

Intro to Shell

Home Directory - /home/matt

- Unique to user
- ~ tilde symbol

Commands and Arguments

- Example command echo
- Needs an argument after it e.g.
i.e. echo hello
- Command Options & Arguments
 - options look like -n, -v, -e
- Command types
 - Internal - echo, cd, pwd
 - External - mv, date, uptime, cp
 - Can find out using type command
- Start out in home directory
 - pwd - prints working directory
 - ls - list contents of current directory
 - mkdir - make directory
- needs parent dir or -p option
 - i.e. if /India dir. doesn't exist
/India/India: mkdir -p
- Absolute vs. relative paths
 - pushd or popd
- mv - move file or directory
- cp - copy file and directory
- cat - concatenate files together
 - cat > blah.txt - add text to file
 - ctrl d to leave / cat >> to append
- touch - create new file

- More about text
- Pagers - used to present stuff
 - more - look at text file
 - space - scroll one screen
 - enter - scroll one line
 - b - scroll back one screen
 - / - search text
 - less - look at text files
 - Up Arrow - scroll up one line
 - Down Arrow - scroll down one line
 - / - search text
 - Long List = ls -l
 - List all (hidden too) - ls -a
 - List in order created - ls -lt
 - List in reverse order created - ls -ltr
 - Getting help
 - Whatis Command
 - whatis date - simple info
 - man date - more info
 - date --help - info on command
 - apropos modprobe - more info

- Shell types
- Bourne Shell - sh
 - C Shell - csh or tcsh
 - Korn Shell - ksh
 - Z Shell - zsh
 - Bourne Again Shell - bash
 - echo \$~~shell~~ \$SHELL
 - Chsh to change shell

Bash Shell Features

- Auto complete w/ tab key then space
- Alias - alias dt= date
- history - see previous run command
- variables - environment variable
- Environmental Variable - example \$SHELL
- Export command - set variables
- export OFFICE = aleston
- env command - show all env variables
- can set w/o export, but do not persist
- set variables in .profile
- PATH variable, : separated, stores all folders to look for commands
- which command shows paths to commands
- export PATH=\$PATH:/opt/local/bin
- update prompt with \$PS1 variable
PS1 = "ubuntu-server: ~\\$ "
- PS1 = "[`id`@`hostname`:`pwd`]\\$ "

Linux Core Concepts

- Linux Kernel
 - uname command
 - uname -r prints version
 - 4.15.0-72-generic
 - Kernel Ver major ver Minor Ver Patch Rel. Distro Spec.
- Kernel Space vs. User Space
 - Kernel + Drivers
 - Applications
- Attaching to flash drive → /dev
- Use dmsetup command for hardware info
- udevadm to monitor - monitors hw events
- lsusb - lists pci devices
- lsblk - shows hardware info / partitions
- physical disk → sda
- lscpu - list cpu info
- lsmem --summary - memory info
- free -m shows more mem info
- lshw - detailed info for hardware
- Boot Order
 - BIOS Post
- Boot Loader (GRUB2 or others)
- Kernel Initialization
- Init Process (Systemd)
 - ls -l /sbin/init to see info
- Run Levels
 - runlevel gives a #
 - CVS(b)us cmd line(3) etc
 - 5 = GUI, 3 = multi user cmd line
- systemctl get-default symbolic link to runlevel
- Systemctl Set-default multi-user.target graphical
- 0 = poweroff, 1 = rescue, 2/multiuser, 5 = GUI, 6 = reboot

File Types

- Every object in Linux is a file
- Character Files - get information from device
- Block Files - store large amounts of data
- Links → Hard Link or Soft Link
- Regular Files
- Directory - used to store other files
- Socket File - Communicate b/w proc.
- Named Pipes - Connect processes /uni-directional
- File Command shows file type
 - or ls -l / first letter (- for reg. file)

/bin - internal binaries

/boot

/dev - files for devices connected to pc

/etc - stores most config files

/home - home directory for all users except /root

/lib - shared libraries

/media - external media mount locations

/mnt - mount locations

/opt - third party program install location (cd - h P)

/tmp - stores temporary data

/usr - user applications

/var - logs and cached data

Package Management

DPKG / APT / ^{APT-CACHE}APT for Ubuntu / Debian / Mint

RPM / YUM / ^{DNF}DNF RHEL / CentOS / Fedora

CentOS = Community branch of RHEL

- Software package is all files needed
for a software to run.

