



# Linux Process Management

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# Linux - Process Managements



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## Process

- Linux process management involves the creation, monitoring, and control of processes
- **What is a Process?** - A process is an executing instance of a program.
- Each process in Linux has:
  - Process ID (PID), Parent Process ID (PPID), User ID (UID), State

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## Types of Process in Linux

Background Processes

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## Types of Process in Linux

### Background Processes

These processes run in the background, allowing the terminal to be used for other tasks.

- To run a process in the background : &

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## Types of Process in Linux

### Background Processes

These processes run in the background, allowing the terminal to be used for other tasks.

- To run a process in the background : &

```
File Edit View Search Terminal Help
```

```
[root@localhost Desktop]# sleep 100 &
[1] 19883
[root@localhost Desktop]#
```

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## Types of Process in Linux

Foreground Processes

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## Types of Process in Linux

### Foreground Processes

These processes run directly from the terminal and occupy it until they finish execution.

- Brings a background job to the foreground : **fg**

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## Types of Process in Linux

### Foreground Processes

These processes run directly from the terminal and occupy it until they finish execution.

- Brings a background job to the foreground : **fg**

```
File Edit View Search Terminal Help
[root@localhost Desktop]# sleep 100 &
[1] 19883
[root@localhost Desktop]# fg %1
sleep 100
```

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## Types of Process in Linux

### Foreground Processes

These processes run directly from the terminal and occupy it until they finish execution.

- Brings a background job to the foreground : **fg**

### Background Processes

These processes run in the background, allowing the terminal to be used for other tasks.

- To run a process in the background : **&**

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## Process States

Processes in Linux can be in various states

- Running (R): The process is either running or ready to run.
- Sleeping (S): The process is waiting for some event (like I/O) to complete.
- Stopped (T): The process has been stopped, usually by a signal like SIGSTOP.
- Zombie (Z): The process has finished execution but still has an entry in the process table, awaiting cleanup by its parent.

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## Linux Process

How to see/display the process in Linux ?



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## Linux Process

\$ ps

How to see/display the process in Linux ?



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## Linux Process

\$ ps

list of currently running processes

```
File Edit View Search Terminal Help
[root@localhost Desktop]# ps
  PID TTY          TIME CMD
18792 pts/0        00:00:00 su
18798 pts/0        00:00:00 bash
20440 pts/0        00:00:00 ps
[root@localhost Desktop]#
```

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## Linux Process

\$ ps -e

list of all processes

```
[root@localhost Desktop]# ps -e
 PID TTY      TIME CMD
  1 ?        00:00:12 systemd
  2 ?        00:00:00 kthreadd
  4 ?        00:00:00 kworker/0:0H
  6 ?        00:00:02 ksoftirqd/0
  7 ?        00:00:00 migration/0
  8 ?        00:00:00 rcu_bh
  9 ?        00:00:06 rcu_sched
 10 ?       00:00:00 lru-add-drain
 11 ?       00:00:00 watchdog/0
 13 ?       00:00:00 kdevtmpfs
 14 ?       00:00:00 netns
 15 ?       00:00:00 khungtaskd
```

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## Linux Process

\$ ps -ef

list of all processes with full info

File	Edit	View	Search	Terminal	Help		
UID	PID	PPID	C	STIME	TTY	TIME	CMD
root	1	0	0	Oct02	?	00:00:12	/usr/lib/systemd/systemd --swit
root	2	0	0	Oct02	?	00:00:00	[kthreadd]
root	4	2	0	Oct02	?	00:00:00	[kworker/0:0H]
root	6	2	0	Oct02	?	00:00:02	[ksoftirqd/0]
root	7	2	0	Oct02	?	00:00:00	[migration/0]
root	8	2	0	Oct02	?	00:00:00	[rcu_bh]
root	9	2	0	Oct02	?	00:00:06	[rcu_sched]
root	10	2	0	Oct02	?	00:00:00	[lru-add-drain]
root	11	2	0	Oct02	?	00:00:00	[watchdog/0]
root	13	2	0	Oct02	?	00:00:00	[kdevtmpfs]
root	14	2	0	Oct02	?	00:00:00	[netns]
root	15	2	0	Oct02	?	00:00:00	[kthrecoresd]

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## Linux Process

How to see/display the  
real-time information  
about running processes?



