### **Step-by-Step Guide for Setting Up RAID 10 (1+0) on Linux**

RAID 10 (also called RAID 1+0) combines the features of **RAID 1** (mirroring) and **RAID 0** (striping). It provides redundancy with mirroring and improved performance with striping. RAID 10 requires **at least 4 disks** and is suitable for scenarios where both performance and data redundancy are critical.

### **Pre-requisites:**

* A Linux system (Ubuntu, CentOS, etc.).
* **At least 4 unformatted disks** (e.g., /dev/sdb, /dev/sdc, /dev/sdd, /dev/sde).
* A **root or sudo user** to execute commands.
* The mdadm utility installed (this is used to manage RAID arrays on Linux).

### **Step 1: Install mdadm (RAID Management Tool)**

**On Ubuntu/Debian**:  
  
 sudo apt update

sudo apt install mdadm

**On CentOS/RHEL**:  
  
 sudo yum install mdadm

### **Step 2: Prepare the Disks**

Before proceeding, ensure that the disks are unformatted. You can list the available disks with:

sudo lsblk

Identify the disks you want to use (e.g., /dev/sdb, /dev/sdc, /dev/sdd, /dev/sde). You can also use tools like fdisk or parted to create new partitions if necessary.

### **Step 3: Create the RAID 10 Array**

RAID 10 requires at least 4 disks. Here's how you create a RAID 10 array with these disks:

**Create the RAID 10 array** with four disks (/dev/sdb, /dev/sdc, /dev/sdd, /dev/sde):  
  
 sudo mdadm --create /dev/md0 --level=10 --raid-devices=4 /dev/sdb /dev/sdc /dev/sdd /dev/sde

* + /dev/md0: The name of the RAID array.
  + --level=10: Specifies RAID 10 (RAID 1+0, mirroring and striping).
  + --raid-devices=4: Defines the number of devices (disks) in the RAID array.
  + /dev/sdb /dev/sdc /dev/sdd /dev/sde: The disks you are adding to the array.

**Verify the RAID Array Creation**:  
  
 Once the array is created, you can verify the RAID array by running:  
  
 sudo mdadm --detail /dev/md0

1. This command will provide detailed information about the RAID array, including its status, number of disks, and size.

**Check RAID Array Status**:  
  
 To monitor the progress and status of the RAID array, you can use:  
  
 cat /proc/mdstat

1. This will show whether the RAID array is synchronizing or if it's healthy.

### **Step 4: Create a Filesystem on the RAID Array**

Once the RAID 10 array is created, you'll need to format it with a filesystem.

**Create an ext4 filesystem** on the RAID array:  
  
 sudo mkfs.ext4 /dev/md0

**Verify the filesystem**:  
  
 Use the following command to verify the filesystem and its UUID:  
  
 sudo blkid /dev/md0

1. This will display the filesystem type (e.g., ext4) and UUID of the RAID array.

### **Step 5: Mount the RAID Array**

Now, you need to mount the RAID 10 array to use it.

**Create a mount point**:  
  
 sudo mkdir /mnt/my\_raid10

**Mount the RAID array**:  
  
 sudo mount /dev/md0 /mnt/my\_raid10

**Verify the mount**:  
  
 To confirm that the RAID array is successfully mounted, run:  
  
 df -h

This will display the disk usage of mounted filesystems, confirming that the RAID 10 array is mounted.  
  
 Alternatively, use:  
  
 mount | grep /mnt/my\_raid10

1. This will check if the RAID array is mounted at the desired location.

### **Step 6: Make the Mount Persistent**

To ensure the RAID 10 array is automatically mounted after a reboot, you'll need to add an entry to /etc/fstab.

**Get the UUID of the RAID array**:  
  
 sudo blkid /dev/md0

Example output:  
  
 /dev/md0: UUID="f0953ff5-cd3b-47fb-bd9a-dc6693254b28" TYPE="ext4"

**Edit /etc/fstab to add the RAID array entry**:  
  
 sudo nano /etc/fstab

**Add the following line**:  
  
 UUID=f0953ff5-cd3b-47fb-bd9a-dc6693254b28 /mnt/my\_raid10 ext4 defaults 0 0

**Verify the fstab entry**:  
  
 After editing /etc/fstab, check if the RAID 10 array is listed for automatic mounting:  
  
 cat /etc/fstab

### **Step 7: Monitor the RAID Array (Optional)**

To check the health and status of your RAID 10 array periodically, you can use the following command:

**Monitor RAID array health**:  
  
 sudo mdadm --detail /dev/md0

1. This will provide detailed information about the RAID array, including its current status, devices, and RAID level.

### **Step 8: Remove the RAID Array (Optional)**

If you need to remove the RAID 10 array, follow these steps:

**Unmount the RAID array**:  
  
 sudo umount /mnt/my\_raid10

**Stop the RAID array**:  
  
 sudo mdadm --stop /dev/md0

**Remove the RAID array**:  
  
 sudo mdadm --remove /dev/md0

**Zero the superblock on the disks** (this removes the RAID metadata from the disks):  
  
 sudo mdadm --zero-superblock /dev/sdb1

sudo mdadm --zero-superblock /dev/sdc1

sudo mdadm --zero-superblock /dev/sdd1

sudo mdadm --zero-superblock /dev/sde1

### **Full Command Summary for RAID 10 Setup:**

1. **Install mdadm**:  
   * On Ubuntu/Debian: sudo apt install mdadm
   * On CentOS/RHEL: sudo yum install mdadm

**Create RAID 10 Array**:  
  
 sudo mdadm --create /dev/md0 --level=10 --raid-devices=4 /dev/sdb /dev/sdc /dev/sdd /dev/sde

**Verify RAID Array**:  
  
 sudo mdadm --detail /dev/md0

**Create Filesystem on RAID Array**:  
  
 sudo mkfs.ext4 /dev/md0

**Mount RAID Array**:  
  
 sudo mount /dev/md0 /mnt/my\_raid10

1. **Make Mount Persistent**:  
   * Get the UUID: sudo blkid /dev/md0
   * Edit /etc/fstab and add the entry.

**Monitor RAID Health** (Optional):  
  
 sudo mdadm --detail /dev/md0

### **Additional Notes:**

* **RAID 10 provides redundancy and performance**: It combines the benefits of both RAID 1 (data mirroring) and RAID 0 (data striping). It offers **high redundancy** (tolerates one drive failure in each mirrored pair) and **good performance**.
* **RAID 10 requires at least 4 disks**, and the array's size is the combined capacity of half of the disks (since each disk is mirrored).
* **Data Protection**: RAID 10 can tolerate the failure of one disk in each mirrored pair, but not the failure of two disks in the same mirrored pair.
* **Performance**: RAID 10 is faster than RAID 5 because there is no parity calculation overhead. It offers both improved read and write performance.

This guide should help you set up a **RAID 10 array** on your Linux system. If you have further questions or encounter issues, feel free to ask!