Systeme-operare

Useful stuff for OS an 1 sem 2

Number all output lines -b : Number non

- -blank output lines
 -s : Squeeze multiple blank lines into one
 -T : Show tabs as ^I
- -v : Display control characters-A : Show

Linux Command Reference Guide

Categories 1–20 (Based on Your Pasted File)

1. Directory Management

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
Is	Lists files and directories in the current or specified directory	-I : Long listing format -a : Show hidden files -h : Human -readable file sizes -R : Recursively list subdirectories -t : Sort by modification time -S : Sort by file size	ls -alh	N/A (non-destructive command)	You can combine options, e.g., Is -Ih
pwd	Prints the current working directory	(No major specifiers, simple command)	pwd	N/A (informational command)	Helpful for scripting when absolute paths are needed
cd	Changes the current working directory	(No direct specifiers; path is argument)	cd /home/user	N/A (navigation only)	Use cd to go up one directory level
ср	Copies files and directories	-r : Copy directories recursively -i : Prompt before overwrite -u : Copy only when source is newer -v : Verbose output -p : Preserve file attributes -a : Archive mode (preserve all)	cp -r ~/Documents ~/Backup	Manually remove the copied files or directory using rm -r [destination]	Use -a for backups to preserve file metadata
mv	Moves or renames files and directories	-i : Prompt before overwrite-v : Verbose output-f : Force move without prompt	mv oldname.txt newname.txt	Move back manually if needed	Can be used to rename files as well
rm	Removes files or directories	-r : Remove directories recursively -f : Force deletion without prompt -i : Prompt before deletion	rm -rf temp_folder	Recovery may be difficult; use carefully	Be cautious with -rf, especially as root
mkdir	Creates new directories	-p : Create parent directories as needed -m : Set permissions -v : Verbose output	mkdir -p project/{src,bin}	Manually delete using rm -r	Useful for creating nested directory structures
rmdir	Removes empty directories	-p : Remove parent directories if also empty -v : Verbose output	rmdir temp_dir	Re-create the directory manually	Only works on empty directories

2 Text Processing

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
cat	Concatenates and displays file content	-n: Number all output lines -b: Number non -blank output lines -s: Squeeze multiple blank lines into one -T: Show tabs as ^I -v: Display control characters -A: Show all (including line endings)	cat -n notes.txt	N/A (read-only operation)	Can combine multiple files using redirection (cat file1 file2 > combined.txt)
head	Displays the first few lines of a file	-n N : Output the first N lines -c N : Output the first N bytes -q : Never print headers -v : Always print headers	head -n 10 logfile.log	N/A (display-only command)	Useful for previewing large files or checking logs quickly
tail	Displays the last few lines of a file	 -n N : Output the last N lines -f : Follow file as it grows -c N : Output the last N bytes -q : Suppress headers -v : Always output headers 	tail -f /var/log/syslog	N/A (display-only command)	Commonly used with -f to monitor log files live
grep	Searches for patterns in files using regular expressions	-i : Ignore case -v : Invert match (show non -matching lines)-r : Recursive search -n : Show line numbers -I : List filenames only -c : Count matching lines	grep -i "error" server.log	Use grep -v to find lines that don't match a pattern	Extremely fast and works well with pipes; supports regex
sed	Stream editor for modifying file contents on the fly	-i : Edit files in place -e : Add multiple commands -n : Suppress automatic printing -r : Use extended regex -f : Read commands from a file	sed -i 's/apple/orange/g' fruits.txt	Undo changes manually or revert from backup	Powerful for batch text editing, especially in scripts
awk	Pattern scanning and processing language	-F fs : Set field separator -v var=value : Assign variable before execution'{print \$1}' : Print specific columnsNR == n : Process specific record number	awk '{print \$1}' data.csv	N/A (text parsing tool)	Great for column-based data manipulation and extraction
less	View file content page by page	-N : Show line numbers -S : Disable line wrapping -i : Ignore case in searches -X : Do not clear screen after exit+G : Start at end of file	less -N server.log	N/A (read-only viewer)	Supports backward/forward navigation and searching with /

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
more	View file content page by page (older tool)	-d : Prompt before scrolling -f : Count logical lines -p : Clear screen then display page -s : Squeeze blank lines -u : Suppress underlining+n : Start at line n	more +20 notes.txt	N/A (read-only viewer)	Older than less, but still found on minimal systems
cut	Removes sections from each line of files	-d : Delimiter-f : Fields to extract-c : Characters toextract–complement : Excludeselected fields	cut -d',' -f1 data.csv	N/A (text extraction utility)	Good for slicing out specific columns from structured text
sort	Sorts lines of text files	-n : Numeric sort -r : Reverse order -k : Sort by key/column -u : Unique entries only -t : Field delimiter	sort -nr scores.txt	Re-sort with opposite flags if needed	Used frequently with pipelines to organize output
uniq	Reports or omits repeated lines	-c : Prefix lines by count -d : Only print duplicate lines -u : Only print unique lines -i : Ignore case	uniq -c names.txt	N/A (analysis tool)	Works best when input is already sorted; often paired with sort
paste	Merges lines of files	-d : Delimiter -s : Serial concatenation–delimiters= : Specify delimiters	paste file1.txt file2.txt	N/A (file merging utility)	Opposite of cut; useful for combining parallel outputs
join	Joins lines of two files on a common field	-1 FIELD : Join on this field from file 1 -2 FIELD : Join on this field from file 2 -t CHAR : Field separator	join -1 2 -2 1 file1 file2	N/A (data joining utility)	Similar to SQL JOINs; works best with sorted input

3. Process Management

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
ps	Displays information about active processes	-e : Show all processes -f : Full -format listing -u user : Filter by user	ps -ef	N/A (snapshot only)	Often used with grep to filter specific processes
top	Displays real-time system info and running processes	-u user : Show processes for a user -p pid : Monitor specific PID -d secs : Delay between updates	top	Exit with q	Interactive: Press k to kill a process directly from interface
htop	Enhanced interactive process viewer	-u user : Show processes for a user -p pid : Monitor specific PID -d delay : Set update interval	htop	Exit with F10 or q	Supports mouse navigation and color-coded resource usage
kill	Sends signals to processes (usually to terminate)	-9 : Force kill (SIGKILL)-15 : Graceful termination (SIGTERM)-I : List available signals	kill 1234	Restart process manually if needed	Use kill -9 for unresponsive processes
pkill	Kills processes by name or other attributes	-f : Match full command line -u user : Kill processes of a user -n : Most recently started process -o : Oldest process	pkill firefox	Restart process manually if needed	More flexible than killall; supports pattern matching
killall	Kills processes by name	-v : Verbose output -i : Ask for confirmation before killing -s : Send specific signal	killall httpd	Restart service or app manually	Works differently on Solaris vs Linux; ensure compatibility
bg	Resumes a suspended job in the background	%jobid : Resume a specific job	bg %1	Bring back to foreground with fg %1	Useful after suspending a process with Ctrl+Z
fg	Brings a background job to the foreground	%jobid : Bring specific job to front	fg %1	Send back to background with bg %1	Only one job can be in the foreground at a time
jobs	Lists active background jobs	-I : Show PIDs -n : Show status -changed jobs only -p : Show only PIDs	jobs	N/A (informational)	Helps manage multiple running background tasks
nice	Runs a command with adjusted scheduling priority	-n value : Set niceness (-20 to 19)	nice -n 10 ./heavy_script.sh	Rerun with different priority if needed	Lower values mean higher priority; default is 0
renice	Changes priority of a running process	-n value : Adjust niceness -p PID : Target process ID	renice 15 -p 1234	Reset to previous value if known	Can be used to adjust performance impact of long-running tasks
uptime	Shows how long the system has been running	No major specifiers	uptime	N/A (informational)	Also shows load averages and number of users

4. Network Management

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
oing	Tests network connectivity to a host	-c N : Send N packets -i N : Interval between packets (seconds)-s N : Packet size	ping -c 4 google.com	N/A (diagnostic tool)	Basic tool to check if a host is reachable
traceroute	Shows the route packets take to reach a host	-n : Display IP addresses only -w N : Time to wait for response -m N : Maximum number of hops	traceroute google.com	N/A (diagnostic tool)	Useful for identifying routing issues or bottlenecks
netstat	Displays network connections, routing tables, and interface statistics	-t: TCP connections -u: UDP connections -n: No DNS lookup -I: Listening ports -p: Show PID and name -a: All connections	netstat -tulnp	N/A (diagnostic tool)	Deprecated in favor of ss, but still widely used
SS	Investigates sockets (like netstat)	-t: TCP connections -u: UDP connections -n: No DNS lookup -l: Listening ports -p: Show process info -a: All sockets	ss -tulnp	N/A (diagnostic tool)	Faster and more modern than netstat
ifconfig	Configures and displays network interfaces	up/down : Enable/disable interfaceadd/del : Add/remove IP addressnetmask : Set subnet maskbroadcast : Set broadcast address	ifconfig eth0 up	Reverse configuration manually (e.g., ifconfig eth0 down)	Considered deprecated; use ip command instead
ip	Manages network interfaces, routes, tunnels,	addr : Manage IP addresseslink :	ip addr showip link set	Use inverse commands like ip link set eth0 down	Modern replacement for ifconfig; supports IPv6

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
	etc.	Manage interfacesroute : Manage routing tableneigh : ARP table management	eth0 up		
arp	Manages Address Resolution Protocol cache	-a : Show all entries -d : Delete entry -s : Add static entry	arp -a	Remove with arp -d [host]	Used to view or manipulate MAC address mappings
hostname	Shows or sets the system's hostname	(No major specifiers; pass new hostname as argument)	hostname myserver	Change back to original hostname manually	Hostname resets on reboot unless saved in config file
nslookup	Queries DNS servers to look up domain information	-type=mx : Lookup MX records -type=ns : Lookup NS records@server : Query specific DNS server	nslookup google.com	N/A (DNS lookup tool)	Can be replaced by dig or host
dig	Flexible DNS lookup utility	+short : Compact output+trace : Trace DNS delegation path@server : Query specific DNS server	dig A google.com	N/A (DNS lookup tool)	More powerful and flexible than nslookup
curl	Transfers data from or to a server using URLs	-X : Request method (GET/POST/etc.)-H : Add header -d : Data to POST–insecure : Allow insecure SSL/TLS connections -o : Save output to file	curl -O https://example.com/file.tx t	Depends on what was transferred or posted	Supports many protocols including HTTP, FTP, SFTP
wget	Retrieves content from web servers	-c : Resume interrupted download -O : Output filename -r : Recursive download–limit -rate : Throttle speed–no -check -certificate : Ignore SSL errors	wget https://example.com/file.zi p	Delete downloaded file manually if needed	Great for downloading files non-interactively
ssh	Securely connects to remote hosts	-p : Custom port -i : Identity file (private key)-L : Local port forwarding -R : Remote port forwarding -N : Do not execute remote command	ssh user@remote_host	Exit session with exit or Ctrl+D	Uses public-key cryptography for authentication
scp	Securely copies files between hosts	-P : Port number -i : Identity file -r : Recursively copy directories	scp file.txt user@remote:/path/	Copy back from remote host if needed	Based on SSH protocol; secure alternative to rcp
sftp	Interactive secure file transfer over SSH	get/put : Download/upload filesls/lls : List remote/local directorycd/lcd : Change remote/local dirmkdir/rmdir : Create/delete dirs	sftp user@remote	Upload/delete files accordingly	Safer than regular FTP; uses encryption
tcpdump	Captures and analyzes network traffic	-i INTERFACE : Interface to capture on -w FILE : Write to file -r FILE : Read from file -nn : Don't resolve names -v : Verbosity level	tcpdump -i eth0 -w capture.pcap	Analyze capture later or stop capture	Powerful packet analyzer for troubleshooting
nmap	Scans networks and discovers hosts and services	(No major specifiers listed)	nmap google.com	Avoid scanning unauthorized networks	Often used for security auditing and mapping
iptables	Administers firewall rules	-A : Append rule -D : Delete rule -I : Insert rule -L : List rules -F : Flush rules -j : Jump target (ACCEPT/DROP/REJECT)	iptables -A INPUT -p tcp dport 22 -j ACCEPT	Reverse by deleting or modifying rules	Low-level firewall control; consider ufw for simplicity
ufw	Uncomplicated Firewall (frontend for iptables)	allow/deny : Permit/block trafficstatus : Show current statusenable/disable : Toggle firewalldelete : Remove a rule	ufw allow OpenSSH	Disable or remove rules as needed	Easier-to-use firewall manager for Ubuntu/Debian systems

