Software Raid

Objectives:

- The student will be able to correctly define Raid levels 0,5,10.
- The student will be able to correctly implement software Raid levels 0,5,10.
- The student will be able to correctly rebuild a software Raid array.

Requirements:

You will follow the tasks below to correctly configure the RAID arrays.

Task 1 - Initial setup

Begin by making sure that you have a hard-drive in each slot. (It helps if they are about the same size)

Install an OS to your flash drive. The OS should be a GUI version of Ubuntu. It will be much easier to install an Operating System once (on a flash drive) rather than on the raid drives themselves. Otherwise, everytime you changed your RAID configuration you would likely be re-installing your OS. Boot your rack server from your flash drive. The easiest way to install to a flash drive is to use usb-creator-gtk from a linux instance and point it to the correct iso. Windows also has a nice utility (Universal USB Installer). You should reserve probably 1 GB or so for your persistent storage. A 4GB flash drive ought to be sufficient. Spring 2017, I followed the instructions here to create a persistent Ubuntu.

Make sure that the SATA mode is AHCI. We won’t use fake-raid.

Task 2 - Striping

Description

Use the appropriate commands and stripe 2 of the disks together.

Format the new array as ext4.

Mount the partition.

Grab output of `df` and relevant `mount` output (i.e. `mount | grep sda`)

Benchmarking

If you have a gui version of linux installed, you can use ubuntu’s built-in disk utility to benchmark minimum read and write speeds. And it will display it to you in a nice colorful, graphical format! (This is the preferred way to benchmark).

Do some benchmark tests. I don’t care what you choose, but you should do at least 3 benchmark tests for each Raid Array you build. Tweak the numbers how you would like and examine the results. (Take note that whatever numbers you choose, you should use for each new Raid build so we can compare apples to apples). For example, if I choose 100 samples of 20MiB for Transfer rate, I should use those numbers in both my Raid0, Raid5, and Raid 10 tests.

Screen capture the results of all your benchmark tests.

Rebuilding

One of the main purposes of RAID is redundancy in case of a drive failure. We need to see what happens as we fail. Make sure that you have done the other requirements above and correctly recorded the output as defined in the pass off section below before you attempt this section, else you may end up with an unusable RAID state and have to start over again. (Note: If you are doing striping, there IS no redundant data, so you CAN’T rebuild anything... You may skip this entire section on rebuilding for striping ONLY)
Physically or via `mdadm` remove a drive that is participating in your RAID array.

Now that you have removed a drive, your RAID array should be broken, let's now try to resurrect our stuff. Note that at this point, if you do the appropriate command you should see a status of `DEGRADED` or `Broken` for your array (screen capture that).

Before you re-insert the disk, re-run your benchmark i/o tests with the disk utility and record your results.

Re-insert and scan for the newly inserted disk.

It may take a while for your unit to rebuild. Screen capture the status of your array again.

**Task 3 - Raid 10**

You guessed it. Do a raid 10 configuration. Clean old raid configs, Remount, benchmark and rebuild.

**Task 4 - Raid 5**

Do a raid5 configuration. Clean old raid configs, Remount, benchmark and rebuild.

**Task 5 - Results**

Finally, compare and contrast the results of your benchmarks of raid0, raid5, and raid10. You should discuss the following:

- Which one has the best read speeds?
- What about write speeds?
- You should probably talk about which level you would choose for particular applications.
- Anything you did differently above
- Anything else you learned

This should follow appropriate technical report-writing conventions. Make sure that you include a cover page and that you have subdivided your report into appropriate sections using subheadings and headings as appropriate.

Any of your screen captures from above should be an appendix to this report. Make it neat and legible as if you were submitting this to your CEO so he could decide what to buy!!