

priorities 3

1. Linux Boot Process.

#####

1. Overview.

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2. Linux Boot Process.

boot and efi files.

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bootloader phase.

kernel phase.

initialization phase.

3. Bootstrap Phase.

BIOS.

POST.

bootloader code, master boot record.

UEFI.

efibootmgr

ESP

PXE

TFTP

pxelinux.cfg directory

4. Boot options.

ISO.

HTTP, FTP.

NFS Boot.

5. Bootloader phase part1.

GRUB.

stage 1, stage 1.5, stage 2.

boot/grub

grub.conf /boot/grub/grub.conf

menu.lst /boot/grub/menu.lst

6. Bootloader phase part2.

ubuntu: grub-install-v

centos8: grub2-install-v

/etc/default/grub

/etc/grub.d

grub2-mkconfig

7. Grub file overview.

centos6: cd /boot/grub

centos6: ls -al

centos6: sudoedit grub.conf

8. Grub2 file overview.

centos8: sudo bash

centos8: cd boot/grub2

centos8: ls -al

centos8: less grub.cfg

centos8: less /etc/default/grub

centos8: ls /etc/grub.d

ubuntu: cd /boot/grub

ubuntu: ls -al

```
ubuntu: less /etc/default/grub
ubuntu: which update-grub
ubuntu: less /usr/sbin/update-grub
ubuntu: less /etc/default/grub
ubuntu: ls /etc/grub.d
```

9. Boot and EFI file overview.

```
centos8: cd /boot
centos8: ls
centos8: file vmlinuz-4.18.0-193.28.1.x86_64
centos8: ls
centos8: cd efi
centos8: cd EFI
centos8: ls
centos8: ls -al
centos8: sudo ls centos
ubuntu: cd /boot
ubuntu: ls
ubuntu: ls -al
```

10. Initrd and intramfs.

```
ubuntu: cd /boot
ubuntu: uname -r
ubuntu: cp /boot/initrd.img-$(uname -r) /root
ubuntu: sudo ls /root
ubuntu: sudo ls -al /root
ubuntu: date
ubuntu: sudo mkinitramfs -0 /boot/initrd.img-$(uname -r) $(uname -r)
ubuntu: ls -l /boot/initrd.img-$(uname -r)
centos8: cd /boot
centos8: ls
centos8: dracut
centos8: sudo dracut newimage.img
centos8: ls
centos8: sudo lsinitrd newimage.img | less
centos8: dracut --add-drivers <driver> <newimage.img>
```

11. Boot commands.

```
centos8: sudo bash
centos8: cd /boot/grub2/
centos8: ls
centos8: less /etc/default/grub
centos8: less /etc/grub.d
centos8: cp /boot/grub2/grub.cfg /boot/grub2/grub.cfg.older
centos8: ls /boot/grub2
centos8: vim /etc/default/grub
reset time
centos8: less /etc/default/grub
centos8: grub2-mkconfig -o /boot/grub2/grub.cfg.newer
centos8: ls
centos8: cp grub.cfg.newer grub.cfg
centos8: reboot
```

12. Kernel panic.

```
kdump
crashkernel
kexec
crash
```

2. Kernel Modules.

```
#####
#####
```

1. Kernel commands.

```
:lsmod
:insmod
:rmmod
:rmmod -v
:modprobe
:modinfo, :modeinfo -d, modinfo -l
:depmod
:depmod -a
:dmesg
```

2. Kernel Commands and file locations.

```
centos8: lsmod
centos8: lsmod | less
centos8: sudo modprobe dummy
centos8: lsmod | grep dummy
centos8: sudo modprobe -r dummy
centos8: lsmod | grep dummy
centos8: cd /usr/lib/modules
centos8: ls
centos8: uname -r
centos8: cd $(uname -r)
centos8: ls
centos8: ls /etc/modprobe
centos8: ls /etc/modprobe.conf
centos8: ls /etc/modprobe.d/
ubuntu: cd /etc/modprobe
ubuntu: ls /etc/modprobe.conf
ubuntu: ls /etc/modprobe.d/
ubuntu: ls
ubuntu: cd usr/lib/modules
ubuntu: ls
ubuntu: cd $(uname -r)
ubuntu: ls
```

3. Networks

```
#####
#####
```

1. Hostname Configuration.

```
#hostname
ubuntu: cat /etc/hosts
centos8: cat /etc/hostname

#change hostname
#temporarily
ubuntu: sudo hostname ubuntu
ubuntu: bash
centos8: sudo hostname centos
centos8: exec bash

#permanently
centos8: sudo hostnamectl set-hostname centos
```

2. Network connection files.

```
/etc/sysconfig/network-scripts
/etc/dhcp/dhclient

centos8: cd /etc/sysconfig/network-scripts
centos8: ls -al
centos8: less ifcfg-ens160

centos8: sudoedit /etc/dhcp/dhclient.conf

ubuntu: cd /etc/netplan/
```

```
ubuntu: ls
ubuntu: less 01-network-manager-all.yaml

ubuntu: cd /etc/NetworkManager/system-connection
ubuntu: ls

ubuntu: less /etc/dhcp/dhclient*
```

3. Network Connection Configuration.

```
#show ip address
centos8: ip addr show

#change ip address temporarily
centos8: ip addr add 192.168.1.15 dev enp0s3

#change permanently
less /etc/systemconfig/network-scripts/ifcfg-enp0s3

centos8: sudo ip link set enp0s3 down
centos8: sudo ip link set enp0s3 up
centos8: ping -c 4 www.google.com
centos8: man ping
centos8: ip link show
centos8: ethtool enp0s3
centos8: ethtool enp0s3 --speed <val>
centos8: ethtool enp0s3 --duplex <val>
centos8: ethtool enp0s3 --autoneg off
ubuntu: man iwconfig
```