5. Disk Management

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
df	Displays disk space usage for mounted filesystems	-h : Human -readable sizes -T : Show filesystem type -i : Show inode usage—total : Display total usage at the end	df -h	N/A (informational command)	Useful for checking available disk space and mounted devices
du	Shows the size of directories and files	-h: Human-readable sizes-s: Summary only-c: Total at the end–max-depth=N: Limit directory depth	du -sh /home/user	N/A (read-only operation)	Helps identify large directories consuming disk space
fdisk	Manages disk partitions (MBR style)	-I : List all partitions -u : Show sizes in sectors -b : Specify sector size	sudo fdisk -l	Use inverse operations within interactive mode to delete or resize partitions	Older tool; use parted or gdisk for GPT disks
parted	Manages disk partitions (supports MBR and GPT)	mklabel : Create partition tableprint : Display partition infomkpart : Create a new partition	sudo parted /dev/sda print	Undo with reverse commands inside parted	More modern than fdisk, supports larger disks and GPT
Isblk	Lists block devices (disks and partitions)	-f : Show filesystem info -o : Customize output columns	lsblk -f	N/A (informational command)	Great for quickly viewing disk layout and mount points
blkid	Displays block device attributes	-s : Show specific tag–match -tag : Limit to certain tags	blkid /dev/sdb1	N/A (read-only command)	Used often in scripts to get UUIDs or verify filesystem types
mount	Mounts a filesystem to a directory	-t : Filesystem type -o : Mount options—bind : Bind mount a directory—remount : Remount an already mounted filesystem	mount /dev/sdb1 /mnt/usb	Unmount with umount /mnt/usb	Essential for mounting external drives, ISOs, or shares
umount	Unmounts a mounted filesystem	-I : Lazy unmount (detach after use)-f : Force unmount	umount /mnt/usb	Remount using mount again	Always unmount before removing hardware to prevent data loss
mkfs	Creates a filesystem on a partition	-t : Filesystem type -L : Set volume label	mkfs -t ext4 /dev/sdb1	Formatting is irreversible — requires reformatting or recovery tools	Must be used carefully; erases all data on target device
tune2fs	Adjusts ext2/ext3/ext4 filesystem parameters	-I : Show filesystem info -c : Max mount count	tune2fs -l /dev/sda1	Most changes can be reverted using same command with previous values	Advanced users can optimize performance or enable features

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
		-i : Interval between checks -L : Change volume label			
fsck	Checks and repairs filesystems	-t : Specify filesystem type -r : Interactive repair -y : Assume yes to prompts -n : Assume no to prompts	fsck /dev/sdb1	Repairs may not recover all data; backups recommended	Should be run when filesystem is unmounted or during boot

6. User and Group Management

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
useradd	Adds a new user to the system	-m : Create home directory -d : Specify home directory -s : Set login shell -g : Primary group -G : Supplementary groups -u : UID -p : Encrypted password	sudo useradd -m john	Remove user with userdel john	Creates user account and related files in /etc/passwd, /etc/shadow, etc.
usermod	Modifies user account settings	-I : Change username -d : Change home directory -s : Change login shell -aG : Add to supplementary groups -g : Change primary group -L : Lock account -U : Unlock account	sudo usermod -aG sudo john	Reverse changes using same command with original values	Useful for updating user info without deleting/recreating
userdel	Deletes a user account	-r : Remove home directory and mail spool -f : Force removal of running processes	sudo userdel -r john	Recreate user manually if needed	Be cautious with -r as it permanently deletes user data
passwd	Sets or changes user passwords	-I : Lock account -u : Unlock account -d : Delete password (disable)—stdin : Read password from stdin	sudo passwd john	Reset password or unlock with same command	Used interactively or in scripts for automated setups
groupadd	Adds a new group to the system	-g : GID -r : Create system group -f : Force; use when GID exists	sudo groupadd developers	Remove group with groupdel developers	Adds entry to /etc/group
groupmod	Modifies group settings	-n : Rename group -g : Change GID	sudo groupmod -n devteam developers	Reverse renaming or GID change with same command	Useful for maintaining consistent group names/IDs
groupdel	Removes a group from the system	(No major specifiers)	sudo groupdel devteam	Recreate group manually if needed	Cannot remove group if it's a user's primary group
id	Displays user and group IDs	-u : Show UID only-g : Show GID only-n : Show names instead of numeric IDs-G : Show all group memberships	id john	N/A (read-only command)	Helps verify user/group mappings, especially in LDAP environments
su	Switches to another user account	- : Start login shell -c : Run single command -I : Same as -	su - root	Exit with exit or Ctrl+D	Commonly used to switch to root or other users temporarily
sudo	Executes a command with elevated privileges	-i : Start interactive shell -u : Run as specified user -l : List allowed commands -k : Invalidate timestamp -b : Run in background	sudo systemctl restart nginx	Depends on executed command	Requires proper configuration in /etc/sudoers
whoami	Displays the current effective user name	(No major specifiers)	whoami	N/A (informational)	Often used in scripts to check execution context
chage	Changes password expiry information	-I : List current settings -M : Max days before password change -m : Min days between changes -W : Warning days -I : Inactive days after expiry -E : Account expiration date	sudo chage -M 90 john	Adjust again with chage	Enforces password policies and account expiration
lastlog	Displays most recent login of all users	-u : Filter by user-b DAYS : Logins older than DAYS-t DAYS : Logins within last DAYS	lastlog	N/A (informational)	Reads from /var/log/lastlog; useful for auditing
groups	Displays the groups a user belongs to	(Pass username as argument)	groups john	N/A (informational)	Shows both primary and supplementary group memberships
finger	Displays user information	(Pass username as argument)	finger john	N/A (informational)	May not be installed by default; can expose sensitive info
getent	Gets entries from Name Service Switch libraries	passwd : Show user infogroup : Show group infohosts : Show host info	getent passwd john	N/A (lookup tool)	Works with local files, LDAP, NIS, and other databases
adduser	Interactive tool to add a new user (wrapper for useradd)	(Same as useradd but more user-friendly)	sudo adduser jane	Remove with deluser or userdel	Preferred on Debian/Ubuntu systems for its simplicity
deluser	Removes a user (Debian/Ubuntu alternative to userdel)	-remove-home : Delete home directory-remove-all-files : Remove all user-owned files	sudo deluserremove- home jane	Recreate user manually if needed	More intuitive than raw userdel on some distros

7. Security and Encryption

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
chmod	Changes file permissions	-R : Recursive -v : Verbose output	chmod u+rwx file.txt	Remove permissions with chmod u-rwx file.txt	Permissions can be symbolic or numeric (644, 755)
chown	Changes file owner and/or group	-R : Recursive -v : Verbose output	sudo chown user:group file.txt	Change back using same command with original owner/group	Must have root privileges to change ownership
sudo	Executes a command with elevated privileges	-i : Start interactive shell -u : Run as specified user -l : List allowed commands -k : Invalidate timestamp -b : Run in background	sudo systemctl restart nginx	Depends on executed command	Requires proper configuration in /etc/sudoers
su	Switches to another user account	- : Start login shell -c : Run single command -l : Same as -	su - root	Exit shell with exit or Ctrl+D	Often used to switch to root or other users temporarily
passwd	Sets or changes user passwords	-I : Lock account -u : Unlock account -d : Delete password (disable)–stdin : Read password	sudo passwd john	Reset password or unlock with same command	Used interactively or in scripts for automation

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
		from stdin			
ssh	Securely connects to remote hosts	 -p : Custom port -i : Identity file (private key)-L : Local port forwarding -R : Remote port forwarding -N : Do not execute remote command 	ssh user@remote_host	Exit session with exit or Ctrl+D	Uses public-key cryptography; supports tunnels and X11 forwarding
scp	Securely copies files between hosts	-P : Port number -i : Identity file -r : Recursively copy directories	scp file.txt user@remote:/path/	Copy back from remote host if needed	Based on SSH protocol; secure alternative to rcp
sftp	Interactive secure file transfer over SSH	get/put : Download/upload filesls/lls : List remote/local directorycd/lcd : Change remote/local dirmkdir/rmdir : Create/delete dirs	sftp user@remote	Upload/delete files accordingly	Safer than regular FTP; uses encryption
iptables	Administers firewall rules	-A : Append rule -D : Delete rule -I : Insert rule -L : List rules -F : Flush rules -j : Jump target (ACCEPT/DROP/REJECT)	iptables -A INPUT -p tcp dport 22 -j ACCEPT	Reverse by deleting or modifying rules	Low-level firewall control; consider ufw for simplicity
ufw	Uncomplicated Firewall (frontend for iptables)	allow/deny : Permit/block trafficstatus : Show current statusenable/disable : Toggle firewalldelete : Remove a rule	ufw allow OpenSSH	Disable or remove rules as needed	Easier-to-use firewall manager for Ubuntu/Debian systems
fail2ban	Bans IPs after failed login attempts	-x : Stop service -r : Reload config–set jail action ban/unban IP	fail2ban-client set sshd banip 192.168.1.100	Manually unban with fail2ban-client set sshd unbanip	Helps prevent brute-force attacks on SSH and other services
openssl	Toolkit for SSL/TLS protocols	enc : Encrypt/decrypt filesgenrsa : Generate RSA private keyreq : Create certificate requestsx509 : Self-signed cert generationdgst : Message digest calculation	openssl enc -aes-256-cbc - in secret.txt -out encrypted.bin	Decrypt using same command with -d flag	Supports many cryptographic operations including signing and hashing
gpg	GNU Privacy Guard – encrypting and signing data	-c : Symmetric encryption -e : Encrypt for recipient -d : Decrypt file -s : Sign file-verify : Verify signature-import/export : Manage keys	gpg -c secret.txt	Decrypt using gpg -d secret.txt.gpg	Used for secure communication, software verification, and file encryption
ssh-keygen	Generates, manages, and converts SSH keys	-t : Key type -b : Bits for RSA keys -f : Filename for generated key -N : Passphrase -I : Show fingerprint of existing key	ssh-keygen -t ed25519 -C "user@example.com"	Delete key manually; regenerate if needed	Essential for setting up passwordless SSH access

8. Monitoring and Troubleshooting

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
top	Displays real-time system information and running processes	-u user: Show only a specific user's processes -p pid: Monitor specific PID -d secs: Delay between updates -n number: Number of updates to show	top	Exit with q	Interactive: Press k to kill a process directly from interface
htop	Enhanced interactive process viewer	-u user : Show processes for a user -p pid : Monitor specific PID -d delay : Set update interval	htop	Exit with F10 or q	Supports mouse navigation, color coding, and better UI than top
iotop	Displays I/O usage by processes	-o : Only show processes doing I/O -b : Batch mode -d SEC : Delay between iterations	iotop	Exit with q	Similar to top, but focused on disk I/O activity
vmstat	Reports virtual memory statistics	-s : Display memory summary -d : Disk statistics -m : Slab memory info	vmstat 1 5	N/A (snapshot or interval-based)	Useful for monitoring system performance and bottlenecks
free	Displays amount of free and used memory	-h : Human -readable format -m/g/k : Output in MB/GB/KB -I : Show detailed low/high memory stats	free -h	N/A (informational command)	Shows RAM and swap space usage; useful in scripts
sar	Collects, reports, or saves system activity information	-u : CPU usage -r : Memory usage -d : Disk I/O -n DEV : Network stats -A : All available reports	sar -u 1 5	N/A (system activity reporter)	Part of sysstat package; logs can be saved and analyzed later
dmesg	Prints or controls the kernel ring buffer	-T : Show human -readable timestamps–level : Filter log levels -C : Clear ring buffer	dmesg	Depends on what was cleared or filtered	Useful for viewing hardware/driver messages and boot logs
journalctl	Query systemd journal (system logs)	-b : Boot logs only -u service : Filter by unit–since/–until : Time range -f : Follow live output -x : Add explanatory text	journalctl -u ssh.service	Depends on logged events	Centralized logging in modern Linux systems using systemd
lastlog	Displays most recent login of all users	-u : Filter by user -b DAYS : Logins older than DAYS -t DAYS : Logins within last DAYS	lastlog	N/A (informational)	Reads from /var/log/lastlog; useful for auditing
last	Shows listing of last logged-in users	-n NUM : Show NUM lines -x : Show system shutdown/reboot events -F : Full date/time format	last -n 10	N/A (informational)	Reads from /var/log/wtmp; good for historical login tracking
logwatch	Analyzes and reports log summaries	-range : Time range (Today, Yesterday, All)-service : Specific service to report on-detail : Level of detail	logwatchdetail High service sshd	N/A (reporting tool)	Useful for daily security monitoring and intrusion detection

