

Computing architecture and operating systems

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1. Key functions of general operating systems

An operating system is the main software that keeps the computer running. It manages all things such as hardware, runs applications and helps interact with the computer in a easier way, there are different kinds of operating systems such as Windows, MacOS, Linux, they all have different and unique features however they mostly share the same fundamentals and core responsibilities.

One of the main roles of the OS is handling all tasks and running applications/programs running on your computer. You can see how much of the CPU and memory is being used on the application task manager, or you can also press ctrl+shift+esc and it also allows you to close any program that may have gotten frozen.

The memory of the computer is very crucial and important, it acts as a temporary workspace for active programs. The OS allocates RAM to applications so that they can run efficiently without interfering with each other. You can also see the RAM allocation/usage you can go on the task manager

The OS can also help you keep your files clean and organized in a way that you can find and access it very easily, it manages everything that is stored on your drive or SSD making sure that the files do not get lost or corrupted.

The OS acts like a translator between software and hardware, things such as your keyboard, mouse, printer or graphics card or RAM, the OS uses drivers-small programs. The windows users can update or troubleshoot drivers through the device manager whilst macOS handles these things behind the scenes and whilst Linux often uses commands such as lsusb or lspci.

Security is another key function. The OS protects all of your files and personal information from unauthorized access, Windows provides options for security through setting and control panel, in the settings and control panel you can set passwords, enable firewalls and manage different sorts of privacy settings, MacBook's have similar controls in System Preferences under Privacy and Security. Linux however relies heavily on file permissions, and user groups and admins need to use commands such as “sudo” carefully for administrative tasks.

Finally, an OS provides the interface you use daily. Windows has the Start Menu and desktop icons, macOS features the Dock and menu bar, and Linux offers a variety of desktop environments like GNOME or KDE. These interfaces let you launch apps, browse files, change settings, and do most of your tasks with ease

References: Silberschatz, A., Galvin, P. B., & Gagne, G. (2018). Operating System Concepts. Wiley.

Bovet, D. P., & Cesati, M. (2005). Understanding the Linux Kernel. O'Reilly Media.

Microsoft Support. (2023). Task Manager. <https://support.microsoft.com>
<https://support.apple.com>

Linux Documentation Project. (2023). Linux Commands. <https://tldp.org>

2. Use of Windows OS CLI commands

The windows command line interface provides powerful ways to manage your computer, perform different tasks and troubleshoot any issues

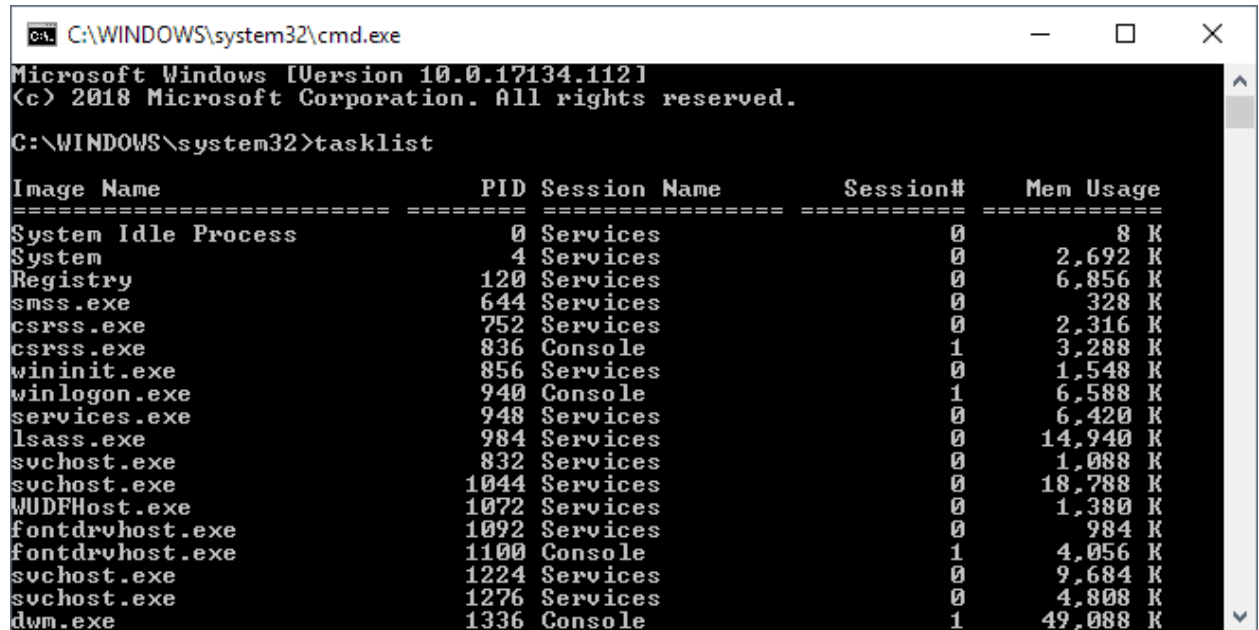
1. Process management

Process management

tasklist: Display a list of all running processes

Command

Tasklist /v



```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows [Version 10.0.17134.112]
(c) 2018 Microsoft Corporation. All rights reserved.

C:\WINDOWS\system32>tasklist

Image Name                      PID Session Name        Session#    Mem Usage
=====
System Idle Process             0 Services             0             8 K
System                          4 Services             0          2,692 K
Registry                       120 Services            0          6,856 K
smss.exe                       644 Services            0           328 K
csrss.exe                      752 Services            0          2,316 K
csrss.exe                      836 Console             1          3,288 K
wininit.exe                    856 Services            0          1,548 K
winlogon.exe                   940 Console             1          6,588 K
services.exe                   948 Services            0          6,420 K
lsass.exe                      984 Services            0         14,940 K
svchost.exe                    832 Services            0          1,088 K
svchost.exe                    1044 Services            0         18,788 K
WUDFHost.exe                  1072 Services            0           984 K
fontdrvhost.exe               1092 Services            0           984 K
fontdrvhost.exe               1100 Console             1          4,056 K
svchost.exe                    1224 Services            0          9,684 K
svchost.exe                    1276 Services            0          4,808 K
dwm.exe                       1336 Console             1         49,088 K
```

Shows process IDs, names, CPU usage, memory usage, and more.

