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## **SYSTEM MONITORING & COMPRESSION**

### **Usage, Options, and Sample Outputs**

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#### **PART 1 — SYSTEM MONITORING COMMANDS**

System monitoring commands are used to check disk space, memory usage, CPU load, and system performance. These commands are very important for system administrators and Linux users to maintain system health.

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##### **1. df — Disk Filesystem Usage**

###### **df = Disk Filesystem**

This command shows how much disk space is used and available on all mounted file systems.

###### **Used when:**

- Disk is full
- Monitoring server storage
- Checking available space

###### **Basic Usage**

df

###### **Options**

- df -h → Human readable format (KB, MB, GB)
- df -T → Show filesystem type
- df -h /home → Check specific directory space

###### **Related Commands**

- du -sh \* → Check folder sizes
- lsblk → Show disks and partitions

###### **Sample Output**

```

[~(kali㉿kali)-[~/Documents/project]
└─$ df
Filesystem      1K-blocks    Used Available Use% Mounted on
udev             884788       0   884788  0% /dev
tmpfs            198156   1208   196948  1% /run
/dev/sda1     82083148 16841252  61026348 22% /
tmpfs            990772       4   990768  1% /dev/shm
none              1024       0    1024  0% /run/credentials/systemd-journald.service
tmpfs            990776       8   990768  1% /tmp
none              1024       0    1024  0% /run/credentials/getty@tty1.service
tmpfs            198152    104   198048  1% /run/user/1000

[~(kali㉿kali)-[~/Documents/project]
└─$ df -h
Filesystem      Size  Used Avail Use% Mounted on
udev           865M   0  865M  0% /dev
tmpfs          194M  1.2M 193M  1% /run
/dev/sda1      79G   17G  59G  22% /
tmpfs          968M  4.0K 968M  1% /dev/shm
none            1.0M   0  1.0M  0% /run/credentials/systemd-journald.service
tmpfs          968M  8.0K 968M  1% /tmp
none            1.0M   0  1.0M  0% /run/credentials/getty@tty1.service
tmpfs          194M  104K 194M  1% /run/user/1000

[~(kali㉿kali)-[~/Documents/project]
└─$ df -T
Filesystem      Type      1K-blocks    Used Available Use% Mounted on
udev           devtmpfs   884788       0   884788  0% /dev
tmpfs           tmpfs     198156   1204   196952  1% /run
/dev/sda1       ext4     82083148 16841312  61026288 22% /
tmpfs           tmpfs     990772       4   990768  1% /dev/shm
none            tmpfs     1024       0    1024  0% /run/credentials/systemd-journald.service
tmpfs           tmpfs     990776       8   990768  1% /tmp
none            tmpfs     1024       0    1024  0% /run/credentials/getty@tty1.service

```

## 2. du — Disk Usage of Files/Folders

### du = Disk Usage

Shows how much space files and folders are using.

#### Difference:

- df → total disk usage
- du → file/folder usage

#### Basic Usage

du

#### Options

- du -h → Human readable
- du -sh → Total size of current folder
- du -h \* → Size of each folder
- du -sh /home/user → Specific directory size

#### Combined Commands

du -h | sort -h

Sort folders by size.

```
du -ah | sort -rh | head -10
```

Show top 10 largest files.

### Sample Output

```
└─(kali㉿kali)-[~/Documents]
└─$ du -h
8.0K    ./project
4.0K    ./salary_details
24K     .

└─(kali㉿kali)-[~/Documents]
└─$ du -sh
24K     .

└─(kali㉿kali)-[~/Documents]
└─$ du -h *
4.0K    animals.txt
0       copy1.txt
4.0K    numbers.txt
8.0K    project
0       project.txt
4.0K    salary_details
0       test1.txt

└─(kali㉿kali)-[~/Documents]
└─$ du -sh /hoe/kali
du: cannot access '/hoe/kali': No such file or directory

└─(kali㉿kali)-[~/Documents]
└─$ du -sh /home/kali
213M   /home/kali

└─(kali㉿kali)-[~/Documents]
└─$ █
```

```
└─(kali㉿kali)-[~/Documents]
└─$ du -h | sort -h
4.0K    ./salary_details
8.0K    ./project
24K     .
```

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### 3. free — Memory (RAM) Usage

Shows RAM usage, free memory, and swap memory.

