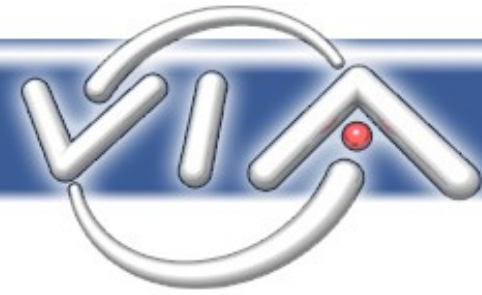# Manage your disk space... for free :)

Julien Wallior

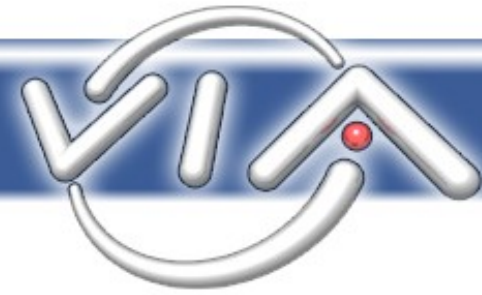Plug Central
11.1.2006

Agenda

- Background

- RAID

  - Some basics
  - Practice
  - Booting on a raid device

- LVM

  - What is that?
  - How it works

- Hardware raid... if you really want it

Background

- Just got out of college
  - I don't want a pay for anything
  - I don't need that much performance
  - If it breaks... it's my problem

- Does it mean this presentation is useless?
  - Of course not...
  - I've been using these technologies for two years without issue
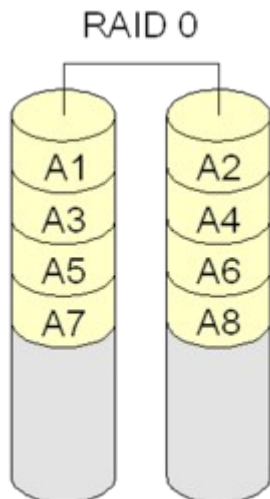
RAID: The Basics

- Redundant Array of Inexpensive Disks

- Two usage:

  - Performance

  - Redundancy

- Different RAID level depending on your needs
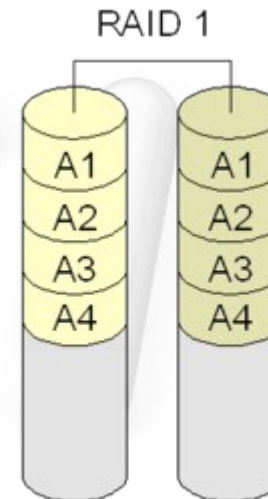
  - Tradeoffs

Basic Levels

- ## RAID 0 (stripping)
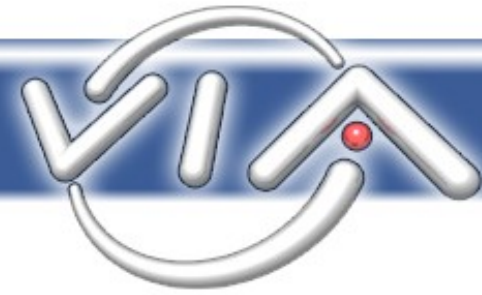
  - Performance ++
  - Redundancy --

- ## RAID 1 (mirroring)
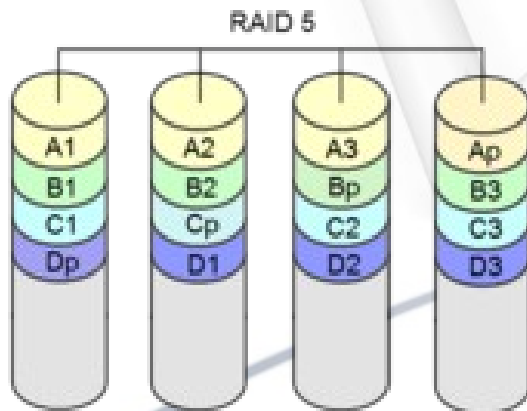
  - Performance
    - Read ++
    - Write --
  - Redundancy ++