Taskkill output, Microsoft recommends users to use Taskkill to terminate a process that is not responding correctly

File & Directory Management

Dir: Displays a list of files and directories in the current dictionary

- Code: dir
- Output: Shows file names, sizes, last modified dates, and more

```

PS C:\Users\user1>
PS C:\Users\user1> tasklist | findstr /i edge
msedge.exe           1440 Console           1    131,920 K
msedge.exe           1344 Console           1     7,492 K
msedge.exe           6608 Console           1    45,244 K
msedge.exe           6604 Console           1    31,404 K
msedge.exe           3900 Console           1    18,296 K
msedge.exe           2648 Console           1    26,856 K
msedge.exe           4068 Console           1    156,928 K
msedge.exe           5480 Console           1    18,036 K
PS C:\Users\user1>
PS C:\Users\user1>
PS C:\Users\user1>
PS C:\Users\user1> taskkill /f /t /im msedge.exe
SUCCESS: The process with PID 1344 (child process of PID 1440) has been terminated.
SUCCESS: The process with PID 6608 (child process of PID 1440) has been terminated.
SUCCESS: The process with PID 6604 (child process of PID 1440) has been terminated.
SUCCESS: The process with PID 3900 (child process of PID 1440) has been terminated.
SUCCESS: The process with PID 2648 (child process of PID 1440) has been terminated.
SUCCESS: The process with PID 4068 (child process of PID 1440) has been terminated.
SUCCESS: The process with PID 5480 (child process of PID 1440) has been terminated.
SUCCESS: The process with PID 1440 (child process of PID 2936) has been terminated.
PS C:\Users\user1>

```

www.ConfigServerFirewall.com

2. File & Directory Management

Command 3: dir

Dir /s /b

Description: It lists all files and folders recursively.

```

C:\WINDOWS\system32\cmd.exe
C:\Users\Jon>dir /?
Displays a list of files and subdirectories in a directory.

DIR [drive:][path][filename] [/A[[:]attributes]] [/B] [/C] [/D] [/L] [/N]
  [/O[[:]sortorder]] [/P] [/Q] [/R] [/S] [/T[[:]timefield]] [/W] [/X] [/4]

[drive:][path][filename]
    Specifies drive, directory, and/or files to list.

/A      Displays files with specified attributes.
attributes  D Directories                R Read-only files
              H Hidden files              A Files ready for archiving
              S System files              I Not content indexed files
              L Reparse Points            O Offline files
              - Prefix meaning not

/B      Uses bare format (no heading information or summary).
/C      Display the thousand separator in file sizes. This is the
        default. Use /-C to disable display of separator.
/D      Same as wide but files are list sorted by column.
/L      Uses lowercase.
/N      New long list format where filenames are on the far right.
Press any key to continue . . .

```

Command 4: mkdir

Command: mkdir TestFolder

Description: creates a new folder named “TestFolder”

```
[admin@vm4-dev-infotechys ~]$ mkdir -p testparent/test1/test2
[admin@vm4-dev-infotechys ~]$ ls -l
total 0
drwxrwxr-x. 3 admin admin 19 Feb  5 02:00 testparent
[admin@vm4-dev-infotechys ~]$ ls -l testparent/
total 0
drwxrwxr-x. 3 admin admin 19 Feb  5 02:00 test1
[admin@vm4-dev-infotechys ~]$ ls -lh testparent/test1
total 0
drwxrwxr-x. 2 admin admin 6 Feb  5 02:00 test2
[admin@vm4-dev-infotechys ~]$
```

Command 5: copy

Command: copy report.txt D:\Backup\

Description: copies a file from a location to another.

```
PS>Copy-Item -Path C:\test\* -Filter p*.txt -Exclude *7*.txt -Destination C:\test2\ -PassThru

Directory: C:\test2

Mode                LastWriteTime         Length Name
----                -
-a---             2/21/2025 11:33 AM         27870 p1.txt
-a---             2/21/2025 11:33 AM         27870 p10.txt
-a---             2/21/2025 11:33 AM         27870 p2.txt
-a---             2/21/2025 11:33 AM         27870 p3.txt
-a---             2/21/2025 11:33 AM         27870 p4.txt
-a---             2/21/2025 11:33 AM         27870 p5.txt
-a---             2/21/2025 11:33 AM         27870 p6.txt
-a---             2/21/2025 11:33 AM         27870 p8.txt
-a---             2/21/2025 11:33 AM         27870 p9.txt

PS>
```

3. Network Testing & Monitoring

Command 6: ipconfig

Command:ipconfig /all

Description: Displays detailed network configuration, IP address, DNS servers and MAC address

```
C:\WINDOWS\system32\cmd.exe
C:\Users\peter>ipconfig /all

Windows IP Configuration

Host Name . . . . . : 
Primary Dns Suffix . . . . . : 
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No
DNS Suffix Search List. . . . . : fritz.box

Ethernet adapter Ethernet:

Connection-specific DNS Suffix . : fritz.box
Description . . . . . : Realtek PCIe GBE Family Controller
Physical Address. . . . . : 
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
IPv6 Address. . . . . : fd00::c983:261a:570b:eebf(Preferred)
Temporary IPv6 Address. . . . . : fd00::e4a7:42e6:44:f31c(Preferred)
Link-local IPv6 Address . . . . . : fe80::c983:261a:570b:eebf%8(Preferred)
IPv4 Address. . . . . : 192.168.178.20(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Lease Obtained. . . . . : 17 January 2021 13:45:37
Lease Expires . . . . . : 29 January 2021 11:25:13
Default Gateway . . . . . : 192.168.178.1
DHCP Server . . . . . : 192.168.178.1
DHCPv6 IAID . . . . . : 67657838
DHCPv6 Client DUID. . . . . : 00-01-00-01-18-5D-A1-5F-08-60-6E-6D-41-C0
DNS Servers . . . . . : fd00::e228:6dff:fe6d:42ae
                        192.168.178.1
NetBIOS over Tcpip. . . . . : Enabled
```

Command 7: ping

Command: ping google.com -n 4

Description: sends four ICMP echo requests to test the internet connection.

```
C:\Users\>ping fs6712x

Pinging FS6712X.local [2600:8800:6209:f400: ] with 32 bytes of data:
Reply from 2600:8800:6209:f400:7a72: : time=1ms
Reply from 2600:8800:6209:f400:7a72: : time=3ms
Reply from 2600:8800:6209:f400:7a72: : time=1ms
Reply from 2600:8800:6209:f400:7a72: : time=3ms

Ping statistics for 2600:8800:6209:f400:7a72: :
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 3ms, Average = 2ms

C:\Users\>ping -4 fs6712x

Pinging FS6712X.local [192.168.0.105] with 32 bytes of data:
Reply from 192.168.0.105: bytes=32 time=1ms TTL=64
Reply from 192.168.0.105: bytes=32 time=1ms TTL=64
Reply from 192.168.0.105: bytes=32 time=1ms TTL=64
Reply from 192.168.0.105: bytes=32 time=3ms TTL=64

Ping statistics for 192.168.0.105:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 3ms, Average = 1ms
```

Command 8: netstat

Command: netstat -ano

Description: Displays the active internet connections, listening ports and associated process IDs

```
C:\Users\sarav>netstat
Active Connections

