**Linux Basics & Commands** + **Interview Questions & Answers**

**📘 Linux Basics & Commands (Interview Notes)**

**🔹 1. Linux Architecture**

Linux OS mainly 3 layers madhun banlela aahe:

1. **Kernel**
   * Heart of Linux OS.
   * Hardware control karतो (CPU, Memory, Disk, Devices).
   * Types: **Monolithic Kernel** (Linux), Microkernel.
   * Functions: Process Management, Memory Management, File System, Networking, Device Drivers.
2. **Shell**
   * Interface between **User & Kernel**.
   * Commands accept karतो & Kernel la pass करतो.
   * Types: bash, sh, ksh, zsh.
3. **User Space**
   * Applications & Utilities run honyacha भाग.
   * Example: Apache, MySQL, User Programs.

📌 **Interview Q&A**

* **Q:** What is the role of Kernel in Linux?  
  **A:** Kernel is the core of Linux OS, responsible for communication between hardware & software, managing CPU, memory, I/O devices, and processes.
* **Q:** Difference between Shell & Kernel?  
  **A:** Shell is the user interface for command execution, while Kernel manages hardware resources.

**🔹 2. Linux File System Hierarchy (FHS)**

| **Directory** | **Purpose** |
| --- | --- |
| / | Root directory (all starts here) |
| /etc | Configuration files (/etc/passwd, /etc/hosts) |
| /var | Variable data (logs, mail, spool) |
| /home | User home directories |
| /tmp | Temporary files (cleared on reboot) |
| /boot | Kernel & boot loader files (vmlinuz, initrd) |
| /proc | Virtual FS, kernel & process info (/proc/cpuinfo) |
| /dev | Device files (/dev/sda, /dev/null) |
| /bin | Essential binaries (ls, cp, mv, rm) |
| /usr | User utilities & applications |

📌 **Interview Q&A**

* **Q:** What is stored in /etc?  
  **A:** System-wide configuration files.
* **Q:** What is /proc?  
  **A:** A virtual filesystem providing runtime system information like CPU, memory, processes.

**🔹 3. Important Linux Commands**

**Basic Navigation**

ls # List files

ls -l # Long listing

cd /etc # Change directory

pwd # Print working directory

**File Operations**

cp file1 file2 # Copy

mv file1 file2 # Move/Rename

rm file1 # Remove

touch file1 # Create empty file

**File Searching**

find / -name file.txt # Find file

locate file.txt # Search (using DB)

grep "error" logfile.txt # Search inside file

**Text Processing**

awk '{print $1,$3}' file.txt # Print columns

sed 's/error/warning/g' file # Replace text

📌 **Interview Q&A**

* **Q:** Difference between find & locate?  
  **A:** find searches in real-time, locate uses pre-built DB (faster).
* **Q:** How is grep different from awk?  
  **A:** grep searches patterns in text, awk is used for advanced text processing (column extraction, calculations).

**🔹 4. File Compression & Archiving**

# Archive (combine files)

tar -cvf backup.tar file1 file2 dir/

# Extract tar

tar -xvf backup.tar

# Compress

gzip file.txt # Creates file.txt.gz

bzip2 file.txt # Creates file.txt.bz2

zip backup.zip file1 file2

# Decompress

gunzip file.txt.gz

bunzip2 file.txt.bz2

unzip backup.zip

📌 **Interview Q&A**

* **Q:** Difference between tar & gzip?  
  **A:** tar is archiving tool, gzip is compression tool. Mostly used together (.tar.gz).

**🔹 5. File Permission & Ownership**

**Permission Types**

* r (read = 4), w (write = 2), x (execute = 1)
* Applied on: **Owner, Group, Others**

Example:

-rwxr-xr-- 1 root root 1234 test.sh

* Owner: rwx (7), Group: r-x (5), Others: r-- (4)

**Commands**

chmod 755 file.sh # Change permissions

chown user:group file # Change owner & group

chgrp developers file # Change group only

📌 **Interview Q&A**

* **Q:** What does chmod 644 file.txt mean?  
  **A:** Owner=rw-, Group=r--, Others=r--
* **Q:** Difference between chown and chgrp?  
  **A:** chown changes both owner & group, chgrp changes only group.

**🔹 6. Hard Link vs Soft Link**

**Hard Link**

* Points to same inode (same data on disk).
* Deleting original file won’t delete data until all hard links are removed.
* Cannot link across file systems.

**Soft Link (Symbolic Link)**

* Shortcut (points to file path, not inode).
* If original file is deleted, symlink becomes broken.
* Can link across file systems.

**Commands**

ln file1 file2 # Hard link

ln -s file1 link1 # Soft link

📌 **Interview Q&A**

* **Q:** Difference between Hard & Soft link?  
  **A:** Hard link shares same inode (data), Soft link is a pointer (like shortcut).
* **Q:** Can we create a hard link for directories?  
  **A:** No (except by system internally), only soft links allowed.

✅ **Summary for Interview**:

* **Architecture** – Kernel, Shell, User space roles.
* **File system hierarchy** – /etc, /var, /proc, /boot.
* **Commands** – grep, awk, sed, find, locate.
* **File compression** – tar, gzip.
* **Permissions** – chmod, chown, umask.
* **Links** – Hard vs Soft.