Fancier (or Funkier)

- ## RAID 5
  - ### – Distributed Parity
    - Performance
      - Read ++
      - Write -
    - Redundancy +

- ## Less popular
  - ### – Dedicated parity disk
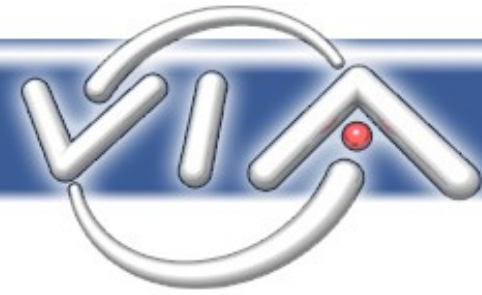   - RAID 3
      - – Byte level stripping
    - RAID 4
      - – Block level stripping
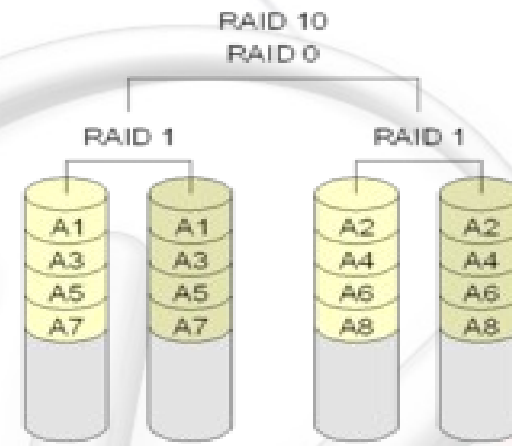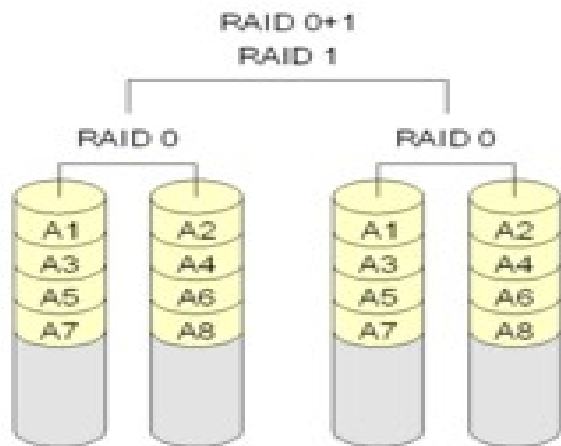 - ### – Two parity disks
    - RAID 6
      - – Like RAID 5

The Combos

- ## RAID 0+1
- ## RAID 1+0

What's the difference???
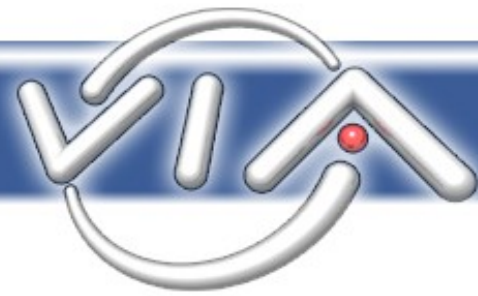
mdadm...

- Some nice features:
  - integrated in the OS
  - spare drives
  - email when a disk fails
  - periodic rebuild
- Enough theory for now...

Let's play a little bit

- ## Create a raid 5 array with one hot spare

  - mdadm --create /dev/md0 --raid-devices=3 --spare-device=1 --level=5 /dev/ram0 /dev/ram1 /dev/ram2 /dev/ram3

- ## Check the state of the array

  - mdadm --detail /dev/md0

  - cat /proc/mdstat

- ## Simulate a drive failure

  - mdadm --manage /dev/md0 --set-faulty /dev/ram0

Let's play a little bit
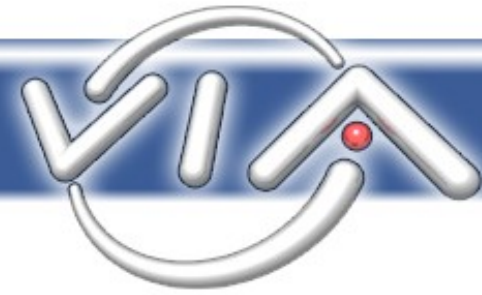
- ## Hot remove a drive
    - mdadm --manage /dev/md0 --remove /dev/ram0

