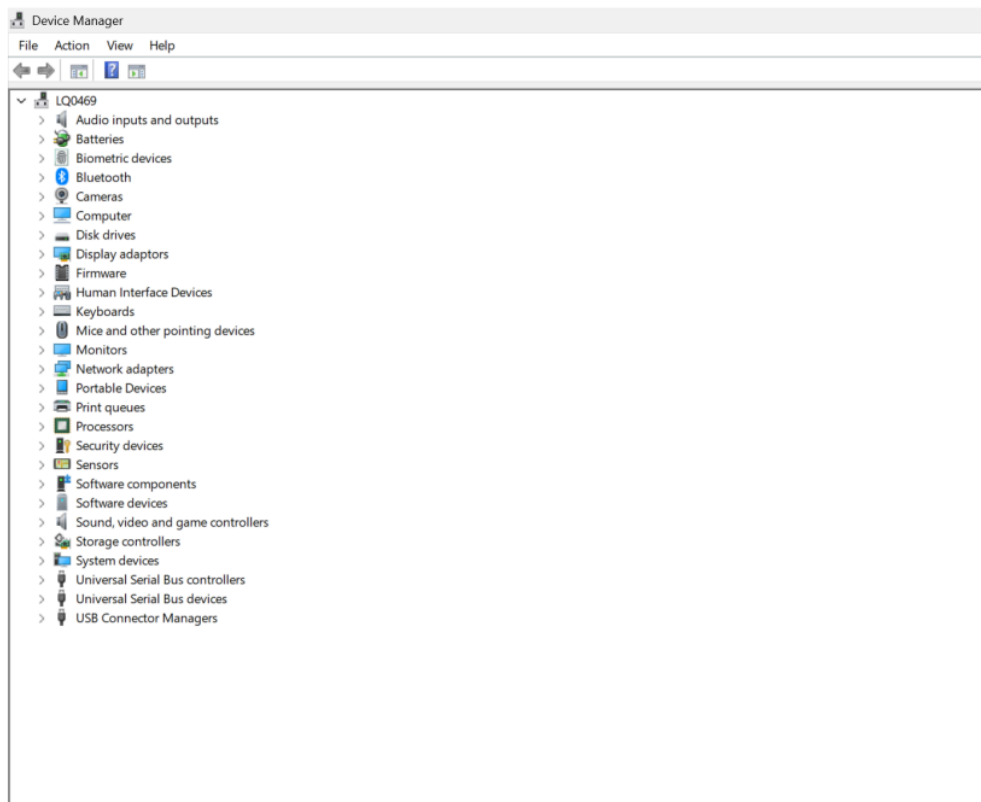
There is also Command Line Interfaces (CLIs) and Mobile User Interfaces (MUI).

Networking

Networking in operating systems helps computers communicate with each other over the internet or a local network. It uses protocols such as Transmission Control Protocol (TCP) and Internet Protocol (IP), to send data back and forth. Operating systems also provide tools for setting up internet connections, sharing files, and keeping systems secure with firewalls. These features make sure that data can travel safely and efficiently between computers. [5]

Device Management

A device manager in an operating system oversees hardware and virtual devices, allocating and deallocating resources based on process priorities. It maintains the status of each device and manages interactions between the operating system and hardware through device drivers. [6] This can be viewed on the device by opening the 'Device Manager' application. This is also where you're able to identify if there are any missing driver updates.



Use of Windows OS CLI Commands

Networking Commands

The “ipconfig /all” command gives the user detailed network information including MAC Addresses, DHCP status and DNS servers. It displays like this:

```
PS C:\WINDOWS\system32> ipconfig /all

Windows IP Configuration

Host Name . . . . . : LQ0469
Primary Dns Suffix . . . . . :
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No
DNS Suffix Search List. . . . . : www.btwifi.com


Ethernet adapter Ethernet 3:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . : internal.bridgend.gov.uk
Description . . . . . : Realtek USB GbE Family Controller #2
Physical Address. . . . . : 84-BA-59-0F-B2-93
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes


Wireless LAN adapter Local Area Connection* 1:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Description . . . . . : Microsoft Wi-Fi Direct Virtual Adapter
Physical Address. . . . . : F0-57-A6-02-D4-E8
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes


Wireless LAN adapter Local Area Connection* 2:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Description . . . . . : Microsoft Wi-Fi Direct Virtual Adapter #2
Physical Address. . . . . : F2-57-A6-02-D4-E7
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes


Wireless LAN adapter WiFi:

Connection-specific DNS Suffix . : www.btwifi.com
Description . . . . . : Intel(R) Wi-Fi 6 AX201 160MHz
Physical Address. . . . . : F0-57-A6-02-D4-E7
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
Link-local IPv6 Address . . . . . : fe80::1f19:f253:940d:1384%15(Preferred)
IPv4 Address. . . . . : 10.201.181.173(Preferred)
Subnet Mask . . . . . : 255.255.240.0
Lease Obtained. . . . . : 25 March 2025 14:11:11
Lease Expires . . . . . : 25 March 2025 14:50:57
Default Gateway . . . . . : 10.201.176.1
DHCP Server . . . . . : 1.1.1.1
DHCPv6 IAID . . . . . : 99637158
DHCPv6 Client DUID. . . . . : 00-01-00-01-2F-69-C8-E6-F0-57-A6-02-D4-E7
DNS Servers . . . . . : 86.189.0.94
NetBIOS over Tcpip. . . . . : Enabled

PS C:\WINDOWS\system32>
```