Category 9: File Compression and Archiving

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
tar	Archives multiple files into a single file (tape archive)	-c : Create new archive -x : Extract files -v : Verbose output -f : Specify filename -z : Compress with gzip -j : Compress with bzip2 -J : Compress with xz	tar -czvf archive.tar.gz folder/	Use -x to extract the archive	Commonly used for backups and distributing source code
gzip	Compresses files using GZIP format	-d : Decompress -r : Recursively compress directories -l : List compressed file info -k : Keep original file -v : Verbose output	gzip file.txt	Decompress with gzip -d file.txt.gz or gunzip file.txt.gz	Reduces file size significantly; often used with tar
gunzip	Decompresses GZIP-compressed files	-r : Recursively decompress directories -I : List compressed file info -v : Verbose output	gunzip file.txt.gz	Re-compress with gzip file.txt	Equivalent to gzip -d
zip	Compresses files into a ZIP archive	-r : Recursively add directories -d : Delete entries from archive -u : Update existing archive -v : Verbose output	zip -r backup.zip folder/	Unzip with unzip backup.zip	Widely compatible across operating systems
unzip	Extracts files from ZIP archives	-I : List contents without extracting -q : Quiet mode -d : Extract to specific directory	unzip backup.zip	Recompress with zip command	Useful for unpacking downloaded software or assets
bzip2	Compresses files using BZIP2 algorithm	-d : Decompress -k : Keep original file -v : Verbose output -z : Force compression	bzip2 file.txt	Decompress with bzip2 -d file.txt.bz2 or bunzip2 file.txt.bz2	Offers better compression than gzip, but slower
bunzip2	Decompresses BZIP2-compressed files	-k : Keep original file -v : Verbose output	bunzip2 file.txt.bz2	Re-compress with bzip2 file.txt	Equivalent to bzip2 -d
XZ	Compresses files using LZMA/XZ compression	-d : Decompress -k : Keep original file -z : Compress (default)-v : Verbose output	xz file.txt	Decompress with xz -d file.txt.xz or unxz file.txt.xz	High compression ratio, ideal for large static files
unxz	Decompresses XZ-compressed files	-k : Keep original file -v : Verbose output	unxz file.txt.xz	Re-compress with xz file.txt	Equivalent to xz -d
7z	Creates and extracts 7-Zip archives	a : Add files to archivex : Extract with full pathse : Extract without paths-t : Set archive type-m : Set compression method-p : Set password	7z a archive.7z folder/	Extract with 7z x archive.7z	Supports many formats including 7z, ZIP, RAR, ISO
rsync	Efficient remote and local file copying and syncing tool	 -a : Archive mode (recursive, preserves permissions)-v : Verbose output -z : Compress during transfer–delete : Remove files not in source -e ssh : Use SSH as transport 	rsync -avz folder/ user@remote:/path/	Reverse by swapping source and destination	Great for backups and mirroring data between machines
dd	Converts and copies files (often used for disk imaging)	if=FILE : Input fileof=FILE : Output filebs=BYTES : Block sizecount=BLOCKS : Number of blocks	dd if=/dev/sda of=disk.img bs=64K	Depends on what was copied — image can be restored or deleted	Used for creating bootable USB drives, cloning disks
split	Splits large files into smaller chunks	-b SIZE : Split by byte size -I LINES : Split by line count -a NUM : Use NUM suffix digits	split -b 100M largefile.tar.gz chunk_	Combine with cat or cat > combinedfile	Useful when transferring large files through limited-size storage
cat (with redirection)	Concatenates and combines files	(No direct specifiers)	cat chunk_* > combinedfile.tar.gz	N/A (reversal depends on how it was used)	Often used with split to reassemble large archives

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
gcc	Compiles C and C++ programs	-o : Specify output filename -c : Compile without linking -Wall : Enable all warnings -g : Generate debug info -O : Optimize code (e.g., -O2, -O3)	gcc -o hello hello.c	N/A (compilation process)	Part of the GNU Compiler Collection; supports multiple languages
g++	Compiles C++ programs	-o: Output filename -c: Compile only -std=C++11: Use specific standard -I: Include directory -L: Library path -I: Link library	g++ -std=c++17 -o app main.cpp	N/A (compilation process)	Works similarly to gcc, but defaults to C++ mode
make	Builds projects using Makefiles	-f: Specify a Makefile -C: Change directory before reading Makefile -j: Parallel jobs (e.g., -j4)-k: Continue despite errors—dry -run: Show what would be done	make	Run make clean (if defined in Makefile)	Automates build processes; often used with C/C++ projects
gdb	Debugs programs	-q : Quiet mode–args : Pass arguments to program -ex : Execute command at startup–batch : Run non -interactively	gdb ./myprogram	N/A (debugging tool)	Supports breakpoints, stepping, memory inspection, and more
valgrind	Detects memory leaks and profiling issues	-leak-check= : Level of leak checking-track-origins=yes : Track uninitialized values-tool= : Choose tool (memcheck, callgrind, etc.)	valgrindleak- check=full ./app	N/A (analysis tool)	Slows down execution significantly; use for debugging and testing
cmake	Cross-platform build system generator	-S : Source directory -B : Build directory–build : Build project–target : Build specific target–clean -first : Clean before building	cmake -SB build	Remove build directory manually	Used to generate Makefiles, Ninja files, Visual Studio projects
clang	LLVM-based compiler for C/C++/Objective-C	-Weverything : Enable all warnings–analyze : Static analysis	clang -o app main.c	N/A (compilation process)	Known for better error messages than GCC; supports modern standards

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
		mode -fsanitize= : Enable sanitizers (address, undefined, etc.)-o : Output file			
javac	Java compiler	-d : Destination directory for class files -source : Language version -target : Target JVM version -cp : Classpath -g : Generate debug info	javac -d bin src/*.java	N/A (compilation process)	Compiles .java files into bytecode .class files
java	Runs compiled Java applications	-jar : Run from JAR file -cp : Set classpath -Xmx / -Xms : Memory settings–module -path : For Java modules–add -modules : Add required modules	java -cp bin MainClass	N/A (runtime command)	Requires compiled .class or .jar files
python	Interprets Python scripts	-m : Run module as script -c : Execute code inline–version : Show Python version -i : Interactive after script–help : Show help	python3 script.py	N/A (interpreted language)	Default interpreter for running .py files; versions vary (2.x vs 3.x)
pip	Installs and manages Python packages	install: Install packageuninstall: Remove packagefreeze: List installed packageslist: Show installed packagesupgrade: Update package	pip install requests	Uninstall with pip uninstall package	Package manager for Python; works with virtual environments
node	Executes JavaScript on the server-side (Node.js)	-v : Show version -e : Evaluate script inline–inspect : Enable debugger–experimental -specifier -resolution : Resolve imports	node app.js	N/A (script execution)	Built on V8 engine; enables backend development in JS
npm	Node.js package manager	install : Install packageuninstall : Remove packagestart : Run start scriptrun : Run custom scriptinit : Initialize new package.json	npm install express	Uninstall with npm uninstall package	Manages dependencies for Node.js projects
yarn	Alternative Node.js package manager	add : Install packageremove : Uninstall packagerun : Run scriptinit : Create package.jsoncache clean : Clear cache	yarn add react	Remove with yarn remove package	Faster and more deterministic than npm; uses yarn.lock
ruby	Interprets Ruby scripts	-e : Execute code inline -n : Assume loop over input lines -p : Print result of each line–version : Show Ruby version	ruby script.rb	N/A (interpreted language)	Popular for web development via Ruby on Rails framework
gem	Ruby package manager	install : Install gemuninstall : Remove gemupdate : Update gemlist : Show installed gemssearch : Find gems	gem install bundler	Uninstall with gem uninstall gemname	Manages Ruby libraries and tools
perl	Interprets Perl scripts	-e : Execute code inline -n : Loop over input -p : Loop and print -w : Enable warnings -c : Syntax check only	perl script.pl	N/A (interpreted language)	Often used for text processing, sysadmin tasks, and CGI scripting
rustc	Rust compiler	-o : Output executable–crate -type : Set crate type–edition : Use specific edition (2015, 2018, 2021)- C opt -level= : Optimization level	rustc main.rs	N/A (compilation process)	Safe systems programming language; compiles to native binaries
cargo	Rust build system and package manager	new : Create new projectbuild : Build projectrun : Build and runtest : Run testsclippy : Linting toolfmt : Format code	cargo new myproject	Delete project folder manually	Central tool for managing Rust projects and dependencies
go	Go compiler and toolchain	run : Compile and runbuild : Build binaryget : Download packagestest : Run testsfmt : Format source codemod : Module management	go run main.go	N/A (compiled or interpreted)	Statically typed, garbage-collected; emphasizes simplicity and concurrency
gradle	Build automation system (especially for Java/Kotlin)	build : Build projectclean : Clean build outputstasks : List available tasks–info/–debug : Verbose logging	gradle build	Run gradle clean	Uses Groovy or Kotlin DSL for build scripts; popular in Android dev
maven	Project management and comprehension tool (Java)	compile : Compile sourcespackage : Build JAR/WARclean : Remove build filesinstall : Install in local repodependency:tree : Show dependency tree	mvn package	Run mvn clean	Based on POM.xml; widely used in enterprise Java apps

☼ Category 11: System and Kernel Management

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
uname	Displays system information	-a : Display all info -r : Kernel release -s : Kernel name -v : Kernel version -m : Machine hardware name	uname -a	N/A (informational)	Useful for checking system architecture and kernel version
hostname	Shows or sets the system's hostname	-f : Show FQDN -i : Show IP address -d : Show domain name -I : Show all IPs	hostnamehostname newname	Change back manually with same command	Hostname is used in networking and logs
Ismod	Lists loaded kernel modules	(No major specifiers)	Ismod	N/A (informational)	Shows which drivers and features are currently active
modprobe	Adds or removes kernel modules	-r : Remove module–first -time : Only insert if not already loaded–ignore -install : Skip install commands–show	sudo modprobe vboxdrvsudo modprobe -r vboxdrv	Use -r to remove a module	Automatically handles dependencies when loading/unloading

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
		-depends : Show dependency actions only			
rmmod	Removes a module from the kernel	-f : Force removal -w : Wait until module is not in use	sudo rmmod usb_storage	Load again with modprobe or insmod	More low-level than modprobe; doesn't handle dependencies
insmod	Inserts a module into the kernel	(Pass module path as argument)	sudo insmod /lib/modules//module.ko	Remove with rmmod or modprobe -r	Requires full path to .ko file; does not resolve dependencies
dmesg	Prints or controls the kernel ring buffer	-T : Show human -readable timestamps—level : Filter by log level -C : Clear ring buffer -c : Clear after printing	dmesg	Depends on what was cleared or filtered	Used to view hardware/driver messages and boot logs
sysctl	Configures kernel parameters at runtime	-a : Show all settings -w : Write value temporarily -p : Load settings from config file–system : Load all system config files	sysctl vm.swappiness=10	Revert by writing original value or rebooting	Settings changed this way are temporary unless saved
systemctl	Controls the systemd system和服务管理器	start : Start servicestop : Stop servicerestart : Restart servicestatus : Show statusenable : Enable at bootdisable : Disable at bootreboot/poweroff/halt : System control	sudo systemctl restart nginx	Reverse using inverse command (e.g., stop, disable)	Central tool for managing services, units, and system state
journalctl	Query systemd journal (system logs)	-b : Boot logs only -u service : Filter by unit–since/–until : Time range -f : Follow live output -x : Add explanatory text	journalctl -u ssh.service	Depends on logged events	Centralized logging in modern Linux systems using systemd
timedatectl	Queries and sets system time and date	set-time : Set system timeset- timezone : Set timezoneset-local- rtc : Configure RTC mode	timedatectlsudo timedatectl set-time "2025- 01-01 12:00:00"	Adjust again with timedatectl	Manages time synchronization and localization settings
hwclock	Accesses the hardware clock	-r : Read hardware clock -w : Write system time to hardware clock -s : Set system time from hardware clock	hwclock -r	Correct with hwclockset orw	Ensures correct time across reboots, especially useful without NTP
reboot	Reboots the system	-f : Force reboot without shutdown -n : Don't sync before reboot	sudo reboot	Cancel pending shutdown/reboot if any	Should be used carefully on production systems
poweroff	Shuts down and powers off the system	-f : Force poweroff without shutdown -n : Don't sync before poweroff	sudo poweroff	Power on manually again	Similar to shutdown -h now but more direct
halt	Stops the system but does not power it off	-f : Force halt -p : Also power off	sudo halt	Power on manually again	Older systems may stay powered on unless -p is used
perf	Performance analysis tool	stat : Get overall statsrecord : Record performance datareport : Display recorded datatop : Live profilingannotate : Disassemble annotated instructions	perf stat ./myapp	Depends on what was measured	Requires kernel support; useful for CPU usage and optimization
cpufreq-set	Sets CPU frequency scaling parameters	-c : CPU core number -g : Governor to use -u : Upper frequency limit -d : Lower frequency limit	sudo cpufreq-set -c 0 -f 2.0GHz	Reset to default governor or frequency	Used for tuning performance or saving power
cpupower	CPU frequency and power management utility	frequency-info: Show current settingsfrequency-set: Change frequencyinfo: General CPU power info	cpupower frequency-info	Revert by setting previous frequency or governor	Works with cpufreq drivers to manage CPU behavior
kexec	Loads and boots another kernel without rebooting	-I : Load new kernel–reuse -cmdline : Use current cmdline -e : Execute loaded kernel	sudo kexec -l /boot/vmlinuz initrd=/boot/initrd.img command-line="\$(cat /proc/cmdline)"	Reboot normally if needed	Advanced feature for fast reboots, often used in kernel testing