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## Linux Process

\$ top

How to see/display the  
real-time information  
about running processes?



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## Linux Process

\$ top

```
File Edit View Search Terminal Help
top - 00:34:27 up 9:08, 2 users, load average: 0.00, 0.02, 0.05
Tasks: 207 total, 1 running, 206 sleeping, 0 stopped, 0 zombie
%Cpu(s): 1.7 us, 0.7 sy, 0.0 ni, 97.3 id, 0.3 wa, 0.0 hi, 0.0 si, 0.0 st
KiB Mem : 3861052 total, 1373776 free, 1064472 used, 1422804 buff/cache
KiB Swap: 2098172 total, 2098172 free, 0 used. 2500528 avail Mem
```

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
4307	master	20	0	2985904	183760	66032	S	1.0	4.8	1:29.48	gnome-shell
623	root	20	0	295380	5184	3960	S	0.3	0.1	1:39.01	vmtoolsd
1202	root	20	0	319044	46716	25372	S	0.3	1.2	0:17.47	X
1879	root	20	0	1739712	56432	2568	S	0.3	1.5	1:10.80	salt-api
5382	master	20	0	609360	26144	18880	S	0.3	0.7	1:35.78	vmtoolsd
8081	master	20	0	680876	30216	17508	S	0.3	0.8	0:07.94	gnome-terminal
20547	root	20	0	0	0	0	S	0.3	0.0	0:00.21	lvworker/0.3

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## Linux Process

How to terminate/kill the process?



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## Linux Process

\$ kill

How to terminate/kill the process?



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## Linux Process

\$ kill



```
File Edit View Search Terminal Help
[root@localhost Desktop]# sleep 100 &
[1] 22189
[root@localhost Desktop]# ps
 PID TTY      TIME CMD
18792 pts/0    00:00:00 su
18798 pts/0    00:00:00 bash
22189 pts/0    00:00:00 sleep
22190 pts/0    00:00:00 ps
[root@localhost Desktop]# kill 22189
[root@localhost Desktop]# ps
 PID TTY      TIME CMD
18792 pts/0    00:00:00 su
18798 pts/0    00:00:00 bash
22199 pts/0    00:00:00 ps
[1]+  Terminated                  sleep 100
[root@localhost Desktop]#
```

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## Linux Process

\$ kill



### Signals

**SIGTERM (15)**: Gracefully terminates a process, allowing it to clean up resources. **(Default)**

**SIGKILL (9)**: Forces immediate termination of the process without cleanup.

**SIGSTOP (19)**: Pauses the process.

**SIGCONT (18)**: Resumes a paused process.

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## Linux Process

\$ kill

SIGTERM(15)

```
File Edit View Search Terminal Help
[root@localhost Desktop]# sleep 100 &
[1] 22189
[root@localhost Desktop]# ps
 PID TTY      TIME CMD
18792 pts/0    00:00:00 su
18798 pts/0    00:00:00 bash
22189 pts/0    00:00:00 sleep
22190 pts/0    00:00:00 ps
[root@localhost Desktop]# kill 22189
[root@localhost Desktop]# ps
 PID TTY      TIME CMD
18792 pts/0    00:00:00 su
18798 pts/0    00:00:00 bash
22199 pts/0    00:00:00 ps
[1]+  Terminated                  sleep 100
[root@localhost Desktop]#
```

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## Multi-Process/Tasking vs Multi-Threading

