

CTS2322C – FINAL EXAM

Final Exam

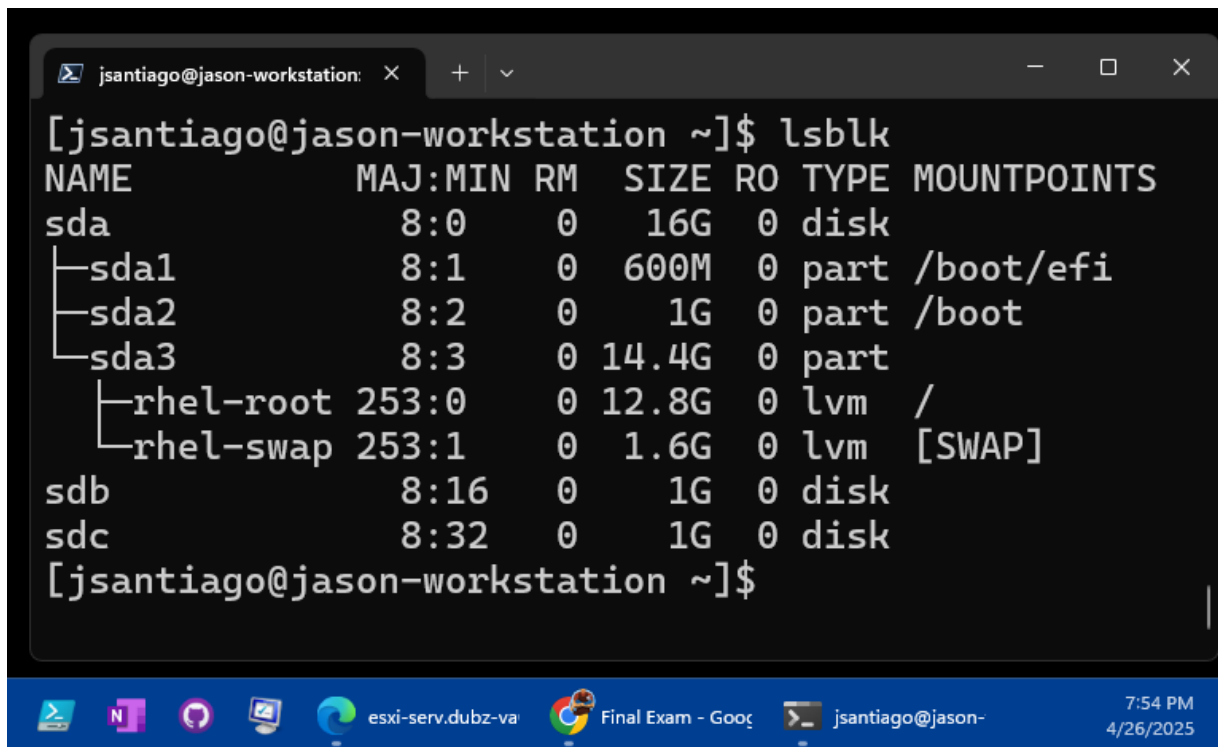
Student Name: Jason Santiago

Course Name: CTS-2322C

Submission Date: 04-26-2025

==== [Final Exam Screenshots 1] ====

Screenshot 1: lsblk showing two new disks (e.g., /dev/sdb, /dev/sdc) with **no partitions**.



```
[jsantiago@jason-workstation ~]$ lsblk
NAME                MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
sda                  8:0    0   16G  0 disk
├─sda1               8:1    0   600M  0 part /boot/efi
├─sda2               8:2    0    1G  0 part /boot
└─sda3               8:3    0  14.4G  0 part
   ├─rhel-root       253:0    0  12.8G  0 lvm  /
   └─rhel-swap       253:1    0   1.6G  0 lvm  [SWAP]
sdb                  8:16    0    1G  0 disk
sdc                  8:32    0    1G  0 disk
[jsantiago@jason-workstation ~]$
```

The screenshot shows a terminal window titled 'jsantiago@jason-workstation:'. The command 'lsblk' has been executed, displaying a table of block devices. The table includes columns for NAME, MAJ:MIN, RM, SIZE, RO, TYPE, and MOUNTPOINTS. It lists the sda disk with its partitions (sda1, sda2, sda3) and logical volumes (rhel-root, rhel-swap), as well as two new disks, sdb and sdc, which are currently unpartitioned. The terminal window is part of a desktop environment with a taskbar at the bottom showing various application icons and the system clock indicating 7:54 PM on 4/26/2025.