Used alongside this is often the “ipconfig /release” and the “ipconfig /renew” commands. “ipconfig /release” is used to release the configuration that is currently has and gets rid of the current IP address whilst “ipconfig /renew” assigns a new DHCP configuration and IP address.

```

PS C:\WINDOWS\system32> ipconfig /release

Windows IP Configuration

No operation can be performed on Ethernet 3 while it has its media disconnected.
No operation can be performed on Local Area Connection* 1 while it has its media disconnected.
No operation can be performed on Local Area Connection* 2 while it has its media disconnected.

Ethernet adapter Ethernet 3:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . : internal.bridgend.gov.uk

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 WiFi:

    Connection-specific DNS Suffix  . :
    Link-local IPv6 Address . . . . . : fe80::1f19:f253:940d:1384%15
    Default Gateway . . . . . :
PS C:\WINDOWS\system32>

```

Shown above is what happens when you release the IP. It also disconnects the user from the network briefly. Shown below is what happens when you're reassigned a new IP address.

```

PS C:\WINDOWS\system32> ipconfig /renew

Windows IP Configuration

No operation can be performed on Ethernet 3 while it has its media disconnected.
No operation can be performed on Local Area Connection* 1 while it has its media disconnected.
No operation can be performed on Local Area Connection* 2 while it has its media disconnected.

Ethernet adapter Ethernet 3:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . : internal.bridgend.gov.uk

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 WiFi:

    Connection-specific DNS Suffix  . : www.btwifi.com
    Link-local IPv6 Address . . . . . : fe80::1f19:f253:940d:1384%15
    IPv4 Address. . . . . : 10.201.191.123
    Subnet Mask . . . . . : 255.255.240.0
    Default Gateway . . . . . : 10.201.176.1
PS C:\WINDOWS\system32>

```

The ping command can be very useful within an IT Support role. If working within a company, you would be able to ping specific devices that are on the network to ensure they're fully connected to the network and servers. It is also possible to test if websites are down.

```
PS C:\WINDOWS\system32> ping google.com

Pinging google.com [172.217.16.238] with 32 bytes of data:
Reply from 172.217.16.238: bytes=32 time=25ms TTL=56
Reply from 172.217.16.238: bytes=32 time=24ms TTL=56
Reply from 172.217.16.238: bytes=32 time=24ms TTL=56
Reply from 172.217.16.238: bytes=32 time=22ms TTL=56

Ping statistics for 172.217.16.238:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 22ms, Maximum = 25ms, Average = 23ms
PS C:\WINDOWS\system32> █
```

As shown above, here are the results of a Ping I made to Google.com. This shows that the site is up and fully functioning.

Dir Commands

By using the “dir” command it lists all of the files and directories in the current directory. You can change the directory using the “cd” command.

```
PS C:\WINDOWS\system32> dir

Directory: C:\WINDOWS\system32

Mode                LastWriteTime         Length Name
----                -
d-----          17/03/2025         11:54             %userprofile%
d-----          01/04/2024         17:12             0409
d-----          17/03/2025         11:54             1029
d-----          17/03/2025         11:54             1033
d-----          17/03/2025         11:54             1036
d-----          17/03/2025         11:54             1040
d-----          17/03/2025         11:54             1045
d-----          17/03/2025         11:54             1046
d-----          17/03/2025         11:54             1049
d-----          17/03/2025         11:54             1055
d-----          17/03/2025         11:54             3082
d-----          24/03/2025         18:00        AdvancedInstallers
d-----          17/03/2025         11:49             af-ZA
d-----          17/03/2025         11:49             am-ET
d-----          17/03/2025         11:54        AppLocker
d-----          17/03/2025         11:54        appmgmt
d-----          24/03/2025         18:00        appraiser
d---s-          17/03/2025         11:49        AppV
d-----          17/03/2025         11:49             ar-SA
d-----          17/03/2025         11:49             as-IN
d-----          17/03/2025         11:49             az-Latn-AZ
d-----          17/03/2025         11:49             be-BY
d-----          17/03/2025         11:49             bg-BG
d-----          17/03/2025         11:49             bn-IN
d-----          24/03/2025         18:00             Boot
d-----          17/03/2025         11:49             bs-Latn-BA
d-----          01/04/2024         08:26        Bthprops
d-----          17/03/2025         11:49             ca-ES
d-----          17/03/2025         11:49             ca-ES-valencia
d-----          01/04/2024         08:34        CatRoot
d-----          25/03/2025         09:13        catroot2
d-----          17/03/2025         11:49             chr-CHER-US
d-----          24/03/2025         18:00        CodeIntegrity
d-----          17/03/2025         11:49             Com
d-----          25/03/2025         12:39        config
d---s-          01/04/2024         08:34        Configuration
d-----          17/03/2025         11:49             cs-CZ
d-----          17/03/2025         11:49             cy-GB
d-----          17/03/2025         11:49             da-DK
d-----          17/03/2025         11:49             DDFs
d-----          17/03/2025         11:49             de-DE
d---s-          17/03/2025         11:52        DiagSvc
d-----          24/03/2025         18:00        Dism
d-----          01/04/2024         08:26        downlevel
d-----          25/03/2025         09:13        drivers
d-----          01/04/2024         08:26        DriverState
d-----          25/03/2025         09:13        DriverStore
d---s-          01/04/2024         17:12        dsc
d-----          17/03/2025         11:49             el-GR
```

```
PS C:\WINDOWS\system32> mkdir Admin
```

```
Directory: C:\WINDOWS\system32
```

