

Linux for DevOps Engineers — Premium Master Documentation

Advanced Linux Notes for DevOps, Cloud, SRE, Platform Engineering, Containers, Kubernetes, and Production Infrastructure.

Linux Introduction

What is Linux?

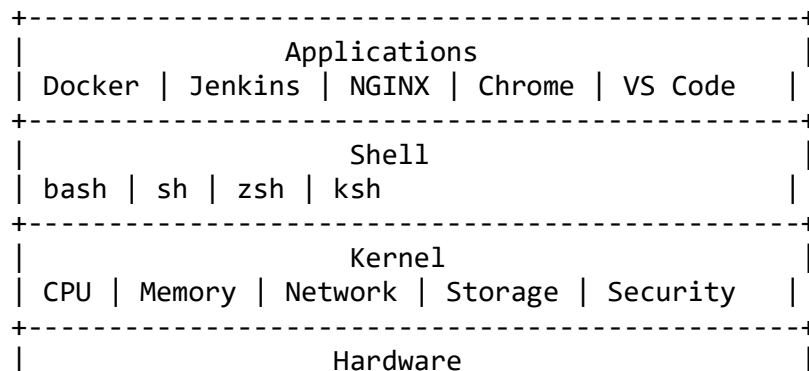
Linux is an open-source operating system kernel created by Linus Torvalds in 1991.

Linux powers:

- Cloud Infrastructure
- AWS, Azure, GCP
- Kubernetes clusters
- Docker containers
- DevOps platforms
- CI/CD servers
- Networking devices
- Supercomputers
- Android devices

Linux is the backbone of modern infrastructure engineering.

Linux Architecture



| RAM | CPU | SSD | NIC | GPU |
+-----+-----+

Applications Layer

Applications are software programs users interact with.

Examples:

- Docker
- Jenkins
- Kubernetes CLI
- Terraform
- NGINX
- Apache
- Git

Applications cannot directly access hardware. They communicate with the Linux kernel through system calls.

Shell Layer

Shell acts as a communication bridge between:

- User
- Kernel

It interprets commands and sends requests to kernel.

Types of Shells

Shell	Description
sh	Bourne Shell
bash	Bourne Again Shell
zsh	Z Shell
ksh	Korn Shell

Linux Prompt Symbols

Symbol	Meaning
\$	Normal User
#	Root User

Example:

\$

Root User:

#

Kernel Layer

Kernel is the heart of Linux.

Responsibilities:

- Process management
 - Memory management
 - Device management
 - File system management
 - Security management
 - Network management
-

Internal Working of Linux Kernel

When user runs:

```
cat file.txt
```

Flow:

```
User
↓
Shell
↓
System Call
↓
Kernel
↓
```

Disk Access



Kernel



Shell



Output

Kernel communicates directly with hardware drivers.

Hardware Layer

Hardware components include:

- CPU
- RAM
- SSD/HDD
- NIC
- GPU
- Motherboard

Kernel controls hardware resources.

Linux Boot Process

Boot Sequence

BIOS/UEFI



GRUB Bootloader



Linux Kernel



systemd/init



Services Start



User Login

Bootloader

Bootloader loads operating system into memory.

Most common bootloader:

- GRUB

Full Form:

- Grand Unified Bootloader
-

Remote Access Protocols

RDP

RDP = Remote Desktop Protocol

Used for:

- GUI remote access
- Windows servers

Default Port:

3389

SSH

SSH = Secure Shell

Used for:

- Remote Linux access
- Server management
- Automation
- Secure communication

Default Port:

22

SSH Internal Working

SSH uses:

- Encryption
- Authentication
- Key exchange

Protocols:

- RSA
 - ED25519
 - AES Encryption
-

SSH Commands

SSH Login

```
ssh user@server-ip
```

Generate SSH Key

```
ssh-keygen
```

Creates:

- Public key
 - Private key
-

Connect Using Key

```
ssh -i key.pem ubuntu@10.0.0.10
```

SSH Security Best Practices

X Never:

- Share private key
- Use root login directly

- Use weak passwords

Always:

- Use SSH keys
 - Disable password authentication
 - Rotate keys
 - Use MFA where possible
 - Restrict IP access
-

Linux File System

Everything starts from:

/

Called:

- Root filesystem
-

Important Linux Directories

Directory	Purpose
/	Root directory
/home	User home directories
/etc	Configuration files
/var	Logs and variable data
/bin	Essential binaries
/usr	Applications
/tmp	Temporary files
/dev	Device files

Real Production Examples

NGINX logs:

/var/log/nginx/

SSH configuration:

`/etc/ssh/sshd_config`

Linux Commands

ls Command

List files and directories.

`ls`

Detailed Listing

`ls -l`

Example Output:

```
drwxr-xr-x 2 root root 4096 Jan 1 test
```

Breakdown:

Part	Meaning
d	Directory
rw-r-xr-x	Permissions
root	Owner
root	Group

Hidden Files

`ls -a`

Hidden files begin with:

•

Example:

`bashrc`

Detailed + Hidden

```
ls -al
```

◇ pwd Command

Present Working Directory.

```
pwd
```

◇ mkdir Command

Create directory.

```
mkdir project
```

◇ cd Command

Change directory.

```
cd /etc
```

Parent directory:

```
cd ..
```

◇ touch Command

Create empty file.

```
touch app.log
```

◇ rm Command

Remove files.


```
rm file.txt
```

Recursive delete:

```
rm -r folder
```

Dangerous Command Warning

```
rm -rf /
```

 Deletes entire filesystem.

