

LFCS: Storage (20%)

This section covers managing **LVM**, filesystems, remote storage, swap, automount, and monitoring storage performance.

Goals

Storage 20%

1. Configure and manage LVM storage
 2. Manage and configure the virtual file system
 3. Create, manage, and troubleshoot filesystems
 4. Use remote filesystems and network block devices
 5. Configure and manage swap space
 6. Configure filesystem automounters
 7. Monitor storage performance
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1. Configure and Manage LVM Storage

Learn

- Logical Volume Manager (LVM) basics: **PV**, **VG**, **LV**.
- Create, extend, and reduce logical volumes.

Commands

```
# Create physical volume  
sudo pvcreate /dev/sdb
```

```
# Create volume group
sudo vgcreate vg01 /dev/sdb

# Create logical volume
sudo lvcreate -L 10G -n lv01 vg01

# Extend logical volume
sudo lvextend -L +5G /dev/vg01/lv01
sudo resize2fs /dev/vg01/lv01

# Reduce logical volume (careful)
sudo umount /mnt
sudo e2fsck -f /dev/vg01/lv01
sudo resize2fs /dev/vg01/lv01 5G
sudo lvreduce -L 5G /dev/vg01/lv01
```

Exercises

1. Create a new LVM on a spare disk.
2. Extend the logical volume and verify the new size.

2. Manage and Configure the Virtual Filesystem

Learn

- Mount and unmount filesystems.
- Configure persistent mounts using `/etc/fstab`.

Commands

```
# Mount filesystem
sudo mount /dev/sdb1 /mnt
```

```
# Unmount filesystem
sudo umount /mnt

# Add to /etc/fstab for persistent mounting
/dev/sdb1 /mnt ext4 defaults 0 2
```

Exercises

1. Mount a new disk temporarily.
2. Add it to `/etc/fstab` for persistent mounting.

3. Create, Manage, and Troubleshoot Filesystems

Learn

- Create and repair filesystems (ext4, xfs, btrfs).
- Diagnose filesystem errors with `fsck`.

Commands

```
# Create filesystem
sudo mkfs.ext4 /dev/sdb1
sudo mkfs.xfs /dev/sdb2

# Check filesystem integrity
sudo fsck /dev/sdb1

# Repair filesystem
sudo fsck -y /dev/sdb1
```

Exercises

1. Format a partition as ext4.
 2. Simulate and repair a filesystem error.
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4. Use Remote Filesystems and Network Block Devices

Learn

- Mount **NFS**, **CIFS**, or **iSCSI** shares.
- Manage remote storage connections.

Commands

```
# Mount NFS
sudo mount -t nfs server:/share /mnt

# Mount CIFS (SMB)
sudo mount -t cifs //server/share /mnt -o username=user,password=pass

# iSCSI discovery and login
sudo iscsiadm -m discovery -t st -p 192.168.1.100
sudo iscsiadm -m node -l
```

Exercises

1. Mount an NFS share.
 2. Connect to an iSCSI target.
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5. Configure and Manage Swap Space

Learn

- Add, remove, and monitor swap space.

Commands

```
# Create swap file
sudo fallocate -l 2G /swapfile
sudo chmod 600 /swapfile
sudo mkswap /swapfile
sudo swapon /swapfile

# Make swap permanent
echo "/swapfile none swap sw 0 0" | sudo tee -a /etc/fstab

# Monitor swap usage
swapon -s
free -h
```

Exercises

1. Create a swap file and activate it.
 2. Remove the swap file and update `/etc/fstab`.
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6. Configure Filesystem Automounters

Learn

- Configure **autofs** to mount filesystems automatically when accessed.

Commands

```
# Install autofs
sudo apt install autofs

# Configure auto.master
sudo nano /etc/auto.master

# Example entry:
# /mnt /etc/auto.nfs

# Restart autofs
sudo systemctl restart autofs
```

Exercises

1. Configure automount for an NFS share.
 2. Test automount by accessing the directory.
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7. Monitor Storage Performance

Learn

- Use tools to monitor disk I/O and performance.

Commands

```
# Display I/O statistics
iostat -x 2 3

# Show disk usage
df -h

# Disk usage by directory
du -sh /var/log/*

# Monitor disk activity in real-time
iotop -o
```

Exercises

1. Check disk I/O using `iostat`.
 2. Identify large directories consuming storage space.
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☐☐ Exam Tips

- Understand **LVM creation, resizing, and removal**.
 - Know how to **mount local and remote filesystems permanently**.
 - Be able to **create and manage swap**.
 - Use **autofs** for automount configurations.
 - Monitor storage performance and identify I/O bottlenecks.
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Revision #2

Created 2025-11-07 10:37:00 UTC by Loïc

Updated 2025-11-07 14:14:00 UTC by Loïc