Mode	LastWriteTime	Length	Name
----	-----	-----	----
d-----	07/04/2025 18:11		Admin

The 'mkdir' command creates a single directory called Admin in the current location. You can then remove this directory by using the 'rmdir' command. This can only be done if the folder is completely empty.

```
PS C:\WINDOWS\system32> rmdir Admin2
```

System Information Commands

The “systeminfo” command displays a detailed material on the device.

```
PS C:\WINDOWS\system32> systeminfo

Host Name:                               LQ0469
OS Name:                                 Microsoft Windows 11 Pro
OS Version:                             10.0.26100 N/A Build 26100
OS Manufacturer:                       Microsoft Corporation
OS Configuration:                      Standalone Workstation
OS Build Type:                          Multiprocessor Free
Registered Owner:                       smsstarter
Registered Organization:                Bridgend C.B.C
Product ID:                             00331-10000-00001-AA296
Original Install Date:                  17/03/2025, 12:02:41
System Boot Time:                       25/03/2025, 08:59:59
System Manufacturer:                   LENOVO
System Model:                           20UN002EUK
System Type:                            x64-based PC
Processor(s):                           1 Processor(s) Installed.
                                          [01]: Intel64 Family 6 Model 140 Stepping 1 GenuineIntel ~1103 Mhz
BIOS Version:                           LENOVO N2TET66W (1.44 ), 24/06/2021
Windows Directory:                     C:\WINDOWS
System Directory:                       C:\WINDOWS\system32
Boot Device:                            \Device\HarddiskVolume1
System Locale:                           en-gb;English (United Kingdom)
Input Locale:                           en-gb;English (United Kingdom)
Time Zone:                              (UTC+00:00) Dublin, Edinburgh, Lisbon, London
Total Physical Memory:                  16,103 MB
Available Physical Memory:               5,636 MB
Virtual Memory: Max Size:                17,127 MB
Virtual Memory: Available:               5,593 MB
Virtual Memory: In Use:                  11,534 MB
Page File Location(s):                  C:\pagefile.sys
Domain:                                 WORKGROUP
Logon Server:                           N/A
Hotfix(s):                              3 Hotfix(s) Installed.
                                          [01]: KB5049622
                                          [02]: KB5053598
                                          [03]: KB5052915
Network Card(s):                        1 NIC(s) Installed.
                                          [01]: Intel(R) Wi-Fi 6 AX201 160MHz
                                              Connection Name: Wi-Fi
                                              DHCP Enabled:   Yes
                                              DHCP Server:    1.1.1.1
                                              IP address(es)
                                              [01]: 10.201.186.44
                                              [02]: fe80::1f19:f253:940d:1384
Virtualization-based security: Status: Running
Required Security Properties:
Available Security Properties:
    Base Virtualization Support
    Secure Boot
```

This can be very useful as it can be used to monitor hardware performance and drivers.

The ‘hostname’ command is used to display the computer's name.

```
PS C:\WINDOWS\system32> hostname
LQ0469
```

The “tasklist” command can be very resourceful as it displays a list of all the current running programmes.

```
PS C:\WINDOWS\system32> tasklist
```

Image Name	PID	Session Name	Session#	Mem Usage
System Idle Process	0	Services	0	8 K
System	4	Services	0	176 K
Secure System	140	Services	0	63,296 K
Registry	180	Services	0	68,040 K
smss.exe	624	Services	0	580 K
csrss.exe	1012	Services	0	3,772 K
wininit.exe	988	Services	0	2,332 K
csrss.exe	1032	Console	1	5,744 K
services.exe	1096	Services	0	11,244 K
LsaIso.exe	1116	Services	0	2,544 K
lsass.exe	1124	Services	0	23,892 K
winlogon.exe	1224	Console	1	9,400 K
svchost.exe	1320	Services	0	35,576 K
fontdrvhost.exe	1360	Console	1	8,920 K
fontdrvhost.exe	1368	Services	0	2,548 K
WUDFHost.exe	1412	Services	0	6,972 K
svchost.exe	1500	Services	0	18,600 K
svchost.exe	1548	Services	0	6,416 K
WUDFHost.exe	1588	Services	0	14,484 K
svchost.exe	1708	Services	0	2,672 K
svchost.exe	1728	Services	0	9,492 K