Never run this command.

rmdir Command

Remove empty directory.

```
rmdir folder
```

Echo Command

Print text:

```
echo "hello"
```

Save output:

```
echo "hello" > file.txt
```

Append output:

```
echo "hello" >> file.txt
```

File Reading Commands

cat Command

Display complete file.

```
cat file.txt
```

head Command

Display first 10 lines.

```
head file.txt
```

First 5 lines:

```
head -n 5 file.txt
```

tail Command

Display last 10 lines.

```
tail file.txt
```

Live monitoring:

```
tail -f app.log
```

Real DevOps Example

Monitor NGINX logs:

```
tail -f /var/log/nginx/access.log
```

less Command

Read large files efficiently.

```
less app.log
```

Advantages:

- Search support
 - Scrolling
 - Efficient memory usage
-

File Operations

cp Command

Copy files.

```
cp source.txt destination.txt
```

Recursive copy:

```
cp -r folder1 folder2
```

mv Command

Move or rename files.

```
mv old.txt new.txt
```

wc Command

Word count.

```
wc file.txt
```

Shows:

- Lines

- Words
 - Bytes
-

Links in Linux

Soft Link

Shortcut/reference file.

```
ln -s original.txt shortcut.txt
```

If original deleted: Link breaks

Hard Link

Shares same inode.

```
ln file1 file2
```

If original deleted: Still works

Inode Concept

Inode stores:

- Metadata
 - Permissions
 - Ownership
 - Disk block locations
-

Process Management

ps Command

Show processes.

```
ps aux
```

top Command

Real-time process monitoring.

```
top
```

Quit:

```
q
```

kill Command

Kill process.

```
kill PID
```

Force kill:

```
kill -9 PID
```

Linux Process States

State	Meaning
Running	Currently executing
Sleeping	Waiting for resource
Zombie	Dead but entry exists
Stopped	Paused

Zombie Process

Zombie process:

- Finished execution
- Parent process did not collect status

Find zombie process:

```
ps aux | grep Z
```

Memory Commands

free Command

Show RAM information.

```
free -h
```

vmstat Command

Virtual memory statistics.

```
vmstat
```

Shows:

- CPU
 - Memory
 - IO
 - Swap
-

User Management

Create User

```
useradd -m devops
```

Set Password

`passwd devops`

Switch User

`su - devops`

Delete User

`userdel -r devops`

Group Management

Create group:

`groupadd developers`

Add user:

`gpasswd -a devops developers`

Linux Permissions

`-rwxr-xr--`

Breakdown:

Type User Group Others

Permission Values

Number Permission

Number	Permission
0	—
1	-x
2	-w-
3	-wx
4	r-
5	r-x
6	rw-
7	rwX

chmod Command

`chmod 755 script.sh`

Meaning:

- Owner → rwx
 - Group → r-x
 - Others → r-x
-

Security Warning

Avoid:

`chmod 777`

Reason:

- Huge security risk
 - Anyone can modify files
-

chown Command

Change ownership.

`chown user file.txt`

chgrp Command

Change group.

```
chgrp devops file.txt
```

Compression Commands

zip Command

```
zip -r backup.zip folder/
```

unzip Command

```
unzip backup.zip
```

tar Command

Create archive:

```
tar -cvzf backup.tar.gz folder/
```

Extract archive:

```
tar -xvzf backup.tar.gz
```

Networking Commands

ping Command

Check connectivity.

```
ping google.com
```

5 packets:

```
ping -c 5 google.com
```

◇ ifconfig Command

Show network interface information.

Modern replacement:

```
ip addr
```

◇ netstat Command

Show network connections.

```
netstat -tulpn
```

◇ ss Command

Modern replacement for netstat.

```
ss -tulpn
```

◇ traceroute Command

Trace network path.

```
traceroute google.com
```

◇ nslookup Command

DNS lookup.

```
nslookup google.com
```

dig Command

Advanced DNS lookup.

```
dig google.com
```

curl Command

Call APIs.

```
curl https://api.github.com
```

Formatted output:

```
curl api | jq
```

wget Command

Download files.

```
wget https://example.com/file.zip
```

Storage Management

lsblk Command

List block devices.

```
lsblk
```

df Command

Show disk usage.

```
df -h
```

mount Command

Attach filesystem.

```
mount /dev/xvdf /mnt/data
```

umount Command

Detach filesystem.

```
umount /mnt/data
```

LVM (Logical Volume Manager)

Why LVM?

Traditional partitions: **✗** Hard to resize

LVM: Dynamic storage management

LVM Architecture

Physical Volume → Volume Group → Logical Volume

Create Physical Volume

```
pvcreate /dev/xvdf
```

Create Volume Group

```
vgcreate data_vg /dev/xvdf
```

Create Logical Volume

```
lvcreate -L 10G -n data_lv data_vg
```

Format Filesystem

```
mkfs.ext4 /dev/data_vg/data_lv
```

Mount Logical Volume

```
mount /dev/data_vg/data_lv /mnt/data
```

Extend Logical Volume

```
lvextend -L +5G /dev/data_vg/data_lv
```

Resize filesystem:

```
resize2fs /dev/data_vg/data_lv
```

awk Command

Pattern scanning and processing.

Example:

```
awk '{print $1}' file.txt
```

sed Command

Stream editor.

Replace text:

```
sed 's/info/log/g' app.log
```

grep Command

Search text.

```
grep "ERROR" app.log
```

Case insensitive:

```
grep -i error app.log
```

Production DevOps Scenarios

Scenario 1 — High CPU Usage

Check:

```
top
```

Find high CPU process:

```
ps aux --sort=-%cpu
```

Kill process:

```
kill -9 PID
```

Scenario 2 — Disk Full

Check:

```
df -h
```

Find large files:

```
du -sh /*
```

◇ Scenario 3 — Service Not Running

Check service:

```
systemctl status nginx
```

View logs:

```
journalctl -u nginx
```

Linux Security Best Practices

Use SSH keys Disable root login Use least privilege access Enable firewalls
Keep systems updated Rotate credentials Enable logging and monitoring Use MFA

Senior DevOps Engineer Tips

Use aliases:

```
alias ll='ls -al'
```

Reverse search:

```
Ctrl + r
```

Live monitoring:

```
watch -n 2 df -h
```

Use tmux/screen for long-running sessions.