```

Proto	Local Address	Foreign Address	State
TCP	10.211.55.3:52992	40.90.189.152:https	ESTABLISHED
TCP	10.211.55.3:53030	13.107.42.254:https	TIME_WAIT
TCP	10.211.55.3:53031	13.107.18.254:https	TIME_WAIT
TCP	10.211.55.3:53032	131.253.33.254:https	TIME_WAIT
TCP	10.211.55.3:53033	204.79.197.222:https	ESTABLISHED
TCP	10.211.55.3:53034	a-0001:https	ESTABLISHED
TCP	10.211.55.3:53035	13.107.18.11:https	ESTABLISHED
TCP	10.211.55.3:53036	13.107.246.254:https	ESTABLISHED
TCP	10.211.55.3:53037	117.18.232.200:https	ESTABLISHED
TCP	10.211.55.3:53040	13.107.246.10:https	ESTABLISHED
TCP	10.211.55.3:53041	ec2-54-167-36-150:ms-wbt-server	ESTABLISHED
TCP	127.0.0.1:7778	mylocalserver:51929	ESTABLISHED
TCP	127.0.0.1:49681	mylocalserver:49682	ESTABLISHED
TCP	127.0.0.1:49682	mylocalserver:49681	ESTABLISHED
TCP	127.0.0.1:51927	mylocalserver:51928	ESTABLISHED
TCP	127.0.0.1:51928	mylocalserver:51927	ESTABLISHED
TCP	127.0.0.1:51929	mylocalserver:7778	ESTABLISHED
TCP	127.0.0.1:51930	mylocalserver:51931	ESTABLISHED
TCP	127.0.0.1:51931	mylocalserver:51930	ESTABLISHED
TCP	127.0.0.1:51932	mylocalserver:51933	ESTABLISHED
TCP	127.0.0.1:51933	mylocalserver:51932	ESTABLISHED

4. User Management

Command 9: net user

Command: net user

Description: it lists all of the local user accounts on the computer

```
C:\WINDOWS\system32\cmd. x + v
Microsoft Windows [Version 10.0.22631.3737]
(c) Microsoft Corporation. All rights reserved.

C:\Users\jonfi>net user /?
The syntax of this command is:

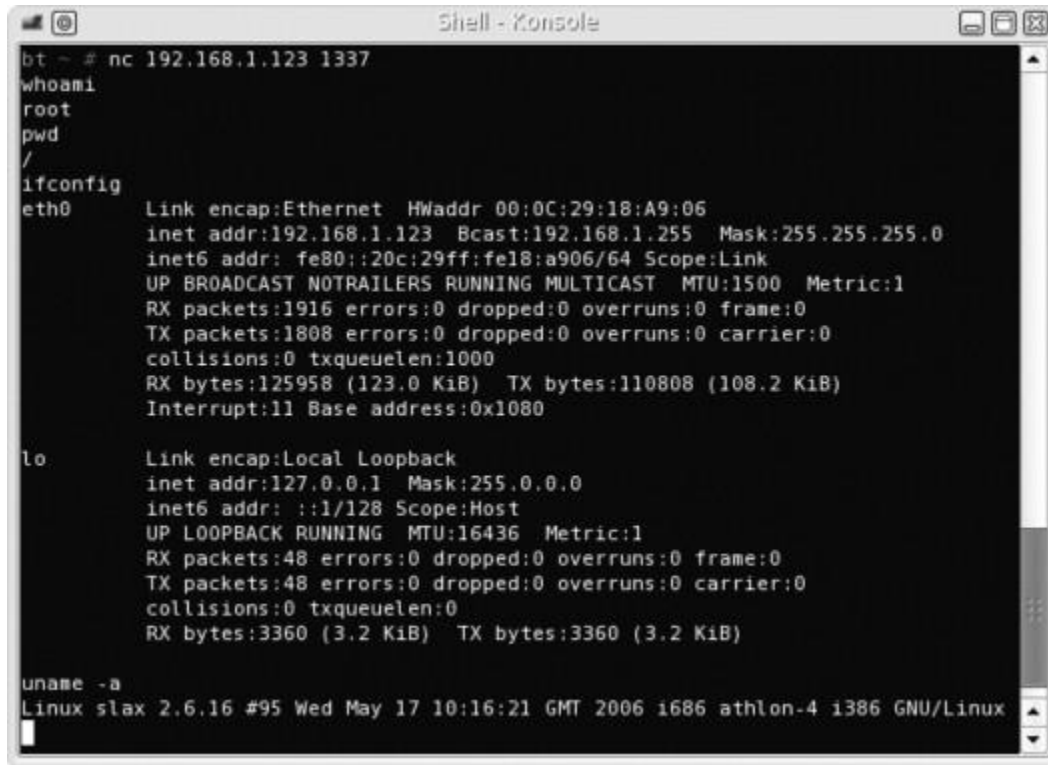
NET USER
[username [password | *] [options]] [/DOMAIN]
    username {password | *} /ADD [options] [/DOMAIN]
    username [/DELETE] [/DOMAIN]
    username [/TIMES:{times | ALL}]
    username [/ACTIVE: {YES | NO}]

C:\Users\jonfi>
```

Command 10: whoami

Command: whoami /all

Description: Displays the user's identity, security identifiers, privileges and group memberships



```
bt ~ # nc 192.168.1.123 1337
whoami
root
pwd
/
ifconfig
eth0      Link encap:Ethernet  HWaddr 00:0C:29:18:A9:06
          inet addr:192.168.1.123  Bcast:192.168.1.255  Mask:255.255.255.0
          inet6 addr: fe80::20c:29ff:fe18:a906/64 Scope:Link
          UP BROADCAST NOTRAILERS RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:1916 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1808 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:125958 (123.0 KiB)  TX bytes:110808 (108.2 KiB)
          Interrupt:11 Base address:0x1080

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:48 errors:0 dropped:0 overruns:0 frame:0
          TX packets:48 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:3360 (3.2 KiB)  TX bytes:3360 (3.2 KiB)

uname -a
Linux slax 2.6.16 #95 Wed May 17 10:16:21 GMT 2006 i686 athlon-4 i386 GNU/Linux
```