4. Name resolution.

```
centos8: cd /etc/hosts
centos8: less /etc/hosts
centos8: less /etc/nsswitch.conf
centos8: less /etc/resolv.conf
centos8: sudoedit /etc/resolv.conf
nameserver 8.8.8.8
```

5. Name resolution commands.

```
centos8: dig www.google.com
centos8: dig www.google.com google.com mx
centos8: dig www.google.com google.com ns
centos8: nslookup dns.google.com
centos8: nslookup 8.8.8.8
centos8: host www.google.com
centos8: host dns.google.com
```

6. Network connection monitoring.

```
centos8: less /etc/networks
centos8: netstat
centos8: netstat -a
centos8: netstat -i
centos8: netstat -t
centos8: netstat -u
centos8: netstat -n
centos8: netstat -r
centos8: netstat -tuna
centos8: ss
centos8: ss -lt
centos8: ss -ut
centos8: ss -a
centos8: ss -s
```

7. Network configuration management.

```
centos8: nmcli connection show
centos8: nmcli device show
centos8: nmcli device status
centos8: nmtui
```

8. Network bridging overview.

```
:brctl
:brctl addbr <bridge name>
:brctl addif <interface>
:brctl delif <interface>
:brctl delbr <bridge name>
:brctl show
:brctl showbr
```

9. Network routing overview.

```
ubuntu: route
ubuntu: route -n
ubuntu: netstat -r
ubuntu: ip route show
ubuntu: route -h
:route add <target> gw <ip address>
:route delete <target> gw <ip address>
:ip route
:ip route add <target> via <gateway> dev <device>
:ip route del <target>
/etc/sysconfig/network-scripts/ifcfg-<interface>
/etc/sysconfig/network-scripts/route-<interface>
ubuntu: /etc/netplan/config>.yaml
```

10. Network bonding.

```
aggregation(mode #4)
active/passive(mode #1)
load balancing(mode #5)
centos: /etc/sysconfig/network-scripts/ifconfig-<bond name>
ubuntu: /etc/network/interfaces
ubuntu: neplan YAML
ubuntu: nmcli and nmtui
```

11. Network tuning.

```
sysctl.conf
:sysctl
icmp_echo_ignore_broadcasts = 1
ip_foward = 1
alias <bond name> bonding
options <bond name> mode = <mode #>
```

5. Cloud and Virtulization Concepts.

```
#####
#####
```

1. Vm Templates and markup languages

```
OVF OVA
json yaml
docker
```

2. Initialization tools

```
cloud init
anaconda installer
```

3. Storage Types.

```
thick provisioned storage
thin provisoned storage
blob storage
```

block storage

4. Virtual network concepts.
host-only adapter.
Network Address Translation.
dual-homed system.
bridged networks.
overlay network.

5. Hypervisor types.
Type 1 hypervisor.
Type 2 hypervisor.
embeded hypervisor.
chroots.

6. Virtualization commands.
libvirt.
KVM.
virsh.
ubuntu: sudo apt-get install libvirt-clients
centos: yum install libvirt-client
:virsh list
:virsh list --all
:virsh console
:virsh create
:virsh reboot
:virsh shutdown
vmm

6. Localization Options.

#####

1. Environmental variables

LANG
LC_*
LC_ALL
locale
TZ
character sets; ascii, utf-8, unicode

2. Localization Files.

ubuntu: /etc/timezone
centos: /etc/localtime
/usr/share/zoneinfo
centos8: ls -al /etc/localtime
centos8: ls -al /usr/share/zoneinfo

3. Localization Commands.

:locale
:localectl
:timedatectl
:date
:hwclock
ubuntu: locale
ubuntu: localectl
ubuntu: sudo localectl set-locale LANG=en_CA.UTF-8
centos8: timedatectl
centos8: sudo timedatectl set-timezone "America/Los_Angeles"
centos8: date -s "Tue Apr 13 20:50:39 PDT 2021"
centos8: hwclock, hwclock -s, hwclock -w,

7. Software Management.

```
#####  
#####
```

1. Package Types

```
rpm  
deb  
dpkg  
tar, gzip, gz, tgz
```

2. RPM command.

```
yum, dnf, zypper  
centos8: cd /root  
centos8: ls  
centos8: rpm -i httpd-2.4.37-21.module_el8.2.0+494+1df74eae.x86_64.rpm  
centos8: rpm -ivh pidgin-2.13.0-5.el8.x86_64.rpm  
centos8: rpm -q pidgin  
centos8: rpm -ql pidgin  
centos8: rpm -qd pidgin  
centos8: rpm -qa  
centos8: rpm -qa | pidgin  
centos8: rpm -e pidgin
```

3. RPM package managers.

```
centos8: yum install httpd  
centos8: yum info httpd  
centos8: yum list installed  
centos8: yum list installed | grep httpd  
centos8: yum remove httpd  
centos8: yum search pidgin  
centos8: yum repolist  
centos8: yum clean all  
centos8: yum check-update  
centos8: yum update  
centos8: dnf install mariadb  
centos8: dnf info mariadb  
centos8: dnf list installed  
centos8: dnf list installed | grep maria  
centos8: dnf search pidgin  
centos8: dnf repolist  
centos8: dnf clean all  
centos8: dnf check-update  
suse: sudo bash  
suse: zypper in apache2  
suse: zypper if apache2  
suse: zypper list-patches  
suse: zypper patch  
suse: zypper update  
suse: zypper rm apache2
```