Common Interview Questions

? What is Linux Kernel?

Kernel is the core component of Linux responsible for communication between hardware and software.

? Difference Between Hard Link and Soft Link?

Hard Link	Soft Link
Shares inode	Separate inode
Works after source deletion	Breaks after source deletion

? Difference Between grep, sed, awk?

Command	Purpose
grep	Search
sed	Stream editing
awk	Structured data processing

Linux Firewall Management

◇ What is Firewall?

Firewall is a security layer that controls:

- Incoming traffic
- Outgoing traffic
- Network access rules

Purpose:

- Protect server from unauthorized access
 - Allow only required ports/services
 - Prevent attacks
-

◇ Types of Linux Firewalls

Firewall	Linux Distribution
iptables	Traditional Linux firewall
firewalld	RHEL/CentOS/Fedora
UFW	Ubuntu
nftables	Modern Linux firewall

UFW (Uncomplicated Firewall)

Mostly used in Ubuntu.

Install UFW

```
sudo apt install ufw -y
```

Enable Firewall

```
sudo ufw enable
```

Check Firewall Status

```
sudo ufw status
```

Allow SSH

```
sudo ufw allow 22
```

Allow HTTP and HTTPS

```
sudo ufw allow 80  
sudo ufw allow 443
```

Deny Specific Port

```
sudo ufw deny 3306
```

Delete Firewall Rule

```
sudo ufw delete allow 80
```

Important Security Warning

Before enabling firewall:

Always allow SSH first.

Otherwise: **✗** You may lock yourself out of server.

Production Firewall Architecture

```
Internet
  ↓
Cloud Security Group
  ↓
Linux Firewall (UFW/iptables)
  ↓
NGINX / Application
```

iptables Firewall

iptables is low-level Linux firewall.

Allow SSH Using iptables

```
iptables -A INPUT -p tcp --dport 22 -j ACCEPT
```

Allow HTTP

```
iptables -A INPUT -p tcp --dport 80 -j ACCEPT
```

Block IP Address

```
iptables -A INPUT -s 192.168.1.10 -j DROP
```

Why Firewalls Are Important?

Without firewall:

- Open ports exposed
- Server vulnerable to attacks
- Brute force possible
- Malware access possible

Firewall acts as first security checkpoint.

Multiple Websites on One Linux Instance

Why Run Multiple Websites?

Companies run multiple applications on one server to:

- Reduce infrastructure cost
 - Optimize resources
 - Simplify management
 - Share load balancer and reverse proxy
-

Methods to Run Multiple Websites

Method	Description
Port-Based Hosting	Different ports
Name-Based Hosting	Different domain names
IP-Based Hosting	Multiple IP addresses
Reverse Proxy	NGINX/Apache routing
Containers	Docker-based isolation

Port-Based Hosting

Example:

Website	Port
app1	80
app2	8080
app3	3000

Example Using Python Server

Website 1:

```
python3 -m http.server 80
```

Website 2:

```
python3 -m http.server 8080
```

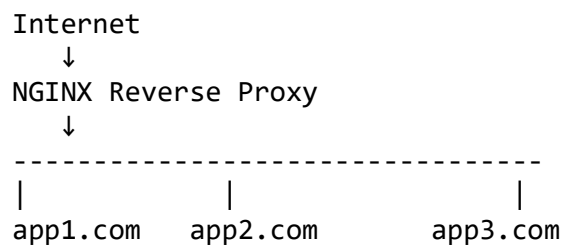
Access:

```
http://IP  
http://IP:8080
```

Name-Based Virtual Hosting (NGINX)

Most common production approach.

Architecture



◇ Install NGINX

```
sudo apt install nginx -y
```

◇ Create Website Directories

```
sudo mkdir -p /var/www/app1  
sudo mkdir -p /var/www/app2
```

◇ Create Sample Pages

```
echo "App1 Website" | sudo tee /var/www/app1/index.html  
echo "App2 Website" | sudo tee /var/www/app2/index.html
```

◇ Create Virtual Host Config

```
sudo vim /etc/nginx/sites-available/app1
```

Configuration:

```
server {  
    listen 80;  
    server_name app1.com;  
  
    root /var/www/app1;  
    index index.html;  
}
```

◇ Enable Site

```
sudo ln -s /etc/nginx/sites-available/app1 /etc/nginx/sites-enabled/
```

◇ Test NGINX Config

```
sudo nginx -t
```

Restart NGINX

```
sudo systemctl restart nginx
```

Alias in Linux

What is Alias?

Alias creates shortcut for long commands.

Purpose:

- Faster command execution
 - Reduce typing
 - Improve productivity
-

Temporary Alias

```
alias ll='ls -al'
```

Works only for current terminal session.

Permanent Alias

Add inside:

```
~/.bashrc
```

Example:

```
alias k='kubectl'  
alias d='docker'  
alias ll='ls -al'
```

Apply changes:

```
source ~/.bashrc
```

Real DevOps Aliases

```
alias k='kubectl'  
alias kgp='kubectl get pods'  
alias dps='docker ps'  
alias tf='terraform'
```

How to Secure Linux Instance

What is Secure Server Hardening?

Hardening means:

- Reducing attack surface
- Removing vulnerabilities
- Restricting unauthorized access

Goal:

- Protect infrastructure
 - Protect data
 - Protect applications
-

Linux Server Hardening Checklist

Security Practice	Purpose
Disable root login	Prevent direct attacks
Use SSH keys	Strong authentication
Enable firewall	Restrict traffic
Update packages	Patch vulnerabilities
Disable unused services	Reduce attack surface
Use least privilege	Prevent misuse
Monitor logs	Detect attacks
Install Fail2Ban	Prevent brute force
Enable MFA	Extra security

◇ Disable Root SSH Login

Edit SSH config:

```
sudo vim /etc/ssh/sshd_config
```

Change:

```
PermitRootLogin no
```

Restart SSH:

```
sudo systemctl restart ssh
```

◇ Disable Password Authentication

Inside:

```
PasswordAuthentication no
```

Use only SSH keys.