**Used when:**

- System slow

- Applications crash
- High RAM usage

## **Basic Usage**

free

## **Options**

- free -h → Human readable
- free -m → Show in MB
- free -g → Show in GB
- free -s 2 → Refresh every 2 seconds

## **Sample Output**

[Insert Screenshot Here – free command output]

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## **4. uptime — System Running Status**

Shows:

- How long system is running
- Number of logged-in users
- CPU load average

## **Usage**

uptime

## **Sample Output**

```

[(kali㉿kali)-[~/Documents]]$ free
      total        used        free      shared  buff/cache   available
Mem:   1981548     1361624     105476      55024    757336       619924
Swap:  976556      126736     849820

[(kali㉿kali)-[~/Documents]]$ free -h
      total        used        free      shared  buff/cache   available
Mem:   1.9Gi      1.3Gi      102Mi      53Mi    739Mi       605Mi
Swap:  953Mi     123Mi     829Mi

[(kali㉿kali)-[~/Documents]]$ free -g
      total        used        free      shared  buff/cache   available
Mem:      1          1          0          0          0          0
Swap:      0          0          0          0          0          0

[(kali㉿kali)-[~/Documents]]$ free -s 2
      total        used        free      shared  buff/cache   available
Mem:   1981548     1362032     105008      55024    757396       619516
Swap:  976556      126728     849828

      total        used        free      shared  buff/cache   available
Mem:   1981548     1362284     104756      55024    757396       619264
Swap:  976556      126728     849828

      total        used        free      shared  buff/cache   available
Mem:   1981548     1362536     104504      55024    757396       619012
Swap:  976556      126728     849828

      total        used        free      shared  buff/cache   available
Mem:   1981548     1361900     105140      55024    757396       619648

```

## 5. vmstat — Virtual Memory Statistics

Displays virtual Memory statistics ,system performance including:

- CPU usage
- Memory usage
- Processes
- I/O activity

### Usage

vmstat

### Live Monitoring

vmstat 2

(refresh every 2 seconds)

### Sample Output

```

[(kali㉿kali)-~/Documents]
$ vmstat
procs      memory      swap--      io-- -system--      cpu--
r b  swpd   free   buff  cache    si   so    bi   bo   in   cs us sy id wa st gu
1 0 126720 99380 27268 730220    0    1   15   22  322   1  0  1 99  0  0  0

[(kali㉿kali)-~/Documents]
$ vmstat 2
procs      memory      swap--      io-- -system--      cpu--
r b  swpd   free   buff  cache    si   so    bi   bo   in   cs us sy id wa st gu
0 0 126672 107520 27468 730240    0    1   15   22  322   1  0  1 99  0  0  0
0 0 126672 107428 27476 730240    0    0    0   28  601  739   0  1 99  0  0  0
0 0 126672 107176 27476 730240    0    0    0   0  335  431   0  0 99  0  0  0
0 0 126672 107176 27476 730240    0    0    0   0  431  517   1  1 97  0  0  0
0 0 126672 107176 27476 730244    0    0    0   0  386  476   1  1 99  0  0  0
0 0 126672 107176 27476 730244    0    0    0   0  305  393   0  1 99  0  0  0
^C

```

## Daily Commands Used by System Administrator

These commands are commonly used daily for monitoring:

df -h → Check disk space

du -sh /\* → Find large folders

free -h → Check RAM

uptime → Check system load

vmstat 1 → Deep monitoring

```

Session Actions Edit View Help
kali@kali: ~/Documents kali@kali: ~/Documents

[(kali㉿kali)-~/Documents]
$ df -h
Filesystem      Size  Used Avail Use% Mounted on
udev            865M    0  865M  0% /dev
tmpfs           194M  1.2M 193M  1% /run
/dev/sda1        79G   17G  59G  22% /
tmpfs           968M  4.0K 968M  1% /dev/shm
none            1.0M    0  1.0M  0% /run/credentials/systemd-journald.service
tmpfs           968M  8.0K 968M  1% /tmp
none            1.0M    0  1.0M  0% /run/credentials/getty@tty1.service
tmpfs           194M 104K 194M  1% /run/user/1000

[(kali㉿kali)-~/Documents]
$ vmstat 1
procs      memory      swap--      io-- -system--      cpu--
r b  swpd   free   buff  cache    si   so    bi   bo   in   cs us sy id wa st gu
2 0 126472 114516 27008 728200    0    1   14   22  322   1  0  1 99  0  0  0
0 0 126472 114264 27008 728200    0    0    0   0  334  422   0  1 99  0  0  0
0 0 126472 114264 27008 728200    0    0    0   0  417  638   1  1 98  0  0  0
0 0 126472 114264 27008 728200    0    0    0   56  474  777   1  1 99  0  0  0
0 0 126472 114264 27008 728200    0    0    0   0  298  388   0  1 99  0  0  0
0 0 126472 114264 27008 728200    0    0    0   472  325  409   0  1 99  0  0  0
0 0 126472 114264 27008 728200    0    0    0   0  283  390   0  1 99  0  0  0

```

## PART 2 — COMPRESSION & ARCHIVING

Compression reduces file size.

Archiving combines multiple files into one.

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### 1. tar — Archive Files

**tar = Tape Archive**

Used to combine multiple files/folders into a single file.

**Extension:** .tar

Note: tar only archives. It does not compress unless gzip/bzip2 is used.

