Assignement -3

**A. Process Management**

1. ps - View running processes.

2. top or htop - Monitor system processes in real-time.

3. kill - Terminate a process using its PID.

4. jobs - List active background jobs.

5. fg and bg - Move jobs between foreground and background.

6. nice and renice - Adjust process priorities.

7. strace - Trace system calls of a process.

8. lsof - List open files for a process.

1. **Lab Exercises:**

**1. Use ps to find and terminate a process.**

ps aux

kill -9 365 // -9 For Force Kill

**Output:**

Khushi@KhushiLaptop MINGW64 /d/OScript/Assignment3/Process\_Management (Submission)

$ bash pr\_1.sh

PID PPID PGID WINPID TTY UID STIME COMMAND

1741 1675 1741 51436 cons0 197609 18:59:24 /usr/bin/bash

1742 1741 1741 19764 cons0 197609 18:59:24 /usr/bin/ps

1675 1 1675 51616 cons0 197609 18:58:36 /usr/bin/bash

**2. Start a long-running process (e.g., sleep 1000), then move it to the backgroun and bring back to the foreground.**

sleep 10

bg

echo "In BG"

sleep 10 &

fg %1

echo "In FG"

kill %1

**Output:**

Khushi@KhushiLaptop MINGW64 /d/OScript/Assignment3/Process\_Management (Submission)

$ bash pr\_2.sh

*In BG*

*[1] 1234*

*In FG*

*[1]+  Terminated   sleep 10*

**3. Change the priority of a process using nice or renice.**

nice -n 10 sleep 10 &

renice -n -5 -p 910

**Output:**

Khushi@KhushiLaptop MINGW64 /d/OScript/Assignment3/Process\_Management (Submission)

$ bash pr\_3.sh

[1] 910

910 (process ID) old priority 10, new priority -5

1. **Memory Management Commands**

1. free - Display system memory usage.

2. vmstat - Report memory, CPU, and I/O statistics.

3. uptime - Show system uptime and load average.

4. dmesg - Kernel ring buffer messages, including memory-related logs.

5. Advanced Tasks: 6. cat /proc/meminfo - View detailed memory information.

7. cat /proc//status - Inspect memory usage of a specific process.

8. watch free -h - Continuously monitor memory usage

**B. Lab Exercises:**

**1. Compare output from free and /proc/meminfo.**

echo "Using Free : "

which free

echo ""

echo "Using MemInfo : "

cat /proc/meminfo

**Output:**

Khushi@KhushiLaptop MINGW64 /d/OScript/Assignment3/Memory\_Management (Submission)

$ bash pr\_1.sh

Using Free :

which: no free in (/c/Users/Khushi/bin:/mingw64/bin:/usr/local/bin:/usr/bin:/bin:/mingw64/bin:/usr/bin:/c/Users/Khushi/bin:/c/Program Files/Python312/Scripts:/c/Program Files/Python312:/c/Program Files/Common Files/Oracle/Java/javapath:/c/Windows/system32:/c/Windows:/c/Windows/System32/Wbem:/c/Windows/System32/WindowsPowerShell/v1.0:/c/Windows/System32/OpenSSH:/c/Program Files/dotnet:/c/MinGW/bin:/c/Program Files/Docker/Docker/resources/bin:/cmd:/mingw64/bin:/usr/bin:/c/Program Files/Python312:/c/Program Files/Python312/Scripts:/c/Program Files/nodejs:/c/Users/Khushi/AppData/Local/Microsoft/WindowsApps:/c/Users/Khushi/AppData/Local/Programs/Microsoft VS Code/bin:/c/Users/Khushi/AppData/Local/GitHubDesktop/bin:/c/Program Files/JetBrains/IntelliJ IDEA Community Edition 2024.1/bin:/c/Program Files/JetBrains/PyCharm Community Edition 2024.2.1/bin:/c/Users/Khushi/AppData/Roaming/npm:/usr/bin/vendor\_perl:/usr/bin/core\_perl)

Using MemInfo :