4. DPKG Tools.

```
ubuntu: su  
ubuntu: cd /root  
ubuntu: ls  
ubuntu: dpkg -i ./apache2_2.4.41-ubuntu3.1_amd64.deb  
ubuntu: dpkg -i pidgin_1%3a2.13.0-2.2ubuntu64_amd64.deb  
ubuntu: dpkg -I pidgin_1%3a2.13.0-2.2ubuntu64_amd64.deb  
ubuntu: dpkg -L pidgin  
ubuntu: dpkg -r pidgin  
ubuntu: dpkg -I pidgin  
ubuntu: apt-get update  
ubuntu: apt purge apache2  
ubuntu: apt install apache2  
ubuntu: apt-cache show apache2  
ubuntu: apt-cache pkgnames
```

```
ubuntu: apt remove apache2
ubuntu: apt search pidgin
ubuntu: apt upgrade
ubuntu: apt clean
ubuntu: aptitude
```

5. Build Tools.

```
tar -xzvf <filename>.tgz
tar -xvf <filename>.tar
./configure
make
make install
```

6. Working with libraries.

```
ldd /usr/bin/diff
/lib, /usr/lib
/lib64, /usr/lib64
/etc/ld.so.conf
/etc/ld.so.conf.d
ldconfig
```

7. Repositories.

```
centos: /etc/yum/repos.d
ubuntu: /etc/apt/sources.list
```

8. Repository Commands.

```
centos: cd /etc/yum/repos.d
centos: ls
centos: vim test.repo
centos: yum repolist
centos: yum reposync
```

9. Acquisition Commands.

```
wget <URL of file or package to download>
curl -O <URL of file or package to download>
curl -o <filename> <URL of file or package to download>
```

8. User and group management

```
#####
#####
```

1. User and group creation.

```
:useradd
/etc/passwd
/etc/shadow
/etc/default/useradd
/etc/login.defs
/etc/skel
:groupadd
/etc/group
centos8: less /etc/login.defs
/CREATE_HOME
centos8: less /etc/login.defs
centos8: ls -al /etc/skel
centos8: sudo useradd -G wheel test
centos8: grep test /etc/passwd
centos8: ls /home
ubuntu: useradd test
ubuntu: sudo useradd test
ubuntu: cd /home/test
ubuntu: less /etc/login.defs
/CREATE_HOME
ubuntu: sudo useradd -mG sudo test2
ubuntu: grep test /etc/passwd
```



```
ubuntu: cd /home/test2/
ubuntu: ls -al
ubuntu: groupadd -g 1337 best
ubuntu: sudo groupadd -g 1337 best
ubuntu: grep best /etc/group
```

2. User and group modification.

```
:usermod -aG
:usermod -L
:groupmod -n
:groupmod -g
centos8: sudo useradd test2
centos8: id test2
centos8: sudo usermod -aG wheel test2
centos8: id test2
centos8: sudo usermod -aG best test2
centos8: id test2
centos8: sudo passwd test2
centos8: grep test2 /etc/shadow
centos8: sudo grep test2 /etc/shadow
centos8: sudo usermod -L test2
centos8: sudo grep test2 /etc/shadow
centos8: sudo usermod -U test2
centos8: sudo grep test2 /etc/shadow
centos8: grep best /etc/group
centos8: sudo groupmod -n worst best
centos8: grep worst /etc/group
centos8: sudo groupmod -g 666 worst
centos8: grep worst /etc/group
```

3. User and group deletion

```
:userdel
:userdel -r
:groupdel
centos8: id test
centos8: ls /home
centos8: sudo userdel test
centos8: id test
centos8: ls /home
centos8: id test2
centos8: ls /home
centos8: userdel -r test2
centos8: cat /etc/group
centos8: sudo groupdel worst
centos8: cat /etc/group
centos8: grep worst /etc/group
```

4. User and group file locations.

```
/etc/passwd
/etc/shadow
/etc/group
ubuntu: grep test2 /etc/passwd
ubuntu: grep test2 /etc/shadow
ubuntu: sudo passwd test2
ubuntu: sudo grep test2 /etc/shadow
ubuntu: grep best /etc/group
ubuntu: sudo usermod -aG best test2
ubuntu: grep best /etc/group
```

5. Password management.

```
:passwd
:chage
centos8: useradd test
```

```
centos8: grep test /etc/passwd
centos8: grep test /etc/shadow
centos8: passwd test
centos8: grep test /etc/shadow
centos8: passwd -l test
centos8: grep test /etc/shadow
centos8: passwd -d test
centos8: grep test /etc/shadow
centos8: passwd test
centos8: chage -W 14 test
centos8: grep test /etc/shadow
centos8: chage -m 3 test
centos8: grep test /etc/shadow
centos8: chage -M 90 test
centos8: grep test /etc/shadow
```

6. Query commands.

```
ubuntu: id test
ubuntu: cat /etc/group
ubuntu: usermod -aG best test
ubuntu: id test
ubuntu: whoami
ubuntu: sudo su -
ubuntu: whoami
ubuntu: logout
ubuntu: id
ubuntu: who
ubuntu: who -H
ubuntu: who -q
ubuntu: w
ubuntu: last
ubuntu: last -2
ubuntu: last -2 -F
ubuntu: lastb
```

7. Enabling quotas.

```
centos8: lsblk
centos8: vim /etc/fstab
centos8: mount -o remount, rw /mnt/ext4
centos8: mount | grep usrquota
centos8: man quotacheck
centos8: quotacheck -avugc
centos8: ls /mnt/ext4
```

8. User and group quotas.

```
:edquota -u test
:edquota -g <group name>
:edquota -t
:quota -u <user name>
:quota -g <group name>
:repquota <mountpoint>
:repquota -a
```