**Multitasking** → Execution of multiple processes (**Context Switching**)

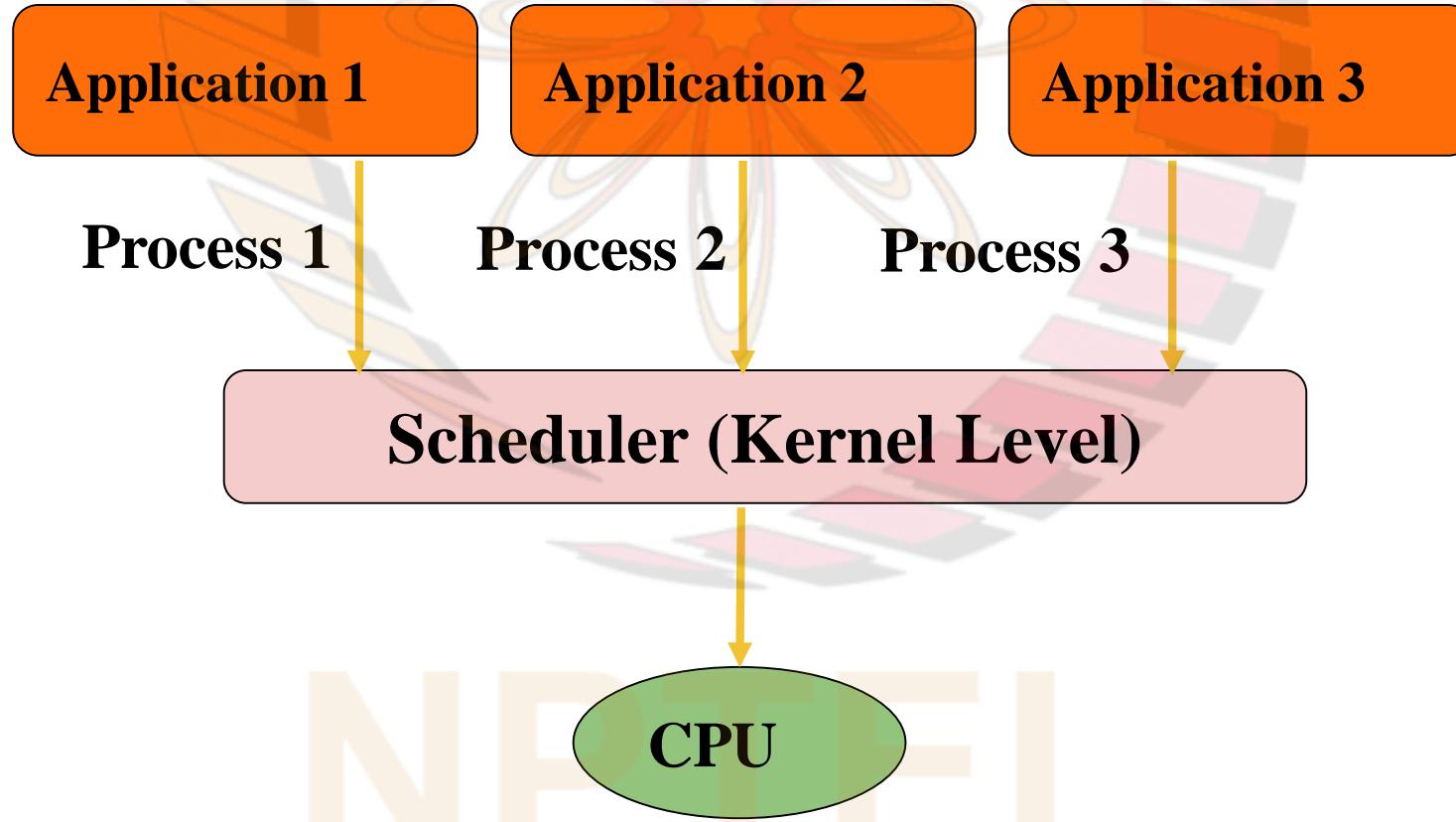
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## Multi-Process/Tasking vs Multi-Threading



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## Multi-Process/Tasking vs Multi-Threading

