Assignment-10

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Command for Basic-level of Linux Users and System Administrator

Shell Utility: echo Command – Detailed Study

(1) What is the echo Command?

The echo command is one of the oldest commands used in Unix systems. It first appeared in the early versions of Unix during the 1970s at AT&T Bell Labs. Developers like Ken Thompson and Dennis Ritchie were responsible for building many of these early tools, and echo became a standard part of the shell. Its basic role is simple: it displays text on the screen. Over time, it became part of the POSIX standard, which is why almost all Unix-like systems—including Linux and macOS—support it.

(2) Why is echo Useful for System Administrators?

System administrators rely on echo for several reasons: - Printing messages inside shell scripts. - Checking and displaying the values of environment variables. - Writing simple text into files. - Displaying system information or status updates. - Making automation scripts easier to read and understand.

For example, during a maintenance script, an admin might write:

Backup completed successfully.This helps track the flow of the script.

(3) How Does the echo Command Work?

The basic idea is straightforward: whatever text you pass to the command gets printed on the screen.
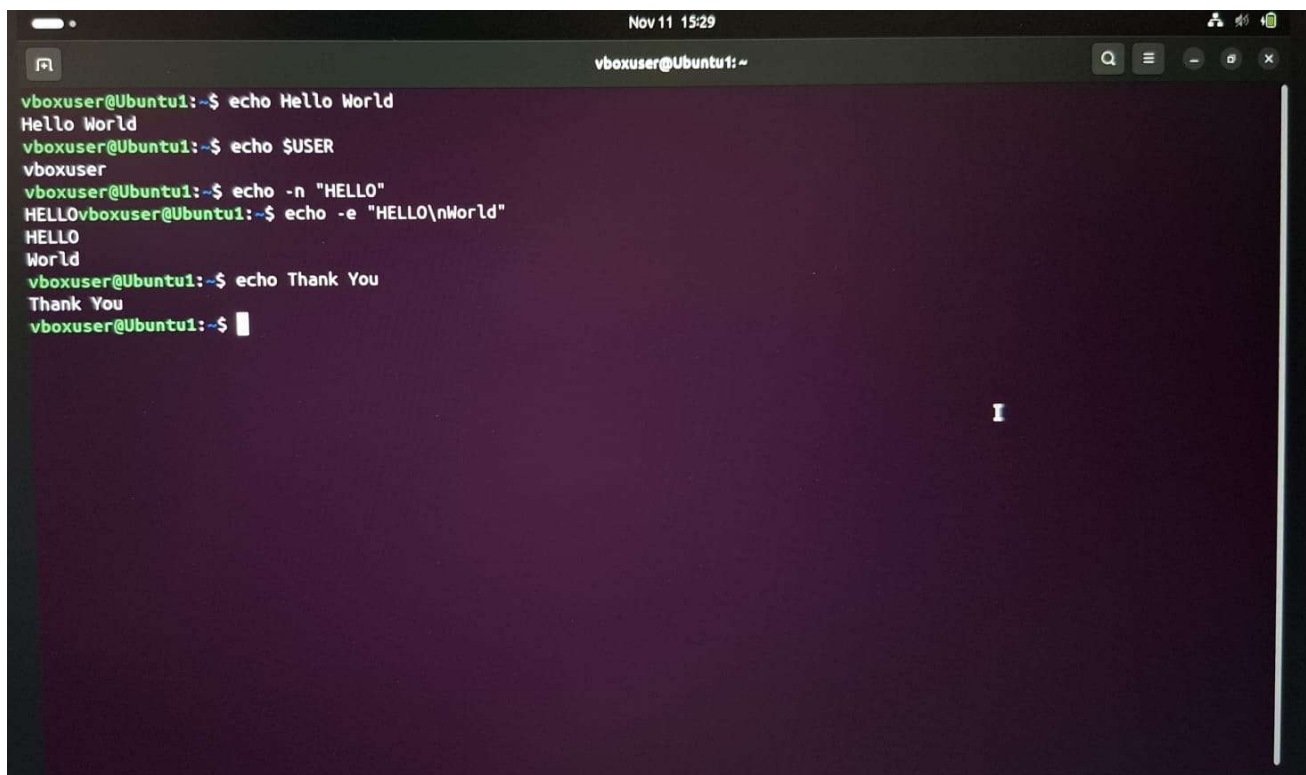
Example 1: Basic Output

Hello World

Example 2: Using Variables

When a variable contains a value such as a name, echo can display it: Welcome Draco

Example 3: Without Quotes

Both quoted and unquoted text generally behave the same for simple strings.

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(4) Snapshot

(5) Options and Flags of the echo Command

Here are some commonly used options:

1. -n

Prints output without adding a new line at the end.

2. -e

Allows special characters such as newline or tab to be interpreted.

3. -E

This disables special character interpretation and prints the text normally.