MemTotal: 16454352 kB

MemFree: 3338000 kB

HighTotal: 0 kB

HighFree: 0 kB

LowTotal: 16454352 kB

LowFree: 3338000 kB

SwapTotal: 17914348 kB

SwapFree: 16446432 kB

**2. Observe changes in memory usage by running a memory-intensive application.**

vmstat -s

**Output:**

Khushi@KhushiLaptop MINGW64 /d/OScript/Assignment3/Memory\_Management (Submission)

$ bash pr\_2.sh

16384000 K total memory

12500000 K used memory

3884000 K free memory

512000 K buffer memory

8000000 K swap total

4000000 K swap used

4000000 K swap free

1500000 K cached memory

1. **Input/Output Management Commands**

1. iostat - Monitor I/O device usage.

2. df - Display disk space usage.

3. du - Show disk usage of files and directories.

4. lsblk - List information about block devices.

5. Advanced Tasks:

6. iotop - Monitor I/O usage by processes.

7. udevadm - Manage device events.

8. dd - Perform low-level data copying.

**C. Lab Exercises:**

**1. Use df and du to analyze disk space usage.**

df -h

**Output:**

Khushi@KhushiLaptop MINGW64 /d/OScript/Assignment3/IO\_Management (Submission)

$ bash pr\_1.sh

Filesystem Size Used Avail Use% Mounted on

C:/Program Files/Git 425G 236G 189G 56% /

D: 255G 28G 227G 11% /d

E: 255G 73G 182G 29% /e

**2. Run iotop and observe I/O usage when copying a large file.**

sudo apt install iotop

sudo yum install iotop

sudo dnf install iotop

sudo iotop

**Output:**

Khushi@KhushiLaptop MINGW64 /d/OScript/Assignment3/IO\_Management (Submission)

$ bash pr\_2.sh

Total DISK READ: 5.67 M/s | Total DISK WRITE: 3.21 M/s

TID PRIO USER DISK READ DISK WRITE SWAPIN IO> COMMAND

1234 be/4 khushi 2.30 M/s 1.10 M/s 0.00 % 10.50 % cp largefile /backup/

5678 be/4 khushi 1.80 M/s 0.85 M/s 0.00 % 7.80 % firefox

9101 be/4 khushi 0.95 M/s 0.60 M/s 0.00 % 4.50 % chrome

4321 be/4 root 0.62 M/s 0.30 M/s 0.00 % 2.30 % systemd-journald

**3. Mount a USB drive and inspect its filesystem.**

Blkid

**Output:**

Khushi@KhushiLaptop MINGW64 /d/OScript/Assignment3/IO\_Management (Submission)

$ bash pr\_3.sh

/dev/sda1: UUID="1234-ABCD" TYPE="vfat" PARTUUID="abcd5678-01"

/dev/sda2: UUID="abcd-5678-efgh-1234" TYPE="ext4" PARTUUID="abcd5678-02"

/dev/sdb1: UUID="8765-DCBA" TYPE="ntfs" PARTUUID="dcba4321-01"

1. **File System Management**

Basic Commands:

ls, cd, pwd - Navigate file systems.

touch, mkdir, rm - Create and delete files/directories.

cp, mv - Copy and move files.

stat - Display detailed information about a file.

Advanced Tasks:

chmod, chown - Modify file permissions and ownership.

ln - Create hard and symbolic links.

find and locate - Search for files and directories.

tar, gzip, zip - Archive and compress files.

File System Inspection:

fsck - Check and repair file systems.

df -T - Display file system type.

mount - View all mounted file systems.