Command What It Does

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
journalctl	Query systemd journal (system logs)	-b : Boot logs only -u service : Filter by unit–since / –until : Time range -f : Follow live output -x : Add explanatory text	journalctl -u ssh.service	Depends on logged events	Centralized logging in modern Linux systems using systemd
dmesg	Prints or controls the kernel ring buffer	-T : Show human -readable timestamps—level : Filter log level -C : Clear ring buffer -c : Clear after printing	dmesg	Depends on what was cleared or filtered	Useful for viewing hardware/driver messages and boot logs
tail	Displays the last few lines of a file	-n N : Output the last N lines -f : Follow new lines as file grows -c N : Output last N bytes -q : Suppress headers -v : Always print headers	tail -f /var/log/syslog	N/A (display-only command)	Commonly used with -f to monitor log files live
less	View file content one page at a time	-N : Show line numbers -S : Disable line wrapping -i : Ignore case in searches -X : Do not clear screen after exit+G : Start at end of file	less -N server.log	N/A (read-only viewer)	Supports backward/forward navigation and searching with /
cat	Concatenates and displays file content	-n: Number all output lines -b: Number non -blank output lines -s: Squeeze multiple blank lines into one -T: Show tabs as ^I -v: Display control characters	cat /var/log/auth.log	N/A (read-only operation)	Often used to read small log files quickly
grep	Searches for patterns in files using regular expressions	-i : Ignore case -v : Invert match -r : Recursive search -n : Show line numbers	grep -i "error" /var/log/syslog	N/A (search-only command)	Extremely fast and works well with pipes; supports regex

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
		-I : List filenames only -c : Count matching lines			
awk	Pattern scanning and processing language	'{print \$1}' : Print specific columns-F fs : Set field separatorNR == n : Process specific record number	awk '/error/ {print \$1,\$3}' /var/log/syslog	N/A (text parsing tool)	Great for structured log analysis and extraction
sed	Stream editor for modifying file contents on the fly	-i : Edit files in place-e : Add multiple commands-n : Suppress automatic printing-r : Use extended regex	sed -i 's/error/warning/g' logfile.log	Undo changes manually or restore from backup	Useful for batch editing logs or redacting sensitive data
logger	Adds custom entries to the system log	-t TAG: Tag the message -p: Priority (e.g., user.notice)—server: Send to remote syslog server	logger -t myscript "Custom log message"	N/A (once logged, can't be undone)	Useful for testing or adding script-generated logs
logrotate	Manages log rotation and compression	-f : Force rotation-d : Debug mode-v : Verbose output–status : Show status file	logrotate /etc/logrotate.conf	Rotate logs back manually if backups exist	Automates log cleanup, prevents disk overfilling
rsyslogd	Enhanced multi-threaded syslog daemon	(Configured via /etc/rsyslog.conf)	rsyslogd	Stop with systemctl stop rsyslog or edit config	Handles centralized logging and forwarding
syslog-ng	Advanced logging daemon with filtering and forwarding	(Configured via /etc/syslog- ng/syslog-ng.conf)	syslog-ng	Stop with systemctl stop syslog-ng or edit config	Offers more flexibility than traditional syslogd
fail2ban	Bans IPs after failed login attempts	-x : Stop service -r : Reload config–set jail action ban/unban IP	fail2ban-client set sshd banip 192.168.1.100	Manually unban with fail2ban-client set sshd unbanip	Helps prevent brute-force attacks on SSH and other services
auditctl	Configures Linux audit system rules	 -w path -p [rwa] : Watch file/path for read/write/attribute changes -I : List current rules -d : Delete rule -D : Delete all rules 	auditctl -w /etc/passwd -p wa -k user-modify	Remove rule using same syntax with -d	Part of Linux Audit Framework; logs captured via ausearch or aureport
ausearch	Searches the audit log for specific events	-k KEY : Search by key name–start/-end : Time range -i : Interpret numeric fields into readable format	ausearch -k user-modify	N/A (analysis tool)	Used with auditctl to review security-related events
aureport	Generates summary reports from audit logs	-i : Interpret numeric fields–start/–end : Time range -au : Auth report -x : Executable report	aureport -au	N/A (reporting tool)	Helps generate high-level views of audit events
logwatch	Analyzes and reports log summaries	-range : Time range (Today, Yesterday, All)-service : Specific service to report on-detail : Level of detail	logwatchdetail High service sshd	N/A (reporting tool)	Useful for daily security monitoring and intrusion detection
multitail	Views multiple log files side-by-side in real-time	-s : Split screen layout -i : Input file or commandC : Color highlightingf : Add filter	multitail /var/log/syslog /var/log/auth.log	Exit with q	Excellent for comparing logs from different sources
Inav	Log file navigator with auto-detection and analysis	-f : Follow mode -t : Set log format -d : Debug SQL parsing -c : Execute command on startup	Inav /var/log/*.log	Exit with q	Interactive tool with syntax highlighting and search features

Category 13: Package Management

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
apt	Advanced Package Tool – manages packages on Debian/Ubuntu systems	update: Update package listupgrade: Upgrade installed packagesinstall: Install a packageremove: Remove a packageautoclean: Remove outdated upgradesautoremove: Remove unused dependenciessearch: Search for a packageshow: Show package details	sudo apt update && sudo apt upgrade	Reverse with apt remove package_name or apt install previous_version	Uses /etc/apt/sources.list and repositories in /etc/apt/sources.list.d/
apt-get	Older CLI interface for APT (still widely used)	update: Refresh package indexupgrade: Upgrade all upgradable packagesdist-upgrade: Smart upgrade with dependency changesinstall: Install packageremove: Remove packagepurge: Remove package + config filessource: Download source package	sudo apt-get install curl	Uninstall with apt-get remove curl or purge configs	Often preferred in scripts due to predictable behavior
apt-cache	Query APT's package cache	search: Search for packagesshow: Display package infodepends: List dependenciesrdepends: List reverse dependenciespolicy: Show package installation policy	apt-cache search nginx	N/A (search/query tool)	Useful for checking available versions and dependencies
dpkg	Low-level package manager for Debian- based systems	-i: Install package -r: Remove package -P: Purge package (remove + configs)-I: List installed packages -L: List files owned by package—configure: Configure unpacked packages	sudo dpkg -i package.deb	Remove with dpkg -r package_name or dpkg -P to purge	Used when installing .deb files directly
yum	Yellowdog Updater Modified – RPM-based package manager (used in CentOS/RHEL 7 and earlier)	install: Install packageupdate: Update packageremove: Remove packagelist: List available packagessearch: Search for a packageclean all: Clear cachemakecache: Generate metadata cache	sudo yum install httpd	Remove with yum remove httpd	Automatically resolves dependencies; deprecated by DNF
dnf	Dandified YUM – next-generation RPM package manager (used in Fedora, RHEL 8+, CentOS Stream)	install: Install packageupdate: Update packageremove: Remove packagereinstall: Reinstall packagelist: List packagesinfo: Show package infohistory: View transaction history	sudo dnf install git	Remove with dnf remove git	Faster than yum; supports modular content and better dependency resolution
rpm	RPM Package Manager – low-level tool for	-i : Install package	sudo rpm -ivh package.rpm	Uninstall with rpm -e package_name	Should be used carefully; doesn't handle dependencies

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
	managing .rpm packages	-U : Upgrade package -e : Erase (uninstall) package -q : Query package -I : List files in package -V : Verify package integrity–import : Import GPG key			automatically
pacman	Package manager for Arch Linux and derivatives	-S: Sync and install packages -Syu: Update system -R: Remove package -Rs: Remove package and dependencies -Qs: Search installed packages -Qii: Show package info -Sw: Download only (no install)	sudo pacman -Syu	Remove with pacman -R package_name	Simple and fast; all operations are handled with one tool
emerge	Portage package manager for Gentoo Linux	sync : Update repositoryinstall : Install packageunmerge : Remove package and filesupdate : Update system—search : Search for package—info : Show package details	sudo emergesync && sudo emerge firefox	Remove with emergeunmerge firefox	Source-based package manager; compiles from source by default
zypper	Package manager for openSUSE and SUSE Linux Enterprise	refresh: Update repo metadataupdate: Upgrade packagesinstall: Install packageremove: Remove packagesearch: Search for packageinfo: Show package infopatch: Apply patchespatches: List available patches	sudo zypper install vim	Remove with zypper remove vim	Supports patches, service packs, and enterprise features
flatpak	Universal package manager across Linux distributions	install: Install app from remoteuninstall: Remove appupdate: Update appsremoteadd: Add new software sourcelist: List installed appsinfo: Show app details	flatpak install flathub com.example.App	Remove with flatpak uninstall com.example.App	Runs sandboxed applications; works across distros
snap	Canonical's universal package format with auto-updates	install: Install a snapremove: Remove a snaprefresh: Update snapenable/disable: Toggle auto- refreshfind: Search available snapsinfo: Show snap details	sudo snap install code classic	Remove with snap remove code	Self-contained apps with confinement; auto-updates by default
nix	Functional package manager supporting multiple platforms	install: Install packageuninstall: Remove packageenv: Create isolated environmentsbuild: Build from expressionprofile: Manage user/system profiles	nix install nixpkgs#hello	Uninstall with nix uninstall hello	Purely functional; allows rollbacks and multi-version installs
guix	GNU Guix package manager based on Scheme	install : Install packageremove : Remove packagepackage : Install for current usersystem : Manage system configurationsearch : Find packagesdescribe : Show package origin	guix install hello	Remove with guix remove hello	Reproducible builds; integrates with GNU/Linux system management

