Operating System Fails to Load — Detailed Troubleshooting Guide

Scenario A — GRUB Bootloader Missing or Corrupted

This issue occurs when the bootloader is deleted, overwritten, or misconfigured. The system may stop at a GRUB rescue prompt or fail silently.

Identify Partitions

Use these commands to detect available disks and partitions before recovery.

```
lsblk -f
sudo fdisk -l
sudo blkid
```

Mounting the Linux System for Chroot

Mount the root partition and required directories.

```
sudo mkdir /mnt/recovery
sudo mount /dev/sdXn /mnt/recovery
sudo mount /dev/sdYp /mnt/recovery/boot
sudo mount /dev/sdZp /mnt/recovery/boot/efi
```

Bind Virtual Filesystems

Bind necessary system files to enable chroot.

```
for i in /dev /dev/pts /proc /sys /run; do
    sudo mount --bind $i /mnt/recovery$i
done
```

Enter Chroot

Switch into the mounted system.

```
sudo chroot /mnt/recovery /bin/bash
```

Reinstall GRUB (UEFI Mode)

Use this if your system boots using UEFI firmware.

```
mount -t efivarfs efivarfs /sys/firmware/efi/efivars
grub-install --target=x86_64-efi --efi-directory=/boot/efi --bootloader-id=GRUB
update-grub
```

Scenario B — Root Filesystem or Disk Mount Failure

This happens when the system cannot mount essential filesystem structures. It may drop to emergency mode or show kernel panic errors.

Filesystem Repair (EXT4)

Run fsck after unmounting the partition.

```
sudo umount /dev/sdXn
sudo e2fsck -f -y /dev/sdXn
```

Check Disk Health (SMART)

Use smartctl to diagnose bad sectors or disk failure.

```
sudo smartctl -a /dev/sdX
sudo smartctl -t long /dev/sdX
```

Handling LVM

If you use LVM-based installations.

```
sudo vgscan
sudo vgchange -ay
sudo lvdisplay
```

Fix Incorrect /etc/fstab

Incorrect UUIDs can prevent booting.

```
sudo blkid
sudo nano /mnt/recovery/etc/fstab
```