4. Common Special Sequences

- New line
- Tab space
- Backslash
- Backspace
- Stop further output

5. Redirecting Output to a File

You can send text directly into a file using redirection. This is very useful for logs and automated scripts.

Sources

- GNU Coreutils Manual
- POSIX Standard Documentation
- Local Linux manual pages (man echo)

System Management and Monitoring Tool: iostat -x (Extended I/O Statistics) – Detailed Study

(1) What is the iostat Command? (History & Background)

The iostat command is part of the **sysstat** package, which was originally developed for Linux by **Sebastien Godard**. The purpose of the tool is to monitor system performance—especially disk (I/O) usage. The command first appeared in Unix System V and later became available on Linux systems as part of the performance monitoring toolkit.

The name "iostat" stands for **Input/Output Statistics**. It helps administrators track how hard disks and partitions are performing, including how busy they are, how many read/write requests they handle, and how long operations take.

iostat -x is the **extended mode**, which shows deeper details compared to the normal iostat output.

(2) Why is iostat -x Useful for System Administrators?

System administrators use iostat -x because it provides insights into the **health and performance of storage devices**. This is especially helpful when diagnosing system slowness.

Some common uses:

- Checking if a disk is overloaded.
- Detecting failing or slow hard drives.
- Monitoring read/write performance.
- Troubleshooting server lag or bottlenecks.
- Analyzing I/O patterns on busy systems.

With this command, admins can tell whether a problem comes from the CPU, RAM, or storage.

(3) How Does iostat -x Work? (Examples Included)

The command collects statistics from the kernel and displays them in a readable form.

Example 1: Basic Usage

iostat -x

This shows extended statistics for all disks.
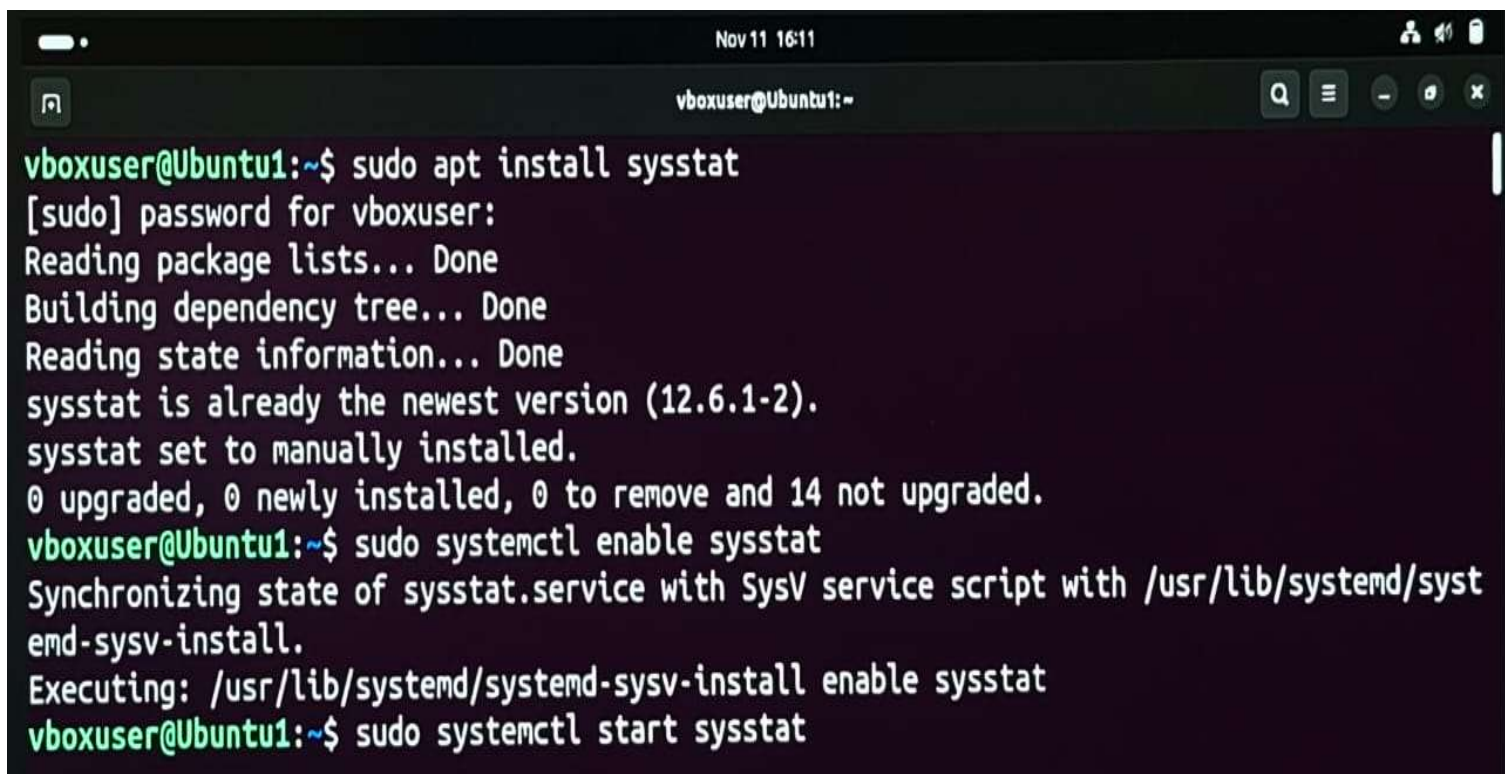
Example 2: Refresh Every 2 Seconds