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
bash	Executes shell commands and scripts	-c : Run a command string -x : Print commands as they are executed -v : Print input lines as read -n : Syntax check only–login : Start as login shell	bash script.sh	Depends on what the script does	Default shell for many Linux systems; supports scripting, pipes, functions
sh	Bourne shell – used for executing shell scripts	-c : Execute command string -x : Debug mode (show commands)-n : Syntax check only -s : Read from stdin- : End of options	sh legacy_script.sh	Depends on what the script does	More POSIX-compliant than bash; often symlinked to dash or bash
zsh	Z Shell – advanced shell with scripting and customization features	-c : Run command -x : Debug output -I : Login shell -s : Read from stdin -o : Set option	zsh myscript.sh	Depends on script behavior	Offers better tab completion, globbing, and theme support
ksh	KornShell – enhanced version of Bourne shell with scripting enhancements	-c : Execute command -x : Trace execution -n : Syntax check only -s : Read from stdin	ksh script.ksh	Depends on script logic	Widely used in enterprise environments for portability and robustness
csh	C Shell – uses syntax similar to C language	-c : Run command -f : Don't execute startup file -b : Force batch execution	csh script.csh	Depends on script actions	Popular among developers familiar with C-style syntax
tcsh	Enhanced version of C Shell with interactive features	-c : Execute command -f : Skip .tcshrc -m : Merge stderr into stdout	tcsh script.tcsh	Depends on script behavior	Adds command-line editing, history, and filename completion
perl	Practical Extraction and Reporting Language – powerful scripting tool	-e : Execute inline code -n : Loop over input lines -p : Loop and print result -w : Enable warnings -c : Syntax check only	perl -e 'print "Hello\n"'	N/A (interpreted language)	Often used for text processing, sysadmin tasks, and CGI scripting
awk	Pattern scanning and processing language	'{print \$1}' : Print specific columns-F fs : Set field separatorNR == n : Process specific record number	awk '/error/ {print \$1,\$3}' /var/log/syslog	N/A (text parsing tool)	Great for structured log analysis and extraction
sed	Stream editor for modifying file contents on the fly	-i : Edit files in place -e : Add multiple commands -n : Suppress automatic printing -r : Use extended regex	sed -i 's/apple/orange/g' fruits.txt	Undo changes manually or revert from backup	Powerful for batch text editing, especially in scripts
cut	Removes sections from each line of files	-d : Delimiter -f : Fields to extract -c : Characters to extract–complement : Exclude selected fields	cut -d',' -f1 data.csv	N/A (text extraction utility)	Good for slicing out specific columns from structured text

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
paste	Merges lines of files	-d : Delimiter	paste file1.txt file2.txt	N/A (file merging utility)	Opposite of cut; useful for combining parallel outputs
		-s : Serial concatenation–delimiters= : Specify delimiters			
join	Joins lines of two files on a common field	-1 FIELD : Join on this field from file	join -1 2 -2 1 file1 file2	N/A (data joining utility)	Similar to SQL JOINs; works best with sorted input
		1 -2 FIELD : Join on this field from file			
		-t CHAR : Field separator			
sort	Sorts lines of text files	-n: Numeric sort -r: Reverse order -k: Sort by key/column -u: Unique entries only -t: Field delimiter	sort -nr scores.txt	Re-sort with opposite flags if needed	Used frequently with pipelines to organize output
uniq	Reports or omits repeated lines	-c : Prefix lines by count -d : Only print duplicate lines -u : Only print unique lines -i : Ignore case	uniq -c names.txt	N/A (analysis tool)	Works best when input is already sorted; often paired with sort
tr	Translates or deletes characters	-d : Delete specified characters -s : Squeeze repeated characters -c : Complement SET1 -t : Truncate SET1	echo "hello" tr 'a-z' 'A-Z'	Reapply tr with inverse sets if needed	Useful for cleaning input, converting cases, removing CR chars
xargs	Builds and executes command lines from standard input	-n N : Use N arguments per command -d DELIM : Input delimiter -I {} : Replace placeholder in command–max -procs=N : Run N processes in parallel	cat files.txt xargs rm	Backup list first; recovery may be difficult after delete	Useful for handling long lists of files or arguments
tee	Reads standard input and writes it to both stdout and files	-a : Append to file -i : Ignore interrupts	ls -l tee listing.txt	Remove the file manually if needed	Useful in scripts to log outputs while still seeing them live
eval	Evaluates and executes arguments as a shell command	(No direct specifiers)	eval "\$command"	N/A (executes command dynamically)	Useful for dynamic command execution in scripts
seq	Prints a sequence of numbers	-s : Separator between numbers -w : Equal width output–format : Custom format -f : Same as –format	seq 1 5	N/A (generates sequence)	Useful in loops and iterations
yes	Outputs a string repeatedly until killed	(Pass string as argument)	yesyes no	Exit with Ctrl+C	Often used to automate responses
sleep	Delays execution for a specified amount of time	(No major specifiers)	sleep 5	N/A (simple delay)	Supports seconds, minutes, hours, days
timeout	Runs a command with a time limit	-s : Send signal on timeout -k : Kill command after timeout	timeout 5 ping google.com	N/A (runs until time or completion)	Useful for enforcing time limits on scripts or commands
watch	Executes a command repeatedly at intervals	-n sec : Interval in seconds-d : Highlight differences between updates-g : Exit if output changes	watch -n 1 'ps -ef \ grep python'	Ctrl+C to stop	Great for monitoring live changes like logs or system stats
logger	Adds custom entries to the system log	-t TAG : Tag the message -p : Priority (e.g., user.notice)–server : Send to remote syslog server	logger -t myscript "Custom log message"	N/A (once logged, can't be undone)	Useful for testing or adding script-generated logs
source	Executes commands from a file in the current shell	(No major specifiers)	source ~/.bashrc	Depends on what was sourced	Changes environment variables, aliases, etc. in current shell
read	Reads a line from standard input	-p : Prompt message -s : Silent input (for passwords)-n : Read N characters -t : Timeout after N seconds	read -p "Enter name: " name	N/A (interactive input)	Useful in scripts for user interaction
exec	Replaces the current shell with a specified command	(No major specifiers)	exec /bin/bash	N/A (replaces shell)	Can also be used to redirect file descriptors
mkfifo	Creates named pipes (FIFOs)	-m : Set permissions	mkfifo mypipe	Remove with rm mypipe	Useful for inter-process communication
wait	Waits for background processes to complete	(Pass PID as argument)	wait \$!	N/A (waits for process)	Often used in scripts to synchronize background jobs
trap	Specifies actions on receipt of signals	0 : On exit1 : SIGHUP2 : SIGINT (Ctrl+C)9 : SIGKILL15 : SIGTERM	trap 'echo Exiting' 0	Depends on how cleanup is defined	Useful for graceful script termination and cleanup
declare	Declares shell variables with attributes	-i : Integer variable -r : Readonly variable -a : Array variable -x : Export variable	declare -i count=5	Unset with unset or reassign	Controls variable type and scope in scripts

Category 15: I/O and Redirection

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
echo	Displays a line of text or variables	-n : Don't output trailing newline -e : Enable interpretation of backslash escapes	echo "Hello, World!"	N/A (output-only command)	Frequently used in shell scripts for displaying messages
read	Reads a line from standard input	-p : Prompt message -s : Silent input (for passwords)-n : Read N characters -t : Timeout after N seconds	read -p "Enter name: " name	N/A (interactive input)	Useful in scripts for capturing user input
cat	Concatenates and displays file content	-n: Number all output lines -b: Number non -blank output lines -s: Squeeze multiple blank lines into one -T: Show tabs as ^I -v: Display control characters	cat file.txt	N/A (read-only operation)	Can also be used with pipes to pass content to other commands
tee	Reads standard input and writes it to both stdout and files	-a : Append to file instead of overwriting -i : Ignore interrupts	ls -l tee listing.txt	Remove the file manually if needed	Useful in scripts to log outputs while still seeing them live
>	Redirects standard output to a file (overwrites)	No direct specifiers	echo "Hello" > file.txt	Manually restore previous content if backed up	Basic redirection operator; useful for writing output to files
>>	Redirects standard output and appends to a file	No direct specifiers	echo "More text" >> file.txt	Manually remove added content if needed	Used to add content without losing existing data
<	Redirects standard input from a file	No direct specifiers	sort < input.txt	Depends on how input is processed	Allows reading from files instead of keyboard input
<<	Here document – redirects input until a	No direct specifiers (delimiter-	cat << EOF > file.txtThis is	Depends on what was written	Useful for embedding multi-line input directly in scripts

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
	specified delimiter	based)	contentEOF		
<<<	Here string – passes a string as input	No direct specifiers	grep "pattern" <<< "test string"	Depends on processing logic	Similar to echo, but avoids subshell
(pipe)	Sends the output of one command as input to another	No direct specifiers	ps aux grep sshd	Reverse order of commands if applicable	Fundamental for chaining commands together
exec	Replaces the current shell with a specified command	(No major specifiers)	exec /bin/bash	N/A (replaces shell)	Can also be used to redirect file descriptors
xargs	Builds and executes command lines from standard input	-n N : Use N arguments per command -d DELIM : Input delimiter -I {} : Replace placeholder in command–max -procs=N : Run N processes in parallel	cat files.txt xargs rm	Backup list first; recovery may be difficult after delete	Useful for handling long lists of files or arguments
split	Splits large files into smaller chunks	-b SIZE : Split by byte size -l LINES : Split by line count -a NUM : Use NUM suffix digits	split -b 100M largefile.tar.gz chunk_	Combine using cat chunk_* > combinedfile.tar.gz	Useful when transferring large files through limited-size storage
cat (with redirection)	Concatenates and combines files	(No direct specifiers)	cat chunk_* > combinedfile.tar.gz	N/A (reversal depends on usage)	Often used with split to reassemble large archives
mkfifo	Creates named pipes (FIFOs)	-m : Set permissions	mkfifo mypipe	Remove with rm mypipe	Useful for inter-process communication
wait	Waits for background processes to complete	(Pass PID as argument)	wait \$!	N/A (waits for process)	Often used in scripts to synchronize background jobs
eval	Evaluates and executes arguments as a shell command	(No major specifiers)	eval "\$command"	N/A (executes command dynamically)	Useful for dynamic command execution in scripts
logger	Adds custom entries to the system log	-t TAG : Tag the message -p : Priority (e.g., user.notice)—server : Send to remote syslog server	logger -t myscript "Custom log message"	N/A (once logged, can't be undone)	Useful for testing or adding script-generated logs
source	Executes commands from a file in the current shell	(No major specifiers)	source ~/.bashrc	Depends on what was sourced	Changes environment variables, aliases, etc. in current shell
стр	Compares two files byte-by-byte	-I : List differing bytes -n N : Compare only N bytes -i SKIP : Skip initial bytes	cmp file1.bin file2.bin	N/A (comparison tool only)	Faster than diff for binary files
diff	Shows differences between files	-u : Unified format -r : Recursive comparison -q : Quiet output -b : Ignore whitespace -w : Ignore all whitespace	diff -u file1.txt file2.txt	N/A (informational)	Commonly used in version control and patching
comm	Compares sorted files line by line	-1 : Suppress lines unique to file1 -2 : Suppress lines unique to file2 -3 : Suppress lines common to both	comm -12 file1.txt file2.txt	N/A (analysis tool)	Good for comparing word lists, logs, and sorted datasets

Tategory 16: Container and Virtualization

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
docker	Manages Docker containers	run: Run a new containerps: List running containersstop: Stop a containerrm: Remove a containerimages: List imagesbuild: Build an image from Dockerfileexec: Execute command in running containerpull: Pull image from registry	docker run -d nginx	Stop and remove with docker stop and docker rm	Central tool for managing Docker-based applications
docker-compose	Manages multi-container Docker applications using YAML files	up : Start servicesdown : Stop and remove containersbuild : Build or rebuild serviceslogs : View logsps : List running services	docker-compose up	Stop and delete with docker-compose down	Uses docker-compose.yml for defining services, networks, volumes
podman	Container engine (alternative to Docker)	run : Run a containerps : List containersstop : Stop containerrm : Remove containerimages : List imagesbuild : Build imageexec : Execute command in container	podman run -d httpd	Stop and remove with podman stop and podman rm	Rootless by default; no daemon required
buildah	Builds OCI container images	from : Create working container from imagerun : Run command in containercommit : Commit container to imagecopy : Copy files into containeradd : Add remote file or directory	buildah from ubuntu	Delete container/image manually if needed	Works well with Podman for building and modifying images
kubectl	Kubernetes command-line tool for managing clusters	get: List resourcesdescribe: Show detailed resource infocreate: Create resourceapply: Apply configurationdelete: Remove resourcelogs: View container logsexec: Execute command in pod	kubectl get pods	Undo changes via kubectl delete or revert config	Essential for managing Kubernetes workloads
minikube	Runs a local Kubernetes cluster for development	start : Start the clusterstop : Stop the clusterdelete : Remove the clusterstatus : Check current statusip : Get cluster IPdashboard : Open dashboard	minikube start	Stop and delete with minikube stop && minikube delete	Great for testing Kubernetes locally without cloud costs
kubeadm	Tool to create and manage Kubernetes clusters	init : Initialize master nodejoin : Join worker node to clusterreset : Reset node to pristine statetoken : Manage tokens for joining nodes	sudo kubeadm init	Reset with sudo kubeadm reset	Used for setting up production-like Kubernetes clusters
ctr	Low-level CLI for interacting with containerd	containers list : Show all containersimage pull : Pull imagetask kill : Kill tasksnapshot mounts : Show mounted snapshots	ctr image pull docker.io/library/ubuntu:la test	Depends on what was pulled or created	More technical than Docker CLI; used when debugging containerd
virsh	Manages virtual machines and hypervisors (libvirt)	list : List VMsstart : Start VMshutdown : Graceful shutdowndestroy : Force stop VMdefine : Define VM from XMLundefine : Remove VM definition	virsh start myvm	Shutdown or undefine with virsh shutdown and virsh undefine	Works with KVM/QEMU and other virtualization backends
virt-install	Command-line tool to create virtual machines	-name : VM name-ram : Memory	virt-installname testvm	Delete VM with virsh undefine and remove disk file	Used for scripting VM creation