- ## Hot add a drive
    - mdadm --manage /dev/md0 --add /dev/ram4

- ## Some performance measurements
    - Raid 5 vs Raid 1 write: 7 times slower !
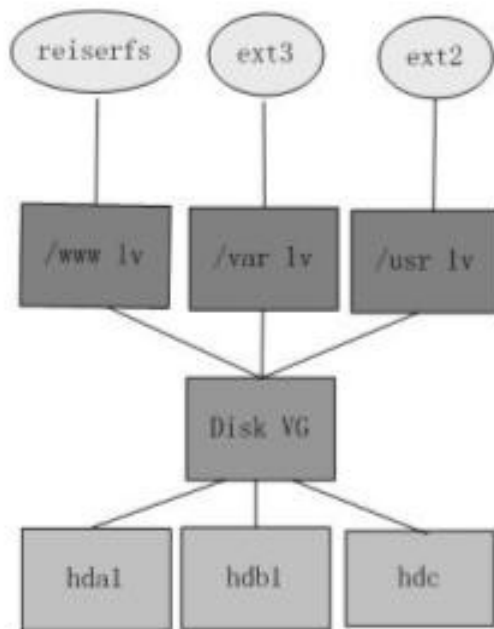
Booting on it?

- It works...

- Little tricky grub setup (mbr not mirrored)

  - grub> device (hd0) /dev/hda

  - grub> root (hd0,0)

  - grub> setup (hd0)

  - grub> device (hd0) /dev/hdb

  - grub> root (hd0,0)

  - grub> setup (hd0)

  - grub> exit

LVM: what is that?

- Logical Volume Manager

- LVM2 is standard in kernel 2.6

- Physical volume (pv...)
- Volume group (vg...)
- Logical volume (lv...)
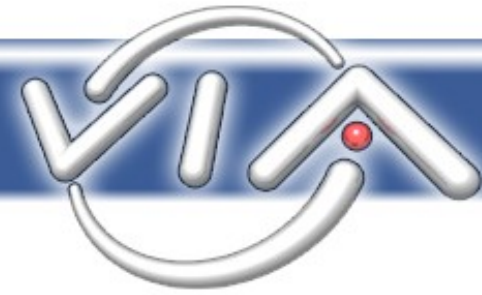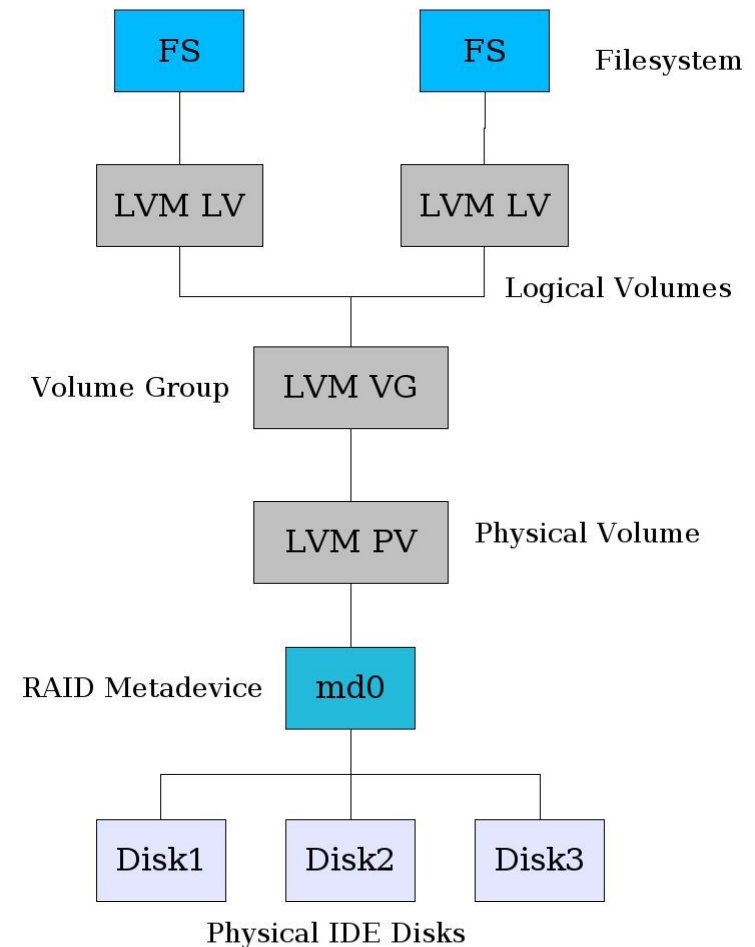
- Partition spread across multiple disks