5. Task Scheduling

Command 11: schtasks

Command: schtasks /query /fo LIST /v

```

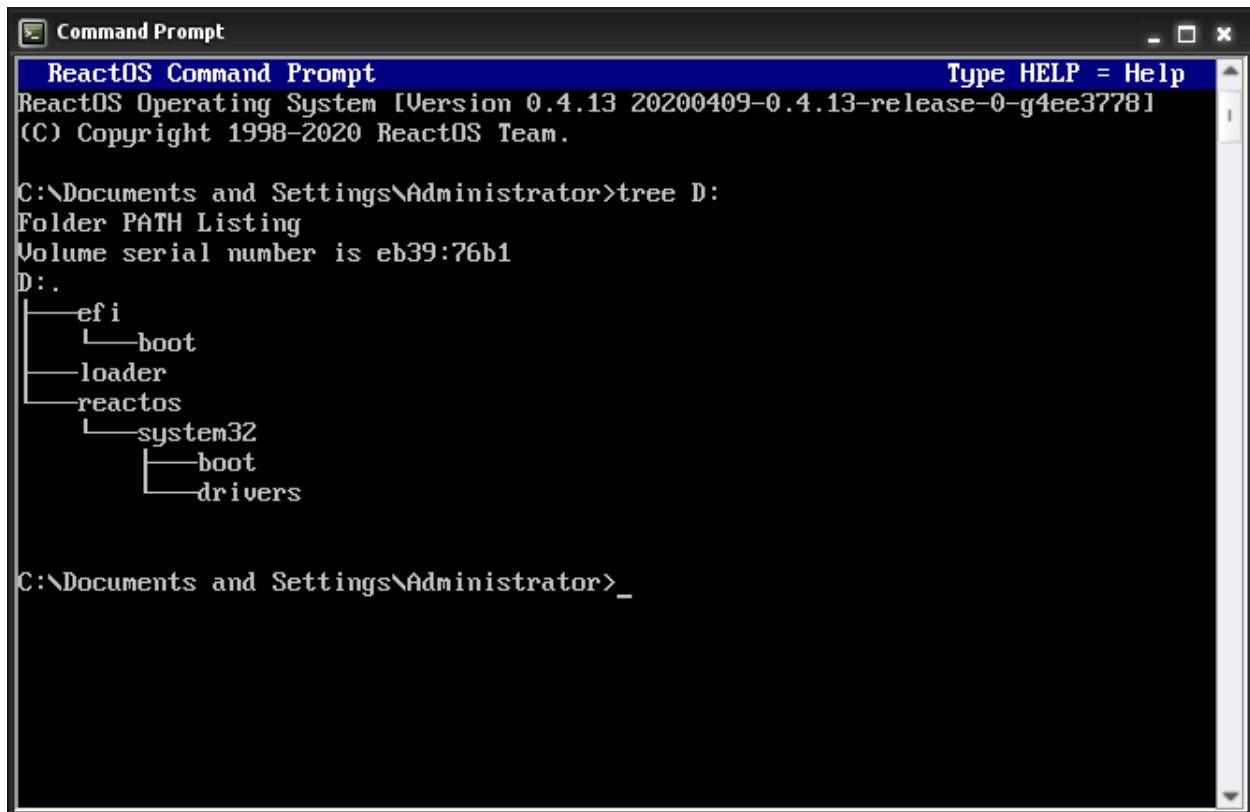
selection_schtasks:
  Image|endswith: '\schtasks.exe'
  CommandLine|contains|all:
    - ' /Change '
    - ' /TN '
selection_susp_locations:
  CommandLine|contains:
    - '\AppData\Local\Temp'
    - '\AppData\Roaming\'
    - '\Users\Public\'
    - '\WINDOWS\Temp\'
    - '\Desktop\'
    - '\Downloads\'
    - '\Temporary Internet'
    - 'C:\ProgramData\'
    - 'C:\Perflogs\'
    - '%ProgramData%'
    - '%appdata%'
    - '%comspec%'
    - '%localappdata%'
selection_susp_images:
  CommandLine|contains:
    - 'regsvr32'
    - 'rundll32'
    - 'cmd /c '
    - 'cmd.exe /c '
    - 'powershell'
    - 'mshta'
    - 'wscript'
    - 'cscript'
    - 'certutil'
    - 'bitsadmin'
    - 'bash.exe'
    - 'bash '
    - 'scrcons'
    - 'wmic '
    - 'wmic.exe'
    - 'forfiles'
    - 'scriptrunner'
    - 'hh.exe'
    - 'hh '
condition: all of selection_*

```

Command 12: tree

Command: tree /F

Description: Displays the folder structure of the current directory.



```
Command Prompt
ReactOS Command Prompt                                     Type HELP = Help
ReactOS Operating System [Version 0.4.13 20200409-0.4.13-release-0-g4ee3778]
(C) Copyright 1998-2020 ReactOS Team.

C:\Documents and Settings\Administrator>tree D:
Folder PATH Listing
Volume serial number is eb39:76b1
D:
├── efi
│   └── boot
├── loader
├── reactos
│   └── system32
│       ├── boot
│       └── drivers

C:\Documents and Settings\Administrator>_
```

References:

1. Microsoft. (2025). *Command-line reference A-Z*.
<https://learn.microsoft.com/windows-server/administration/windows-commands/>
2. Microsoft. (2025). *Windows PowerShell documentation*.
<https://learn.microsoft.com/powershell/>
3. Microsoft. (2025). *Task Scheduler documentation*.
<https://learn.microsoft.com/windows/win32/taskschd/task-scheduler-start-page>
4. Microsoft. (2025). *Netstat command*. <https://learn.microsoft.com/windows-server/administration/windows-commands/netstat>
5. Microsoft. (2025). *Ipconfig command*. <https://learn.microsoft.com/windows-server/administration/windows-commands/ipconfig>

Use of Linux OS CLI commands

The Linux OS provides a very powerful CLI through the bash shell, allowing users to perform tasks for system management efficiently

1. Process Management

Command 1: ps

Command: ps -ef

Description: Displays all of the running processes in full-formal listing

```
kbuzdar@kbuzdar-VirtualBox:~$ ps --help

Usage:
ps [options]

Try 'ps --help <simple|list|output|threads|misc|all>'
or 'ps --help <s|l|o|t|m|a>'
for additional help text.

For more details see ps(1).
kbuzdar@kbuzdar-VirtualBox:~$
```

Command 2: top

Command: top -o %CPU

Description: monitors the system processes in real time

```

last pid: 80032; load averages: 0.84, 1.06, 1.05 up 199+03:28:06 22:26:35
107 processes: 1 running, 106 sleeping
CPU: 0.2% user, 5.0% nice, 1.0% system, 0.0% interrupt, 93.7% idle
Mem: 7938M Active, 3027M Inact, 2359M Wired, 683M Cache, 1643M Buf, 1842M Free
Swap: 8192M Total, 821M Used, 7371M Free, 10% Inuse

```

PID	USERNAME	THR	PRI	NICE	SIZE	RES	STATE	C	TIME	WCPU	COMMAND
79957	www	1	52	8	356M	44704K	accept	6	0:02	13.87%	php-cgi
79477	www	1	52	8	360M	62256K	accept	3	0:30	9.18%	php-cgi
79471	www	1	52	8	356M	47792K	accept	7	0:03	9.18%	php-cgi
79476	www	1	34	8	356M	56140K	accept	1	0:14	5.96%	php-cgi
79933	www	1	40	8	356M	47340K	accept	2	0:02	5.96%	php-cgi
79958	pgsql	1	21	0	6399M	164M	sbwait	0	0:00	2.10%	postgres
79490	pgsql	1	21	0	6413M	652M	sbwait	4	0:14	1.76%	postgres
79474	www	1	28	8	360M	58620K	sbwait	0	0:21	1.17%	php-cgi
79475	www	1	30	8	360M	49396K	accept	4	0:04	1.07%	php-cgi
79934	pgsql	1	20	0	6407M	187M	sbwait	0	0:00	0.98%	postgres
79480	pgsql	1	20	0	6407M	397M	sbwait	2	0:02	0.88%	postgres
79482	pgsql	1	22	0	6403M	215M	sbwait	3	0:01	0.88%	postgres
79483	pgsql	1	20	0	6405M	495M	sbwait	7	0:05	0.78%	postgres
79470	www	1	30	8	356M	47476K	accept	0	0:04	0.29%	php-cgi
1321	nobody	4	52	0	152M	85708K	uwait	4	55.3H	0.10%	memcached
79472	www	1	30	8	356M	46868K	accept	6	0:02	0.10%	php-cgi
1308	pgsql	1	20	0	6391M	5328M	select	1	287:40	0.00%	postgres