**Multithreading** → Execution of multiple threads in a process (**Threads Switching**)

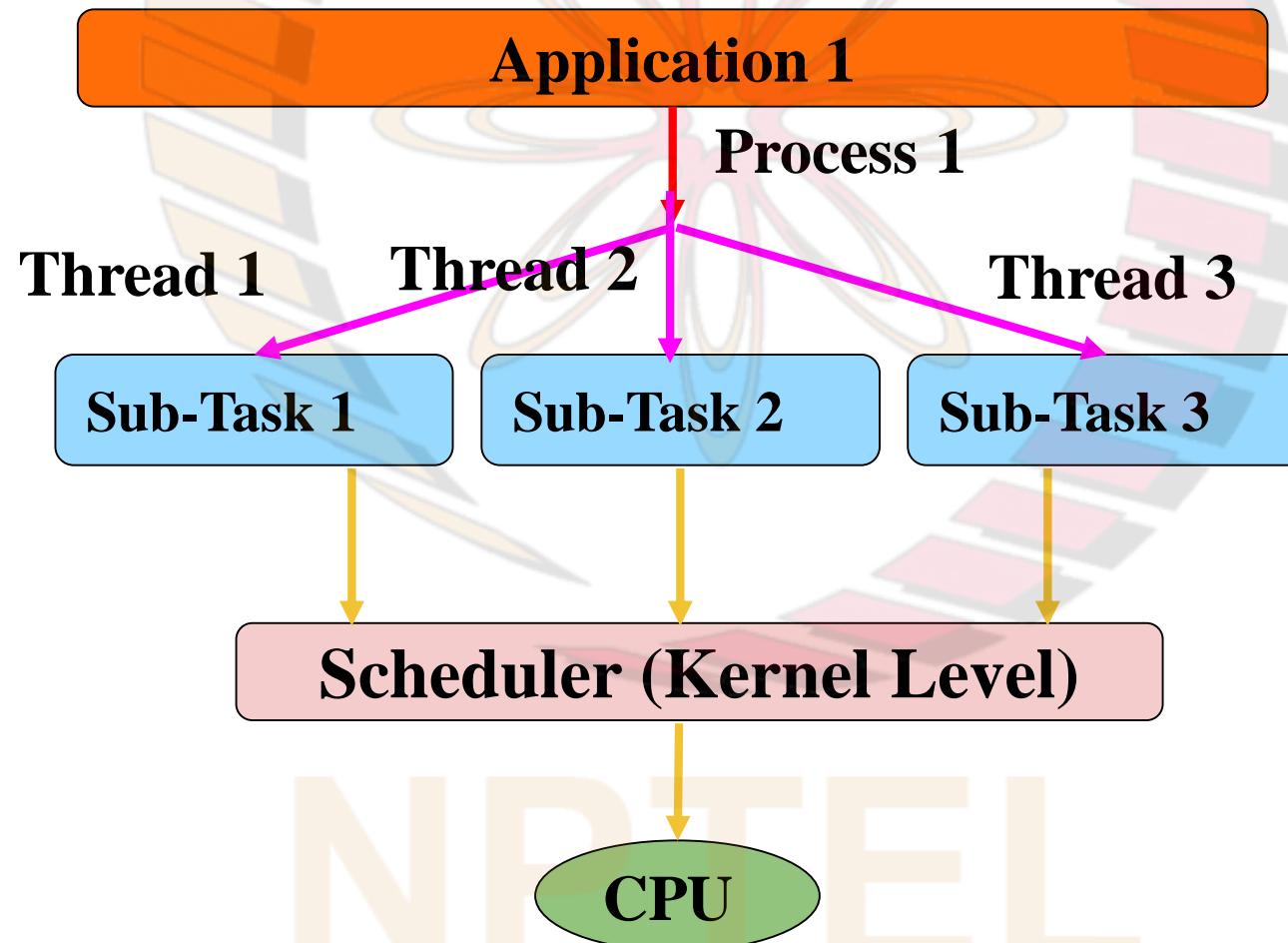
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## Multi-Process/Tasking vs Multi-Threading





# Linux Text Processing Commands

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## Text Processing Commands in Linux

- Linux provides powerful commands for text processing, allowing users to manipulate, filter, search, and transform text data efficiently.
- These commands are essential for automating tasks, handling logs, managing data, and writing scripts.