==== [Final Exam Screenshots 2] ====

Screenshot 2: `lsblk`, `df -h`, and `cat /etc/fstab` showing `/archive` mounted and configured.

```
jsantiago@jason-workstation: ~]$ lsblk
NAME        MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
sda          8:0    0   16G  0 disk
├─sda1       8:1    0   600M  0 part /boot/efi
├─sda2       8:2    0    1G  0 part /boot
├─sda3       8:3    0  14.4G  0 part
│   └─rhel-root 253:0    0  12.8G  0 lvm  /
│   └─rhel-swap 253:1    0    1.6G  0 lvm  [SWAP]
└─sdb        8:16   0    1G  0 disk
   └─sdb1     8:17   0 1023M  0 part /archive
sdc          8:32   0    1G  0 disk

jsantiago@jason-workstation: ~]$ df -h
Filesystem      Size  Used Avail Use% Mounted on
devtmpfs        4.0M   0  4.0M   0% /dev
tmpfs           888M   0  888M   0% /dev/shm
tmpfs           356M  7.1M  348M   2% /run
/dev/mapper/rhel-root 13G  5.8G  7.1G  45% /
/dev/sda2       960M  296M  665M  31% /boot
/dev/sda1       599M   7.1M  592M   2% /boot/efi
tmpfs           178M  100K  178M   1% /run/user/1000
/dev/sdb1       959M   39M  921M   5% /archive

jsantiago@jason-workstation: ~]$
```

```
jsantiago@jason-workstation: ~]$ cat /etc/fstab
#
# /etc/fstab
# Created by anaconda on Mon Mar 17 13:47:49 2025
#
# Accessible filesystems, by reference, are maintained under '/dev/disk/'.
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info.
#
# After editing this file, run 'systemctl daemon-reload' to update systemd
# units generated from this file.
#
/dev/mapper/rhel-root / xfs defaults 0 0
UUID=79035cbb-e284-4442-a49f-d8c0a480ecca /boot xfs defaults
0 0
UUID=8018-0EA4 /boot/efi vfat umask=0077,shortname=winnt
0 2
/dev/mapper/rhel-swap none swap defaults 0 0
UUID="26b58097-438d-4989-b062-52bb0a299884" /archive xfs defaults 0 0

jsantiago@jason-workstation: ~]$
```

CTS2322C – FINAL EXAM

==== [Final Exam Screenshots 3] ====

Screenshot 3: lsblk, df -h, and cat /etc/fstab showing /backup mounted and configured.

