Welcome To:
Module 8

Disk Management and Run Levels

System Run Level

- System Run Levels

Main Run level

- 0   Shut down (or halt) the system
- 1   Single-user mode; usually aliased as s or S
- 6   Reboot the system

Other Run levels

- 2   Multiuser mode without networking
- 3   Multiuser mode with networking
- 5   Multiuser mode with networking and GUI.

Linux Boot Process

BIOS	Basic Input/Output System executes MBR
MBR	Master Boot Record executes GRUB
GRUB	Grand Unified Bootloader executes Kernel
Kernel	Kernel executes /sbin/init
Init	Init executes runlevel programs
Runlevel	Runlevel programs are executed from /etc/ rc.d/rc*.d/

File Transfer

- `ftp`
- `scp`
- `rsync`

By: Imran Afzal

Message of the Day

- Message of the day file location
  - **/etc/motd**

Customize Message of the Day

- Once again, message of the day is the first message users will see when they login to the Linux machine

- Steps:
  - Create a new file in **/etc/profile.d/motd.sh**
  - Add desired commands in motd.sh file
  - Modify the **/etc/ssh/sshd_config** file to edit

    #PrintMotd yes to **PrintMotd no**
  - Restart sshd service
    - **systemctl restart sshd.service**

Disk Partition

- Commands for disk partition
  - `df`
  - `fdisk`

By: Imran Afzal

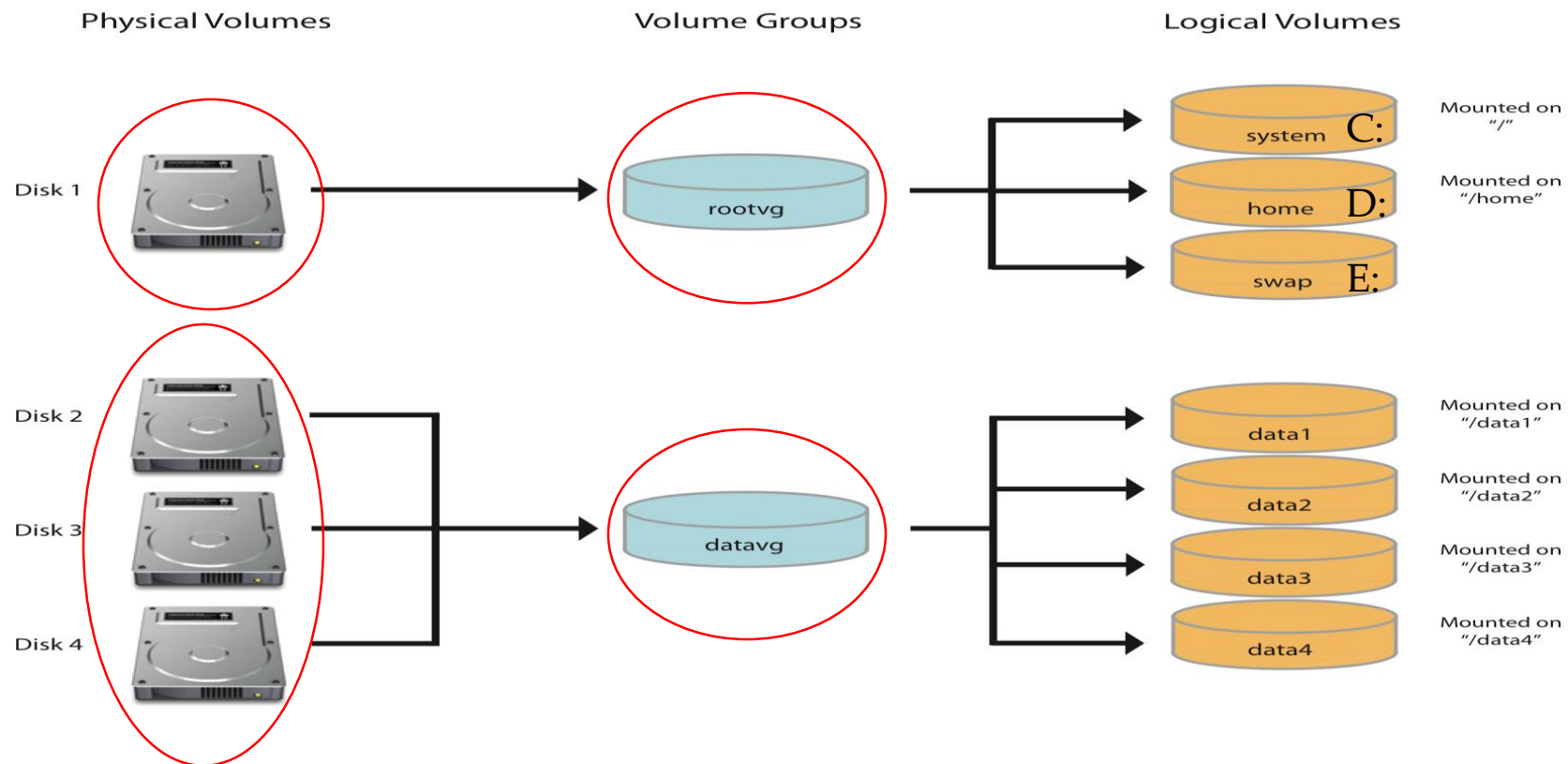# Adding Disk and Creating Partition

- Purpose? = Out of Space, Additional Apps etc.

- Commands for disk partition
  - `df`
  - `fdisk`

Storage

- Local Storage
- SAN (Storage Area Network)
- NAS (Network Attached Storage)

By: Imran Afzal

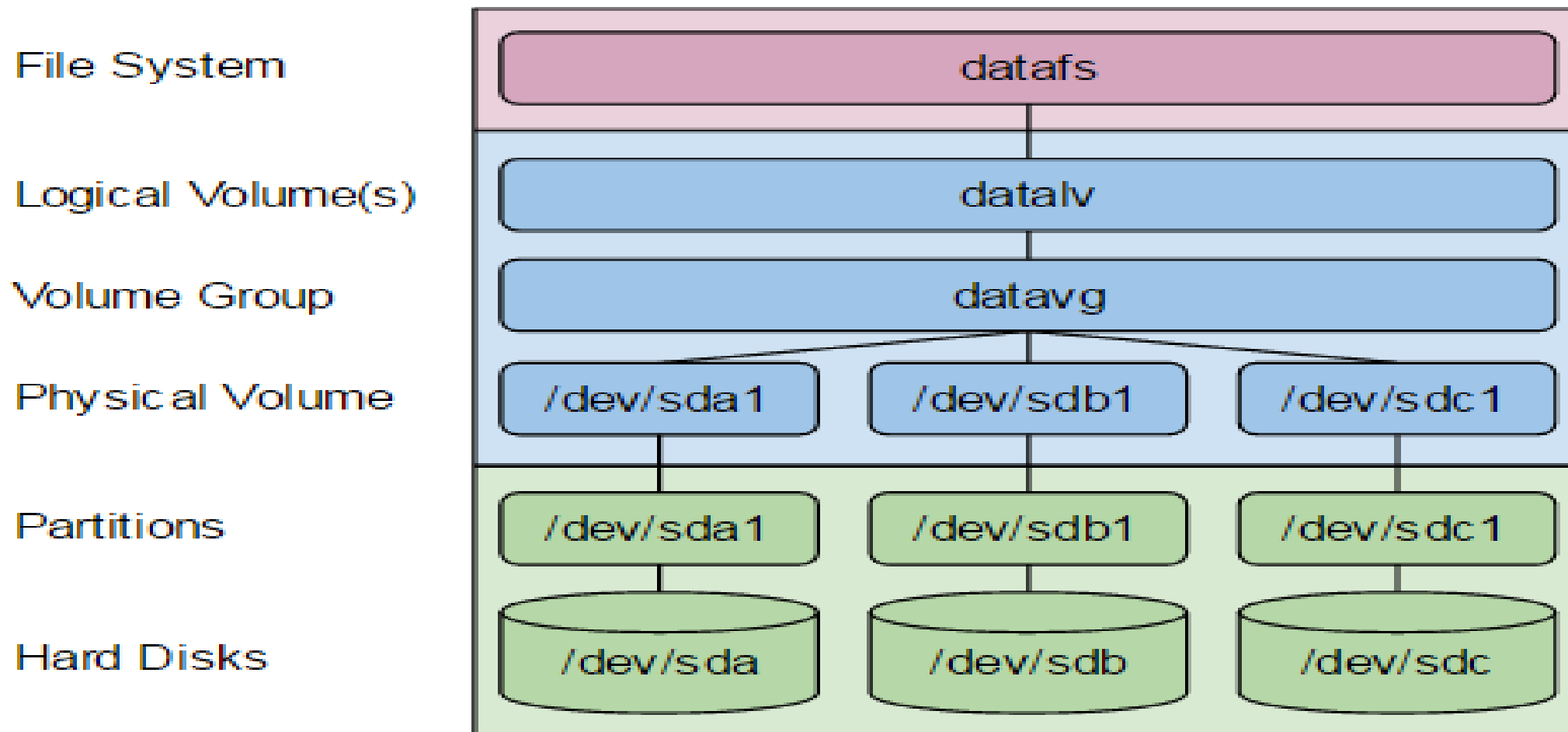# Logical Volume Management (LVM)