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## Text Processing Commands in Linux

Search for Patterns in a file  
?



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## Text Processing Commands in Linux

\$ grep

Search for Patterns in a file

?



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## Text Processing Commands in Linux

\$ grep

It searches for a string or pattern in files or input streams.

```
[root@localhost Desktop]# cat file3
Hello Ved !
How are you ?
Ved is good student.
He is tallented !
[root@localhost Desktop]# grep "Ved" file3
Hello Ved !
Ved is good student.
[root@localhost Desktop]# grep -n "Ved" file3
1>Hello Ved !
3:Ved is good student.
[root@localhost Desktop]#
```

# Linux - Text Processing



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## Text Processing Commands in Linux

\$ grep -r

It searches for a string or pattern in files or input streams.

```
[root@localhost TestDir]# ls
dir1  exe.sh  file1  file2  file3  Test  test.sh
[root@localhost TestDir]# grep -r "Ved" *
file3:Hello Ved !
file3:Ved is good student.
Test/Child.txt:Ved is child of Mr. Shyam
[root@localhost TestDir]#
```

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## Text Processing Commands in Linux

Pattern scanning and  
Processing ?



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## Text Processing Commands in Linux

\$ awk

Pattern scanning and  
Processing ?



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## Text Processing Commands in Linux

\$ awk

It allows for pattern scanning, text extraction, and data manipulation, and it supports complex operations like filtering, transforming, and generating formatted output.

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## Text Processing Commands in Linux

\$ awk

➤ Printing Columns from file

```
[root@localhost TestDir]# cat file.txt
John 25 M
Alice 30 F
Bob 28 M
[root@localhost TestDir]# awk '{print $1, $3}' file.txt
John M
Alice F
Bob M
[root@localhost TestDir]#
```

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# Linux - Text Processing



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## Text Processing Commands in Linux

\$ awk

➤ Filtering Rows Based on Condition

```
[root@localhost TestDir]# cat file.txt
John 25 M
Alice 30 F
Bob 28 M
[root@localhost TestDir]# awk '$3 == "M" {print $1}' file.txt
John
Bob
[root@localhost TestDir]#
```

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## Text Processing Commands in Linux

\$ awk

➤ Using Arithmetic Operations

```
[root@localhost TestDir]# cat file.txt
John 25 M
Alice 30 F
Bob 28 M
[root@localhost TestDir]# awk '{print $1, $2 * 2}' file.txt
John 50
Alice 60
Bob 56
[root@localhost TestDir]#
```

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## Text Processing Commands in Linux

\$ awk

➤ Pattern Matching

```
[root@localhost TestDir]# cat file.txt
John 25 M
Alice 30 F
Bob 28 M
[root@localhost TestDir]# awk '/John/ {print $0}' file.txt
John 25 M
[root@localhost TestDir]# awk '/M/ {print $0}' file.txt
John 25 M
Bob 28 M
[root@localhost TestDir]#
```

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## Text Processing Commands in Linux

How to sort lines of text file  
?



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## Text Processing Commands in Linux

\$ sort

How to sort lines of text file

?



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## Text Processing Commands in Linux



\$ sort

arranges lines of text files alphabetically, numerically, or by other criteria.

```
[root@localhost TestDir]# cat file2
Mango is Yello
Apple is red
Green Vegetables
[root@localhost TestDir]# sort file2
Apple is red
Green Vegetables
Mango is Yello
[root@localhost TestDir]#
```

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## Text Processing Commands in Linux

\$ sort

➤ Sort alphabetically

```
[root@localhost TestDir]# cat file2
Mango is Yello
Apple is red
Green Vegetables
[root@localhost TestDir]# sort file2
Apple is red
Green Vegetables
Mango is Yello
[root@localhost TestDir]#
```