iostat -x 2

This updates the output every 2 seconds.

Example 3: Show 5 Refreshes Only

iostat -x 2 5

This prints extended I/O stats every 2 seconds, but only 5 times.

(4) Snapshot

vboxuser@Ubuntu1: ~

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vboxuser@Ubuntu1:~$ iostat -x
Linux 6.14.0-28-generic (Ubuntu1)        11/11/2025      _x86_64_        (2 CPU)

avg-cpu:  %user   %nice %system %iowait  %steal   %idle
           0.45    0.00    1.19    0.08    0.00   98.28

Device            r/s     rkB/s   rrqm/s  %rrqm r_await rareq-sz     w/s    wkB/s   wrqm/s  %wrqm w_await wareq-sz     d/s
    dkB/s   drqm/s  %drqm d_await dareq-sz     f/s f_await  aqu-sz  %util
loop0            0.00      0.01     0.00   0.00    0.07     1.21    0.00     0.00     0.00   0.00    0.00     0.00    0.00
     0.00     0.00   0.00    0.00     0.00    0.00    0.00    0.00   0.00
loop1            0.02      0.36     0.00   0.00    1.09    19.32    0.00     0.00     0.00   0.00    0.00     0.00    0.00
     0.00     0.00   0.00    0.00     0.00    0.00    0.00    0.00   0.00
loop10           0.01      0.12     0.00   0.00    0.47     7.76    0.00     0.00     0.00   0.00    0.00     0.00    0.00
     0.00     0.00   0.00    0.00     0.00    0.00    0.00    0.00   0.00
loop11           0.01      0.11     0.00   0.00    0.29     9.49    0.00     0.00     0.00   0.00    0.00     0.00    0.00
     0.00     0.00   0.00    0.00     0.00    0.00    0.00    0.00   0.00
loop12           0.02      0.12     0.00   0.00    0.12     6.15    0.00     0.00     0.00   0.00    0.00     0.00    0.00
     0.00     0.00   0.00    0.00     0.00    0.00    0.00    0.00   0.00
loop13           0.02      0.38     0.00   0.00    0.00    15.85    0.00     0.00     0.00   0.00    0.00     0.00    0.00
     0.00     0.00   0.00    0.00     0.00    0.00    0.00    0.00   0.00
loop2            0.13      1.70     0.00   0.00    0.31    13.21    0.00     0.00     0.00   0.00    0.00     0.00    0.00
     0.00     0.00   0.00    0.00     0.00    0.00    0.00    0.01
loop3            0.02      0.36     0.00   0.00    0.77    18.08    0.00     0.00     0.00   0.00    0.00     0.00    0.00
     0.00     0.00   0.00    0.00     0.00    0.00    0.00    0.00
loop4            0.61      7.43     0.00   0.00    0.19    12.18    0.00     0.00     0.00   0.00    0.00     0.00    0.00
     0.00     0.00   0.00    0.00     0.00    0.00    0.00    0.01
loop5            0.02      0.12     0.00   0.00    0.61     7.65    0.00     0.00     0.00   0.00    0.00     0.00    0.00
     0.00     0.00   0.00    0.00     0.00    0.00    0.00    0.00
loop6            0.02      0.38     0.00   0.00    0.70    18.70    0.00     0.00     0.00   0.00    0.00     0.00    0.00
     0.00     0.00   0.00    0.00     0.00    0.00    0.00    0.00
loop7            0.59      1.77     0.00   0.00    0.05     3.01    0.00     0.00     0.00   0.00    0.00     0.00    0.00
     0.00     0.00   0.00    0.00     0.00    0.00    0.00    0.00
loop8            0.25      9.01     0.00   0.00    0.77    36.21    0.00
```

vboxuser@Ubuntu1: ~

```
           0.00    0.66    0.98    0.01    0.66

vboxuser@Ubuntu1:~$ iostat -x 2
Linux 6.14.0-28-generic (Ubuntu1)        11/11/2025      _x86_64_        (2 CPU)

avg-cpu:  %user   %nice %system %iowait  %steal   %idle
           0.51    0.00    1.29    0.07    0.00   98.12