Command 3: kill

Command: kill -9 1234

Description: terminates the process with PID 1234

```

root@ubuntu:~# killall --help
Usage: killall [ -Z CONTEXT ] [ -u USER ] [ -y TIME ] [ -o TIME ] [ -eIgiqrwv ]
        [ -s SIGNAL | -SIGNAL ] NAME...

        killall -l, --list
        killall -V, --version

-e,--exact           require exact match for very long names
-I,--ignore-case     case insensitive process name match
-g,--process-group   kill process group instead of process
-y,--younger-than    kill processes younger than TIME
-o,--older-than      kill processes older than TIME
-i,--interactive     ask for confirmation before killing
-l,--list            list all known signal names
-q,--quiet           don't print complaints
-r,--regex           interpret NAME as an extended regular expression
-s,--signal SIGNAL   send this signal instead of SIGTERM
-u,--user USER       kill only process(es) running as USER
-v,--verbose         report if the signal was successfully sent
-V,--version         display version information
-w,--wait            wait for processes to die
-n,--ns PID          match processes that belong to the same namespaces
                     as PID or 0 for all namespaces
-Z,--context REGEXP  kill only process(es) having context
                     (must precede other arguments)

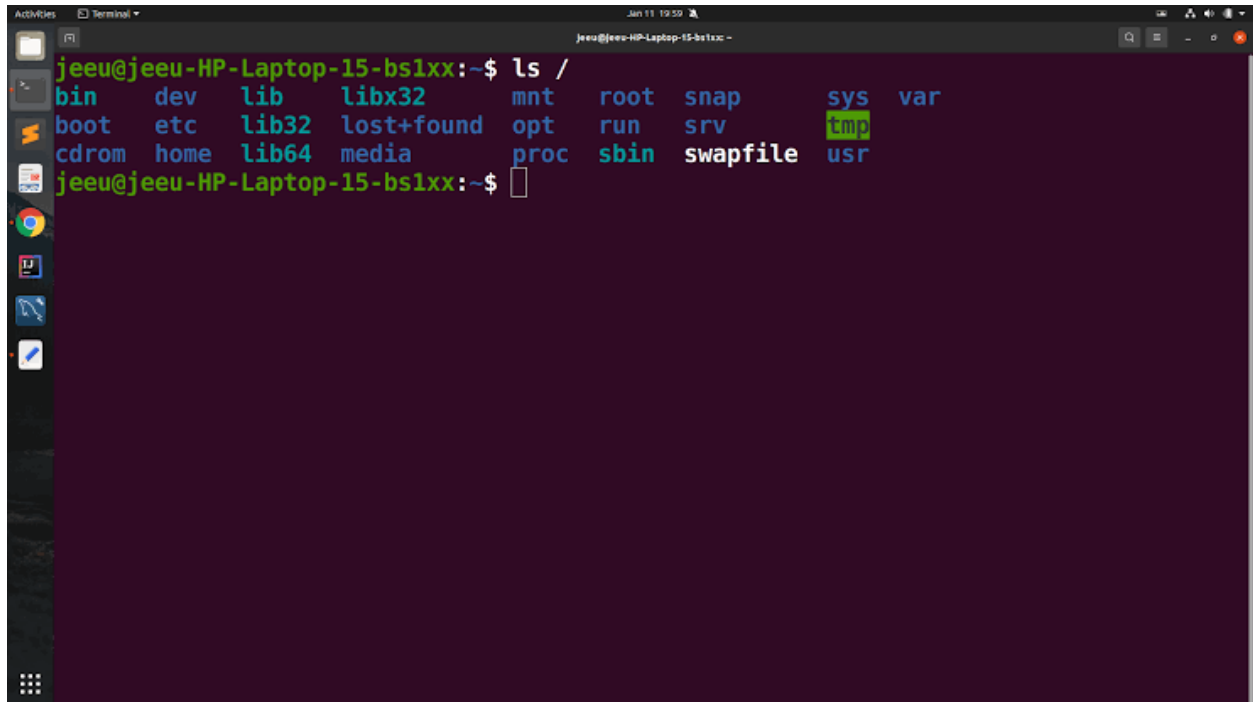
```

2. File & Directory management

Command 4: ls

Command: ls -lah

Description: Lists files and directories

A screenshot of a Linux terminal window. The terminal title bar shows 'Activities', 'Terminal', and the system time 'Jan 11 12:59'. The terminal content shows the user 'jeeu' at the prompt 'jeeu@jeeu-HP-Laptop-15-bs1xx:~\$' typing the command 'ls /'. The output lists the root directory's contents in a multi-column format: 'bin', 'dev', 'lib', 'libx32', 'mnt', 'root', 'snap', 'sys', 'var' on the first line; 'boot', 'etc', 'lib32', 'lost+found', 'opt', 'run', 'srv', 'tmp', on the second line; and 'cdrom', 'home', 'lib64', 'media', 'proc', 'sbin', 'swapfile', 'usr' on the third line. The 'tmp' directory is highlighted in green. The prompt 'jeeu@jeeu-HP-Laptop-15-bs1xx:~\$' is shown again on the fourth line with a cursor. On the left side of the terminal, a vertical dock contains icons for a file manager, Firefox, and other applications. The desktop background is a dark, textured image.