The manage-bde -status command checks if the device is fully encrypted i.e. Bitlocker encryption, TPM Chip etc.

```
PS C:\WINDOWS\system32> manage-bde -status
```

```
BitLocker Drive Encryption: Configuration Tool version 10.0.26100  
Copyright (C) 2013 Microsoft Corporation. All rights reserved.
```

```
Disk volumes that can be protected with
```

```
BitLocker Drive Encryption:
```

```
Volume C: [Windows]
```

```
[OS Volume]
```

```
Size: 471.55 GB  
BitLocker Version: 2.0  
Conversion Status: Used Space Only Encrypted  
Percentage Encrypted: 100.0%  
Encryption Method: XTS-AES 128  
Protection Status: Protection Off  
Lock Status: Unlocked  
Identification Field: Unknown  
Key Protectors: None Found
```

```
PS C:\WINDOWS\system32>
```

```
PS C:\WINDOWS\system32> Get-Process Grammarly.Desktop
```

Handles	NPM(K)	PM(K)	WS(K)	CPU(s)	Id	SI	ProcessName
2585	284	319092	316076	1,106.44	19248	1	Grammarly.Desktop

Using the Get-Process command, I am able to track the CPU and memory usage that an application uses.

```
PS C:\WINDOWS\system32> ps Grammarly.Desktop
```

Handles	NPM(K)	PM(K)	WS(K)	CPU(s)	Id	SI	ProcessName
2558	284	322108	318808	1,152.70	19248	1	Grammarly.Desktop

Due to Powershell allowing the use of shortened alias commands, you also just use ps as you would in Linux.

Disk Management

The 'diskpart' command is the parameter that is required to be entered in order to complete any functions with the disk.

```
PS C:\WINDOWS\system32> diskpart

Microsoft DiskPart version 10.0.26100.1150

Copyright (C) Microsoft Corporation.
On computer: LQ0469
```

Below is a list of different functions that can be completed whilst in the diskpart parameter.

```
Microsoft DiskPart version 10.0.26100.1150

ACTIVE      - Mark the selected partition as active.
ADD         - Add a mirror to a simple volume.
ASSIGN      - Assign a drive letter or mount point to the selected volume.
ATTRIBUTES  - Manipulate volume or disk attributes.
ATTACH      - Attaches a virtual disk file.
AUTOMOUNT   - Enable and disable automatic mounting of basic volumes.
BREAK       - Break a mirror set.
CLEAN       - Clear the configuration information, or all information, off the
              disk.
COMPACT     - Attempts to reduce the physical size of the file.
CONVERT     - Convert between different disk formats.
CREATE      - Create a volume, partition or virtual disk.
DELETE      - Delete an object.
DETAIL      - Provide details about an object.
DETACH      - Detaches a virtual disk file.
EXIT        - Exit DiskPart.
EXTEND      - Extend a volume.
EXPAND      - Expands the maximum size available on a virtual disk.
FILESYSTEMS - Display current and supported file systems on the volume.
FORMAT      - Format the volume or partition.
GPT         - Assign attributes to the selected GPT partition.
HELP        - Display a list of commands.
IMPORT      - Import a disk group.
INACTIVE    - Mark the selected partition as inactive.
LIST        - Display a list of objects.
MERGE       - Merges a child disk with its parents.
ONLINE      - Online an object that is currently marked as offline.
OFFLINE     - Offline an object that is currently marked as online.
RECOVER     - Refreshes the state of all disks in the selected pack.
              Attempts recovery on disks in the invalid pack, and
              resynchronizes mirrored volumes and RAID5 volumes
              that have stale plex or parity data.
REM         - Does nothing. This is used to comment scripts.
REMOVE      - Remove a drive letter or mount point assignment.
REPAIR      - Repair a RAID-5 volume with a failed member.
RESCAN     - Rescan the computer looking for disks and volumes.
RETAIN      - Place a retained partition under a simple volume.
SAN         - Display or set the SAN policy for the currently booted OS.
SELECT      - Shift the focus to an object.
SETID       - Change the partition type.
SHRINK      - Reduce the size of the selected volume.
UNIQUEID    - Displays or sets the GUID partition table (GPT) identifier or
              master boot record (MBR) signature of a disk.
```

The 'chkdsk C:' checks the drives for any errors. This can help to maintain system stability and prevent data loss.

```
PS C:\WINDOWS\system32> chkdsk C:
The type of the file system is NTFS.
Volume label is Windows.

WARNING! /F parameter not specified.
Running CHKDSK in read-only mode.

Stage 1: Examining basic file system structure ...
    1098240 file records processed.
File verification completed.
Phase duration (File record verification): 6.74 seconds.
    25818 large file records processed.
Phase duration (Orphan file record recovery): 13.22 milliseconds.
    0 bad file records processed.
Phase duration (Bad file record checking): 0.47 milliseconds.

Stage 2: Examining file name linkage ...
    976 reparse records processed.
    1262504 index entries processed.
Index verification completed.
Phase duration (Index verification): 15.77 seconds.
    0 unindexed files scanned.
Phase duration (Orphan reconnection): 1.36 seconds.
    0 unindexed files recovered to lost and found.
Phase duration (Orphan recovery to lost and found): 0.44 milliseconds.
    976 reparse records processed.
Phase duration (Reparse point and Object ID verification): 8.06 milliseconds.
```

