How to Configure Swap Space in Ubuntu 24.04?

Article Number: 135 | Rating: Unrated | Last Updated: Thu, Sep 25, 2025 at 12:34 PM

Prerequisites

Before starting, ensure you have:

- Ubuntu 24.04 is installed and running
- Terminal access with sudo privileges
- Sufficient disk space for the swap file (usually 1-2 times your RAM size)
- Basic understanding of command-line operations

Step 1: Check Current Memory and Swap Status

First, examine your system's current memory configuration to understand what resources are already available.

1.1 View the current memory usage, including any existing swap:

```
sudo free -h
```

```
                :~# sudo free -h
               total        used        free      shared  buff/cache   available
Mem:           961Mi       345Mi       197Mi       2.4Mi       587Mi       615Mi
Swap:             0B          0B          0B
```

The swap total is 0B, which means no swap is enabled.

This command displays memory information in a human-readable format. You'll see output similar to above:

1.2 Check specifically for active swap spaces:

```
sudo swapon --show
```

If no output appears, your system does not have any active swap files or partitions. If you see output, it displays currently active swap spaces, along with their sizes and priorities.

1.3 Verify available disk space to ensure you have enough room for the swap file:

```
df -h
```

```
                :~# df -h
Filesystem      Size  Used Avail Use% Mounted on
tmpfs            97M  944K   96M   1% /run
/dev/vda2        24G  4.4G   18G  20% /
tmpfs           481M     0  481M   0% /dev/shm
tmpfs           5.0M     0  5.0M   0% /run/lock
tmpfs            97M   16K   97M   1% /run/user/0
```

Look for the root filesystem (/) and ensure you have adequate free space. A good rule of thumb is to have at least 1-2GB of free space beyond your intended swap size.

Step 2: Create the Swap File

Now, create a dedicated swap file. The size depends on your system's needs, but here are standard guidelines:

- **Systems with 2 GB RAM or less:** Create a swap equal to 2x RAM
- **Systems with 2-8 GB RAM:** Create a swap equal to the RAM size

- **Systems with 8 GB+ RAM:** Create 2-4GB swap (unless specific applications require more)

2.1 Create a 2GB swap file using the fallocate command:

```
sudo fallocate -l 2G /swapfile
```

No Direct Output

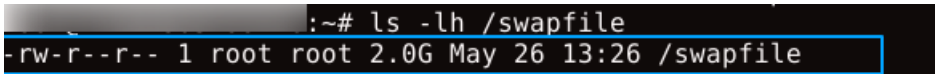
The fallocate command immediately allocates the specified space. If fallocate doesn't work, use the alternative dd method:

```
sudo dd if=/dev/zero of=/swapfile bs=1M count=2048
```

This creates the same 2GB file but may take longer as it writes zeros to the entire file.

2.2 Verify the file was created with the correct size:

```
ls -lh /swapfile
```



You should see output showing the file size as 2.0 G.

Step 3: Set Proper File Permissions

Swap files contain sensitive data from your system's memory, so securing them is crucial.

3.1 Set restrictive permissions so only the root user can read and write the file:

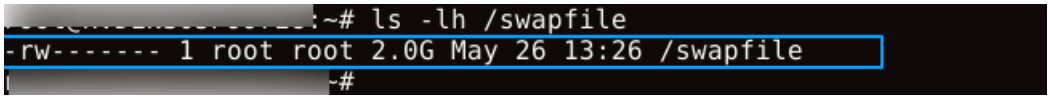
Sudo chmod with code 600 is used to keep any file private

```
sudo chmod 600 /swapfile
```

No Direct Output

3.2 Verify the permissions are correctly set:

```
ls -lh /swapfile
```



The output should show -rw-------, indicating only root has read/write access.

Step 4: Format and Enable the Swap File

Transform your regular file into a swap space that the system can use.

4.1 Format the file as swap space:

```
sudo mkswap /swapfile
```

```
[redacted]~# sudo mkswap /swapfile
Setting up swapspace version 1, size = 2 GiB (2147479552 bytes)
no label, UUID=71994504-9f0f-4b9f-8e0e-357967821a10
```

This command prepares the file for use as swap and displays information about the created swap space, including its UUID.

4.2 Enable the swap file for immediate use:

```
sudo swapon /swapfile
```

No Direct Output

4.3 Verify the swap is now active:

```
sudo swapon --show
```

```
[redacted]:~# sudo swapon --show
NAME      TYPE SIZE USED PRIO
/swapfile file   2G   0B   -2
```

You should see your new swap file listed with its size and priority.