◇ Keep Server Updated

```
sudo apt update && sudo apt upgrade -y
```

◇ Install Fail2Ban

Protect against brute-force attacks.

```
sudo apt install fail2ban -y
```

◇ Check Open Ports

```
ss -tulpn
```

Close unnecessary ports.

Monitor Logs

Authentication logs:

```
/var/log/auth.log
```

NGINX logs:

```
/var/log/nginx/access.log
```

Secure File Permissions

Correct SSH key permission:

```
chmod 400 key.pem
```

Use Non-Root User

Create secure admin user:

```
useradd -m devops  
passwd devops  
usermod -aG sudo devops
```

Production Security Architecture

```
Internet  
↓  
Cloud Security Group  
↓  
Linux Firewall  
↓  
NGINX Reverse Proxy  
↓  
Application Layer  
↓  
Database Layer
```

Common Security Mistakes

✘ Using root login ✘ Opening all ports ✘ Using weak passwords ✘ chmod 777 ✘ Not updating packages ✘ Running everything as root

Senior DevOps Engineer Tips

Use SSH keys instead of passwords Restrict access using firewall Monitor logs continuously
Use reverse proxy for applications Automate backups Enable monitoring tools Use Infrastructure as Code Rotate credentials regularly

Cron Jobs in Linux

What is Cron?

Cron is a Linux job scheduler used to:

- Run tasks automatically
- Execute scripts periodically
- Automate backups
- Run monitoring jobs
- Schedule maintenance tasks

Cron service runs in background continuously.

Daemon name:

crond

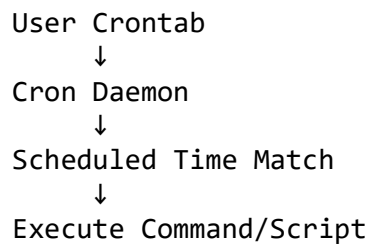
Why Cron Jobs Are Important?

Used heavily in production for:

- Backup automation

- Log cleanup
 - Monitoring scripts
 - Database dumps
 - SSL renewal
 - Security scanning
 - Scheduled deployments
-

◇ Cron Job Architecture



◇ Open Crontab

`crontab -e`

◇ View Cron Jobs

`crontab -l`

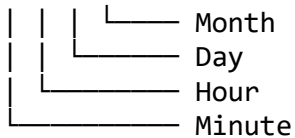
◇ Remove Cron Jobs

`crontab -r`

◇ Cron Job Format

* * * * * command

- - - - -
| | | | |
| | | | | └─ Day of Week



◇ Common Cron Examples

Run every minute:

```
* * * * * /home/ubuntu/script.sh
```

Run every day at 11 AM:

```
0 11 * * * /home/ubuntu/backup.sh
```

Run every Sunday:

```
0 0 * * 0 script.sh
```

Shell Scripting

◇ What is Shell Scripting?

Shell scripting means writing multiple Linux commands inside one file for automation.

Used for:

- Server automation
 - Monitoring
 - Deployments
 - Backups
 - Health checks
 - CI/CD automation
-

◇ Why Shell Scripting is Important in DevOps?

DevOps engineers automate repetitive tasks.

Without scripting: ✗ Manual operations ✗ Human errors ✗ Slow deployments

With scripting: Automation Faster operations Standardization Reduced human error

◇ Create Shell Script

Create file:

```
touch script.sh
```

Edit:

```
vim script.sh
```

◇ Basic Shell Script Example

```
#!/bin/bash
```

```
echo "Hello DevOps"
```

◇ Script Breakdown

Part	Meaning
#!/bin/bash	Shebang
echo	Print output

◇ Give Execute Permission

```
chmod +x script.sh
```

◇ Run Script

```
./script.sh
```

OR

```
bash script.sh
```

Variables in Shell Script

```
#!/bin/bash
```

```
name="Saumil"
```

```
echo "Hello $name"
```

User Input in Shell Script

```
#!/bin/bash
```

```
read -p "Enter your name: " name
```

```
echo "Welcome $name"
```

Conditions in Shell Script

```
#!/bin/bash
```

```
if [ $USER == "ubuntu" ]
```

```
then
```

```
    echo "Correct User"
```

```
else
```

```
    echo "Wrong User"
```

```
fi
```

Loops in Shell Script

For Loop

```
#!/bin/bash
```

```
for i in 1 2 3 4 5
```

```
do
```

```
    echo $i  
done
```

While Loop

```
#!/bin/bash
```

```
count=1  
  
while [ $count -le 5 ]  
do  
    echo $count  
    count=$((count+1))  
done
```

File Finding Commands

find Command

Used to search files and directories.

Find File by Name

```
find / -name file.txt
```

Find All .log Files

```
find /var/log -name "*.log"
```

Find Files Larger Than 1GB

```
find / -size +1G
```

◇ Find Files Modified in Last 7 Days

```
find /var/log -mtime -7
```

◇ Find and Delete Files

```
find /tmp -name "*.tmp" -delete
```

⚠ Use carefully.