Command 5: mkdir

Command: mkdir -p Projects/Linux/Test

Description: Creates directories recursively.

```
[root@localhost jayeshkumar]# mkdir --help
Usage: mkdir [OPTION]... DIRECTORY...
Create the DIRECTORY(ies), if they do not already exist.

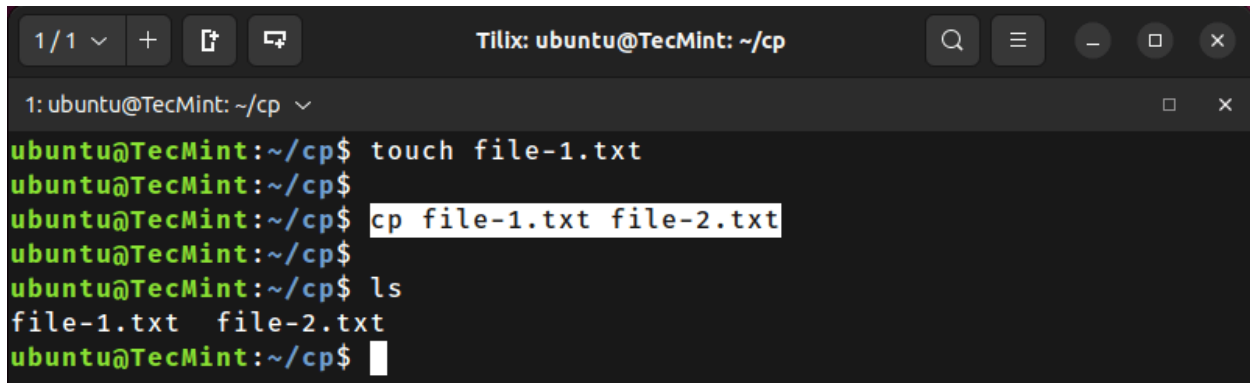
Mandatory arguments to long options are mandatory for short options too.
  -m, --mode=MODE      set file mode (as in chmod), not a=rwx - umask
  -p, --parents         no error if existing, make parent directories
                        as needed
  -v, --verbose        print a message for each created directory
  -Z                   set SELinux security context of each created
                        directory
                        to the default type
  --context[=CTX]      like -Z, or if CTX is specified then set the
                        SELinux security context to CTX
                        or SMACK security context to CTX
  --help              display this help and exit
  --version            output version information and exit

GNU coreutils online help: <https://www.gnu.org/software/coreutils/
/>
Full documentation <https://www.gnu.org/software/coreutils/mkdir>
or available locally via: info '(coreutils) mkdir invocation'
[root@localhost jayeshkumar]#
```

Command 6: cp

Command: cp -r Documents Backup

Description: Copies files and directories.

A terminal window titled 'Tilix: ubuntu@TecMint: ~/cp' showing a series of commands and their outputs. The user creates a file 'file-1.txt' using 'touch', then copies it to 'file-2.txt' using 'cp'. Finally, they use 'ls' to list the files, showing both 'file-1.txt' and 'file-2.txt' are present.

```
1: ubuntu@TecMint: ~/cp
ubuntu@TecMint:~/cp$ touch file-1.txt
ubuntu@TecMint:~/cp$
ubuntu@TecMint:~/cp$ cp file-1.txt file-2.txt
ubuntu@TecMint:~/cp$
ubuntu@TecMint:~/cp$ ls
file-1.txt  file-2.txt
ubuntu@TecMint:~/cp$
```

3. Network Testing & Monitoring

Command 7: ip

Command: ip addr show

Description: Displays IP addresses and network information

```
marko@phoenixnap:~$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default 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
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 10000 qdisc fq_codel state UP group default qlen 10000
    link/ether 08:00:27:68:84:ad brd ff:ff:ff:ff:ff:ff
    inet 192.168.0.27/24 brd 192.168.0.255 scope global dynamic noprefixroute enp0s3
        valid_lft 3403sec preferred_lft 3403sec
    inet6 fe80::e92a:494b:ee54:15b7/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
3: docker0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN group default
    link/ether 02:42:31:0b:c2:e0 brd ff:ff:ff:ff:ff:ff
    inet 172.17.0.1/16 brd 172.17.255.255 scope global docker0
        valid_lft forever preferred_lft forever
marko@phoenixnap:~$
```

Command 8: ping

Command: ping -c 4 google.com

Description: Sends four ICMP echo requests to test the network connectivity.

```
sk@sk:~$ fping 192.168.1.100 ostechnix.com google.com ubuntu.com
192.168.1.100 is alive
google.com is alive
ubuntu.com is alive
ostechnix.com is alive
sk@sk:~$ █
```

Command 9: netstat

Command: netstat -tuln

Description: Lists active TCP and UDP listening ports.

```

gopikiran@dataflair:~/Desktop$ netstat -l
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 0.0.0.0:ssh             0.0.0.0:*               LISTEN
tcp        0      0 localhost:ipp           0.0.0.0:*               LISTEN
tcp        0      0 localhost:61209         0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:smtp            0.0.0.0:*               LISTEN
tcp        0      0 localhost:domain        0.0.0.0:*               LISTEN
tcp6       0      0 [::]:ssh               [::]:*                  LISTEN
tcp6       0      0 ip6-localhost:ipp      [::]:*                  LISTEN
tcp6       0      0 [::]:smtp               [::]:*                  LISTEN
udp        0      0 0.0.0.0:49652           0.0.0.0:*               LISTEN
udp        0      0 0.0.0.0:631            0.0.0.0:*               LISTEN
udp        0      0 0.0.0.0:mdns            0.0.0.0:*               LISTEN
udp        0      0 localhost:domain        0.0.0.0:*               LISTEN
udp6       0      0 [::]:34260             [::]:*                  LISTEN
udp6       0      0 [::]:mdns               [::]:*                  LISTEN
raw6       0      0 [::]:ipv6-icmp          [::]:*                  LISTEN
7
Active UNIX domain sockets (only servers)
Proto RefCnt Flags       Type       State       I-Node      Path
unix   2      [ ACC ] STREAM    LISTENING   145295      public/pickup
unix   2      [ ACC ] STREAM    LISTENING   145299      public/cleanup
unix   2      [ ACC ] STREAM    LISTENING   145302      public/qmgr
unix   2      [ ACC ] STREAM    LISTENING   145306      private/tlsmgr
unix   2      [ ACC ] STREAM    LISTENING   28080       @/tmp/dbus-u0rTDk82
unix   2      [ ACC ] STREAM    LISTENING   145309      private/rewrite
unix   2      [ ACC ] STREAM    LISTENING   145312      private/bounce
unix   2      [ ACC ] STREAM    LISTENING   145315      private/defer
unix   2      [ ACC ] STREAM    LISTENING   14335       /run/systemd/private
unix   2      [ ACC ] STREAM    LISTENING   145318      private/trace
unix   2      [ ACC ] STREAM    LISTENING   145321      private/verify

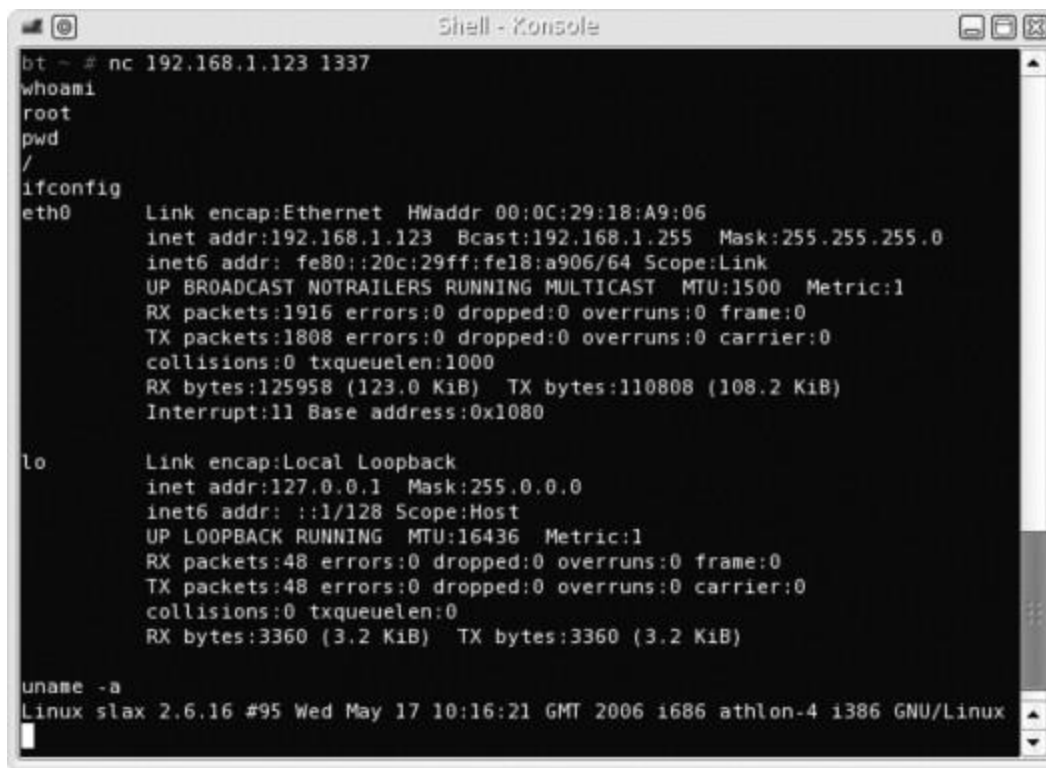
```

