

# **ITAS 181 Lab 6**

## **Linux Server Deployment**

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## **Project Overview**

Objective: To manage storage configurations on Ubuntu Server, using both traditional RAID and next-gen ZFS file systems.

### **Project 6-1: Ubuntu Server Installation**

**The objective** of this activity was to set up Ubuntu Server Linux in a virtual machine.

→ **Virtual Machine & Ubuntu:**

- Set up a VM for Ubuntu Server on macOS.
- Explore post-installation LVM configurations.

→ **RAID Configuration:**

- Implement and understand RAID 5.
- Simulate and recover from drive failures.

→ **ZFS Configuration:**

- Install and set up ZFS with its advanced features.
- Understand ZFS storage types and handle disk corruptions.

### **6-2: Software RAID Configuration**

**The objective** of this activity was to set up a software RAID 5 volume in an Ubuntu Linux virtual machine, simulate a disk failure, recover, and dismantle the RAID setup.

Steps:

→ **Setup:**

- Log into the Ubuntu VM as root using password "LINUXrocks!".
- Shutdown the VM and add four 1 GB SATA/SAS virtual hard disks.

→ **RAID Configuration:**

- Boot the VM, log in, and check new disks with lsblk.
- Create a RAID 5 volume using mdadm.
- Confirm RAID 5 volume creation with /proc/mdstat and /etc/mdadm/mdadm.conf.
- 

```
root@ubuntu:/# lsblk
NAME                                MAJ:MIN RM  SIZE RO TYPE  MOUNTPOINTS
loop0                              7:0    0   59.2M  1 loop  /snap/core20/1977
loop1                              7:1    0   46.4M  1 loop  /snap/snapd/19459
loop2                              7:2    0  109.6M  1 loop  /snap/lxd/24326
sda                                8:0    0    50G   0 disk
├─sda1                             8:1    0     1G   0 part  /boot/efi
├─sda2                             8:2    0     2G   0 part  /boot
└─sda3                             8:3    0   46.9G   0 part
   └─ubuntu--vg-ubuntu--lv 253:0    0   46.9G   0 lvm    /
sdb                                8:16    0     1G   0 disk
└─md0                              9:0    0     3G   0 raid5  /data
sdc                                8:32    0     1G   0 disk
└─md0                              9:0    0     3G   0 raid5  /data
sdd                                8:48    0     1G   0 disk
└─md0                              9:0    0     3G   0 raid5  /data
sde                                8:64    0     1G   0 disk
└─md0                              9:0    0     3G   0 raid5  /data
sr0                                11:0    1    1.9G   0 rom
```

Figure 1 - Ubuntu Server Storage Configuration with RAID5 Setup

→ **Volume Setup:**

- Format the RAID volume with ext4.
- Create and mount the volume to /data.
- Copy the hosts file to the volume and inspect its contents.

→ **Verification:**

- Check the size of the RAID volume using df -hT.
- Confirm device associations with lsblk and blkid.
- Review the status of RAID devices with mdadm --detail.

```
[root@ubuntu:~# mdadm --detail /dev/md0
/dev/md0:
    Version : 1.2
  Creation Time : Tue Oct 17 00:23:19 2023
    Raid Level : raid5
    Array Size : 3139584 (2.99 GiB 3.21 GB)
  Used Dev Size : 1046528 (1022.00 MiB 1071.64 MB)
    Raid Devices : 4
  Total Devices : 4
  Persistence : Superblock is persistent

    Update Time : Tue Oct 17 00:25:58 2023
      State : clean
  Active Devices : 4
 Working Devices : 4
 Failed Devices : 0
  Spare Devices : 0


    Layout : left-symmetric
   Chunk Size : 512K

Consistency Policy : resync

        Name : ubuntu:0 (local to host ubuntu)
        UUID : 39fca228:803d276d:cda839b1:e81d1ac2
        Events : 18


   Number   Major   Minor   RaidDevice State   /dev/sdb
     0         8       16         0   active sync   /dev/sdb
     1         8       32         1   active sync   /dev/sdc
     2         8       48         2   active sync   /dev/sdd
     4         8       64         3   active sync   /dev/sde
```

Figure 2 - RAID5 Configuration Details for /dev/md0 on Ubuntu System

→ **Simulate Failure & Recovery:**

- Induce disk failure on /dev/sdc.
- Check file accessibility in /data.
- Remove and re-add /dev/sdc to the RAID, observing the rebuilding process.

→ **Cleanup:**

- Unmount the RAID volume and stop it.
- Remove RAID signatures from all devices using fdisk.
- Delete the RAID configuration file.
- Log out of the shell.

### **6-3: ZFS Configuration on Ubuntu**

The objective of this activity was to set up and manage the ZFS filesystem on Ubuntu, then remove it.

→ **Volume Setup:**

- Install ZFS and create 'data' volume on /dev/sdb.

→ **Verification:**

- Check the mounted volume at /data and review with zpool list and lsblk.

→ **Mirroring & RAID:**

- Create mirrored ZFS volume and RAID-Z configuration. Verify their statuses.

→ **Simulate Failure & Recovery:**

- Induce corruption on /dev/sdb1 and update ZFS status. Detach corrupted disk, attach a new one, and confirm mirror integrity.

→ **Directories & Datasets:**

- Make directories under /data and set up ZFS datasets. Validate dataset creation.

→ **Dataset Properties:**

- View and adjust dataset options, set quota and compression. Verify changes.

```
[root@ubuntu:~# zfs list
NAME                                USED  AVAIL    REFER  MOUNTPOINT
data                                311K  2.68G    32.9K  /data
data/databases                      32.9K  2.68G    32.9K  /data/databases
data/filestorage                    32.9K  2.68G    32.9K  /data/filestorage
data/webstorage                     32.9K  1024M    32.9K  /data/webstorage
root@ubuntu:~#
```

Figure 3 - ZFS dataset overview for 'data' and its sub-datasets on Ubuntu.

→ **Cleanup:**

- Remove ZFS data volume and partitions. Logout from the terminal.