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
		size–vcpus : Number of CPUs–disk : Disk path/size–network : Network settings–os-variant : OS type optimization	ram 2048disk path=/var/lib/libvirt/images /testvm.img,size=10 network network=default cdrom /isos/ubuntu.iso		
qemu-system-x86_64	QEMU full system emulation for x86_64 architecture	-hda: Hard disk image -cdrom: Bootable CD -ROM image -m: Memory size -cpu: CPU model -smp: Number of CPUs -net: Network configuration	qemu-system-x86_64 -hda disk.img -cdrom ubuntu.iso -m 2048	Exit QEMU session with Ctrl+Alt+2 then quit	Emulates full hardware stack; useful for cross-platform testing
kvm	Kernel-based Virtual Machine launcher (uses QEMU)	-m : Memory size -smp : Number of CPUs -hda : Hard disk image -cdrom : Bootable CD image -boot : Boot device order	kvm -m 2048 -hda disk.img -cdrom ubuntu.iso	Exit with Ctrl+Alt+2 then quit	Requires hardware virtualization support enabled in BIOS
vboxmanage	Command-line interface for Oracle VirtualBox	createvm : Create new VMmodifyvm : Configure VM settingsstartvm : Start VMcontrolvm : Control running VMlist vms : Show existing VMs	VBoxManage createvm name "MyVM"register	Delete VM with VBoxManage unregistervm anddelete	Useful for scripting VM automation tasks
Ixc	Linux Containers – lightweight system containers	launch: Create and start containerlist: Show containersstop: Stop containerstart: Start containerexec: Run command inside containerdelete: Remove container	lxc launch ubuntu:22.04 mycontainer	Delete with lxc delete mycontainer	OS-level virtualization; faster and lighter than VMs
lxd	LXC enhanced with REST API and better UX	init : Setup LXD environmentlaunch : Create and start containerlist : Show containersstop/start : Control lifecycleexec : Run commands inside container	lxd initautolxc launch ubuntu:22.04 mycontainer	Delete with lxc delete mycontainer	Designed for production use; integrates with networking and storage
multipass	Lightweight VM manager for Ubuntu instances	launch : Start new instancelist : Show running instancesstop : Stop instancedelete : Remove instanceexec : Run command in instanceshell : Access shell	multipass launchname devboxmem 2G	Delete with multipass delete devbox	Great for developers needing quick Ubuntu environments
vagrant	Tool for building and managing virtual machine environments	up : Create and configure VMssh : SSH into VMhalt : Shut down VMdestroy : Remove VMreload : Restart VMstatus : Check VM status	vagrant up	Destroy with vagrant destroy	Works with VirtualBox, VMware, AWS, and more
screen	Terminal multiplexer for managing multiple sessions	-S: Start named session -ls: List active sessions -r: Resume session -d: Detach session -X: Send command to session	screen -S mysession	Detach with Ctrl+A D or kill with Ctrl+C	Allows persistent terminal sessions across disconnects
tmux	Terminal multiplexer with modern features	new-session : Start new sessionattach-session : Attach to sessiondetach : Detach from sessionsplit-window : Split viewrename-session : Rename session	tmux new -s dev	Detach with Ctrl+B D or kill with Ctrl+C	Offers panes, windows, and advanced scripting capabilities

② Category 17: Time and Date Management

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
date	Displays or sets the system date and time	-u: Display or set UTC time+%FORMAT: Custom output format (e.g., +%Y -%m -%d)-s "DATE": Set date/time manually	datedate +"%A, %B %d, %Y"	N/A (time is irreversible)	Can be used to format timestamps in scripts
timedatectl	Queries and sets system time and date (systemd-based systems)	set-time : Set system timeset- timezone : Set timezone–adjust- system-clock : Adjust RTC accordingly	timedatectlsudo timedatectl set-time "2025- 01-01 12:00:00"	Adjust again with timedatectl using correct values	Manages time synchronization and localization settings
hwclock	Accesses the hardware clock (RTC)	-r : Read current time from hardware clock -w : Write system time to hardware clock -s : Set system time from hardware clock	hwclock -r	Correct with hwclockset orw	Ensures correct time across reboots; important when dual-booting
ntpdate	Sets the system time from an NTP server (deprecated)	-u : Use UDP instead of TCP-b : Set time using adjtime instead of settimeofday	sudo ntpdate pool.ntp.org	N/A (one-time sync only)	Replaced by chronyd or systemd-timesyncd; use for manual sync
timedatectl (synchronize)	Enables/disables automatic time synchronization via systemd-timesyncd	set-ntp true/false : Enable/disable NTP	sudo timedatectl set-ntp true	Disable with sudo timedatectl set-ntp false	Works well with network connectivity and configured NTP servers
chronyc	Controls the Chrony NTP implementation	tracking: Show current sync statussources: List configured sourcesmakestep: Force immediate synconline/offline: Toggle source availability	chronyc sources	Reverse action depending on what was changed	More flexible than ntpd, supports intermittent connections
adjtimex	Adjusts kernel time variables	-p : Print current time adjustment -t TICK : Set tick value -f FREQ : Set frequency offset	adjtimex -p	Restore original values if recorded	Used for fine-tuning time adjustments and syncing clocks
zdump	Shows current time in specified time zones	-v : Verbose mode showing transitionsZONE : Time zone name (e.g., America/New_York)	zdump America/New_York	N/A (informational)	Useful for checking daylight saving changes and time zone data
tzselect	Helps user select and configure time zone	(Interactive command, no direct specifiers)	tzselect	Change again using same tool or edit /etc/localtime	Guides users through selecting region and location for local time
date (formatting)	Formats timestamps according to locale or	+%FORMAT : Format output	date "+Today	N/A (display-only)	Very useful in shell scripts for logging and filenames

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
	custom format	(e.g., %H:%M:%S, %Y-%m-%d)	is %A, %B %d"		
sleep	Delays execution for a specified amount of time	(No major specifiers)	sleep 5	N/A (simple delay)	Supports seconds, minutes (sleep 1m), hours (sleep 1h)
timeout	Runs a command with a time limit	-s : Send signal on timeout -k : Kill command after timeout	timeout 5 ping google.com	N/A (runs until time or completion)	Useful for enforcing time limits on scripts or commands
at	Schedules one-time tasks at a specific time	-I : List pending jobs -c JOB : View job details -r JOB : Remove scheduled job	echo "tar cf /backup.tar /data" at midnight	Cancel with atrm JOB_ID	Requires atd service running; ideal for delayed operations
batch	Executes commands when system load is low	(No major specifiers; input via stdin)	echo "find / -name core xargs rm -f" batch	Depends on job execution status	Similar to at, but runs based on system load level
watch	Executes a command repeatedly at intervals	-n SEC : Interval in seconds -d : Highlight differences between updates -g : Exit if output changes	watch -n 1 'ps -ef \ grep python'	Ctrl+C to stop	Great for monitoring live changes like logs or system stats
crontab	Edits and manages recurring scheduled tasks	-I : List cron entries -e : Edit cron entries -r : Remove all cron entries -u USER : Manage another user's crontab	crontab -e	Remove or modify entry in editor	Uses syntax: MIN HOUR DOM MON DOW CMD; essential for automation
anacron	Runs daily, weekly, and monthly jobs even if system was off	-s : Serialize execution -f : Run jobs even if already run today -d : Debug mode	anacron -d	Stop with Ctrl+C or disable configuration	Designed for laptops/desktops that aren't always online
rtcwake	Enters a system sleep state until a specified alarm time	-m : Sleep mode (standby, mem, disk)-t TIME : Alarm in seconds since epoch -s SEC : Sleep for SEC seconds	rtcwake -m mem -s 3600	Wake up automatically at set time	Combines power-saving with scheduling
date (epoch conversion)	Converts Unix timestamp to human-readable date	@TIMESTAMP : Convert epoch time	date -d @1717182000	N/A (conversion tool)	Also works in reverse: date +%s -d "2024-06-01"

Command What It Does

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
rsync	Efficient remote and local file copying and syncing tool	 -a : Archive mode (recursive, preserves permissions)-v : Verbose output -z : Compress during transfer–delete : Remove files not in source -e ssh : Use SSH as transport 	rsync -avz folder/ user@remote:/path/	Reverse by swapping source and destination	Great for backups and mirroring data between machines
tar	Archives multiple files into a single file (tape archive)	-c : Create new archive -x : Extract files -v : Verbose output -f : Specify filename -z : Compress with gzip -j : Compress with bzip2 -J : Compress with xz	tar -czvf backup.tar.gz folder/	Use -x to extract the archive	Commonly used for backups and distributing source code
dd	Copies files, converts data, and performs low-level disk operations	if=FILE : Input fileof=FILE : Output filebs=BYTES : Block sizecount=BLOCKS : Number of blocks	dd if=/dev/sda of=disk.img bs=64K	Depends on what was copied — image can be restored or deleted	Often used to create disk images, clone drives, or wipe disks
ср	Copies files and directories	-r : Copy directories recursively -i : Prompt before overwrite -u : Copy only when source is newer -v : Verbose output -p : Preserve file attributes -a : Archive mode (preserve all)	cp -r ~/Documents ~/Backup	Manually remove the copied files or directory using rm -r [destination]	Use -a for backups to preserve file metadata
scp	Securely copies files between hosts	-P : Port number -i : Identity file -r : Recursively copy directories	scp file.txt user@remote:/path/	Copy back from remote host if needed	Based on SSH protocol; secure alternative to rcp
sftp	Interactive secure file transfer over SSH	get/put : Download/upload filesls/lls : List remote/local directorycd/lcd : Change remote/local dirmkdir/rmdir : Create/remove dirs	sftp user@remote	Upload/delete files accordingly	Safer than regular FTP; uses encryption
dump	Backs up ext2/ext3/ext4 filesystems	-0 -9: Backup level (0 = full, 1–9 = incremental)-f: Output file/device -u: Update /etc/dumpdates-z: Compress level (for level 0 only)	dump -0uf /backup/full.dump /home	Restore with restore command	Old-school Unix/Linux backup utility; works at filesystem level
restore	Restores files backed up with dump	-r : Restore entire filesystem -t : List contents of dump -C : Compare dump with filesystem -i : Interactive restore mode	restore -rf /backup/full.dump	N/A (reverse of restore)	Works only with dumps created by dump
rsnapshot	Filesystem snapshot utility based on rsync	configtest : Check configalpha/beta/daily/etc. : Predefined intervals–noexec : Dry run-v : Verbose-q : Quiet	rsnapshot daily	Roll back to previous snapshot manually	Excellent for incremental backups using hard links
sha256sum	Computes SHA-256 cryptographic checksums	(No major specifiers)	sha256sum file.txt > checksum.sha256	N/A (checksum generation)	Used to verify file integrity before/after transfers
md5sum	Computes MD5 hash for files	(No major specifiers)	md5sum file.iso > checksum.md5	N/A (hashing tool)	Less secure than SHA, but still widely used for verification
cksum	Generates CRC32 checksum and byte count	(No major specifiers)	cksum largefile.tar.gz	N/A (integrity check only)	Fast but less reliable than SHA or MD5
diff	Compares two files line by line	-u : Unified format -r : Recursive comparison -q : Quiet output -b : Ignore whitespace -w : Ignore all whitespace	diff -u file1.txt file2.txt	N/A (informational)	Useful for checking differences after restoration
стр	Compares two files byte-by-byte	-I : List differing bytes -n N : Compare only N bytes -i SKIP : Skip initial bytes	cmp file1.bin file2.bin	N/A (comparison tool only)	Faster than diff for binary files
gpg	GNU Privacy Guard – encrypting and signing data	-c : Symmetric encryption -e : Encrypt for recipient	gpg -c secret.txt	Decrypt using gpg -d secret.txt.gpg	Used for securing backups or verifying their authenticity