- LVM allows disks to be combined together

LVM Configuration During Install

- Install Linux CentOS with LVM configuration

Add Disk and Create LVM Partition

By: Imran Afzal

Add and Extend Disk using LVM

/oracle = 1.0G
/oracle = Full

Few Options:
- Delete older files to free up disk space
- Add new physical disk mount to /oracle2
- Create a new virtual disk and mount to /oracle2
- Or extend /oracle through LVM.

Add/Extend Swap Space

- What is swap? – CentOS.org

   Swap space in Linux is used when the amount of physical memory (RAM) is full. If the system needs more memory resources and the RAM is full, inactive pages in memory are moved to the swap space. While swap space can help machines with a small amount of RAM, it should not be considered a replacement for more RAM. Swap space is located on hard drives, which have a slower access time than physical memory

- Recommended swap size = Twice the size of RAM

   M = Amount of RAM in GB, and S = Amount of swap in GB, then
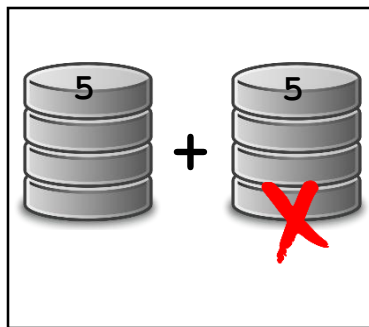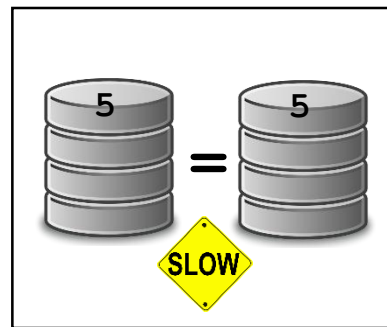
   If M < 2
   then   S = M * 2
   Else   S = M + 2

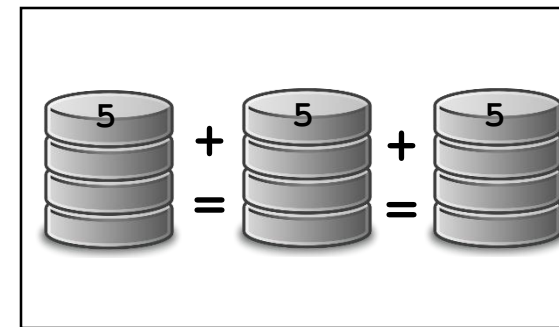- Commands
  - dd
  - mkswap
  - swapon or swapoff

By: Imran Afzal

RAID

- RAID (Redundant Array of Independent Disks)

- Type of RAID
    - **RAID0**
    - **RAID1**
    - **RAID5**

RAID0	RAID1	RAID5
5+5=10G	5,5=5G	5+5+5=12G

- Linux fsck utility is used to check and repair Linux filesystems (**`ext2`**, **`ext3`**, **`ext4`**, **`etc.`**)
- Linux xfs_repair utility is used to check and repair Linux filesystems for **`xfs`** filesystem type
- Depending on when was the last time a file system was checked, the system runs the fsck during boot time to check whether the filesystem is in consistent state
- System administrator could also run it manually when there is a problem with the filesystems
- Make sure to execute the fsck on an **unmounted** file systems to avoid any data corruption issues.