Device            r/s    rkB/s   rrqm/s  %rrqm r_await rareq-sz     w/s    wkB/s   wrqm/s  %wrqm w_await wareq-sz     d/s    dkB/s   drqm/s  %drqm d_await
dareq-sz     f/s f_await  aqu-sz  %util
loop0            0.00     0.01     0.00   0.00    0.07     1.21    0.00     0.00     0.00   0.00    0.00     0.00    0.00     0.00     0.00   0.00    0.00
     0.00    0.00    0.00    0.00   0.00
loop1            0.02     0.35     0.00   0.00    1.09    19.32    0.00     0.00     0.00   0.00    0.00     0.00    0.00     0.00     0.00   0.00    0.00
     0.00    0.00    0.00    0.00   0.00
loop10           0.01     0.11     0.00   0.00    0.47     7.76    0.00     0.00     0.00   0.00    0.00     0.00    0.00     0.00     0.00   0.00    0.00
     0.00    0.00    0.00    0.00   0.00
loop11           0.01     0.11     0.00   0.00    0.29     9.49    0.00     0.00     0.00   0.00    0.00     0.00    0.00     0.00     0.00   0.00    0.00
     0.00    0.00    0.00    0.00   0.00
loop12           0.02     0.12     0.00   0.00    0.12     6.15    0.00     0.00     0.00   0.00    0.00     0.00    0.00     0.00     0.00   0.00    0.00
     0.00    0.00    0.00    0.00   0.00
loop13           0.02     0.37     0.00   0.00    0.00    15.85    0.00     0.00     0.00   0.00    0.00     0.00    0.00     0.00     0.00   0.00    0.00
     0.00    0.00    0.00    0.00   0.00
loop2            0.13     1.66     0.00   0.00    0.31    13.21    0.00     0.00     0.00   0.00    0.00     0.00    0.00     0.00     0.00   0.00    0.00
     0.00    0.00    0.00    0.00   0.01
loop3            0.02     0.35     0.00   0.00    0.77    18.08    0.00     0.00     0.00   0.00    0.00     0.00    0.00     0.00     0.00   0.00    0.00
     0.00    0.00    0.00    0.00   0.00
loop4            0.60     7.28     0.00   0.00    0.19    12.18    0.00     0.00     0.00   0.00    0.00     0.00    0.00     0.00     0.00   0.00    0.00
     0.00    0.00    0.00    0.00   0.01
loop5            0.01     0.11     0.00   0.00    0.61     7.65    0.00     0.00     0.00   0.00    0.00     0.00    0.00     0.00     0.00   0.00    0.00
     0.00    0.00    0.00    0.00   0.00
loop6            0.02     0.37     0.00   0.00    0.70    18.70    0.00     0.00     0.00   0.00    0.00     0.00    0.00     0.00     0.00   0.00    0.00
     0.00    0.00    0.00    0.00   0.00
loop7            0.57     1.73     0.00   0.00    0.05     3.01    0.00     0.00     0.00   0.00    0.00     0.00    0.00     0.00     0.00   0.00    0.00
     0.00    0.00    0.00    0.00   0.00
loop8            0.24     8.82     0.00   0.00    0.77    36.21    0.00     0.00     0.00   0.00    0.00     0.00    0.00     0.00     0.00   0.00    0.00
     0.00    0.00    0.00    0.00   0.03
loop9            0.02     0.12     0.00   0.00    0.53     8.04    0.00     0.00     0.00   0.00    0.00     0.00    0.00     0.00     0.00   0.00    0.00
     0.00    0.00    0.00    0.00   0.00
sda              6.16   349.72     1.38  18.29    0.59    56.82    1.96   160.40     3.49  64.05    2.10    81.82    0.00     0.00     0.00   0.00    0.00
```

(5) Options and Flags of iostat (Explained in Simple Terms)

Below are commonly used options you can include in your assignment:

1. -x (Extended statistics)

Shows in-depth data such as utilization percentage, average wait time, and more.

2. -d (Disk-only statistics)

Displays only disk statistics without CPU info.

3. -p (Show statistics per partition)

Useful for checking specific storage partitions.

4. -k or -m (Show data in KB or MB)

iostat -x -m

Makes the output easier to read.

5. Interval and Count

iostat -x 3 4

Runs every 3 seconds, for 4 cycles.

6. -t (Show timestamp)

Adds a timestamp to the output.

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(6) Meaning of Some Important Columns in iostat -x

- **r/s** – Reads per second
- **w/s** – Writes per second
- **rsec/s & wsec/s** – Sectors read/written per second
- **await** – Total average time for I/O requests (in milliseconds)
- **svctm** – Service time per request
- **%util** – How busy the device is (100% = fully overloaded)

Sources

- Linux Sysstat Documentation
- man iostat in Ubuntu Terminal
- https://github.com/sysstat/sysstat