

Linux Programming: Assignment-4

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Q1) A system has a file /etc/passwd. How would grep + tee be used to extract usernames and save them to a file while also displaying them on screen?

1. The file /etc/passwd contains details of all user accounts. The first field before : is the **username**.
2. To extract usernames:

```
cut -d: -f1 /etc/passwd | grep "" | tee usernames.txt
```

Explanation:

1. cut -d: -f1 → splits each line by : and takes the first field (the username).
2. grep "" → simply passes the output (can be used to filter specific names if needed).
3. tee usernames.txt → displays the usernames on screen and also saves them into usernames.txt.

Q2) A binary isn't found in \$PATH. How would commands (which, find, locate) be used to troubleshoot and fix the issue?

1. **Check with which:**

2. `which binary_name`

If nothing is returned, the binary is not in \$PATH.

3. **Search with find:**

4. `find / -name binary_name 2>/dev/null`

This searches the entire filesystem.

5. **Search with locate:**

6. `locate binary_name`

Faster, but relies on

Once found, add its directory to \$PATH:

```
export PATH=$PATH:/path/to/binary
```

To make it permanent, add that line in `~/.bashrc` or `~/.profile`.

Q3) Write a command pipeline that finds all .log files modified in the last 24 hours in /var/log and saves results into log_report.txt.

```
find /var/log -name "*.log" -mtime -1 | tee log_report.txt
```

Explanation:

1. find /var/log → start searching in /var/log.
2. -name "*.log" → only .log files.
3. -mtime -1 → modified within the last 1 day (24 hours).
4. tee log_report.txt → display results on screen and save into log_report.txt.

Q4) What is the difference between shutdown -r now and reboot?

- shutdown -r now
 1. Initiates a proper shutdown sequence and then restarts the system.
 2. Notifies users, stops processes safely, unmounts filesystems, then reboots.
- reboot
 1. Directly reboots the system.
 2. On modern systems (systemd), it also performs a safe shutdown internally, but traditionally it was a faster, less controlled restart.

Safer option: shutdown -r now because it ensures an orderly restart.

Q5) How can the tee command be used to debug a script that generates both standard output and error messages?

When running scripts, sometimes both **stdout** and **stderr** are needed for debugging.

Example:

```
./myscript.sh 2>&1 | tee debug.log
```

Explanation:

1. 2>&1 → redirects error stream (stderr) into output stream (stdout).
2. tee debug.log → shows everything live on screen and also saves into debug.log.

This way, both normal messages and error messages are captured for later analysis.

Q6) Explain any three real-world applications of Linux in industries.

1. Web Servers:

1. Most web servers (Apache, Nginx) run on Linux.
2. Example: Google, Facebook, and most of the internet backbone.

2. Cloud & Virtualization:

1. AWS, Azure, and GCP use Linux as their foundation.
2. OpenStack, Docker, Kubernetes also depend heavily on Linux.

Q7) Differentiate application, system, and utility software in the context of Linux.

- Application Software**

1. Programs for end-users.
2. Examples: LibreOffice, Firefox, GIMP.

- System Software**

1. OS components that manage hardware and core functions.
2. Linux kernel, device drivers.

- Utility Software**

1. Small programs that help maintain and optimize the system.
2. Examples: ls, top, df, grep.

Q8) What are the key differences between open-source and proprietary operating systems?

Aspect	Open-Source OS (Linux)	Proprietary OS (Windows/macOS)
Source Code	Publicly available, can be modified	Closed, only vendor controls it
Cost	Free or very low	Paid license or bundled cost
Flexibility	Highly customizable	Limited customization
Security	Audited by community, fast patches	Vendor dependent for fixes
Support	Community + paid enterprise support	Vendor official support
Examples	Linux, BSD	Windows, macOS

Q9) Write the command to display the system's kernel version.

`uname -r`

Example Output:

`6.8.0-45-generic`

Alternatively:

`uname -a`

Shows kernel version plus architecture, hostname, and build details.

Q10) What is the difference between head and tail commands in text processing?

- **head command**

1. Displays the **first lines** of a file (default: first 10 lines).
2. Example:
3. `head logfile.txt`

- **tail command**

1. Displays the **last lines** of a file (default: last 10 lines).
2. Example:
3. `tail logfile.txt`

Options:

1. `head -n 20 logfile.txt` → first 20 lines.
2. `tail -n 20 logfile.txt` → last 20 lines.
3. `tail -f logfile.txt` → live monitoring (useful for logs).