Use of Linux OS CLI Commands

When completing the use of Linux OS CLI Commands, I decided to use Bellard Virtual Desktop to demonstrate my understanding. [7]

Directory Management

The 'ls' command within Linux is used to list all directory contents.

```
localhost:~# ls -l  
bench.py  
hello.c  
hello.js  
readme.txt  
localhost:~#
```

Similarly to Windows, you can create new directories within Linux using the 'mkdir' command. Shown below is the command used to create a new directory called Admin.

```
localhost:~# mkdir Admin
```

It can also be removed and deleted using the 'rm' command. This is only possible if the directory is empty.

```
localhost:~# rm -r Admin  
localhost:~#
```

Networking Commands

The 'ifconfig' command displays the network interfaces. This shows IP addresses, masks and more information.

```
localhost:~# ifconfig
eth0      Link encap:Ethernet  HWaddr 02:EE:09:9C:AE:08
          inet addr:10.5.108.27  Bcast:10.5.255.255  Mask:255.255.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:479 errors:0 dropped:56 overruns:0 frame:0
          TX packets:24 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:79814 (77.9 KiB)  TX bytes:2784 (2.7 KiB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:4 errors:0 dropped:0 overruns:0 frame:0
          TX packets:4 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1632 (1.5 KiB)  TX bytes:1632 (1.5 KiB)
```

The IP command is commonly used to manage network interfaces, routing, and other network-related configurations in Linux.

```
localhost:~# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UNKNOWN qlen 1000
    link/ether 02:ee:09:9c:ae:08 brd ff:ff:ff:ff:ff:ff
```

Netstat shows the current active network connections. This is useful because it provides valuable information about network connections, open ports, routing tables, and network statistics, helping administrators diagnose network issues, monitor system activity, and ensure proper network configuration.

```
localhost:~# netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
netstat: /proc/net/tcp6: No such file or directory
netstat: /proc/net/udp6: No such file or directory
netstat: /proc/net/raw6: No such file or directory
Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags               Type                   State                  I-Node Path
unix  2      [ ]                  DGRAM                  2961
```

Moreover, Linux is similar to Windows when using the 'Ping' command. You are able to Ping individual devices or websites to ensure they're connected and up and running. Results of when I ping Google.com are shown below. This shows it is all functioning as it should be and I would be able to connect to it from my current device.

```
localhost:~# ping Google.com
PING Google.com (142.250.189.238): 56 data bytes
64 bytes from 142.250.189.238: seq=0 ttl=115 time=198.200 ms
64 bytes from 142.250.189.238: seq=1 ttl=115 time=158.700 ms
64 bytes from 142.250.189.238: seq=2 ttl=115 time=150.200 ms
64 bytes from 142.250.189.238: seq=3 ttl=115 time=254.700 ms
64 bytes from 142.250.189.238: seq=4 ttl=115 time=187.100 ms
64 bytes from 142.250.189.238: seq=5 ttl=115 time=194.500 ms
64 bytes from 142.250.189.238: seq=6 ttl=115 time=365.401 ms
64 bytes from 142.250.189.238: seq=7 ttl=115 time=324.200 ms
```

System Information

Using the 'uname' command you are able to view all the current system information.

```
localhost:~# uname -a
Linux localhost 4.12.0-rc6-g48ec1f0-dirty #21 Fri Aug 4 21:02:28 CEST 2017 i586
Linux
localhost:~#
```

The 'top' command displays all of the current system processes. It's particularly useful for troubleshooting, identifying resource-heavy processes and monitoring system health.

```
Mem: 5776K used, 181468K free, 4K shrd, 0K buff, 900K cached
CPU:  0% usr  0% sys  0% nic 98% idle  0% io  0% irq  0% sirq
Load average: 0.00 0.00 0.00 1/31 107
```

PID	PPID	USER	STAT	VSZ	%VSZ	CPU	%CPU	COMMAND
107	61	root	R	1516	1%	0	1%	top
61	1	root	S	1552	1%	0	0%	sh -l
1	0	root	S	1512	1%	0	0%	{init} /bin/sh /sbin/init
56	1	root	S	1260	1%	0	0%	dhcpcd -q
55	1	root	S	744	0%	0	0%	settime -d /
15	2	root	SW	0	0%	0	0%	[kworker/0:1]
7	2	root	SW	0	0%	0	0%	[ksoftirqd/0]
6	2	root	SW<	0	0%	0	0%	[mm_percpu_wq]
8	2	root	SW	0	0%	0	0%	[kdevtmpfs]
10	2	root	SW<	0	0%	0	0%	[writeback]
11	2	root	SW	0	0%	0	0%	[kcompactd0]
12	2	root	SW<	0	0%	0	0%	[crypto]
13	2	root	SW<	0	0%	0	0%	[bioset]
14	2	root	SW<	0	0%	0	0%	[kblockd]
4	2	root	SW<	0	0%	0	0%	[kworker/0:0H]
16	2	root	SW	0	0%	0	0%	[kswapd0]
17	2	root	SW<	0	0%	0	0%	[bioset]
34	2	root	SW	0	0%	0	0%	[khvcd]
35	2	root	SW<	0	0%	0	0%	[bioset]
36	2	root	SW<	0	0%	0	0%	[bioset]
37	2	root	SW<	0	0%	0	0%	[bioset]
38	2	root	SW<	0	0%	0	0%	[bioset]
39	2	root	SW<	0	0%	0	0%	[bioset]
40	2	root	SW<	0	0%	0	0%	[bioset]
2	0	root	SW	0	0%	0	0%	[kthreadd]
3	2	root	SW	0	0%	0	0%	[kworker/0:0]