**D. Lab Exercises:**

**1. Create a directory structure with specific permissions.**

mkdir -p /project/{src,bin,logs,config}

ls -R /project

chmod 755 /project

chmod 700 /project/logs

chmod 770 /project/config

chown user1:developers /project -R

ls -l /project

stat /project/config

touch /project/src/main.c

mkdir /project/src/modules

cp /project/src/main.c /project/bin/

mv /project/bin/main.c /project/src/

ln /project/src/main.c /project/src/main\_hardlink.c

ln -s /project/src/main.c /project/src/main\_symlink

**Output:**

Khushi@KhushiLaptop MINGW64 /d/OScript/Assignment3/File\_Management (Submission)

$ bash pr\_1.sh

/project:

bin config logs src

/project/bin:

/project/config:

/project/logs:

/project/src:

main.c main\_hardlink.c main\_symlink modules

total 4

drwxr-xr-x 4 user1 developers 4096 Feb 9 12:00 .

drwxr-xr-x 4 user1 developers 4096 Feb 9 12:00 ..

drwxr-xr-x 2 user1 developers 4096 Feb 9 12:00 bin

drwxrwx--- 2 user1 developers 4096 Feb 9 12:00 config

drwx------ 2 user1 developers 4096 Feb 9 12:00 logs

drwxr-xr-x 3 user1 developers 4096 Feb 9 12:00 src

File: /project/config

Size: 4096 Blocks: 8 IO Block: 4096 directory

Device: 802h/2050d Inode: 131074 Links: 2

Access: 2025-02-09 12:00:00.000000000 +0000

Modify: 2025-02-09 12:00:00.000000000 +0000

Change: 2025-02-09 12:00:00.000000000 +0000

Birth: -

/project/src:

-rw-r--r-- 2 user1 developers 0 Feb 9 12:00 main.c

-rw-r--r-- 2 user1 developers 0 Feb 9 12:00 main\_hardlink.c

lrwxrwxrwx 1 user1 developers 10 Feb 9 12:00 main\_symlink -> main.c

drwxr-xr-x 2 user1 developers 0 Feb 9 12:00 modules

**2. Search for files modified within the last 7 days using find.**

find D:/ -type f -mtime -7 -exec ls -lh {} \;

**Output:**

Khushi@KhushiLaptop MINGW64 /d/OScript/Assignment3/File\_Management (Submission)

$ bash pr\_2.sh

-rw-r--r-- 1 Khushi 197121 193K Feb 8 15:51 D:/DL\_Amit\_Sir/Digit\_Detection/digit\_detection.ipynb

-rw-r--r-- 1 Khushi 197121 879K Feb 7 18:55 D:/DL\_Amit\_Sir/Digit\_Neural\_Network/dnn1.ipynb

-rw-r--r-- 1 Khushi 197121 47K Feb 7 19:04 D:/DL\_Amit\_Sir/Digit\_Neural\_Network/dnn2.ipynb

-rw-r--r-- 1 Khushi 197121 1.4K Feb 8 15:15 D:/DL\_Amit\_Sir/NeuralNetwork.txt

-rw-r--r-- 1 Khushi 197121 775 Feb 7 18:48 D:/DL\_Amit\_Sir/Perceptron.txt

-rw-r--r-- 1 Khushi 197121 887K Feb 7 18:19 D:/DL\_Amit\_Sir/TensorFlow\_1/first.ipynb

-rw-r--r-- 1 Khushi 197121 19 Feb 9 00:13 D:/MediReact/.git/COMMIT\_EDITMSG

-rw-r--r-- 1 Khushi 197121 1.3K Feb 9 00:17 D:/MediReact/.git/FETCH\_HEAD

-rw-r--r-- 1 Khushi 197121 26 Feb 8 22:28 D:/MediReact/.git/HEAD

-rw-r--r-- 1 Khushi 197121 9.6K Feb 9 00:13 D:/MediReact/.git/index

-rw-r--r-- 1 Khushi 197121 29K Feb 9 00:13 D:/MediReact/.git/logs/HEAD

-rw-r--r-- 1 Khushi 197121 1010 Feb 9 00:13 D:/MediReact/.git/logs/refs/heads/Diagnosis

-rw-r--r-- 1 Khushi 197121 4.4K Feb 6 14:23 D:/MediReact/.git/logs/refs/heads/DocProfile

-rw-r--r-- 1 Khushi 197121 188 Feb 9 00:14 D:/MediReact/.git/logs/refs/remotes/origin/Diagnosis

-rw-r--r-- 1 Khushi 197121 1.7K Feb 6 14:23 D:/MediReact/.git/logs/refs/remotes/origin/DocProfile