4. User management

Command 10: whoami

Command:whoami

Description: Displays the username of the currently logged-in user



```
bt ~ # nc 192.168.1.123 1337
whoami
root
pwd
/
ifconfig
eth0      Link encap:Ethernet  HWaddr 00:0C:29:18:A9:06
          inet addr:192.168.1.123  Bcast:192.168.1.255  Mask:255.255.255.0
          inet6 addr: fe80::20c:29ff:fe18:a906/64 Scope:Link
          UP BROADCAST NOTRAILERS RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:1916 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1808 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:125958 (123.0 KiB)  TX bytes:110808 (108.2 KiB)
          Interrupt:11 Base address:0x1080

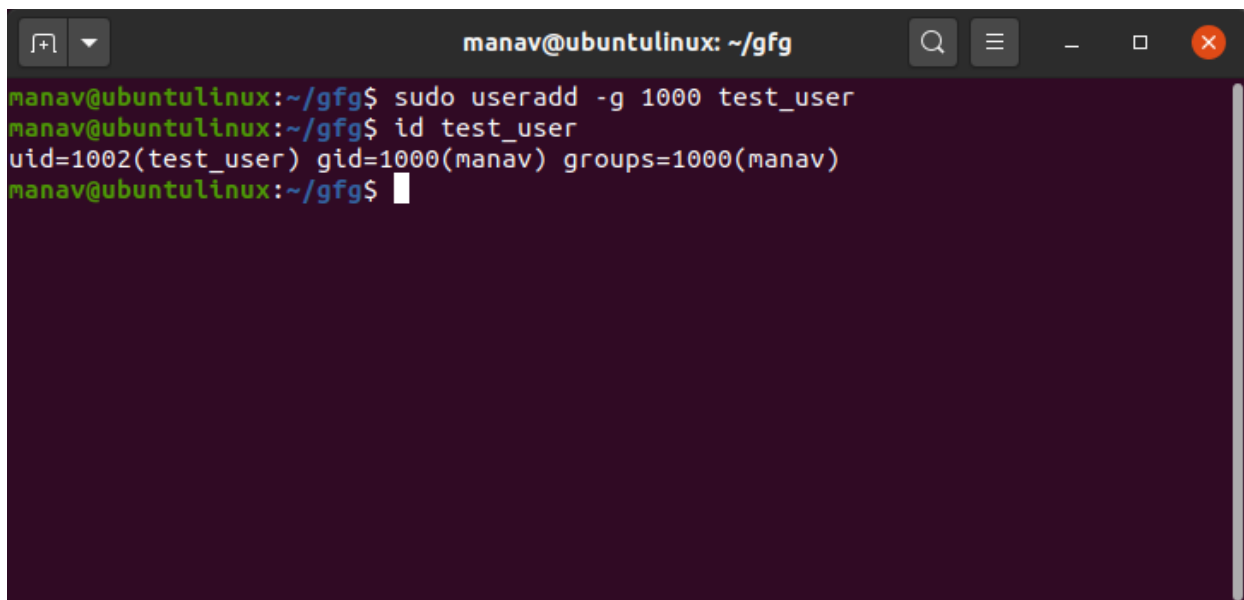
lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:48 errors:0 dropped:0 overruns:0 frame:0
          TX packets:48 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:3360 (3.2 KiB)  TX bytes:3360 (3.2 KiB)

uname -a
Linux slax 2.6.16 #95 Wed May 17 10:16:21 GMT 2006 i686 athlon-4 i386 GNU/Linux
```

Command 11: id

Command: id

Description: Displays the current user's UID, GID, and group memberships.



```
manav@ubuntulinux: ~/gfg
manav@ubuntulinux:~/gfg$ sudo useradd -g 1000 test_user
manav@ubuntulinux:~/gfg$ id test_user
uid=1002(test_user) gid=1000(manav) groups=1000(manav)
manav@ubuntulinux:~/gfg$
```

Command 12: passwd

Command: passwd

Description: changes the password of the current user after verifying the existing password.

```
hp@DESKTOP- :~$ passwd
Changing password for hp.
(current) UNIX password:
Enter new UNIX password:
Retype new UNIX password:
passwd: password updated successfully
hp@DESKTOP- :~$
```

References:

1. Linux Foundation. (2025). *Linux command line basics*.
<https://training.linuxfoundation.org/>
2. GNU Project. (2025). *Bash Reference Manual*.
<https://www.gnu.org/software/bash/manual/bash.html>
3. The Linux Documentation Project. (2025). *Linux Documentation Project*.
<https://tldp.org/>
4. Ubuntu Documentation Team. (2025). *Ubuntu Server Guide*.
<https://ubuntu.com/server/docs>
5. Red Hat. (2025). *Red Hat Enterprise Linux documentation*.
<https://access.redhat.com/documentation/>