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## Text Processing Commands in Linux

\$ sort

➤ Sort numerically

```
[root@localhost TestDir]# cat file1  
6  
8  
4  
2  
[root@localhost TestDir]# sort file1  
2  
4  
6  
8  
[root@localhost TestDir]#
```

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# Linux - Text Processing



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## Text Processing Commands in Linux

\$ sort

➤ Reverse Sort

```
[root@localhost TestDir]# cat file1
```

```
6  
8  
4  
2
```

```
[root@localhost TestDir]# sort -r file1
```

```
8  
6  
4  
2
```

```
[root@localhost TestDir]# █
```

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# Linux - Text Processing



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## Text Processing Commands in Linux

How I can report or Omit  
repeated lines from a file ?



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# Linux - Text Processing



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## Text Processing Commands in Linux

\$ uniq

How I can report or Omit  
repeated lines from a file ?



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# Linux - Text Processing



5

## Text Processing Commands in Linux

\$ uniq

➤ filters out duplicate lines from sorted input

```
[root@localhost TestDir]# cat file2
Mango is Yello
Apple is red
Mango is Yello
Green Vegetables
[root@localhost TestDir]# sort file2 | uniq
Apple is red
Green Vegetables
Mango is Yello
[root@localhost TestDir]#
```

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# Linux - Text Processing



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## Text Processing Commands in Linux

\$ uniq

➤ filters out duplicate lines from sorted input

```
[root@localhost TestDir]# cat file2
Mango is Yello
Apple is red
```

**Pipe:** Output of one command as input to next command

```
+ file2 | uniq
```

```
Green Vegetables
Mango is Yello
[root@localhost TestDir]#
```

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# Linux - Text Processing



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## Text Processing Commands in Linux

How I can count content of  
a file ?



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# Linux - Text Processing



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## Text Processing Commands in Linux

\$ wc

How I can count content of  
a file ?



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# Linux - Text Processing



5

## Text Processing Commands in Linux

\$ wc

```
[root@localhost TestDir]# cat file2
Mango is Yello
Apple is red
Mango is Yello
Green Vegetables
[root@localhost TestDir]# wc file2
4 11 61 file2
[root@localhost TestDir]# wc -l file2
4 file2
[root@localhost TestDir]# wc -w file2
11 file2
[root@localhost TestDir]# wc -c file2
61 file2
[root@localhost TestDir]# █
```

# Linux - Text Processing



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## Text Processing Commands in Linux

How I can print n number  
of lines (start/end) from a  
file ?



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# Linux - Text Processing



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## Text Processing Commands in Linux

\$ head / tail

How I can print n number  
of lines (start/end) from a  
file ?



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# Linux - Text Processing



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## Text Processing Commands in Linux

\$ head

```
[root@localhost TestDir]# cat file2
Mango is Yello
Apple is red
Orange is Orange
Green Vegetables
Pitter is student
[root@localhost TestDir]# head -2 file2
Mango is Yello
Apple is red
[root@localhost TestDir]#
```

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# Linux - Text Processing



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## Text Processing Commands in Linux

\$ tail

```
[root@localhost TestDir]# cat file2
Mango is Yello
Apple is red
Orange is Orange
Green Vegetables
Pitter is student
[root@localhost TestDir]# tail -2 file2
Green Vegetables
Pitter is student
[root@localhost TestDir]# ■
```

# Linux - Text Processing



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## Text Processing Commands in Linux

\$ diff

Compare files line by line



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# Linux - Text Processing



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## Text Processing Commands in Linux

\$ diff

Compare files line by line

\$ paste

Merge lines of files

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# Linux - Text Processing



5

## Text Processing Commands in Linux

\$ diff

Compare files line by line

\$ paste

Merge lines of files

\$ tr

Translate or delete characters

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# Linux - Text Processing



5

## Text Processing Commands in Linux



\$ diff

Compare files line by line



\$ paste

Merge lines of files



\$ tr

Translate or delete characters



\$ sed

Stream editor for filtering and transforming text