**Usage**

```
tar -cvf archive.tar files/
```

**Options**

- -c → Create archive
- -v → Verbose (show process)
- -f → File name

**Extract**

```
tar -xvf archive.tar
```

**Sample Output**

```
[kali㉿kali] - [~/Documents/project]
└─$ ls
file1.txt file2.txt file3.txt

[kali㉿kali] - [~/Documents/project]
└─$ tar -cvf archivefile.tar .
./
./file3.txt
./file2.txt
tar: ./archivefile.tar: archive cannot contain itself; not dumped
./file1.txt

[kali㉿kali] - [~/Documents/project]
└─$ ls
archivefile.tar file1.txt file2.txt file3.txt

[kali㉿kali] - [~/Documents/project]
└─$ tar -xvf archivefile.tar
./
./file3.txt
./file2.txt
./file1.txt

[kali㉿kali] - [~/Documents/project]
└─$ ls
archivefile.tar file1.txt file2.txt file3.txt

[kali㉿kali] - [~/Documents/project]
└─$ █
```

---

## 2. gzip — Compress File

Compresses a file and reduces its size.

**Extension:** .gz

**Usage**

gzip filename

**Decompress**

gunzip filename.gz

**Sample Output**

```
kali㉿kali: ~/Documents/project ✘ kali㉿kali: ~/Documents ✘

└─(kali㉿kali)-[~/Documents/project]
└─$ ls
file1.txt file2.txt file3.txt

└─(kali㉿kali)-[~/Documents/project]
└─$ tar -cvzf backup.tar.gz .
./
./file3.txt
./file2.txt
./file1.txt
tar: ..: file changed as we read it

└─(kali㉿kali)-[~/Documents/project]
└─$ ls
backup.tar.gz file1.txt file2.txt file3.txt

└─(kali㉿kali)-[~/Documents/project]
└─$ tar -xvzf backup.tar.gz .
./
./file3.txt
./file2.txt
./file1.txt

└─(kali㉿kali)-[~/Documents/project]
└─$ ls
backup.tar.gz file1.txt file2.txt file3.txt

└─(kali㉿kali)-[~/Documents/project]
└─$ █
```

---

### 3. bzip2 — Better Compression

Provides higher compression than gzip but slower.

**Extension:** .bz2

**Usage**

bzip2 filename

**Decompress**

bunzip2 filename.bz2

**Sample Output**

```
kali㉿kali: ~/Documents/project ✘ | kali㉿kali: ~/Documents ✘ |  
└─(kali㉿kali)-[~/Documents/project]  
$ tar -cvjf backup.tar.bz2 .  
./  
./file3.txt  
./file2.txt  
./file1.txt  
tar: .: file changed as we read it  
└─(kali㉿kali)-[~/Documents/project]  
$ ls  
backup.tar.bz2  file1.txt  file2.txt  file3.txt  
└─(kali㉿kali)-[~/Documents/project]  
$ █
```

---

## 4. zip — Create Zip File

Used to compress and archive files together.

**Extension:** .zip

**Usage**

zip archive.zip file1 file2

**Zip folder**

zip -r archive.zip folder/

**Sample Output**

```
(kali㉿kali)-[~/Documents/project]
└─$ ls
file1.txt file2.txt file3.txt

(kali㉿kali)-[~/Documents/project]
└─$ zip file.zip file1.txt
adding: file1.txt (stored 0%)

(kali㉿kali)-[~/Documents/project]
└─$ ls
file1.txt file2.txt file3.txt file.zip

(kali㉿kali)-[~/Documents/project]
└─$ unzip file.zip
Archive: file.zip
replace file1.txt? [y]es, [n]o, [A]ll, [N]one, [r]ename: n

(kali㉿kali)-[~/Documents/project]
└─$ ls
file1.txt file2.txt file3.txt file.zip
```

---

## 5. **unzip — Extract Zip File**

Extract files from a zip archive.

### Usage

unzip archive.zip

### Extract to specific folder

unzip archive.zip -d /home/user/

### Sample Output

```
(kali㉿kali)-[~/Documents/project]
└─$ ls
file1.txt file2.txt file3.txt

(kali㉿kali)-[~/Documents/project]
└─$ zip file.zip file1.txt
adding: file1.txt (stored 0%)

(kali㉿kali)-[~/Documents/project]
└─$ ls
file1.txt file2.txt file3.txt file.zip

(kali㉿kali)-[~/Documents/project]
└─$ unzip file.zip
Archive: file.zip
replace file1.txt? [y]es, [n]o, [A]ll, [N]one, [r]ename: n

(kali㉿kali)-[~/Documents/project]
└─$ ls
file1.txt file2.txt file3.txt file.zip
```

---

## Conclusion

System monitoring commands help in checking disk, memory, CPU, and system performance.

Compression and archiving commands help reduce file size and manage multiple files efficiently.

These commands are essential for:

- System administrators
  - Linux users
  - Server management
  - Performance troubleshooting
-