The 'ps' command is very similar to the Windows 'tasklist' command. As shown below, here are the results from running the 'ps' command.

```
localhost:~# ps
PID  USER    TIME  COMMAND
1  root      0:01  {init} /bin/sh /sbin/init
2  root      0:00  [kthreadd]
3  root      0:00  [kworker/0:0]
4  root      0:00  [kworker/0:0H]
5  root      0:00  [kworker/u2:0]
6  root      0:00  [mm_percpu_wq]
7  root      0:00  [ksoftirqd/0]
8  root      0:00  [kdevtmpfs]
9  root      0:00  [oom_reaper]
10 root      0:00  [writeback]
11 root      0:00  [kcompactd0]
12 root      0:00  [crypto]
13 root      0:00  [bioset]
14 root      0:00  [kblockd]
15 root      0:00  [kworker/0:1]
16 root      0:00  [kswapd0]
17 root      0:00  [bioset]
34 root      0:00  [khvcd]
35 root      0:00  [bioset]
36 root      0:00  [bioset]
37 root      0:00  [bioset]
38 root      0:00  [bioset]
```

The 'killall' command terminates all processes by the name provided. If a device is to freeze on a certain application, it is possible to close this down by using this command.

```
localhost:~# killall .mozilla/
killall: .mozilla/: no process killed
localhost:~# killall hello.js
killall: hello.js: no process killed
localhost:~#
```

The command below will show the uptime of the device. This can be useful within an IT support role as, more often than not, users often miss vital updates by not restarting their devices.

```
localhost:~# uptime
16:41:58 up 6 min,  load average: 0.00, 0.00, 0.00
```

```
localhost:~# whoami  
root
```

The 'whoami' command is used to identify who the currently logged-in user is.

```
localhost:~# echo Hello World  
Hello World
```

The 'echo' command is used to print text to the terminal.

Use of Windows OS Scripts

This script is a Number Guessing Game written in Batch scripting for Windows. The game randomly selects a number between 1 and 10 and prompts the user to guess the number. The player receives feedback after each guess, and the game continues until the correct number is guessed. The player is then asked if they want to play again.

```
1 @echo off
2 title Number Guessing Game
3 color 0a
4
5 :game
6
7 set /a "target=%random% %% 10 + 1"
8
9 echo Welcome to the Number Guessing Game!
10 echo.
11 echo I have selected a number between 1 and 10.
12 echo Try to guess it!
13
14 :guess
15 set /p "guess=Enter your guess: "
16
17
18
19 if "%guess%" == "%target%" (
20     echo Congratulations! You guessed the correct number: %target%
21     echo.
22     goto playagain
23 ) else (
24     echo Wrong guess. Try again!
25     goto guess
26 )
27
28 :playagain
29 echo Do you want to play again? (Y/N)
30 set /p playagain=Your choice:
31 if /i "%playagain%" == "Y" goto game
32 if /i "%playagain%" == "N" goto end
33
34 :end
35 echo Thank you for playing the Number Guessing Game!
36 pause
37 exit
```

The game uses a random number generator to generate a number between 1 and 10. The user is then prompted to enter their guess using the 'set /p' command. It is then compared to the generated number. If the number is correct, it will be congratulated. However, if the guess is incorrect, it will prompt the user to re-enter a guess. Once they get the answer correct, it will ask the user if they would like to play again, to which they are advised to say Y or N. If 'N' is selected, the user will be thanked for playing and exits the game. This script demonstrates basic control flow and loops in a Batch script.

```
Welcome to the Number Guessing Game!

I have selected a number between 1 and 10.
Try to guess it!
Enter your guess: 2
Wrong guess. Try again!
Enter your guess: 6
Congratulations! You guessed the correct number: 6

Do you want to play again? (Y/N)
Your choice: |
```

Above is the game in action. As shown, the user enters incorrectly first and then can enter their new guess which is correct to which the game congratulates them.