- Binaries, metadata, config files
- Advantages = Integrity + Authenticity of Software
Simplified Package Management

Grouping Packages

Manage Dependencies

- RPM

- Install rpm -ivh telnet.rpm

- Uninstall rpm -e telnet.rpm

- Upgrade rpm -Uvh telnet.rpm

- Query rpm -q telnet.rpm

- Verifying rpm -Vf <path to file>

- YUM for RPM based distros

- yum.repos.d in /etc = repos

- handles dependencies

- add repositories /etc/yum/repos.d/inserv.repo

- yum install httpd

- y flag to skip prompt

- yum repolist See added repos

- yum provides SCP - see what package provides

- yum remove httpd

- yum update httpd

- yum update [global update]

- DPKG
 - Install - `dpkg -i telnet.deb`
 - Uninstall - `dpkg -r telnet.deb`
 - List - `dpkg -l telnet`
 - Status - `dpkg -S telnet`
 - Verify - `dpkg -v < path to file >`
- APT / APT-GUI
 - Software Repo - `/etc/sources.list`
 - `apt update` - refresh repository
 - `apt upgrade` - install available upgrades
 - `apt edit-sources` - change sources
 - `apt install telnet`
 - `apt remove telnet`
 - `apt search telnet`
 - `apt list | grep telnet`
- Viewing File Size
 - `du -sk testing` → 100000
 - `du -sh testing` → 98M
 - `ls -lh testing` → detailed info
- Archiving Files
 - `tar -cf test.tar file1 file2 file3`
 - `tar -tf test.tar` → files listed
 - `tar -xf test.tar` → extracts
 - `tar -Zcf test.tar file1 file2 file3` → compress
- Compression Options
 - bzip2 · bz3 · bunzip2
 - gzip · j2 · gunzip
 - xz · x2 · unxz
 - 7zcat / b7zcat / xzcat - needs converted paths

Searching for files/directories

- locate City.txt
 - may not show recent files
 - updatedb - will update database
- find /home/michael -name City.txt
- Grep - find in files
 - grep second sample.txt
 - prints only lines w/ "second"
 - -i flag for insensitive case
 - -r recursive search
 - grep -r "third line" /home/michael
 - -v search lines w/o str.
 - grep -v "printed" sample.txt
 - g-w whole word
 - grep -w exam example.txt
 - -A - line below + pattern
 - grep -A1 Arsenal results.txt
 - -B - line above + pattern
 - grep -B1 4 results.txt
- TO Redirection
 - Standard Input - echo \$SHELL > shell.txt
 - Standard Output
 - Standard Error - cat missingfile.txt 2>err.txt
 - /dev/null dump unneeded text here
- ~~process~~ Pipes
 - connect 1 command to another
 - grep Hello sample.txt | less
 - tee and tee - a (append)
 - echo \$SHELL | tee shell.txt

edit this file

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- Text Editors

- vi /home/michael/sample.txt

Command mode

Insert mode

Last Line

- top i to go to insert mode

- escape - insert to Command mode

- Colon - Command mode to Last Line

- escape - back to Command mode.

- Copy a line yy

- Paste p

- delete a letter x

- delete a line dd

- delete 3 lines d3d

- Undo u

- redo Ctrl+r

- /pattern to find a line

find next n

Find previous N

Save file :w

Quit :q

Save & quit :wq

Quit w/o save :q!

Networking

- DNS

- Add a line to /etc/hosts

i.e. 192.168.1.11 db

Name Resolution ↗

- /etc/resolv.conf & DNS Server

nameServer 8.8.8.8

- Domain Name = www.google.com

- Subdomain = drive.google.com

- Search Domains

/etc/resolv.conf

search mycompany.com

- Record - Types

A Record web-server 192.168.1.1

AAAA Record web-server IPv6-Address

CNAME Record food.web-server cat.web-server

↑ Comma-separated for ZT

- nslookup for more info on domain

- DIG ↑ more details

- Search order in /etc/nsswitch.conf

- ip link shows info

H1 IP addr add 192.168.1.10/24 dev eth0

H2 ip addr add 192.168.1.11/24 dev eth0

- Router connects two networks

- Gateway provides routes

- route command shows routing table.

ip route add 192.168.2.0 via 192.168.1.1

ip route add default via 192.168.2.1

ip link - interfaces ip addr - see ip addresses

route - router table ip route add

route - add -

Security and File Permissions

- Linux Accounts
 - Each account has a unique uid
 - stored in /etc/passwd
 - Group is a collection of users
 - UID is user id, GID is group id
 - primary group, but can have up to secondary
 - Superuser uid = 0
 - System accounts created at install
 - < 100 or 500-1000
 - no home directory usually
 - Service accounts
 - similar to system accounts
- Commands
 - id - gives info on logged in account
 - who - currently logged in users
 - last - gives info on all logged in users
 - ↳ last reboot too
 - sudo - su - C runs command as other user
/etc/sudoers - who can sudo/su
 - Field ↳ Desc.
 - 1 User/Group ↳ bob, %sudo (group)
 - 2 Hosts ↳ localhost, All (default)
 - 3 User ↳ ALL (default)
 - 4 Command ↳ /bin/all, ALL (unrestricted)