Command	What It Does	Specifiers -d: Decrypt file -s: Sign file-verify: Verify signature-import/export: Manage	Example	Reversal if Possible	Other Information
openssl	Toolkit for SSL/TLS protocols and cryptography	keys enc : Encrypt/decrypt filesdgst : Message digest calculationrsautl : RSA operationrand : Generate random data	openssl enc -aes-256-cbc - in secret.txt -out encrypted.bin	Decrypt using same command with -d flag	Supports many cryptographic operations including hashing and signing
cryptsetup	Manages encrypted volumes (like LUKS)	luksFormat : Initialize LUKS partitionopen : Unlock volumeclose : Lock volumeisLuks : Check if device is LUKSaddKey/removeKey : Manage encryption keys	sudo cryptsetup luksFormat /dev/sdb1	Destroy or reformat encrypted volume to reverse	Used for full-disk encryption and secure backups
veracrypt	Mounts and creates VeraCrypt encrypted volumes	create : Create new volumemount : Mount volumedismount : Unmount volumelist : Show mounted volumes	veracryptmount /dev/sdb1 /mnt/secure	Dismount and optionally delete encrypted container	Cross-platform FDE solution; successor to TrueCrypt
lvm	Logical Volume Manager for flexible storage management	pvcreate : Create physical volumevgcreate : Create volume grouplvcreate : Create logical volumelvextend : Extend volume sizelvreduce : Shrink volumelvremove : Delete logical volume	lvcreate -L 10G -n myvol mygroup	Reverse using Ivremove, vgremove, pvremove	Enables snapshots, dynamic resizing, and advanced disk management
lvcreate (with snapshot)	Creates LVM snapshots for point-in-time backups	-s : Snapshot mode -L : Size of snapshot	lvcreate -L 10G -s -n snap_vol /dev/mygroup/myvol	Remove snapshot with lvremove /dev/mygroup/snap_vol	Allows safe backups without unmounting live systems
find	Locates files matching criteria	-name/-iname : Match name (case -sensitive/insensitive)-mtime/-ctime/-atime : Time -based filtering -type f/d : File/directory type -exec : Execute command on found items -delete : Delete matched files	find /var/log -name "*.log" - mtime +7 -delete	Depends on action taken (e.g., deletion vs view-only)	Powerful for managing old logs, temp files, and orphaned data
logrotate	Manages log rotation and compression	-f : Force rotation -d : Debug mode -v : Verbose output–status : Show status file	logrotate /etc/logrotate.conf	Rotate logs back manually if backups exist	Automates log cleanup, prevents disk overflow
duplicity	Encrypted bandwidth-efficient backup tool	full/incremental : Full or incremental backup–encrypt-key : GPG key ID–sign-key : Signing key ID–include/–exclude : Selective backup	duplicity /home scp://user@remote//backu p	Restore using duplicity restore	Uses GnuPG and rsync logic for secure offsite backups
timeshift	System restore tool for Linux (similar to Windows System Restore)	setup : Configure settingsbackup : Create snapshotrestore : Recover system statedelete : Remove snapshotlist : Show available snapshots	timeshift-setuptimeshift backup	Restore to earlier snapshot via GUI or CLI	Ideal for restoring system after failed updates or misconfigurations
restic	Fast, secure, and efficient backup program	init : Initialize repositorybackup : Create snapshotrestore : Restore filessnapshots : List backupsforget/prune : Clean old data	restic -r /media/backup initrestic -r /media/backup backup /home	Restore from backup using restic restore	Supports deduplication, encryption, and cloud storage
borg	Deduplicating backup program with compression and encryption	init : Initialize repocreate : Make backup archiveextract : Restore fileslist : Show archivesdelete : Remove archiveprune : Remove old archives	borg init /media/backupborg create /media/backup::archive /home	Restore with borg extract	Space-efficient; great for long-term archival
rsnapshot	Filesystem snapshot utility based on rsync	configtest : Validate configdaily/weekly/monthly : Preset intervals–noexec : Dry run-v : Verbose-q : Quiet	rsnapshot daily	Manually revert to previous snapshot	Uses hard links to save space; ideal for incremental backups
amanda	Client-server network backup tool	configcheck : Validate configamcheck : Check configuration sanityamdump : Run scheduled backupsamrecover : Restore files interactively	amdump	Restore using amrecover	Designed for enterprise environments with multiple servers
bacula	Network backup and recovery system	console : Access control interfacedir : Director servicefd : File daemonsd : Storage daemon	bconsole	Restore via Bacula console or GUI	Suitable for large-scale backup and disaster recovery
duplicity	Encrypted backups using GnuPG and librsync	full/incremental : Backup types–encrypt-key : GPG key–include/–exclude : File filters	duplicity full /home file:///backup	Restore with duplicity restore	Supports SFTP, Rsync, Amazon S3, and more
tar (with compression)	Archives files with optional compression	-z : GZIP compression -j : BZIP2 compression -J : XZ compression—use -compress -program : Custom compressor	tar -cJf backup.tar.xz /data	Extract with matching decompression flag (-xJf)	Flexible way to compress backups efficiently
ddrescue	Data recovery tool for damaged media	-f : Overwrite output file -r N : Retry N times on read errors -n : No truncate, no split	ddrescue /dev/cdrom image.iso rescue.log	Depends on what was recovered	Tries hard to recover data from failing drives
testdisk	Partition table and boot sector recovery tool	(Interactive menu-driven interface)	testdisk /dev/sda	Undo changes within TestDisk before writing	Helps recover lost partitions and repair MBR/GPT
photorec	File recovery tool for deleted files	(Runs interactively; select disk/partition)	photorec /dev/sdb1	Recovered files cannot be "undone" easily	Recovers deleted files even from formatted disks

Q Category 19: Text and Binary File Manipulation

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
tr	Translates or deletes characters	-d : Delete specified characters -s : Squeeze repeated characters -c : Complement SET1 -t : Truncate SET1	echo "hello" tr 'a-z' 'A-Z'	Reapply tr with inverse sets if needed	Useful for cleaning input, converting cases, removing CR chars
sed	Stream editor for modifying file contents on the fly	-i : Edit files in place -e : Add multiple commands	sed -i 's/apple/orange/g' fruits.txt	Undo changes manually or restore from backup	Powerful for batch text editing, especially in scripts

Command	What It Does	Specifiers -n : Suppress automatic printing -r : Use extended regex	Example	Reversal if Possible	Other Information
awk	Pattern scanning and processing language	'{print \$1}' : Print specific columns-F fs : Set field separatorNR == n : Process specific record number	awk '/error/ {print \$1,\$3}' /var/log/syslog	N/A (text parsing tool)	Great for structured log analysis and extraction
cut	Removes sections from each line of files	-d : Delimiter -f : Fields to extract -c : Characters to extract–complement : Exclude selected fields	cut -d',' -f1 data.csv	N/A (text extraction utility)	Good for slicing out specific columns from structured text
paste	Merges lines of files	-d : Delimiter -s : Serial concatenation–delimiters= : Specify delimiters	paste file1.txt file2.txt	N/A (file merging utility)	Opposite of cut; useful for combining parallel outputs
join	Joins lines of two files on a common field	-1 FIELD : Join on this field from file 1 -2 FIELD : Join on this field from file 2 -t CHAR : Field separator	join -1 2 -2 1 file1 file2	N/A (data joining utility)	Similar to SQL JOINs; works best with sorted input
sort	Sorts lines of text files	-n : Numeric sort -r : Reverse order -k : Sort by key/column -u : Unique entries only -t : Field delimiter	sort -nr scores.txt	Re-sort with opposite flags if needed	Used frequently with pipelines to organize output
uniq	Reports or omits repeated lines	-c : Prefix lines by count -d : Only print duplicate lines -u : Only print unique lines -i : Ignore case	uniq -c names.txt	N/A (analysis tool)	Works best when input is already sorted; often paired with sort
grep	Searches for patterns in files using regular expressions	-i : Ignore case -v : Invert match (show non -matching lines)-r : Recursive search -n : Show line numbers -l : List filenames only -c : Count matching lines	grep -i "error" server.log	Use grep -v to find lines that don't match a pattern	Extremely fast and works well with pipes; supports regex
diff	Compares two files line by line	-u : Unified format -r : Recursive comparison -q : Quiet output -b : Ignore whitespace -w : Ignore all whitespace	diff -u file1.txt file2.txt	N/A (informational)	Commonly used in version control and patching
стр	Compares two files byte-by-byte	-l : List differing bytes -n N : Compare only N bytes -i SKIP : Skip initial bytes	cmp file1.bin file2.bin	N/A (comparison tool only)	Faster than diff for binary files
cat	Concatenates and displays file content	-n: Number all output lines -b: Number non -blank output lines -s: Squeeze multiple blank lines into one -T: Show tabs as ^I -v: Display control characters	cat file.txt	N/A (read-only operation)	Often used with pipes to pass content to other commands
head	Displays the first few lines of a file	-n N : Output the first N lines -c N : Output the first N bytes -q : Never print headers -v : Always print headers	head -n 10 logfile.log	N/A (display-only command)	Useful for previewing large files or checking logs quickly
tail	Displays the last few lines of a file	-n N : Output the last N lines -f : Follow new lines in real time -c N : Output the last N bytes -q : Suppress headers -v : Always print headers	tail -f /var/log/syslog	N/A (display-only command)	Commonly used with -f to monitor log files live
rev	Reverses lines of a file or input	(No major specifiers)	rev file.txt	Apply rev again to reverse back	Simple utility for reversing strings or lines
od	Dumps files in octal, hex, or other formats	-x : Hexadecimal two -byte display -b : Octal byte display -c : Character display with C -style escapes -t : Custom output format -A : Address base (dec, hex, etc.)	od -c file.txt	Depends on what was analyzed	Useful for inspecting binary files or debugging raw data
xxd	Creates a hex dump of a file or reverses it	-h : Help-g N : Bytes per group-b : Binary instead of hex-r : Reverse operation (convert hex back to binary)	xxd file.txtxxd -r hexdump.txt original.bin	Convert back using -r flag	Hex editor-friendly format; can convert binary ↔ hex
strings	Extracts printable strings from binary files	-n N : Minimum string length (default 4)-f : Show filename before strings -o : Print offset in file	strings binary.exe	N/A (extraction tool only)	Useful for analyzing compiled binaries or core dumps
iconv	Converts text between different character encodings	-f : From encoding -t : To encoding -o : Output file–list : Show supported encodings	iconv -f latin1 -t utf8 file.txt -o newfile.txt	Convert back using same command with reversed encodings	Essential for fixing encoding issues or preparing data for export
fold	Wraps text to fit a specified width	-w N : Wrap at N characters -s : Break at spaces -b : Count bytes instead of columns	fold -w 80 longline.txt	Unfold using tr -d '\n' or similar tools	Helps format plain text to fixed-width displays or terminals
expand	Converts tabs to spaces in files	-t N : Tab stop every N columns–initial : Don't convert leading tabs -i : Convert only tabs after non -blank characters	expand -t 4 code.py > code_expanded.py	Use unexpand to revert	Useful for code formatting or standardizing indentation
unexpand	Converts spaces to tabs where possible	-t N : Tab stops every N columns–first -only : Convert only leading spaces -a : Convert all spaces	unexpand -t 4 code_expanded.py > code_tabs.py	Use expand to revert	Useful for reducing file size or preserving tab-based indentation
fmt	Simple text formatter	-w N : Set maximum line width -s : Split long lines only -u : Uniform spacing -p : Paragraph prefix	fmt -w 75 essay.txt	Formatting is irreversible unless original preserved	Good for reflowing paragraphs or adjusting prose layout