4.4 Check the updated memory information:

```
sudo free -h
```

```
[redacted]~# sudo free -h
               total        used        free      shared  buff/cache   available
Mem:           961Mi       331Mi       210Mi       2.4Mi       588Mi       630Mi
Swap:          2.0Gi          0B       2.0Gi
```

The swap line should now show the additional space available.

Step 5: Set up Permanent Swap

Currently, your swap file is only active for this session. To ensure it remains active after reboots, add it to the system's file system table.

5.1 First, create a backup of the fstab file:

```
sudo cp /etc/fstab /etc/fstab.backup
```

No Direct Output

5.2 Add the swap file to the fstab configuration:

```
echo '/swapfile none swap sw 0 0' | sudo tee -a /etc/fstab
```

No Direct Output

This line instructs the system to mount the swap file at boot time automatically. The fields mean:

- /swapfile: The swap file location
- none: No mount point (swap doesn't mount to a directory)
- swap: File system type
- sw: Swap-specific mount options
- 0 0: No backup needed, no fsck required

Step 6: How to Optimize Swap?

Fine-tune your swap configuration for optimal performance based on your system's usage patterns.

Adjust Swappiness

Swappiness controls how aggressively the system uses swap space. The value ranges from 0 to 100:

- **0-10:** Minimal swapping, prefer RAM
- **10-50:** Moderate swapping for balanced performance
- **60 (default):** Aggressive swapping, suitable for desktops
- **90-100:** Very aggressive swapping

Check the current swappiness value:

6.1 cat /proc/sys/vm/swappiness

For servers or systems where you want to minimize swap usage, set a lower value:

```
sudo sysctl vm.swappiness=10
```

6.2 Make this change permanent by adding it to the sysctl configuration:

```
echo 'vm.swappiness=10' | sudo tee -a /etc/sysctl.conf
```

6.3 Adjust Cache Pressure

The cache pressure setting controls how quickly the system removes cached file system data. Lower values keep the cache longer, improving file system performance.

Check the current cache pressure:

```
cat /proc/sys/vm/vfs_cache_pressure
```

Set a more conservative value:

```
sudo sysctl vm.vfs_cache_pressure=50
```

Make this permanent:

```
echo 'vm.vfs_cache_pressure=50' | sudo tee -a /etc/sysctl.conf
```

Step 7: Test Your Swap Configuration

Verify everything is working correctly and will persist across reboots.

Test automatic mounting without rebooting:

```
sudo swapoff /swapfile
```

```
sudo swapon -a
```

The first command disables your swap file, and the second command enables all swap spaces listed in the fstab file. Check that your swap is active again:

```
sudo swapon --show
```

Monitor swap usage in real-time:

```
watch -n 1 'free -h'
```

Press Ctrl+C to exit the watch command.

Managing Swap Space

Disabling Swap (If Needed)

If you need to remove swap space later:

 # Disable the swap file

```
sudo swapoff /swapfile
```

 # Remove the file

```
sudo rm /swapfile
```

Remove the swap entry from fstab by editing the file:

```
sudo nano /etc/fstab
```

Delete the line containing /swapfile none swap sw 0 0.

Troubleshooting Common Issues

Issue: The fallocate command fails. **Solution:** Use the dd method instead, or check if your filesystem supports fallocate.

Issue: Swap file doesn't activate after reboot.**Solution:** Verify the fstab entry is correct and the file permissions are set to 600.

Issue: The System becomes slow after enabling swap.**Solution:** Reduce the swappiness value to minimize swap usage, or consider adding more RAM.

Issue: "Operation not permitted" when creating a swap file.**Solution:** Ensure you're using sudo and have sufficient disk space.

Best Practices

1. **Size appropriately:** Don't create unnecessarily large swap files(> 4G) that waste disk space.
2. **Monitor usage:** Regularly check swap usage to ensure it's helping rather than hindering performance.
3. **Consider SSD wear:** On systems with SSDs, monitor swap usage to avoid excessive wear on your storage device.
4. **Security:** Always set proper permissions on swap files to protect sensitive data.

5. **Backup fstab:** Always backup your fstab file before making changes.

Setting up swap space in Ubuntu 24.04 provides your system with extra memory when it becomes tight. Although Ubuntu now includes zram compression by default, traditional swap files still address real problems, especially for hibernation, low-memory systems, and resource-intensive applications.

Your new swap configuration will start automatically every time you boot up, helping prevent those frustrating moments when programs crash due to memory shortages.

Posted by: Saeed Nobakht - Thu, Sep 25, 2025 at 12:14 PM. This article has been viewed 28 times.

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