🚀 Real Production Shell Script — Website Backup Automation

◇ Requirement

Create tar backup of:

```
/var/www/html
```

Destination:

```
/home/ubuntu
```

Run automatically every day at:

```
11:00 AM
```

◇ Create Backup Script

File:

```
vim /home/ubuntu/backup.sh
```

Script:

```
#!/bin/bash
```

```
DATE=$(date +%F-%H-%M-%S)

SOURCE="/var/www/html"
DESTINATION="/home/ubuntu"

TAR_FILE="website-backup-$DATE.tar.gz"

mkdir -p $DESTINATION

tar -cvzf $DESTINATION/$TAR_FILE $SOURCE

echo "Backup completed: $TAR_FILE"
```

◇ Script Breakdown

Line	Purpose
date command	Dynamic timestamp
SOURCE	Website path
DESTINATION	Backup location
tar -cvzf	Compress backup
mkdir -p	Create directory safely

◇ Give Execute Permission

```
chmod +x /home/ubuntu/backup.sh
```

◇ Test Script Manually

```
/home/ubuntu/backup.sh
```

Check backup:

```
ls -lh /home/ubuntu
```



Schedule Backup Using Cron Job

Open crontab:

```
crontab -e
```

Add:

```
0 11 * * * /home/ubuntu/backup.sh >> /home/ubuntu/backup.log 2>&1
```



Cron Job Breakdown

Part	Meaning
0	Minute
11	Hour
*	Every day
*	Every month
*	Every weekday



Logging in Cron Job

```
>> /home/ubuntu/backup.log 2>&1
```

Meaning:

- Save normal logs
 - Save error logs
 - Useful for troubleshooting
-



Common Cron Problems

Problem	Solution
Script not running	Give execute permission
Command not found	Use full path
Cron service stopped	Restart cron
Permission denied	Check ownership

Restart Cron Service

Ubuntu:

```
sudo systemctl restart cron
```

Check status:

```
sudo systemctl status cron
```

Production Backup Best Practices

Store backups on separate disk Use compressed backups Rotate old backups
Test restore process Use monitoring for backup success Encrypt sensitive backups
Upload backups to cloud storage

Real Enterprise Backup Architecture

```
Production Server
  ↓
Cron Job Scheduler
  ↓
Backup Script
  ↓
Tar Compression
  ↓
Local Backup
  ↓
Cloud Storage / S3
```

Advanced DevOps Tips

Use rsync for incremental backups Use AWS S3 lifecycle policies Monitor backup failures with Prometheus Send backup alerts using email or Slack Use logrotate for backup logs
Store backups on remote servers



Most Asked Linux & DevOps Interview Questions

◇ 1. What is Linux?

☑ Interview Answer

Linux is an open-source operating system kernel created by Linus Torvalds.

It manages:

- Hardware resources
- Processes
- Memory
- File systems
- Networking

Linux is widely used in:

- Cloud computing
 - DevOps
 - Containers
 - Kubernetes
 - Enterprise servers
-

◇ 2. What is the Difference Between Linux and Unix?

☑ Interview Answer

Linux	Unix
Open source	Mostly commercial
Community-driven	Vendor-driven
Free	Paid licensing
Highly customizable	Less flexible

Linux is Unix-like but not original Unix.

◇ 3. What is Kernel?

☑ Interview Answer

Kernel is the core component of Linux.

Responsibilities:

- CPU scheduling
- Memory management
- Device management
- Security
- Networking

Kernel acts as bridge between hardware and software.

◇ 4. What Happens When Linux System Boots?

☑ Interview Answer

Boot sequence:

BIOS/UEFI
→ GRUB Bootloader
→ Linux Kernel
→ systemd/init
→ Services
→ Login

GRUB loads kernel into memory. Kernel starts init/systemd process. Then services and user space start.

◇ 5. What is Difference Between Process and Thread?

☑ Interview Answer

Process	Thread
Independent program	Lightweight execution unit
Separate memory	Shared memory
Heavyweight	Lightweight

Process	Thread
More resource usage	Less resource usage

Threads are faster than processes.

◇ 6. What is Zombie Process?

Interview Answer

Zombie process is a terminated process whose entry still exists in process table.

Reason:

- Parent process did not collect exit status.

Check:

```
ps aux | grep Z
```

◇ 7. Difference Between Hard Link and Soft Link?

Interview Answer

Hard Link	Soft Link
Shares inode	Separate inode
Works after source deletion	Breaks after deletion
Cannot cross filesystem	Can cross filesystem

Soft link behaves like shortcut.

◇ 8. What is SSH?

Interview Answer

SSH stands for Secure Shell.

Used for:

- Secure remote login

- Server management
- File transfer
- Automation

Default port:

22

SSH uses encryption for secure communication.

◇ 9. What is Difference Between HTTP and HTTPS?

☑ Interview Answer

HTTP	HTTPS
Not encrypted	Encrypted
Port 80	Port 443
Less secure	More secure

HTTPS uses SSL/TLS encryption.

◇ 10. Explain chmod 777

☑ Interview Answer

`chmod 777 file.txt`

Means:

- Owner → rwx
- Group → rwx
- Others → rwx

Everyone gets full access.

⚠ Dangerous in production because any user can modify file.

Preferred:

`chmod 644 file`

`chmod 755 script.sh`

◇ 11. What is Difference Between grep, sed, awk?

☑ Interview Answer

Command	Purpose
grep	Search text
sed	Modify text
awk	Process structured data

Example:

```
grep ERROR app.log
```

```
sed 's/error/warning/g' file
```

```
awk '{print $1}' file
```

◇ 12. What is Cron Job?

☑ Interview Answer

Cron job is Linux task scheduler used for automation.

Examples:

- Backups
- Monitoring
- Log cleanup
- Scheduled scripts

Example:

```
0 11 * * * /home/ubuntu/backup.sh
```

Runs every day at 11 AM.

◇ 13. Difference Between RAM and Swap?

☑ Interview Answer

RAM	Swap
Physical memory	Disk-based virtual memory
Faster	Slower
Used actively	Used when RAM full

Swap prevents crashes during memory pressure.

◇ 14. What is Load Average in Linux?

☑ Interview Answer

Load average shows system workload.

Command:

```
uptime
```

Values represent:

- 1 minute
- 5 minute
- 15 minute averages

High load means CPU/process pressure.

◇ 15. How to Check Open Ports?

☑ Interview Answer

Using ss:

```
ss -tulpn
```

Using netstat:

```
netstat -tulpn
```

Used for troubleshooting networking issues.