Below is a script that demonstrates the use of functions as BAT files.

```
1  @echo off
2  setlocal
3
4  call :greet "John"
5  call :calculate 5 10
6
7  goto :eof
8
9  :greet
10 echo Hello, %1!
11 goto :eof
12
13 :calculate
14 set /a result=%1 + %2
15 echo The sum of %1 and %2 is %result%.
16
17 pause
```

This batch script defines two functions, ':greet' to print a greeting with a name and ':calculate' to add two numbers and then calls them to display a greeting for "John" and the sum of 5 and 10, before pausing to show the results. The results are shown below.

```
Hello, "John"!
The sum of 5 and 10 is 15.
Press any key to continue . . .
```

The below demonstrates the use of simulated arrays in Windows scripting by assigning values to indexed variables and then displays their values.

```
1  @echo off
2  setlocal EnableDelayedExpansion
3
4  set "array[0]=Rugby"
5  set "array[1]=Football"
6  set "array[2]=Basketball"
7
8  echo !array[0]!
9  echo !array[1]!
10 echo !array[2]!
11
12 endlocal
13
14 pause
```

I have included a pause at the end of the script to ensure we are able to see the output until a key is pressed. The results of this are shown below. This has printed the 3 values which I had declared.

```
Rugby
Football
Basketball
Press any key to continue . . . |
```

Use of Linux OS Scripts [8]

```
1 echo "Welcome to the Number Guessing Game!"
2 echo "I have chosen a number between 1 and 100. Try to guess it."
3
4 random_number=$((RANDOM % 100 + 1))
5 guesses=0
6 guess=0
7
8 while [ $guess -ne $random_number ]; do
9     echo "Enter your guess:"
10    read guess
11    guesses=$((guesses + 1))
12
13    if [ $guess -lt $random_number ]; then
14        echo "Too low! Try again."
15    elif [ $guess -gt $random_number ]; then
16        echo "Too high! Try again."
17    else
18        echo "Congratulations! You've guessed the number $random_number in $guesses guesses."
19    fi
20 done
```

In the above code, I have used a number of different key areas of syntax. Firstly, I have declared variables as specific things e.g. I have declared `random_number` as any number between 1 and 100. I have then implemented user input where the user can guess what the random number is. Comparative feedback is then given depending on the guess given e.g. if the guess is higher than the random number, it will tell the user that. A while loop has been used to ensure the user is able to keep on guessing until they get the correct answer. Conditional statements are used to check if the guesses match the generated number.

This script is a simple number guessing game where the user is prompted to guess a number between 1 and 100. It starts by displaying a welcome message and explaining the rules. A random number between 1 and 100 is generated, and the game enters a loop where the user is asked to enter a guess. The script checks if the guess is too low, too high, or correct, providing appropriate feedback after each guess. The number of guesses is tracked and once the user correctly guesses the number, the script congratulates the user and displays the correct number along with the total number of attempts. The loop continues until the correct number is guessed.

```
Welcome to the Number Guessing Game!
I have chosen a number between 1 and 100. Try to guess it.
Enter your guess:
8
Too low! Try again.
Enter your guess:
56
Too high! Try again.
Enter your guess:
42
Too high! Try again.
Enter your guess:
30
Congratulations! You've guessed the number 30 in 4 guesses.
```

The below code demonstrates the use of arrays and functions. It passes the array through the function and replaces the variables.

```
1 names=("Dafydd" "Kirsty" "Carwyn")
2
3 greet_person() {
4     echo "Hello, $1!"
5 }
6
7 greet_person "${names[0]}"
```

It uses the greet_person function to say hello to the first name in the array which in this case is 'Dafydd'.

```
Hello, Dafydd!
```

Conclusion

In conclusion, operating systems are essential for keeping computers and devices running smoothly. They handle key tasks like managing processes, organizing files, ensuring security, providing user-friendly interfaces, and enabling networking and device management. These functions make sure that everything works efficiently, securely, and in an organized way.

Using command-line interfaces and scripts in Windows or Linux offers ways to interact with your system, manage files, and configure network settings. Using specific commands can help with troubleshooting and improving system performance.

Writing scripts also allows you to automate tasks, making things more efficient and showing just how flexible operating systems can be in both personal and professional settings. Understanding how these key functions work helps both everyday users and IT professionals get the most out of their systems. It makes it easier to solve problems, optimize performance, and keep everything running securely.

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Appendices

Research and briefly define different Types of OSs that are used today.

Windows OS – Windows OS is a popular operating system created by Microsoft. It offers a user-friendly interface that allows users to interact with their computer using visual elements like windows, icons, and menus. This design makes it simple for users to perform tasks, run applications, and navigate their devices for both personal and professional use.