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
column	Formats input into multiple columns	-t : Determine column alignment from headers -s SEPARATOR : Specify delimiter -c WIDTH : Output width in characters	column -t -s ',' data.csv	N/A (formatting tool)	Useful for making flat files more readable
nl	Numbers lines of files	-b : Line numbering mode (a=all, t=non -empty, n=none)-s : Separator between number and text -w : Width of number field	nl -b a script.sh	Remove line numbers via cut or sed	Good for reviewing code or log files with line numbers
tac	Concatenates and displays files in reverse order	(No major specifiers)	tac file.txt	Run again to reverse back	Reverse of cat; useful for reversing logs or sequences
comm	Compares sorted files line by line	-1 : Suppress lines only in file1 -2 : Suppress lines only in file2 -3 : Suppress lines common to both	comm -12 file1.txt file2.txt	N/A (analysis tool)	Shows differences and overlaps between two datasets
pr	Paginates or formats text for printing	+N : Start at page N-I N : Page length in lines-w N : Page width in characters-d : Double-space output-n : Add line numbers	pr -l 60 report.txt	N/A (formatting tool)	Useful for preparing documents for printing or review
split	Splits large files into smaller chunks	-b SIZE : Split by byte size -l LINES : Split by line count -a NUM : Use NUM suffix digits	split -b 100M largefile.tar.gz chunk_	Combine using cat chunk_* > combinedfile.tar.gz	Useful when transferring large files through limited-size storage
cat (with redirection)	Concatenates and combines files	(No direct specifiers)	cat chunk_* > combinedfile.tar.gz	N/A (reversal depends on usage)	Often used with split to reassemble large archives
od (octal dump)	Dumps files in octal, hex, or other formats	-x : Hexadecimal two -byte display -b : Octal byte display -c : Character display with C -style escapes -t : Custom output format	od -c file.txt	Depends on what was analyzed	Useful for inspecting binary files or debugging raw data
hexdump	Displays or converts files to hexadecimal dump	-C : Canonical hex+ASCII display -x : Two -byte hexadecimal display -b : One -byte octal display -n LENGTH : Limit dump to N bytes -s OFFSET : Skip N bytes before dumping	hexdump -C binary.bin	Reconstruct using xxd -r or manual conversion	Detailed view of binary structures and file formats
iconv	Converts text between different character encodings	-f : From encoding -t : To encoding -o : Output file–list : Show supported encodings	iconv -f latin1 -t utf8 file.txt -o newfile.txt	Convert back using same command with reversed encodings	Essential for fixing encoding issues or preparing data for export
recode	Converts file content to different character set	(Use encoding syntax like utf-8latin1)	recode utf-8latin1 file.txt	Convert back using same command with reversed encodings	Older alternative to iconv, still widely available
fold	Wraps text to fit a specified width	-w N : Wrap at N characters -s : Break at spaces -b : Count bytes instead of columns	fold -w 80 longline.txt	Unfold using tr -d '\n' or similar tools	Helps format plain text to fixed-width displays or terminals
dos2unix	Converts Windows/DOS text files to Unix format	 -n : Convert file and write to new file -u : Force Unix to DOS conversion -q : Quiet mode -b : Make backup before conversion 	dos2unix file.txt	Convert back using unix2dos	Removes carriage return (\r) characters from Windows files
unix2dos	Converts Unix text files to Windows/DOS format	·	unix2dos file.txt	Convert back using dos2unix	Adds carriage return (\r) characters for Windows compatibility
file	Determines file type	-b : Brief output -L : Follow symlinks -z : Try decompressing compressed files–mime : Output MIME type	file image.jpg	N/A (informational)	Identifies file types beyond extension, including ASCII, binary, archive, etc.
strings	Extracts printable strings from binary files	-n N : Minimum string length -f : Show filename before strings -o : Print offset in file	strings binary.exe	N/A (extraction tool only)	Useful for analyzing compiled binaries or core dumps
od	Dumps files in octal, hex, or other formats	-x : Hexadecimal two -byte display -b : Octal byte display -c : Character display with C -style escapes -t : Custom output format	od -c file.txt	Depends on what was analyzed	Useful for inspecting binary files or debugging raw data
base64	Encodes/decodes files in Base64 format	-d : Decode–wrap=N : Set line wrapping limit–ignore -garbage : When decoding, ignore invalid characters	base64 file.txt > encoded.b64base64 -d encoded.b64 > decoded.txt	Decode using base64 -d	Useful for embedding binary in text protocols (JSON, XML, etc.)
uuencode/uudecode	Legacy Base64-like encoding and decoding	(Pass input/output file paths)	uuencode file.txt file.txt > encoded.uuuudecode encoded.uu	Decode with uudecode	Older than base64; found in legacy systems
hd	Hex dump utility	-n : Stop after N bytes -s : Skip N bytes before dumping -v : Verbose mode–help : Show help	hd file.bin	Reconstruct using xxd -r or manual conversion	More compact and faster than hexdump in some cases
стр	Compares two files byte-by-byte	-I : List differing bytes -n N : Compare only N bytes -i SKIP : Skip initial bytes	cmp file1.bin file2.bin	N/A (comparison tool only)	Faster than diff for binary files
expand	Converts tabs to spaces in files	-t N : Tab stop every N columns–initial : Don't convert leading tabs -i : Convert only tabs after non -blank characters	expand -t 4 code.py > code_expanded.py	Use unexpand to revert	Useful for code formatting or standardizing indentation
unexpand	Converts spaces to tabs where possible	-t N : Tab stops every N columns–first -only : Convert only leading spaces -a : Convert all spaces	unexpand -t 4 code_expanded.py > code_tabs.py	Use expand to revert	Useful for reducing file size or preserving tab-based indentation
col	Filters reverse line feeds from input	-b : Do not output any backspaces -f : Fine (half -line) movement -p : Pass unknown control	col < formatted.txt > clean.txt	N/A (filtering tool)	Useful for cleaning terminal captures and formfeeds

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
		sequences -x : Output tabs as spaces			
colrm	Removes columns from input	[start] [end] : Column range to removelf end not given, removes from start onward	colrm 10 20 < input.txt	N/A (column removal tool)	Useful for trimming fixed-width data or logs
fmt	Simple text formatter	-w N : Wrap at N characters -s : Split long lines only -u : Uniform spacing -p : Paragraph prefix	fmt -w 75 essay.txt	Formatting is irreversible unless original preserved	Good for reflowing paragraphs or adjusting prose layout
look	Displays lines beginning with a given string	-b : Binary comparison -f : Ignore case -t DELIM : Set field delimiter	look "prefix" wordlist.txt	N/A (search tool)	Fast way to filter dictionary-style files
nl	Numbers lines of files	-b : Line numbering mode (a=all, t=non -empty, n=none)-s : Separator between number and text -w : Width of number field	nl -b a script.sh	Remove line numbers via cut or sed	Good for reviewing code or logs with line numbers
column	Formats input into multiple columns	-t : Auto -detect table -s : Separator -c : Column width -x : Fill rows before columns	column -t -s ',' data.csv	N/A (formatting tool)	Useful for viewing CSVs, logs, and flat tables
pr	Paginates or formats text for printing	+N : Start at page N-I N : Page length in lines-w N : Page width in characters-d : Double-space output-n : Add line numbers	pr -l 60 report.txt	N/A (formatting tool)	Useful for printing or paginating long documents
od	Dumps files in octal, hex, or other formats	-x : Hexadecimal two -byte display -b : Octal byte display -c : Character display with C -style escapes -t : Custom output format	od -c file.txt	Depends on what was analyzed	Useful for inspecting binary files or debugging raw data
hexdump	Displays or converts files to hexadecimal dump	-C : Canonical hex+ASCII display -x : Two -byte hexadecimal display -b : One -byte octal display -n LENGTH : Limit dump to N bytes -s OFFSET : Skip N bytes before dumping	hexdump -C binary.bin	Reconstruct using xxd -r or manual conversion	Detailed view of binary structures and file formats

Category 20: Advanced Networking Tools

(Based strictly on the content from your pasted file)

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
tcpdump	Captures and analyzes network packets	-i : Specify interface-w : Write packets to file-r : Read packets from file-n : Don't resolve hostnames-v : Verbose output	tcpdump -i eth0 -w capture.pcap	Analyze or stop capture manually	Useful for diagnosing network issues
nmap	Scans networks and discovers hosts and services	(No major specifiers listed)	nmap google.com	Avoid scanning unauthorized networks	Often used for security auditing and mapping
ip	Manages IP addresses, routes, tunnels, etc.	addr : Manage IP addresseslink : Manage interfacesroute : Manage routing tableneigh : ARP table management	ip addr showip link set eth0 up	Use inverse commands like ip link set eth0 down	Modern replacement for ifconfig; supports IPv6
SS	Investigates sockets (like netstat)	-t: TCP connections -u: UDP connections -n: No DNS lookup -l: Listening ports -p: Show process info -a: All sockets	ss -tulnp	N/A (diagnostic tool)	Faster and more modern than netstat
arp	Manipulates the system ARP cache	-a : Display all entries -d : Delete an entry -s : Set an entry	arp -a	N/A (informational)	Useful for resolving IP addresses to MAC addresses
ethtool	Displays and changes Ethernet device settings	-i : Show driver info -S : Display statistics—speed : Set speed manually—duplex : Set duplex mode—autoneg : Enable/disable auto -negotiation	ethtool eth0	Reset with same command using original values	Helps diagnose and configure NIC performance
route	Displays and modifies the IP routing table	-n : Show numerical addressesadd : Add a routedel : Delete a route	route -n	Remove route manually	Critical for defining static routes
mtr	Combines traceroute and ping in one network diagnostic tool	-r : Report mode -c : Number of pings -i : Interval between pings -n : No DNS resolution	mtr google.com	N/A (informational)	Continuously traces path and measures latency
nethogs	Monitors network bandwidth usage by process	-d : Delay between updates -p : Show ports	nethogs	Exit with Ctrl+C	Great for identifying bandwidth hogs
iftop	Displays bandwidth usage on an interface	-i : Specify interface -n : Don't resolve hostnames -P : Show ports	iftop -i eth0	Exit with q	Shows real-time bandwidth usage per connection
dhclient	Acquires an IP address via DHCP	-r : Release lease -v : Verbose mode -nw : No daemonize -pf : PID file location	dhclient eth0	Release with dhclient -r eth0	Commonly used when bringing up interfaces manually
nmcli	Manages network connections (part of NetworkManager)	device wifi connect SSID password PASSWORD: Connect to WiFiconnection up/down: Activate/deactivate connectionradio wifi on/off: Toggle WiFi radio	nmcli device wifi connect MyWiFi password mypass	Disconnect with nmcli device disconnect wifi	Used in desktop and mobile Linux environments
tracepath	Traces path to destination showing MTU info	(Pass destination as argument)	tracepath google.com	N/A (diagnostic tool)	Like traceroute, but does not require superuser privileges
sslscan	Tests SSL/TLS support on a server	-no-failed : Hide unsupported ciphers-xml=FILE : Export results	sslscanno-failed example.com	N/A (security scanner)	Identifies weak TLS versions and cipher suites

Command	What It Does	Specifiers	Example	Reversal if Possible	Other Information
		to XML			
openssl s_client	Connects to a TLS server and displays certificate details	-connect HOST:PORT : Target host and port -servername NAME : SNI support	openssl s_client -connect example.com:443	N/A (diagnostic tool)	Useful for inspecting certificates and TLS handshake
iptraf-ng	Colorful console-based IP LAN monitor	-i IFACE : Interface to monitor -g : General interface stats -d : Dashboard mode	iptraf-ng -i eth0	Exit with q	Visualizes traffic flows and network activity
Isof	Lists open files, including network connections	-i : Show internet connections -P : Show port numbers -n : Don't resolve hostnames	Isof -i :80	Depends on what's connected	Shows which processes are using which ports
tshark	CLI version of Wireshark for packet capture	-i INTERFACE : Capture interface -w FILE : Write to file -r FILE : Read from file	tshark -i eth0 -w capture.pcap	Analyze capture later or stop capture	Full-featured packet analyzer
wireshark	GUI-based packet analyzer	(Run without arguments to start GUI)	wireshark	Stop capture manually	Offers deep inspection of network traffic; ideal for advanced debugging
tc	Traffic control (QoS and shaping)	qdisc : Manage queuing disciplinesclass : Manage classesfilter : Packet filtersrate : Bandwidth limitsdelay : Add artificial delay	tc qdisc add dev eth0 root tbf rate 1mbit burst 10kb latency 70ms	Undo QoS settings manually	Advanced feature for simulating slow links or enforcing bandwidth limits
ipset	Manages IP sets for iptables	create : Create new setadd/del : Add/remove entriestest : Test membershiplist : Show contentsflush : Clear set	ipset create blacklist hash:ip`ipset add blacklist 192.16		