9. Bash profiles.

```
centos8: less /etc/profile
centos8: ls /etc/profile.d
centos8: cd /home/test
centos8: ls -al
centos8: less .bash_profile
centos8: less .bashrc
centos8: less .bash_logout
ubuntu: sudo bash
ubuntu: cd /home/test
```

```
ubuntu: less .bash_logout
ubuntu: ls -al
ubuntu: less .profile
ubuntu: su - rob
```

10. Global entries.

/etc/bashrc

/etc/skel

9. File and directory management.

```
#####
#####
```

1. File creation and text editing.

```
:touch
:touch -a
:touch -m
:touch -d
:ls -lu
:ls -l
:ls -lc
:stat <file>
centos8: touch test
centos8: ls -l test
centos8: ls -lc test
centos8: ls -lu test
centos8: stat test
centos8: nano test
I am typing in nano and it is awesome!
centos8: nano test
I am typing more stuff wheel!
centos8: vim test
i, something else, esc, :wq
centos8: vim test
o, new line, esc, shift + o, new line 2, esc, u, u, a,
something else something else something else for everyone
shift + a , wheel
esc, y, y, p, y, y, shift + p, d, d , esc , :wq
```

2. File readers.

```
centos8: grep <string to search> <file to search>
centos8: ctrl + k
centos8: grep test /etc/passwd
centos8: grep root /etc/passwd
centos8: cat /etc/hosts
centos8: cat file1
centos8: cat file2
centos8: cat file1 file2
centos8: cat -n /etc/passwd
centos8: cat -A file1
centos8: head <file>
centos8: tail <file>
centos8: head -n 15 /etc/passwd
centos8: tail -n 20 /etc/passwd
centos8: sudo tail -f /var/log/messages
centos8: less /etc/passwd
centos8: less /var/log/messages
G, g, g, /<what you are searching for>
? <what you are searching for>, n, n, -N, q
```

3. Redirection part 1.

```
centos8: cat file1 >> file2
centos8: cat file2
centos8: cat file1 > file2
```

```
centos8: cat missingfile
centos8: cat missingfile 2> file3
centos8: cat file3
centos8: cat missingfile 2>> file3
centos8: cat file1 missingfile &> file3
centos8: cat file3
centos8: cat namefile
centos8: sort < namefile
centos8: sort < namefile > sorted_namefile
centos8: cat sorted_namefile
centos8: cat << EOF
centos8: cat << EOF > namefile_new
centos8: cat namefile_new
```

4. Redirection part 2.

```
centos8: cat /etc/passwd | grep rob
centos8: sudo bash
centos8: less /var/log/audit/audit.log
centos8: ausearch -i
centos8: ausearch -i | grep -i rob
centos8: cd /dev
centos8: ls /dev/null
centos8: ls
centos8: ctrl + alt + f3
centos8: ctrl + alt + f1
centos8: tty
centos8: cat /var/log/audit/audit.log | tee audit_capture
centos8: cat /var/log/audit/audit.log | tee -a audit_capture
centos8: cat /etc/hosts | tee -a audit_capture
centos8: cat audit_capture
centos8: cd ~
centos8: find . -size +1M
centos8: find . -size | xargs ls -l
```

5. Text processing.

```
centos8: echo "Why hello there!"
centos8: echo "Why hello there!" > hello_file
centos8: cat hello_file
centos8: cd ~
centos8: cat step_info
centos8: ./step_info
centos8: cat mixed_case
centos8: tr 'A-Z' 'a-z' < mixed_case
centos8: cat numbered_file
centos8: tr -d [:digit:] < numbered_file
centos8: cat alpha_sort
centos8: sort alpha_sort
centos8: cat num_sort
centos8: sort num_sort
centos8: sort -n num_sort
centos8: sort -k 2 num_sort
centos8: cut -d ":" -f 1 /etc/passwd
centos8: cat -n alpha_sort
centos8: wc alpha_sort
centos8: wc -l alpha_sort
centos8: grep root /etc/passwd | wc -l
centos8: grep root /etc/passwd
centos8: cat file3 file4
centos8: paste file3 file4
```

6. Advanced text processing part1.

```
centos8: grep <option> <search> <file>
centos8: grep -i rob /etc/passwd
```

```
centos8: grep -i ROB /etc/passwd
centos8: grep -v rob /etc/passwd
centos8: sudo less /etc/ssh/sshd_config
centos8: sudo grep -v "#" /etc/ssh/sshd_config
centos8: grep -n rob /etc/passwd
centos8: sudo grep -l rob /etc/*
centos8: sudo grep -ls rob /etc/*
centos8: grep ro* /etc/passwd
centos8: grep ro. /etc/passwd
centos8: grep ^ro. /etc/passwd
centos8: grep bash$ /etc/passwd
centos8: sudo grep \* /etc/shadow
centos8: grep 'root\|rob' /etc/passwd
centos8: egrep 'root|rob' /etc/passwd
centos8: fgrep "*" /etc/shadow
```

7. Advanced text processing part2.

```
centos8: cat awk_example
centos8: awk '{ print $1}' awk_example
centos8: awk '{print $1, $5, $6}' awk_example
centos8: less /etc/passwd
centos8: awk -F: '{print $1}' /etc/passwd
centos8: awk -F: '{print "User", NR-1, "is: ", $1}' /etc/passwd
centos8: grep root /etc/passwd
centos8: sed s/root/ROOT/ /etc/passwd | grep -i root
centos8: grep root /etc/passwd
centos8: sed s/root/ROOT/g /etc/passwd | grep -i root
centos8: printf "The %s barks %d times\n" "dog" 5
```