◇ 16. What is Difference Between TCP and UDP?

☑ Interview Answer

TCP	UDP
Reliable	Faster
Connection-oriented	Connectionless
Error checking	No guarantee

TCP used for:

- SSH
- HTTP
- HTTPS

UDP used for:

- Streaming
 - DNS
 - Gaming
-

◇ 17. Explain Linux Permissions

☑ Interview Answer

Permissions:

r = read
w = write
x = execute

Example:

-rwxr-xr--

Breakdown:

- Owner → rwx
 - Group → r-x
 - Others → r-
-

◇ 18. What is LVM?

☑ Interview Answer

LVM stands for Logical Volume Manager.

Benefits:

- Dynamic storage resizing
- Flexible partition management
- Better storage utilization

Architecture:

PV → VG → LV

◇ 19. Difference Between apt and yum?

☑ Interview Answer

apt	yum
Ubuntu/Debian	CentOS/RHEL
.deb packages	.rpm packages

Examples:

```
apt install nginx
```

```
yum install nginx
```

◇ 20. Explain Top Command

☑ Interview Answer

Top command shows real-time system monitoring.

Displays:

- CPU usage
- Memory usage
- Running processes

- Load average

Command:

top

◇ 21. What Happens When Disk is Full?

Interview Answer

Problems:

- Application crashes
- Logs stop writing
- Database failures
- System instability

Check:

```
df -h
```

Find large files:

```
du -sh /*
```

◇ 22. What is Difference Between cp and rsync?

Interview Answer

cp	rsync
Simple copy	Incremental sync
Copies everything	Copies changed data
No compression	Compression supported

rsync is better for backups.

◇ 23. Explain NGINX Reverse Proxy

☑ Interview Answer

NGINX reverse proxy receives client requests and forwards them to backend applications.

Benefits:

- Load balancing
 - SSL termination
 - Security
 - Caching
 - Multiple website hosting
-

◇ 24. How to Secure Linux Server?

☑ Interview Answer

Best practices:

- Disable root login
 - Use SSH keys
 - Enable firewall
 - Update packages
 - Use least privilege
 - Monitor logs
 - Close unused ports
-

◇ 25. Explain Difference Between Name-Based and Port-Based Hosting

☑ Interview Answer

Name-Based	Port-Based
Uses domain names	Uses different ports
app1.com	IP:8080
Common in production	Mostly testing/dev

Name-based hosting commonly uses NGINX virtual hosts.

HR + Scenario-Based Questions

Tell Me About Yourself

Professional Answer

I am a DevOps Engineer with strong knowledge of Linux, AWS, Docker, Kubernetes, Git, Jenkins, and monitoring tools.

I have hands-on experience with:

- Linux administration
- CI/CD pipelines
- Containerization
- Infrastructure automation
- Monitoring and troubleshooting

I enjoy automating infrastructure and improving deployment reliability.

Why Do You Want DevOps?

Professional Answer

I like automation, infrastructure management, and solving production problems.

DevOps combines:

- Development
- Operations
- Automation
- Cloud technologies

It allows faster and reliable software delivery.

Explain One Production Issue You Faced

Sample Answer

One time disk usage became 100% on server.

Applications stopped writing logs.

Steps I followed: 1. Checked disk usage using:

```
df -h
```

2. Found large files:

```
du -sh /*
```

3. Cleaned old logs
 4. Restarted affected services
 5. Added monitoring alerts to prevent future issue
-

Why Should We Hire You?

Professional Answer

I have strong Linux and DevOps fundamentals with hands-on practice.

I can:

- Troubleshoot Linux servers
- Automate tasks
- Manage CI/CD pipelines
- Work with cloud infrastructure
- Learn quickly
- Work under pressure

I am passionate about DevOps and continuous learning.

Senior Interview Tips

Speak confidently Explain concepts with examples Focus on troubleshooting approach
Explain WHY not only HOW Mention security best practices Show automation mindset

Use production terminology Never say “I know everything” Be honest if you don’t know something Explain your learning approach

Top 100 Linux & DevOps Interview Questions with Professional Answers

These answers are written in professional interview style. Focus on: - Technical clarity
- Real-world understanding - Production mindset - Troubleshooting approach -
Security awareness

26. What is DevOps?

Professional Interview Answer

DevOps is a culture and engineering practice that combines:

- Development
- Operations
- Automation
- Monitoring
- Continuous delivery

Goal of DevOps:

- Faster software delivery
- Better collaboration
- Stable infrastructure
- Automated deployments
- Reduced downtime

In real production environments, DevOps helps organizations release applications quickly and reliably.

◇ 27. What is CI/CD?

☑ Professional Interview Answer

CI/CD stands for:

Short Form	Meaning
CI	Continuous Integration
CD	Continuous Delivery / Deployment

CI automatically:

- Builds code
- Runs tests
- Detects issues early

CD automatically:

- Deploys applications
- Delivers updates faster

Tools commonly used:

- Jenkins
 - GitHub Actions
 - GitLab CI/CD
 - ArgoCD
-

◇ 28. What is Docker?

☑ Professional Interview Answer

Docker is a containerization platform used to package applications with dependencies.

Benefits:

- Same environment everywhere
- Lightweight compared to VMs
- Faster deployment
- Easy scalability

Real-world use: Applications run inside containers consistently across:

- Developer machine
 - Testing
 - Production
-

◇ 29. Difference Between VM and Container?

☑ Professional Interview Answer

Virtual Machine	Container
Full OS	Shares host kernel
Heavyweight	Lightweight
Slower startup	Faster startup
Higher resource usage	Lower resource usage

Containers are more efficient for microservices.

◇ 30. What is Kubernetes?

☑ Professional Interview Answer

Kubernetes is container orchestration platform.

Used for:

- Container deployment
- Scaling
- Load balancing
- Self-healing
- Service discovery

It manages containers automatically in production environments.