USERNAME:PASSWORD:UID:GID:GECOS:HOME DIR:3216LL
/etc/shadow file

USERNAME:PASSWORD:LASTCHANGE:MINAGE:MAXAGE:
WARN:INACTIVE:EXPIRE

/etc/group file

NAME:PASSWORD:GID:MEMBERS

Managing Users

- useradd bob - add user
- passwd bob - change password
- whoami - current user
- passwd - current user
- useradd common args
 - c custom comments
 - d custom home directory
 - e Expiry date
 - g specific gid
 - G Create user w/ 2+ secondary groups
 - s specify login shell
 - u specific UID
- userdel bob - delete user
- groupadd -g 1011 developer
- groupdel developer

Linux File Permissions

ls -l bash-script.sh			Octal		
-	rwx	rwx	r = x	r = Read	4
Owner	Group	Others		w = Write	2
v	g	o		x = execute	1
				= no permission	0

chmod <permissions> file

i.e. chmod u+rwx, g+r-x, o-rwx test-file

+ add permissions, - remove permissions

i.e. chmod 777 test-file

full access to Owner, group, users

777 - full, 555 ~read+execute,

660 - read+write for O/G, nothing for others

Chown bob:developer test-file change ownership

Chgrp android test-file change group

SSH and SCP

SSH <host or ip>

-l or @ for user

Key pair = Private key + Public key

public key stored in /home/bob/.ssh/id-rsa.pub

private key - /home/bob/.ssh/id-rsa

SSH-copy-id bob@devapp01

key stored in /home/bob/.ssh/authorized-keys

SCP /home/bob/fichier devapp01:/home/bob

dir SCP-r /home/bob/media devapp01:/home/bob

-p is to preserve permissions

Network Security

- iptables -l to show rules

- iptables -A INPUT -p tcp -s 172.16.239.187
--dport 22 -j ACCEPT

Option	Desc.	
-A	Add Rule	INPUT, OUTPUT
-p	Protocol	
-s	Source	
-d	Destination	
--dport	Dest. Port	
-j	Action to Take	ACCEPT, DROP
-D	Delete Rule	iptables -D OUTPUT 5 ← position

netstat -an | grep 5432

Cron

Crontab -e to edit jobs
Minute Hour Day Month Weekday
Crontab -l to list jobs
tail /var/log/syslog to see it runs

Service Management

Service unit file in /etc/systemd/system/
[Service]
ExecStart = /bin/bash /usr/bin/script.sh
Systemctl Start name.service
Systemctl Stop name.service
[Install]
WantedBy graphical.target
[Service]
ExecStart = /bin/bash /usr/bin/service.sh
User = project-meers
Restart = on-failure
RestartSec = 10
[Unit]
Description = Blah
Documentation = LOL
After = postgresql.service
Systemctl daemon-reload
Systemctl start | stop | restart | reload
Status | enable | disable
Active, inactive, failed
Systemctl edit name.service --full
Systemctl get-default / set-default
Systemctl list-units --all ← options
journalctl, -b → all old to new, ← active boot
journalctl -u VNFJ

Storage in Linux

lsblk to list block devices

ls -l /dev/ | grep "1b"

Major #	Type
1	RAM
3	HD or CD ROM
6	Parallel Printer
8	SCSI Disk

fdisk Command

fdisk -l /dev/sda

Partition types GPT & MBR

4-mbr - Primary - used to boot OS

- Extended - cannot be used as boot

- Logical - can have multiple in e

CPT - as many as you want - primary partition

fdisk /dev/sdb

File Systems

EXT2, EXT3, EXT4

Journal BC 16TB file

2TB / 4TB + 1 ex total size

mkfs. ext4 /dev/sdb1

mkdir /mnt/ext4

mount /dev/sdb1 /ext4

mount | grep /dev/sdb1

df - hP | grep /dev/sdb1

/etc/fstab file for permanent mounts

DAS - direct attached storage

NAS - network attached storage

SAN - storage area network

NFS - exportfs -a | mount ip:/software /mnt/software

Logical Volume Manager

apt install lvm2

pvcreate /dev/sdb

vgcreate calestor-vg /dev/sdb

pvdisplay command

VGdisplay command

lvcreate -L 16 -n vol1 calestor-vg

lvs command displays

in NFS, ext4 /dev/calestor-vg/vol1

mount at ext4 /dev/ /mnt/vol1

vgs command

lvresize -L +16 -n /dev/calestor-vg/vol1

resize 2fs /dev/calestor-vg/vol1