8. File and directory operations part1.

```
centos8: pwd
centos8: ls
centos8: ls -l
centos8: ls -lh
centos8: ls -alh
centos8: mkdir somedir
centos8: ls -l
centos8: mkdir -p otherdir/dir1/dir2/dir3
centos8: ls -alR /home/rob/otherdir
centos8: mv <file> <location>
centos8: touch original
centos8: ls
centos8: mv original new
centos8: ls /tmp
centos8: mv new /temp
centos8: ls home/rob
centos8: mv /tmp/new /home/rob/original
centos8: ls /home/rob
centos8: cp <file or dir> <place>
centos8: ls /home/rob
centos8: cp /home/rob/original /tmp
centos8: ls /tmp
centos8: ls /home/rob/
centos8: ls -al /home/rob/somedir/
centos8: cp -R /home/rob/somedir
centos8: ls somedir/
centos8: ls -l somedir/
centos8: ls -ald somedir/
centos8: cp -r /home/rob/somedir/ /tmp
centos8: ls -ald /tmp/somedir/
centos8: cp -ar /home/rob/otherdir/ /tmp/
centos8: ls -ald /tmp/otherdir/
```

9. File and directory operations part2.

```
centos8: rm <file or dir>
centos8: cd /tmp
centos8: ls
centos8: rm original
centos8: rm otherdir/
centos8: rm -r somedir/
centos8: ls -al
centos8: ls
centos8: cp /home/rob/somedir/ /tmp
centos8: rm -ir /tmp/somedir
centos8: ls
centos8: rmdir otherdir/
centos8: cd otherdir/
centos8: rm -ir dir1/
centos8: ls
centos8: cd ..
centos8: ls
centos8: rm otherdir/
centos8: cd ~
centos8: ls
centos8: diff file3 file4
centos8: diff -y file3 file4
```

10. Transfer commands.

```
centos8: scp file remote:path
centos8: pwd
centos8: ls
centos8: less /etc/hosts
centos8: ssh ubuntu
centos8: pwd
centos8: ls
centos8: logout
centos8: ls
centos8: scp alpha_sort ubuntu:/home/rob
centos8: ssh ubuntu
centos8: pwd
centos8: ls
centos8: scp remote:path localfilelocation
centos8: ls
centos8: cat ubuntuFile
centos8: logout
centos8: ls
centos8: scp ubuntu:/home/rob/ubuntuFile
centos8: ls
centos8: cat ubuntuFile
centos8: pwd
centos8: ls
centos8: scp somedir ubuntu
centos8: scp somedir ubuntu:/home/dir
centos8: scp -r somedir ubuntu:/home/rob
centos8: ssh ubuntu
centos8: ls
centos8: rsync -r ./ubuntuDir centos:/home/rob
centos8: logout
centos8: ls
centos8: ls -al ubuntuDir/
centos8: ssh ubuntu
centos8: ls -al ubuntuDir/
centos8: ssh centos rm -rf /home/rob/ubuntuDir
centos8: rsync -ar ./ubuntuDir centos:/home/rob
centos8: logout
centos8: ls -al ubuntuDir/
```

```
centos8: rm -r ubuntuDir/
centos8: ssh ubuntu
centos8: rsync -azvh ./ubuntuDir centos:/home/rob
```

11. Location commands.

```
centos8: find <dir> <options> <search>
centos8: find /home/ -name file1
centos8: sudo find /home/ -type d
centos8: find /home -size +1M
centos8: find / -size +300M
centos8: ls -alh
centos8: which locate
centos8: sudo updatedb
centos8: locate file1
centos8: which locate
centos8: whereis locate
centos8: whereis -b locate
centos8: whereis -m locate
```

12. Link commands.

inodes, symbolic, hardlinks

```
centos8: pwd
centos8: ls
centos8: ln ubuntuFile ubuntuFile2
centos8: ls -il ubuntufile*
centos8: ln -s ubuntuFile symlink
centos8: ls -il ubuntuFile*
centos8: ls -il symlink
centos8: rm symlinkls
centos8: unlink ubuntuFile2
centos8: ls -il ubuntuFile*
centos8: ls
```

10. Service management with systemd and sysvinit.

```
#####
#####
```

1. Systemd overview.

```
sbin/init
systemctl
systemd-analyze
```

2. Systemd commands.

```
:systemctl
ubuntu: systemctl status ssh
ubuntu: systemctl restart ssh
ubuntu: sudo systemctl stop ssh
ubuntu: systemctl status ssh
ubuntu: sudo systemctl disable ssh
ubuntu: systemctl status ssh
ubuntu: sudo systemctl enable ssh
ubuntu: sudo systemctl start ssh
ubuntu: systemctl status ssh
ubuntu: sudo systemctl daemon-reload
ubuntu: sudo systemctl mask ssh
ubuntu: sudo systemctl unmask ssh
ubuntu: systemctl status ssh
```

3. Systemd-analyze blame.

```
:systemd-analyze
:systemd-analyze critical-chain
:systemd-analyze dump
:systemd-analyze verify
:systemd-analyze blame
```

4. Systemd unit files linux.

```
:systemctl list-units
:systemctl list-units --type=service
automount, service, target
autofs
centos8: systemctl cat ssh
centos8: systemctl cat sshd
EnvironmentFile
SSH_USE_STRONG_RNG=0
/usr/lib/systemd/system
/run/systemd/system
/etc/systemd/system
```

5. Systemd Targets.

```
poweroff.target
rescue.target
multi-user.target
graphical.target
reboot.target
centos8: systemctl get-default
centos8: systemctl cat graphical.target
centos8: sudo systemctl isolate multi-user.target
centos8: systemctl get-default
centos8: sudo systemctl isolate reboot.target
centos8: systemctl set-default multi-user.target
centos8: systemctl set-default graphical.target
```