◇ 31. What is Pod in Kubernetes?

☑ Professional Interview Answer

Pod is the smallest deployable unit in Kubernetes.

A pod contains:

- One or more containers
- Shared networking
- Shared storage

Pods are ephemeral and managed by Kubernetes controllers.

◇ 32. What is ReplicaSet?

☑ Professional Interview Answer

ReplicaSet ensures desired number of pod replicas are running.

Example: If desired replicas = 3 and one pod crashes:

- ReplicaSet automatically creates new pod.

Purpose:

- High availability
 - Self-healing
-

◇ 33. What is Deployment in Kubernetes?

☑ Professional Interview Answer

Deployment manages application lifecycle.

Features:

- Rolling updates
- Rollbacks
- Scaling
- Replica management

Production use: Safely deploy application updates without downtime.

◇ 34. Difference Between Deployment and StatefulSet?

☑ Professional Interview Answer

Deployment	StatefulSet
Stateless apps	Stateful apps
Random pod names	Stable pod identity
Web apps	Databases

StatefulSet commonly used for:

- MySQL
 - MongoDB
 - Cassandra
-

◇ 35. What is Namespace in Kubernetes?

☑ Professional Interview Answer

Namespace provides logical isolation inside cluster.

Used for:

- Multi-team environments
- Resource separation
- Environment separation

Examples:

- dev
 - staging
 - production
-

◇ 36. What is Service in Kubernetes?

☑ Professional Interview Answer

Service provides stable networking for pods.

Because pods are temporary and IPs change frequently.

Types:

- ClusterIP
 - NodePort
 - LoadBalancer
-

◇ 37. What is Ingress?

Professional Interview Answer

Ingress manages external HTTP/HTTPS access to services.

Features:

- Routing
- SSL termination
- Virtual hosting
- Reverse proxy

Usually implemented using:

- NGINX Ingress Controller
-

◇ 38. What is ConfigMap?

Professional Interview Answer

ConfigMap stores non-sensitive configuration data.

Examples:

- Environment variables
- Application configs
- URLs

Separates configuration from application code.

◇ 39. What is Secret in Kubernetes?

Professional Interview Answer

Secret stores sensitive information.

Examples:

- Passwords
- Tokens
- API keys
- Certificates

Secrets are base64 encoded.

◇ 40. What is Jenkins?

Professional Interview Answer

Jenkins is open-source automation server.

Used for:

- CI/CD pipelines
- Automated builds
- Automated testing
- Automated deployment

Jenkins supports plugins for integration with:

- Docker
 - Kubernetes
 - GitHub
 - AWS
-

◇ 41. What is Git?

Professional Interview Answer

Git is distributed version control system.

Used for:

- Source code management
- Collaboration
- Version tracking
- Branch management

Benefits:

- Easy rollback
 - Team collaboration
 - Change tracking
-

◇ 42. Difference Between Git Pull and Git Fetch?

Professional Interview Answer

git fetch	git pull
Downloads changes only	Downloads + merges
Safer	Direct update

Production engineers often prefer fetch before merge.

◇ 43. What is Merge Conflict?

Professional Interview Answer

Merge conflict happens when:

- Same lines modified by multiple developers.

Git cannot decide automatically.

Developer must manually resolve conflict.

◇ 44. What is Branching Strategy?

☑ Professional Interview Answer

Branching strategy defines code workflow.

Common strategies:

- GitFlow
- Feature branching
- Trunk-based development

Purpose:

- Organized development
 - Safer releases
 - Team collaboration
-

◇ 45. What is Infrastructure as Code?

☑ Professional Interview Answer

Infrastructure as Code means managing infrastructure using code.

Benefits:

- Automation
- Repeatability
- Version control
- Faster provisioning

Popular tools:

- Terraform
 - CloudFormation
 - Ansible
-

◇ 46. What is Terraform?

☑ Professional Interview Answer

Terraform is Infrastructure as Code tool by HashiCorp.

Used to:

- Create infrastructure
- Automate cloud resources
- Manage networking
- Deploy servers

Supports:

- AWS
 - Azure
 - GCP
 - Kubernetes
-

◇ 47. What is Terraform State File?

☑ Professional Interview Answer

Terraform state file stores infrastructure information.

File:

`terraform.tfstate`

Purpose:

- Resource tracking
- Dependency management
- Infrastructure synchronization

Production best practice: Store state remotely in:

- AWS S3
 - Terraform Cloud
-

◇ 48. What is Ansible?

Professional Interview Answer

Ansible is configuration management and automation tool.

Uses:

- Server configuration
- Package installation
- Deployment automation
- Infrastructure management

Agentless architecture using SSH.

◇ 49. Difference Between Terraform and Ansible?

Professional Interview Answer

Terraform	Ansible
Infrastructure provisioning	Configuration management
Declarative	Procedural
Creates resources	Configures resources

Terraform + Ansible commonly used together.

◇ 50. What is Monitoring?

Professional Interview Answer

Monitoring means continuously observing systems.

Tracks:

- CPU
- Memory
- Disk
- Network
- Application health

Benefits:

- Detect failures early
 - Improve uptime
 - Faster troubleshooting
-

◇ 51. What is Prometheus?

Professional Interview Answer

Prometheus is open-source monitoring tool.

Collects metrics from:

- Servers
- Containers
- Applications
- Kubernetes

Uses pull-based metric collection.

◇ 52. What is Grafana?

Professional Interview Answer

Grafana is visualization tool.

Used for:

- Dashboards
- Monitoring graphs
- Alert visualization

Integrated with:

- Prometheus
 - Elasticsearch
 - Loki
-

◇ 53. What is Load Balancer?

Professional Interview Answer

Load balancer distributes traffic across multiple servers.

Benefits:

- High availability
- Better performance
- Fault tolerance

Examples:

- AWS ELB
 - NGINX
 - HAProxy
-

◇ 54. What is Reverse Proxy?