- Force a filesystem check even if it's clean using option –f

- Attempt to fix detected problems automatically using option –y

- The xfs_repair utility is highly scalable and is designed to repair even very large file systems with many inodes efficiently. Unlike other Linux file systems, xfs_repair does not run at boot time

- The following are the possible <u>exit codes</u> for fsck command

  - 0 – No errors
  - 1 – Filesystem errors corrected
  - 2 – System should be rebooted
  - 4 – Filesystem errors left uncorrected
  - 8 – Operational error
  - 16 – Usage or syntax error
  - 32 – Fsck canceled by user request
  - 128 – Shared-library error

System Backup (dd Command)

5 Different Types of Backups

1. System backup (entire image using tools such as acronis, Veeam, Commvault etc.)

2. Application backup (3rd party application backup solution)

3. Database backup (Oracle dataguard, SQL backup etc.)

4. Filesystem backup (tar, gzip directoris etc.)

5. Disk backup or disk cloning (dd command)

- dd is a command-line utility for Unix and Unix-like operating systems whose primary purpose is to convert and copy files

- As a result, dd can be used for tasks such as backing up the boot sector of a hard drive, and obtaining a fixed amount of random data

- Please note the source and destination disk should be the same size

System Backup (dd Command)…

- To backup or clone an entire hard disk to another hard disk connected to the same system, execute the dd command as shown

```
# dd if=<source file name> of=<target file name> [Options]
# dd if=/dev/sda of=/dev/sdb
```

- To backup/copy the disk partition

```
# dd if =/dev/sda1 of=/root/sda1.img
```

- Restoring this image file to other machine after copying the .img

```
# dd if=/root/sda1.img of=/dev/sdb3
```

Network File System (NFS)

- NFS stands for Network File System, a file system developed by Sun Microsystems, Inc.

- It is a client/server system that allows users to access files across a network and treat them as if they resided in a local file directory

- For example, if you were using a computer linked to a second computer via NFS, you could access files on the second computer as if they resided in a directory on the first computer. This is accomplished through the processes of exporting (the process by which an NFS server provides remote clients with access to its files) and mounting (the process by which client map NFS shared filesystem)

Approved

NFS Request

Server

Client
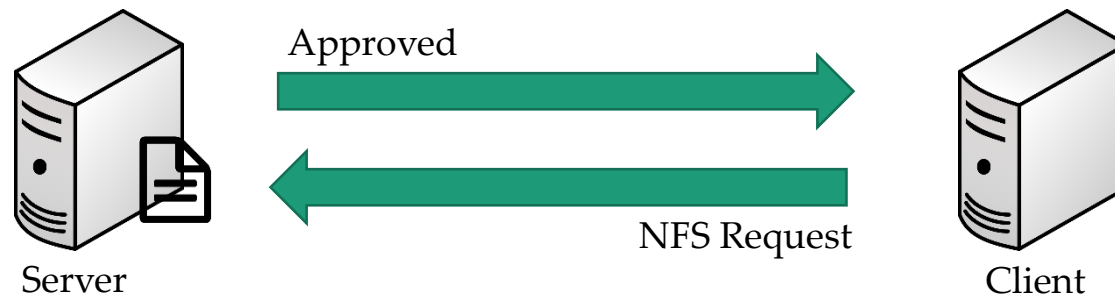
Network File System (NFS)…

Steps for NFS Server Configuration

- Install NFS packages

    `# yum install nfs-utils libnfsidmap` *(most likely they are installed)*

- Once the packages are installed, enable and start NFS services

    `# systemctl enable rpcbind`

    `# systemctl enable nfs-server`

    `# systemctl start rpcbind, nfs-server, rpc-statd, nfs-idmapd`

- Create NFS share directory and assign permissions

    `# mkdir /mypretzels`

    `# chmod a+rwx /mypretzels`

- Modify **/etc/exports** file to add new shared filesystem

    `#` `/mypretzels` `192.168.12.7` `(rw,` `sync,` `no_root_squash) = for only 1 host`

    Read/write

    all changes to the according filesystem are immediately flushed to disk; the respective write operations are being waited for

    `# /mypretzels *(rw,sync,no_root_squash) = for everyone`

- Export the NFS filesystem

    `# exportfs -rv`

    NFS share

    IP address of client machine

    root on the client machine will have the same level of access to the files on the system as root on the server.

Steps for NFS Client Configuration

- Install NFS packages

  ```
  # yum install nfs-utils rpcbind
  ```
- Once the packages are installed enable and start rpcbind service

  ```
  # systemctl rpcbind start
  ```
- Make sure firewalld or iptables stopped (if running)

  ```
  # ps -ef | egrep "firewall|iptable"
  ```
- Show mount from the NFS server

  ```
  # showmount -e 192.168.1.5 (NFS Server IP)
  ```
- Create a mount point

  ```
  # mkdir /mnt/kramer
  ```
- Mount the NFS filesystem

  ```
  # mount 192.168.1.5:/mypretzels /mnt/kramer
  ```
- Verify mounted filesystem

  ```
  # df -h
  ```
- To unmount

  ```
  # umount /mnt/kramer
  ```