6. SysVinit service management.

```
:service
/etc/init.d
centos6: cd /etc/init.d
centos6: pwd
centos6: ls -al
centos6: sudo less sshd
centos6: sudo /etc/init.d/sshd stop
centos6: sudo /etc/init.d/sshd status
centos6: sudo /etc/init.d/sshd start
centos6: sudo /etc/init.d/sshd restart
centos6: sudo service sshd stop
centos6: sudo service sshd status
centos6: sudo service sshd start
centos6: sudo service sshd restart
```

7. SysVinit chkconfig.

```
:chkconfig
centos6: cd /etc/init.d
centos6: less sshd
centos6: chkconfig --list sshd
centos6: sudo chkconfig sshd on
centos6: sudo chkconfig sshd off
centos6: chkconfig --list sshd
centos6: sudo chkconfig --levels 35 sshd on
centos6: chkconfig --list sshd
centos6: sudo chkconfig --del sshd
centos6: chkconfig --list sshd
centos6: sudo chkconfig --add sshd
centos6: chkconfig --list sshd
```

8. SysVinit runlevels.

```
runlevel0 poweroff.target
runlevel1 rescue.target
runlevel2 non-graphical multiuser networkkind disabled multiuser.target
```



```
runlevel3 non-graphical multituser networking enabled multituser.target
runlevel4 unused
runlevel5 graphical.target
runlevel6 reboot.target
/etc/inittab
/etc/rc.d
s to start
k to kill
/etc/rc.d/rc.local
:init
:telint
/etc/rc.d/rc
```

11. Server roles.

```
#####
#####
```

1. NTP server.

```
port 123
server 0.pool.ntp.org
stratum: 0-15
centos8: systemctl status chronyd
centos8: dnf install chrony
centos8: systemctl enable --now chronyd
centos8: vim /etc/chrony.conf
allow NTP access from a local network.
centos8: systemctl restart chronyd.service
centos8: systemctl status firewalld.service
centos8: firewall-cmd --permanent --add-service=ntp
centos8: firewall-cmd --reload
ubuntu: apt install ntp
ubuntu: cat /etc/ntp.conf
ubuntu: vim /etc/ntp.conf
4, d, d
server 0.north-america.pool.ntp.org
y, y, p
server 1.north-america.pool.ntp.org
wq
ubuntu: systemctl restart ntp
ubuntu: systemctl status ufw
ubuntu: ufw allow ntp
```

2. SSH server.

```
ubuntu: apt install openssh.server
ubuntu: systemctl enable ssh
ubuntu: systemctl start ssh
ubuntu: systemctl status ssh
ubuntu: ssh ubuntu20
ubuntu: logout
ubuntu: less /etc/ssh/ssh_config
ubuntu: ls -al /home/rob
ubuntu: ls -al /home/rob/.ssh/
ubuntu: less /etc/ssh/sshd_config/
```

3. Web servers overview.

```
apache, httpd
nginx
port 443
```

4. Apache web server.

```
centos8: sudo yum install httpd
centos8: rpm -ql httpd | less
centos8: less /etc/httpd/conf/httpd.conf
centos8: systemctl start httpd
```

```
centos8: systemctl status httpd
127.0.0.1
ubuntu: sudo apt install apache2
ubuntu: dpkg -L apache2 | less
ubuntu: less /etc/apache2/apache2.conf
ubuntu: ls /etc/apache2/ports.conf
ubuntu: systemctl status apache2
ubuntu: sudo ufw app list
ubuntu: sudo ufw allow "Apache"
127.0.0.1
```

5. nginx web server.

```
centos8: dnf install nginx
centos8: rpm -ql nginx | less
centos8: less /etc/nginx/nginx.conf
centos8: systemctl start nginx
centos8: systemctl status nginx
centos8: systemctl enable --now nginx.service
centos8: systemctl status nginx
127.0.0.1
ubuntu: apt install nginx
ubuntu: dpkg -L nginx
ubuntu: less /etc/nginx/nginx.conf
ubuntu: ls /etc/nginx/
ubuntu: ls /etc/nginx/sites-available/default
ubuntu: systemctl status nginx
ubuntu: ufw app list
ubuntu: ufw allow "nginx HTTP"
```

6. Certificate authority server.

```
digital certificate.
asymmetric encryption.
symmetric key.
ca,
certificate signing request
ssl/tls 443
ldap 389 636
```

7. Name server.

```
dns
port 53
bind, berkley internet name domain
/etc/resolv.conf
centos8: dnf install bind
centos8: rpm -ql bind | less
centos8: less /etc/named.conf
ubuntu: apt install bind9 bind9-docs dnsutils
ubuntu: dpkg -L bind9 | less
ubuntu: less /etc/bind/named.conf
ubuntu: less /etc/bind/named.conf.options
```

8. DHCP server.

```
client port 67
server port 68
DORA, discovery, offer, request, acknowledgement.
centos8: dnf install dhcp-sever
centos8: ip addr list
centos8: less /etc/dhcp/dhcpd.conf
centos8: systemctl enable --now dhcpd
centos8: systemctl stutus firewallld
centos8: firewall-cmd --add-service=dhcp --permanent && firewall-cmd --reload
ubuntu: apt install isc-dhcp-server
ubuntu: ip addr list
```

```
ubuntu: less /etc/dhcp/dhcpd.conf
ubuntu: systemctl enable --now isc-dhcp-server
ubuntu: systemctl status isc-dhcp-server
```