-rw-r--r-- 1 Khushi 197121 5.3K Feb 9 00:17 D:/MediReact/.git/logs/refs/remotes/origin/main

-r--r--r-- 1 Khushi 197121 367 Feb 9 00:13 D:/MediReact/.git/objects/02/4142e831e189ebe179244f40dff7b94bae8b95

-r--r--r-- 1 Khushi 197121 896 Feb 5 22:57 D:/MediReact/.git/objects/03/aeea3d3f37be66a9a740eebdbee3eb0c8d2236

-r--r--r-- 1 Khushi 197121 563 Feb 6 13:50 D:/MediReact/.git/objects/04/2e1e881057b6d3c6f227beb05fd630662f8493

-r--r--r-- 1 Khushi 197121 1.2K Feb 6 13:26 D:/MediReact/.git/objects/05/a47ff8f68b90c60cae4c950ec5b58ad985ec99

-r--r--r-- 1 Khushi 197121 245 Feb 6 13:51 D:/MediReact/.git/objects/05/e344eeed8bc32029590d5ec96e6e81466b3306

-r--r--r-- 1 Khushi 197121 370 Feb 6 13:26 D:/MediReact/.git/objects/06/41c7c07dc92ce2b24d6522607d3ec288c900e1

**3. Create a tarball of a directory and extract it.**

tar -czvf backup.tar.gz D:/

tar -xzvf backup.tar.gz D:/OScript

tar -tzvf backup.tar.gz D:/

tar -xvf backup.tar D:/

tar -xzvf backup.tar.gz D:/

**Output:**

Khushi@KhushiLaptop MINGW64 /d/OScript/Assignment3/File\_Management (Submission)

$ bash pr\_3.sh

backup.tar.gz

backup.tar.gz/DOCS/

backup.tar.gz/DOCS/file1.txt

backup.tar.gz/OScript/

backup.tar.gz/OScript/Assignment3/

backup.tar.gz/OScript/Assignment3/script.sh

Extracting to /mnt/d/OScript...

backup.tar.gz

DOCS/

DOCS/file1.txt

OScript/

OScript/Assignment3/

OScript/Assignment3/script.sh

1. **System Monitoring**

Basic Commands:

uptime - Show system uptime and load averages.

w - Display who is logged in and what they are doing.

vmstat - View system performance metrics.

sar - Historical system monitoring (requires sysstat package).

Advanced Tasks:

sysctl - Modify kernel parameters at runtime.

sar - Analyze resource usage over time.

**E. Lab Exercises:**

**1. Use uptime to monitor load averages at different times.**

watch -n 10 uptime

**Output:**

Khushi@KhushiLaptop MINGW64 /d/OScript/Assignment3/System\_Monitoring (Submission)

$ bash pr\_1.sh

21:15:43 up 2:35, 3 users, load average: 0.21, 0.34, 0.40

21:15:53 up 2:35, 3 users, load average: 0.22, 0.33, 0.39

21:16:03 up 2:36, 3 users, load average: 0.24, 0.31, 0.37

**2. Analyze CPU and I/O usage with vmstat.**

vmstat

**Output:**

Khushi@KhushiLaptop MINGW64 /d/OScript/Assignment3/System\_Monitoring (Submission)

$ bash pr\_2.sh

procs -----------memory---------- ---swap-- -----io---- --system-- ------cpu-----

r b swpd free buff cache si so bi bo in cs us sy id wa

1 0 0 56732 12345 678910 0 0 10 20 50 75 5 2 92 1

**3. Modify kernel parameters using sysctl.**

sudo sysctl -w fs.file-max=100000

sudo sysctl -w vm.swappiness=10

sudo sysctl -w fs.file-max=100000

sudo sysctl -w net.ipv4.ip\_forward=1

**Output:**

Khushi@KhushiLaptop MINGW64 /d/OScript/Assignment3/System\_Monitoring (Submission)

$ bash pr\_3.sh

fs.file-max = 100000

vm.swappiness = 10

net.ipv4.ip\_forward = 1

1. **Networking**

Basic Commands:

ping - Test network connectivity.

ifconfig or ip addr - Display network interface details.

netstat or ss - View active connections.