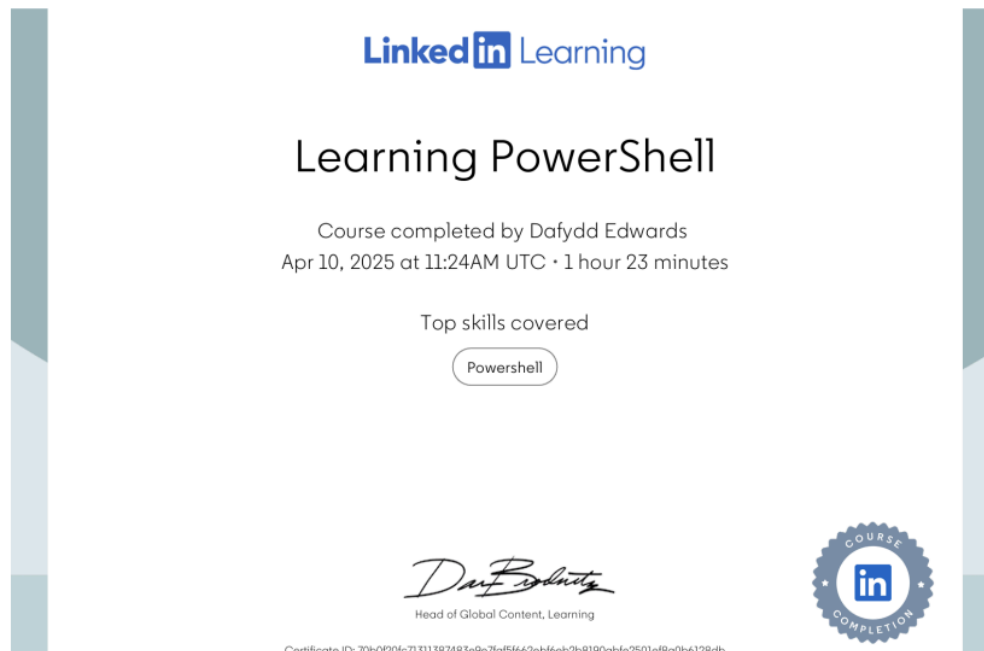
Linux OS - Linux is an open-source operating system based on Unix. It's known for being flexible, secure, and efficient. Linux is used in servers, desktops, and other devices. It offers both a command-line interface (CLI) for advanced users and a graphical user interface (GUI) for beginners, making it easy for everyone to use.

Mac OS - macOS is the operating system used on Apple's Mac computers. It offers a user-friendly experience with a clean, simple design.

iOS - iOS is the operating system that powers Apple's mobile devices, like iPhones and iPads. It's built to provide a smooth, user-friendly experience while keeping your device secure. iOS is designed to make everything run seamlessly and easily.

Android - Android is the operating system found on many smartphones and tablets. It's popular because it's open-source, which means it can be customized, and it gives users access to a huge variety of apps.

LinkedIn Learning Certificate



What is an operating system?

An operating system is the software that helps your device run and lets you interact with it. This is when you're opening apps, browsing the internet, or saving files.

What do operating systems do?

It helps you open apps, save files, connect to the internet, and makes sure all the parts of your computer or phone work together the way they should, without you having to think about it.

Common Sub Directories within Linux

/bin - system keeps its most important everyday tools

/boot – where files are stored when booting the device

/dev – where device drivers are kept

/srv – contains information on the servers.

Linux Commands

Basic commands – pwd, ls, tree, echo, whoami

Network commands – ifconfig, ping, netstat, arp, traceroute

Key Syntax Areas in Batch Scripts

- Loops
- Conditional Statements (IF, Else If)
- User Input
- Validation
- Echo
- Pause
- Exit
- Arrays

Key Syntax Areas in BASH Scripts

- Loops
- Conditional Statements (IF, Else If)
- User Input
- Validation
- Arrays
- Functions
- Case Statement

Operating Systems Assignment

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

86/100

Total:		86
1. Engagement with Literature Skills:		
+ Some good use of citations. + formatted reference list.	20	16
2. Knowledge and Understanding Skills:		
Key functions: + Very good overview of key OS functions documented. + Screenshots showing where some of the functions can be seen/monitored/managed are documented. Win Commands: + V. good overview of relevant commands that demonstrates an understanding of the language. Bash Commands: + V. good overview of relevant commands that demonstrates a sound understanding of the language. - 1/2 additional command options could be described. Win Scripts: + V. good overview of the syntax that demonstrates an understanding of the scripting aspect of the language. Bash Scripts: + Good overview of the syntax that demonstrates understanding	20	17

of the scripting aspect of the language. - could be extended to include some additional syntax areas.		
3. Cognitive and Intellectual Skills:		
+ Evidence of good analysis and understanding of OS functions; + Screenshots showing where some of the functions can be seen/monitored/managed are documented. + Conclusion.	10	
4. Practical Application Skills:		
1. Win Commands: + V. good use of relevant Win. language commands. 2. Bash Commands: + V. good use of relevant Bash commands. - 1/2 additional command options could be used. 3. Win Scripts: + V. good use of Win scripts to demonstrate applied knowledge of the core syntax. 4. Bash Scripts: + Good use of Bash scripts to demonstrate applied knowledge of the core syntax. - could be extended to include some additional syntax areas.	36	
5. Transferable Skills for Life and Professional Practice:		
+ Good report format, structure, and presentation. - Report sections could be numbered.	7	

+/- Tutorial Activity 1 on OS Types: relevant supplementary information on OS types is included in the Appendix of the report. – could be extended to include some additional types e.g. real-time, embedded etc.. + Evidence of engagement with a relevant CPD course documented in the appendix. +/- Lecture activity answers documented. Not labelled. Excellent submission.		
Plagiarism & On-time check:		/

PAGE 1
PAGE 2
PAGE 3
PAGE 4
PAGE 5
PAGE 6
PAGE 7
PAGE 8
PAGE 9
PAGE 10
PAGE 11
PAGE 12
PAGE 13

PAGE 14

PAGE 15

PAGE 16

PAGE 17

PAGE 18

PAGE 19

PAGE 20

PAGE 21

PAGE 22

PAGE 23

PAGE 24

PAGE 25

PAGE 26

PAGE 27

PAGE 28

PAGE 29

PAGE 30

PAGE 31
