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Troubleshooting Disk Space Issues in Linux

Common Storage Issues

1. Disk Space Full

Symptoms:

- Error messages indicating that the disk is full.
- Inability to write files or install software.

Troubleshooting Steps:

Step 1: Identify Directories or Files Consuming Excessive Disk Space

- **Check Disk Usage:** Display available disk space:

```
df -h
```

- **Find Large Files:** Identify large files consuming space:

```
sudo du -ah / | sort -rh | head -n 20
```

- **Check File Sizes in Root Directory:**

```
du -sch /*
```

- **Find the Largest Files/Directories:**

```
du -Sh | sort -rh | head -5
```

```
du -a /dir/ | sort -n -r | head -n 20
```

```
du -sh /home/* | sort -rh | head -n 10
```

```
du -cks * | sort -rn | head
```

```
du -cks / | sort -rn | head
```

- **Find the Largest File Using `find`**

```
find /path/dir/ -type f -printf '%s %p\n' | sort -nr | head -20
```

- **Check File Sizes in a Known Directory:**

```
ls -lh
```

2. Disk Read/Write Errors

Symptoms:

- Input/output errors when accessing files.
- Slow performance or system hangs during disk operations.

Troubleshooting Steps:

- **Check Disk Health:**

```
sudo smartctl -a /dev/sda
```

- **Run Filesystem Check (`fsck`)**

```
sudo fsck /dev/sda1
```

- **Monitor Disk Activity:**

```
iostat  
iotop
```

3. LVM Issues

Symptoms:

- Logical volumes not available or showing incorrect sizes.
- Problems resizing volumes or extending volume groups.

Troubleshooting Steps:

- **Check LVM Status:**

```
lvdisplay  
vgdisplay  
pvdisplay
```

- **Resize Volumes:**

```
sudo lvextend -L +5G /dev/vgname/lvname  
sudo resize2fs /dev/vgname/lvname
```

Fixing a Full Disk

Step 2: Delete Unnecessary Files

- **Delete a Specific File:**

```
rm -rf filename.txt
```

- **Delete Multiple Files:**

```
rm -rf file2.txt work.txt code.txt
```

- **Delete All `.txt` Files in a Directory:**

```
rm -rf *.txt
```

- **Delete Files Older Than 7 Days:**

```
find /path/to/search -type f -mtime +7 -exec rm {} \;
```

Troubleshooting Inodes in Linux

Inodes store metadata about files, and running out of inodes can prevent new file creation even if disk space is available.

1. Check Inode Usage

```
df -i
```

◆ If **IUse%** is **100%**, your system has run out of inodes.

2. Identify Directories with High Inode Usage

```
for i in /*; do echo "$i: $(find "$i" -xdev -type f | wc -l)"; done | sort -nr -k2 | head -10
```

3. Count Files in a Directory

```
ls -l | wc -l
```

4. Find and Remove Small, Unnecessary Files

- Find Files Under 1KB:

```
find /path/to/directory -type f -size -1k
```

- Delete Specific File Types:

```
find /path/to/directory -type f -name "*.log" -delete
```

```
find /path/to/directory -type f -name "*.tmp" -exec rm -f {} \;
```

5. Check Filesystem Type and Disk Space

```
df -Th
```

6. Remove Empty Directories

```
find /path/to/directory -type d -empty -delete
```

7. Check and Repair the Filesystem

- **Identify the Affected Partition:**

```
df -hT
```

- **Run `fsck` on an Unmounted Partition:**

```
umount /dev/sdX  
fsck -fy /dev/sdX
```

(Replace `/dev/sdX` with the actual partition.)

8. Prevent Future Inode Exhaustion

✅ Use filesystems supporting **dynamic inode allocation** (like XFS). ✅ Store small files in **compressed archives**. ✅ Configure **log rotation**. ✅ Regularly monitor inode usage:

```
df -i
```

Preventive Measures

1. Regularly Monitor Disk Space

- Use disk monitoring tools and alerts to avoid unexpected full disks.

2. Implement Log Rotation

- Configure log rotation to limit excessive log growth.

3. Consider Disk Expansion

- If disk space frequently runs low, expand storage capacity or resize partitions.

Advanced Disk Diagnostics

- **Top 5 Disk Consumers:**

```
topdiskconsumer --limit 5 --path /
```

- **Filesystem & Disk Usage Overview:**

```
df -hTP /
```

Following these best practices ensures smooth operation and prevents critical disk space issues. 🚀