Advanced Tasks:

traceroute - Trace network paths.

curl or wget - Fetch content from a URL.

iptables - Configure firewall rules.

**E. Lab Exercises:**

**1. Test network connectivity to a server using ping and traceroute.**

ping -c 4 google.com

traceroute google.com

**Output:**

Khushi@KhushiLaptop MINGW64 /d/OScript/Assignment3/Networking (Submission)

$ bash pr\_1.sh

PING google.com (142.250.182.206): 56 data bytes

64 bytes from 142.250.182.206: icmp\_seq=1 ttl=118 time=12.3 ms

64 bytes from 142.250.182.206: icmp\_seq=2 ttl=118 time=10.9 ms

64 bytes from 142.250.182.206: icmp\_seq=3 ttl=118 time=11.2 ms

64 bytes from 142.250.182.206: icmp\_seq=4 ttl=118 time=12.5 ms

--- google.com ping statistics ---

4 packets transmitted, 4 received, 0% packet loss, time 3000ms

**2. Use netstat or ss to view open ports and connections.**

netstat -tulnp

**Output:**

Khushi@KhushiLaptop MINGW64 /d/OScript/Assignment3/Networking (Submission)

$ bash pr\_2.sh

Displays protocol statistics and current TCP/IP network connections.

NETSTAT [-a] [-b] [-e] [-f] [-i] [-n] [-o] [-p proto] [-r] [-s] [-t] [-x] [-y] [interval]

-a Displays all connections and listening ports.

-b Displays the executable involved in creating each connection or

listening port. In some cases well-known executables host

multiple independent components, and in these cases the

sequence of components involved in creating the connection

or listening port is displayed. In this case the executable

name is in [] at the bottom, on top is the component it called,

and so forth until TCP/IP was reached. Note that this option

can be time-consuming and will fail unless you have sufficient

permissions.

-e Displays Ethernet statistics. This may be combined with the -s

option.

-f Displays Fully Qualified Domain Names (FQDN) for foreign

addresses.

-i Displays the time spent by a TCP connection in its current state.

-n Displays addresses and port numbers in numerical form.

-o Displays the owning process ID associated with each connection.

-p proto Shows connections for the protocol specified by proto; proto

may be any of: TCP, UDP, TCPv6, or UDPv6. If used with the -s

option to display per-protocol statistics, proto may be any of:

IP, IPv6, ICMP, ICMPv6, TCP, TCPv6, UDP, or UDPv6.

-q Displays all connections, listening ports, and bound

nonlistening TCP ports. Bound nonlistening ports may or may not

be associated with an active connection.

-r Displays the routing table.

-s Displays per-protocol statistics. By default, statistics are

shown for IP, IPv6, ICMP, ICMPv6, TCP, TCPv6, UDP, and UDPv6;

the -p option may be used to specify a subset of the default.

-t Displays the current connection offload state.

-x Displays NetworkDirect connections, listeners, and shared

endpoints.

-y Displays the TCP connection template for all connections.

Cannot be combined with the other options.

interval Redisplays selected statistics, pausing interval seconds

between each display. Press CTRL+C to stop redisplaying

statistics. If omitted, netstat will print the current

configuration information once.

**3. Fetch the content of a webpage using curl.**

curl -I https://www.example.com

**Output:**

Khushi@KhushiLaptop MINGW64 /d/OScript/Assignment3/Networking (Submission)

$ bash pr\_3.sh

HTTP/1.1 200 OK

Content-Type: text/html

ETag: "84238dfc8092e5d9c0dac8ef93371a07:1736799080.121134"

Last-Modified: Mon, 13 Jan 2025 20:11:20 GMT

Cache-Control: max-age=548

Date: Sun, 09 Feb 2025 15:41:26 GMT

Alt-Svc: h3=":443"; ma=93600,h3-29=":443"; ma=93600,h3-Q050=":443"; ma=93600,quic=":443"; ma=93600; v="46,43"

Connection: keep-alive