9. File server overview.

```
nfs port 2049 rpcbind port 111
samba port 137 - 139, port 445
```

10. NFS server installation.

```
centos8: systemctl enable --now nfs-server
centos8: systemctl status nfs-server
centos8: vim /etc/exports
/mnt/nfsExp/nfs 192.168.1.0/24(rw,no_root_squash)
centos8: exportfs -rav
ubuntu: apt install nfs-kernel-server
ubuntu: systemctl enable --now nfs-server
ubuntu: systemctl status nfs-server
ubuntu: vim /etc/exports
/mnt/nfsExp/nfs 192.168.1.0/24(rw,no_root_squash)
ubuntu: exportfs -rav
```

11. Samba server installation.

```
centos8: dnf install samba samba-client
centos8: systemctl enable --now {smb,nmb}
centos8: systemctl status smb nmb
centos8: vim /etc/samba/smb.conf
centos8: testparm
centos8: systemctl restart {smb,nmb}
centos8: systemctl status smb nmb
ubuntu: apt install samba
ubuntu: systemctl enable --now {smbd,nmbd}
ubuntu: systemctl status {smbd,nmbd}
ubuntu: vim /etc/samba/smb.conf
ubuntu: cp /etc/samba/smb.conf /etc/samba/smb.conf.bak
ubuntu: bash -c 'grep -v -E "^#|^;" /etc/samba/smb.conf.bak | grep . > /etc/samba/smb.conf'
ubuntu: vim /etc/samba/smb.conf
ubuntu: systemctl restart {smbd,nmbd}
```

12. Authentication server.

```
NIS
port 111, 714, 711
kerberos
port 88
ldap
port 389, 636
radius
AAA
port 1645, 1646, 1812, 1813, 7082
```

13. Proxy server.

```
squid, nginx
port 8080
centos8: dnf install squid
centos8: systemctl enable --now squid
centos8: systemctl status squid
centos8: vim /etc/squid/squid.conf
centos8: systemctl status firewalld
centos8: firewall-cmd --add-service=squid --permanent && firewall-cmd --reload
ubuntu: apt install squid
ubuntu: systemctl status squid
ubuntu: vim /etc/squid/squid.conf
ubuntu: cp /etc/squid/squid.conf /etc/squid/squid.conf.bak
ubuntu: bash -c 'grep -v -E "^#|^;" /etc/squid/squid.conf.bak | grep . > /etc/squid/squid.conf'
```

```
ubuntu: vim /etc/squid/squid.conf
ubuntu: ufw allow 3128/tcp && ufw enable
```

14. Log server.

```
rsyslogd
journald
port 514
/var/log
syslogd
:journalctl
centos8: vim /etc/rsyslog.conf
set number
centos8: systemctl status firewalld
centos8: firewall-cmd --add-port=514/udp --permanent && firewall-cmd --add-port=514/tcp --permanent
&& systemctl restart rsyslog.service
centos8: journalctl
centos8: journalctl -f
centos8: vim /etc/systemd/journald.conf
```

15. Container server.

container orchestration.

16. VPN server.

```
pre-shared key IPsec
SSL/TLS certificate
OpenVpn port 1194
full tunnel.
split tunnel.
```

17. Monitoring server.

```
:top
nagios, cacti
wireshark, tcpdump
SNMP
centos8: top
s +5, shift p, shift m
centos8: free
centos8: free -h
centos8: ps
centos8: ps aux | less
```

18. Database server.

```
postgresql port 5432
mysql/mariadb port 3306
nosql mongodb port 27017
centos8: dnf module list postgresql
centos8: dnf module enable postgresql:12
centos8: dnf module list postgresql
centos8: dnf install postgresql-server
centos8: postgresql-setup --initdb
centos8: systemctl enable --now postgresql
centos8: systemctl status postgresql
ubuntu: apt list postgresql -a
ubuntu: apt install postgresql postgresql-contrib
ubuntu: systemctl status postgresql
ubuntu: ls var/lib/postgresql/12/main/
ubuntu: ls /var/log/postgresql/postgresql-12-main.log
```

19. Print server.

```
cups
internet printing protocol
samba
/etc/cups/cupsd.conf
```

port 631

20. Mail servers.

MTA, mail transfer agent

SMTP, simple mail transfer protocol port 25

centos8: dnf install postfix

centos8: systemctl enable --now postfix

centos8: systemctl status postfix

centos8: less /etc/postfix/main.cf

centos8: grep -v '#' /etc/postfix/main.cf | less

centos8: vim /etc/postfix/main.cf

set number, 94, G, 283, G

centos8: systemctl restart postfix

ubuntu: DEBIAN_PRIORITY=low apt install postfix

ubuntu: systemctl status postfix

21. Load balancers.

least connetion, least response, round robin, least packets

22. Storage device buses.

intergrated drive electroinics IDE

small computer system interface SCSI

SATA

ULTRA 320 SCSI

SAS serial attached scsi

eSATA

eSATAp

/dev

character device files

block device files

:lsblk

:lsblk -p

ubuntu: ls /dev

ubuntu: echo "Something" > /dev/stdout

ubuntu: ls /dev/mapper/

ubuntu: lsblk

ubuntu: lsblk -p

ubuntu: lsblk -p -fs

ubuntu: lsblk -h

13. Linux Devices.

#####

1. Network Devices.

ethernet

wifi

bluetooth

HBA

RJ-45

:iwconfig

:iwlist

rs232

:bluetoothctl

:hcitool

2. I/O Devices.

GPIO

HBA

PCI

IDE, SCSI, SATA

ISCSI Fibre Channel Controllers.

Ethernet

3. Output Devices.

Audio Devices.

Monitor

Video Card.