Professional Interview Answer

Reverse proxy receives client requests and forwards them to backend servers.

Benefits:

- Security
- SSL termination
- Caching
- Load balancing

NGINX commonly used.

◇ 55. What is High Availability?

Professional Interview Answer

High Availability means system remains operational with minimal downtime.

Achieved using:

- Redundancy
- Load balancing
- Failover
- Replication

Goal:

- Avoid single point of failure.
-

◇ 56. What is Scalability?

Professional Interview Answer

Scalability means handling increased workload efficiently.

Types:

- Vertical scaling
- Horizontal scaling

Horizontal scaling preferred in cloud-native architecture.

◇ 57. Difference Between Vertical and Horizontal Scaling?

Professional Interview Answer

Vertical Scaling	Horizontal Scaling
Increase server size	Add more servers
Limited	More scalable
Expensive	Flexible

Kubernetes mainly uses horizontal scaling.

◇ 58. What is DNS?

Professional Interview Answer

DNS converts domain names into IP addresses.

Example:

google.com → 142.x.x.x

Without DNS users would need to remember IP addresses.

◇ 59. What is SSL/TLS?

Professional Interview Answer

SSL/TLS encrypts communication between client and server.

Benefits:

- Secure data transfer
- Authentication
- Data integrity

HTTPS uses SSL/TLS.

◇ 60. What is CIDR?

Professional Interview Answer

CIDR means Classless Inter-Domain Routing.

Used in networking for IP ranges.

Example:

192.168.1.0/24

◇ 61. What is Subnet?

Professional Interview Answer

Subnet divides network into smaller networks.

Benefits:

- Better security
 - Better management
 - Traffic isolation
-

◇ 62. What is NAT?

Professional Interview Answer

NAT stands for Network Address Translation.

Allows private servers to access internet using public IP.

Common in cloud environments.

◇ 63. What is VPN?

Professional Interview Answer

VPN creates secure encrypted tunnel over internet.

Used for:

- Secure remote access
 - Private networking
 - Hybrid cloud connectivity
-

◇ 64. What is Swap Memory?

Professional Interview Answer

Swap is virtual memory on disk.

Used when RAM becomes full.

Helps prevent application crashes.

◇ 65. What is RAID?

Professional Interview Answer

RAID combines multiple disks for:

- Redundancy
- Performance
- Fault tolerance

Common RAID types:

- RAID 0
 - RAID 1
 - RAID 5
-

◇ 66. What is Systemd?

Professional Interview Answer

Systemd is modern Linux init system.

Responsible for:

- Starting services
- Managing processes
- Boot management

Commands:

```
systemctl status nginx
```

◇ 67. What is Daemon Process?

Professional Interview Answer

Daemon is background service process.

Examples:

- sshd
- nginx
- crond

Runs continuously in background.

◇ 68. What is Log Rotation?

Professional Interview Answer

Log rotation manages old logs automatically.

Benefits:

- Prevent disk full
- Compress old logs
- Maintain storage

Linux uses:

logrotate

◇ 69. What is SELinux?

Professional Interview Answer

SELinux provides additional security layer.

Controls:

- Process permissions
- Resource access
- Security policies

Mostly used in RHEL/CentOS.

◇ 70. What is Uptime?

☑ Professional Interview Answer

Uptime means how long system has been running.

Command:

`uptime`

High uptime indicates stable infrastructure.

◇ 71–100 Rapid Fire Interview Questions

Question	Short Professional Answer
What is port 22?	SSH
What is port 80?	HTTP
What is port 443?	HTTPS
What is localhost?	Local machine address
What is loopback IP?	127.0.0.1
What is ping?	Connectivity test
What is traceroute?	Network path tracing
What is chmod?	Change permissions
What is chown?	Change ownership
What is sudo?	Execute as superuser
What is root user?	Highest privilege user
What is package manager?	Software installation tool
What is apt?	Ubuntu package manager
What is yum?	RHEL package manager
What is inode?	File metadata structure
What is shell?	Command interpreter
What is bash?	Linux shell
What is environment variable?	Dynamic system value
What is PATH variable?	Command search path

Question	Short Professional Answer
What is grep?	Search text
What is awk?	Text processing
What is sed?	Stream editor
What is tar?	Archive utility
What is gzip?	Compression tool
What is SCP?	Secure file copy
What is rsync?	Incremental sync
What is cron?	Job scheduler
What is top?	Process monitor
What is df?	Disk usage
What is free?	Memory usage

Advanced Interview Strategy

How Senior Engineers Answer Questions

Senior engineers usually answer in this structure:

1. Definition
 2. Why used
 3. Real-world example
 4. Production challenges
 5. Best practices
-

Example Senior-Level Answer

Question:

“What is Docker?”

Professional Answer:

Docker is a containerization platform used to package applications with all dependencies.

It helps maintain consistency across environments such as development, testing, and production.

In production environments, Docker improves:

- Portability
- Scalability
- Deployment speed
- Resource efficiency

For example, microservices are commonly deployed using Docker containers orchestrated by Kubernetes.

Best practice is using minimal base images and scanning images for vulnerabilities.

◇ Common Interview Mistakes

✗ Giving one-line answers ✗ No real-world examples ✗ Memorized answers only ✗ Ignoring security ✗ No troubleshooting explanation ✗ Panic during scenario questions

◇ Best Interview Practices

Speak clearly Explain architecture thinking Mention production use cases Explain troubleshooting steps Mention monitoring/security Show automation mindset Think like system engineer

Quick Revision Notes

Linux architecture Boot process Shell and kernel SSH Linux filesystem Linux commands Process management Networking Permissions User management LVM Firewall management Multiple website hosting Name-based virtual hosting Port-based hosting Linux hardening Alias commands Shell scripting File finding commands Cron jobs Backup automation Production backup strategy Security best practices Troubleshooting Production scenarios