5. Use of Windows OS scripts

Script 1:

```
@echo off
title Backup Folder Creator

echo Enter the number of backup folders to create:
set /p count=

set i=1

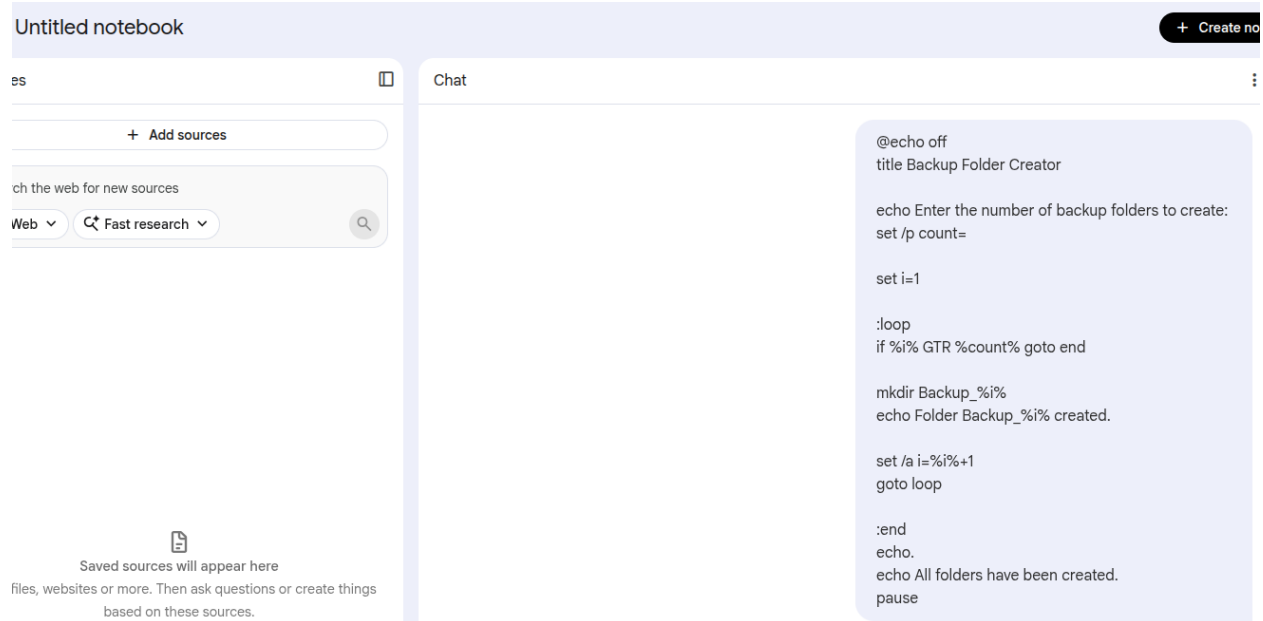
:loop
if %i% GTR %count% goto end

mkdir Backup_%i%
echo Folder Backup_%i% created.

set /a i=%i%+1
goto loop

:end
echo.
echo All folders have been created.
pause
```

The script asks the user how many backup folders to create. It then uses a loop to create folders that are named *backup1*, *backup_2*, etc.



Script 2:

```
@echo off
title Simple Calculator

set /p num1=Enter first number:
set /p num2=Enter second number:

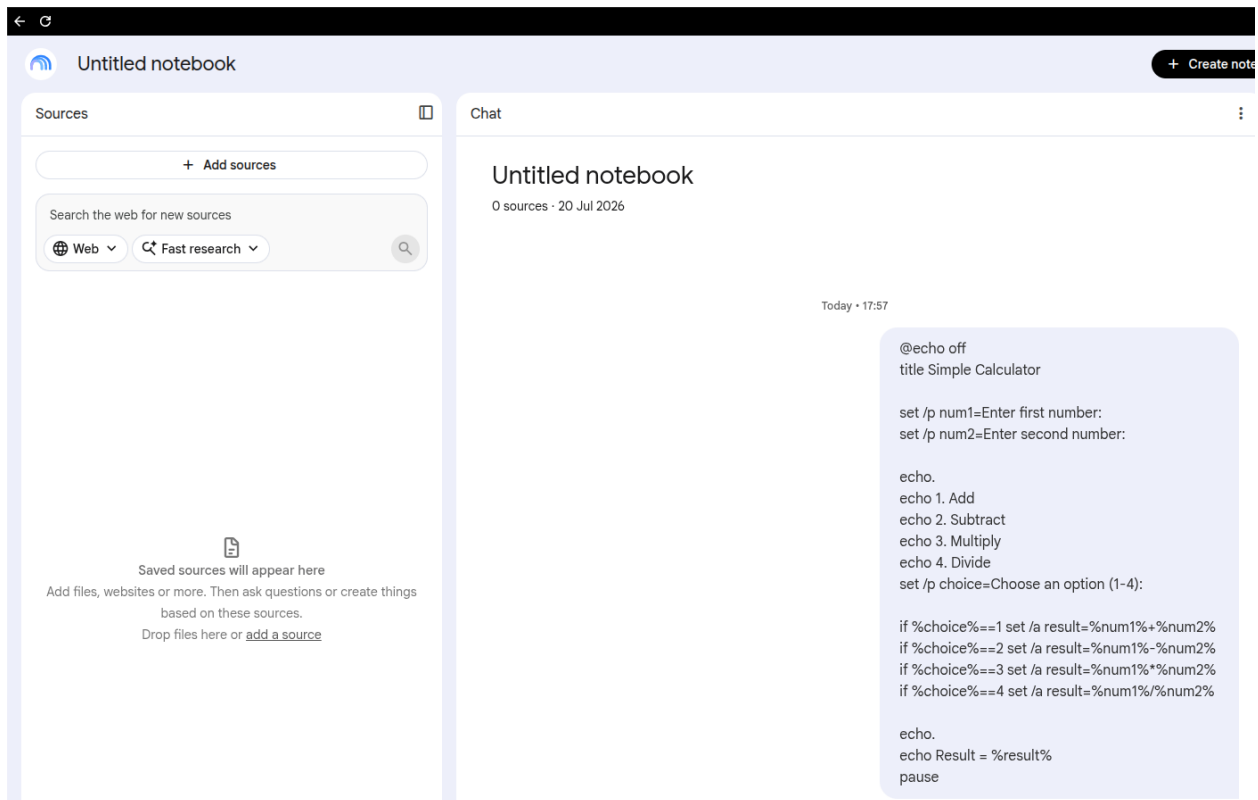
echo.
echo 1. Add
echo 2. Subtract
echo 3. Multiply
echo 4. Divide
set /p choice=Choose an option (1-4):

if %choice%==1 set /a result=%num1%+%num2%
if %choice%==2 set /a result=%num1%-%num2%
if %choice%==3 set /a result=%num1%*%num2%
if %choice%==4 set /a result=%num1%/num2%
```

```
echo.
echo Result = %result%
pause
```

Features: vairables, user input, mathematical operations and conditional statements

The script accepts two numbers from the user and displays a menu of mathematical operations.



These Batch scripts show how Windows command-line scripting can automate common tasks.

References:

1. Microsoft. (2025). *Command-line reference A–Z*.
<https://learn.microsoft.com/windows-server/administration/windows-commands/>
2. Microsoft. (2025). *Cmd.exe command-line reference*.
<https://learn.microsoft.com/windows-server/administration/windows-commands/cmd>
3. Microsoft. (2025). *Set command*. <https://learn.microsoft.com/windows-server/administration/windows-commands/set>
4. Microsoft. (2025). *If command*. <https://learn.microsoft.com/windows-server/administration/windows-commands/if>
5. Microsoft. (2025). *Batch files*. <https://learn.microsoft.com/windows-server/administration/windows-commands/>