X Windows System

X11

4. Printer Devices.

CUPS

Ghostscript, postscript

/etc/cups

/etc/cups/cupsd.conf

IPP

Port 631

http://localhost:631

:lpc

:lpq

:lpr

:lprm

5. Device Buses.

:lsdev

USB

PCI

SATA, SCSI

I/O

IRQ

DMA

/proc

:lshw

/proc/ioproports

/proc/interrupts

/proc/dma

ubuntu: which procinfo

ubuntu: sudo apt install procinfo

ubuntu: sudo lsdev

ubuntu: lshw

ubuntu: sudo lshw -short

ubuntu: sudo lshw -businfo

ubuntu: sudo lshw -class storage

ubuntu: sudo lshw -class disk

ubuntu: sudo lshw -class disk -sanitize

ubuntu: sudo lshw -class disk

6. procfs Filesystem.

/proc

/proc/interrupts

/proc/ioproports

/proc/dma

IRQs

PIC

APIC

16 interrupt lines

255 interrupt lines

I/O ports

/proc/ioproports

DMA, DCC, MCC

/proc/dma

ubuntu: cat /proc/interrupts

ubuntu: sudo cat /proc/ioproports

ubuntu: cat /proc/dma

ubuntu: cat /proc/cpuinfo

ubuntu: cat /proc/meminfo

7. sysfs Filesystem.

```
/sys
/proc
/sys/bus
/sys/devices
/sys/block
/sys/fs
/sys/kernel
ubuntu: ls /sys
ubuntu: ls /sys/bus
ubuntu: ls -al /sys/bus/scsi/
ubuntu: ls -al /sys/bus/scsi/devices/
ubuntu: ls -al /sys/devices
ubuntu: ls -al /sys/block/sda
```

8. Udev and Udev Rules.

```
/dev
/etc/rc5.d/udev
systemd-udevd.service
/usr/lib/udev/rules.d
/etc/udev/rules.d
/run/udev/rules.d
ubuntu: ls /usr/lib/udev/rules.d/
ubuntu: less /usr/lib/udev/rules.d/99-systemd.rules
ubuntu: ls /etc/udev/rules.d/
ubuntu: less /etc/udev/rules.d/60-vboxdrv.rules
```

9. Udevadm command.

```
uvents
udevd
:udevadm info -q
name, symlink, path, property, all
:udevadm monitor
:udevadm test --<action> <device>
:udevadm control --reload
:udevadm trigger
ubuntu: udevadm info -m /dev/sda
ubuntu: udevadm info -q property -n /dev/sda
ubuntu: udevadm monitor
ubuntu: udevadm test --action="add" /dev/char/89:0
ubuntu: sudo udevadm control --reload
```

10. USB Device Bus.

```
:lsusb
port, thumb drive, flash drive
/media
/sys
/dev
:lsusb -t
:lsusb -v
ubuntu: lsusb
ubuntu: lsusb -v
ubuntu: lsusb -t
ubuntu: lsusb -tv
```

11. PCI Device Bus.

```
PCIe
PCIe 5.0
SATA, SCSI
:lspci
Bus:Device:Function
:lspci -v
```

```
:lspci -vv
ubuntu: lspci
ubuntu: lspci -t
ubuntu: lspci -tv
ubuntu: lspci -v
ubuntu: lspci -vv
ubuntu: lspci -k
```

12. Storage Device Buses.

```
:lsblk
IDE
SCSI
SATA
Ultra 320 SCSI
SAS
eSATA
eSATAp
/dev
character device files
block device files
:lsblk -p
ubuntu: ls /dev
ubuntu: echo "Something" > /dev/stdout
ubuntu: ls /dev/mapper/
ubuntu: lsblk
ubuntu: lsblk -p
ubuntu: lsblk -p -fs
```

12. Job scheduling and automation.

```
#####
#####
```

1. Job Scheduling and automation.

```
cron
crontab
:at
job control
kill
```

2. The cron daemon.

```
cron
crond
cron tables
etc/crontab
etc/cron.hourly
etc/cron.daily
etc/cron.weekly
etc/cron.monthly
var/spool/anacron
ubuntu: less /etc/crontab
ubuntu: less /etc/anacrontab
ubuntu: ll var/spool/anacron/
ubuntu: ls /etc/cron.daily/
```

3. The crontab utility.

```
var/spool/cron/<user name>
/var/spool/cron/crontabs/<user name>
/etc/crontab
crontab -e
centos8: cat /etc/crontab
centos8: crontab -e
centos8: which echo
centos8: less /tmp/minutetest
centos8: tail -f /tmpminutetest
```



```
centos8: crontab -r
centos8: sudo ls -al /var/spool/cron
centos8: sudo less /var/spool/cron/rob
```

4. The at command.

```
atd
/var/spool/at
at <-f filename> time
at -f script.sh now + 1 minute
/var/spool/at
:atq
:atrm
centos8: at now +3 minutes
centos8: sudo ls var/spool/at/...
centos8: less /tmp/attest
```

5. Job control

```
somescrpt.sh &
:jobs
:fg
:fg <job number>
CTRL + C, sigint
CTRL + Z, sigstp
:bg
sighup
:nohup some_script.sh &
```

6. The kill command.

```
:top
:kill <PID>
:pkill
:pkill cups
SIGHUP, SIGINT, SIGSTP
SIGTERM, SIGKILL(9), SIGKILL
:kill -9
centos8: firefox &
centos8: nautilus &
centos8: ps aux | grep firefox
centos8: ps aux | grep nautilus
centos8: ps aux | grep nautilus | grep -v grep
centos8: pkill firefox
centos8: ps aux | grep firefox
centos8: ps aux | grep firefox | grep -v grep
centos8: ps aux | grep nautilus | grep -v grep
centos8: kill -9 5346
```