  - different than RAID0 (no stripping)

- Resize partition of the fly

  - you just need to unmount it

  - don't forget to resize the filesystem (resize2fs)

- Snapshots

  - very useful for backups

  - requires free space in the volume group

Let's see something

- Enough talking...
  - Our goal:
    - RAID for redundancy
    - LVM for flexibility

- Demo...

FS — FS — Filesystem

LVM LV — LVM LV — Logical Volumes

Volume Group — LVM VG

LVM PV — Physical Volume

RAID Metadevice — md0

Disk1 — Disk2 — Disk3

Physical IDE Disks

Physical Volume

- ## Creation

  - ### pvcreate /dev/md0

- ## Get config

  - ### pvs

Volume group

- ## Creation

  - ### vgcreate vg1 /dev/md0

- ## Get config

  - ### vgs

- ## Add a new physical volume

  - ### vgextend vg1 /dev/ram5

Logical volume

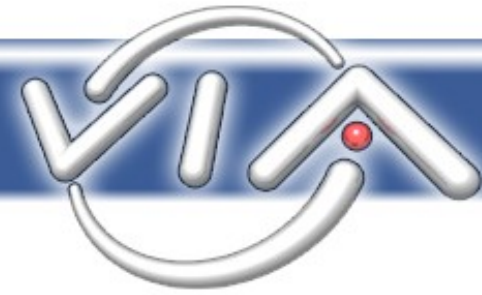- ## Creation

  - lvcreate --name lv1 --size 80M vg1

  - mkfs.ext3 /dev/mapper/vg1-lv1

  - mount /dev/mapper/vg1-lv1 /mnt

- ## Get state

  - lvs

- ## Resize

  - resize2fs /dev/mapper/vg1-lv1 80M (don't forget it)

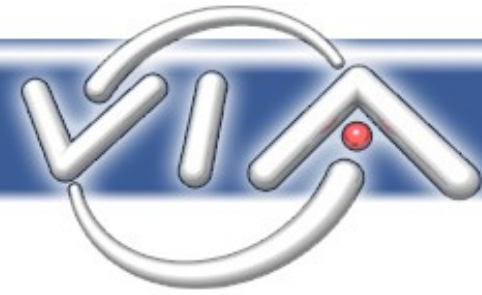 - lvresize -L -20M /dev/vg1/lv1

Snapshot

- Takes a snapshot of a logical volume

    - modprobe dm-snapshot

- Creation

    - lvcreate --snapshot --name lv1-snapshot1 --size 80M /dev/vg1/lv1

- Deletion

    - lvremove /dev/vg1/lv1-snapshot1

Hardware

- Better performances... more expensive

- On HP Proliant servers

- Utility hpacucli for linux

  - ctrl slot=0 pd all show

  - ctrl slot=0 ld all show

  - ctrl slot=0 create type=ld drives=2:0,2:1 raid=1

- Hot plug and hot swap the disks...

- Basically it works and it's no fun at all :)

Conclusion

- Personal experience:

  - You can really do a lot

  - Excellent mean to learn how it works

  - It's amazing how well it works

- Sorry for the french accent :)

- One last thing: make a backup before messing around with these things.

Thank you

Questions ?