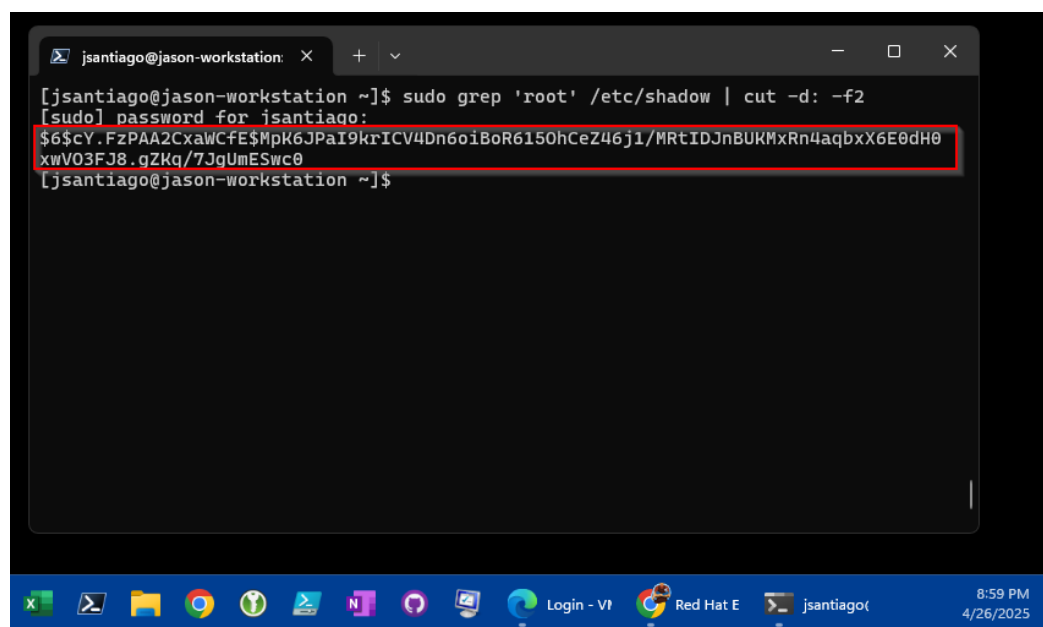
```
jsantiago@jason-workstation: X + v
Discarding blocks...Done.
[jsantiago@jason-workstation ~]$ sudo mkdir /backup
[jsantiago@jason-workstation ~]$ sudo mount /dev/vg0/backup /backup
mount: (hint) your fstab has been modified, but systemd still uses
the old version; use 'systemctl daemon-reload' to reload.
[jsantiago@jason-workstation ~]$ systemctl daemon-reload
==== AUTHENTICATING FOR org.freedesktop.systemd1.reload-daemon ====
Authentication is required to reload the systemd state.
Authenticating as: Jason Santiago (jsantiago)
Password:
==== AUTHENTICATION COMPLETE ====
[jsantiago@jason-workstation ~]$ sudo blkid /dev/mapper/vg0-backup
/dev/mapper/vg0-backup: UUID="0e99cfd-f3b7-4c76-a56a-2a3da3a328a2" TYPE="xfs"
[jsantiago@jason-workstation ~]$ sudo nano /etc/fstab
[jsantiago@jason-workstation ~]$ lsblk
NAME                MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
sda                  8:0    0   16G  0 disk
├─sda1                8:1    0   600M  0 part /boot/efi
├─sda2                8:2    0    1G  0 part /boot
├─sda3                8:3    0  14.4G  0 part
├─rhel-root          253:0    0  12.8G  0 lvm /
└─rhel-swap          253:1    0   1.6G  0 lvm [SWAP]
sdb                  8:16    0    1G  0 disk
└─sdb1               8:17    0  1023M  0 part /archive
sdc                  8:32    0    1G  0 disk
└─vg0-backup         253:2    0   500M  0 lvm /backup
[jsantiago@jason-workstation ~]$ df -h
Filesystem            Size  Used Avail Use% Mounted on
devtmpfs               4.0M   0   4.0M   0% /dev
tmpfs                 888M   0   888M   0% /dev/shm
tmpfs                 356M   7.2M  348M   3% /run
/dev/mapper/rhel-root  13G   5.8G   7.1G  45% /
/dev/sda2             960M  296M  665M  31% /boot
/dev/sda1             599M   7.1M  592M   2% /boot/efi
tmpfs                 178M  100K  178M   1% /run/user/1000
/dev/sdb1             959M   39M   921M   5% /archive
/dev/mapper/vg0-backup 436M   29M   408M   7% /backup
[jsantiago@jason-workstation ~]$ cat /etc/fstab
#
# /etc/fstab
# Created by anaconda on Mon Mar 17 13:47:49 2025
#
# Accessible filesystems, by reference, are maintained under '/dev/disk/'.
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info.
#
# After editing this file, run 'systemctl daemon-reload' to update systemd
# units generated from this file.
#
/dev/mapper/rhel-root / xfs defaults 0 0
UUID=79035cbb-e284-4442-a49f-d8c0a480ecca /boot xfs defaults
UUID=8018-0EA4 /boot/efi vfat umask=0077,shortname=winnt 0 2
/dev/mapper/rhel-swap none swap defaults 0 0
UUID="26b58097-438d-4989-b062-52bb0a299884" /archive xfs defaults 0 0
UUID="0e99cfd-f3b7-4c76-a56a-2a3da3a328a2" /backup xfs defaults 0 0

[jsantiago@jason-workstation ~]$ |
```

CTS2322C – FINAL EXAM

==== [Final Exam Screenshots 4] ====

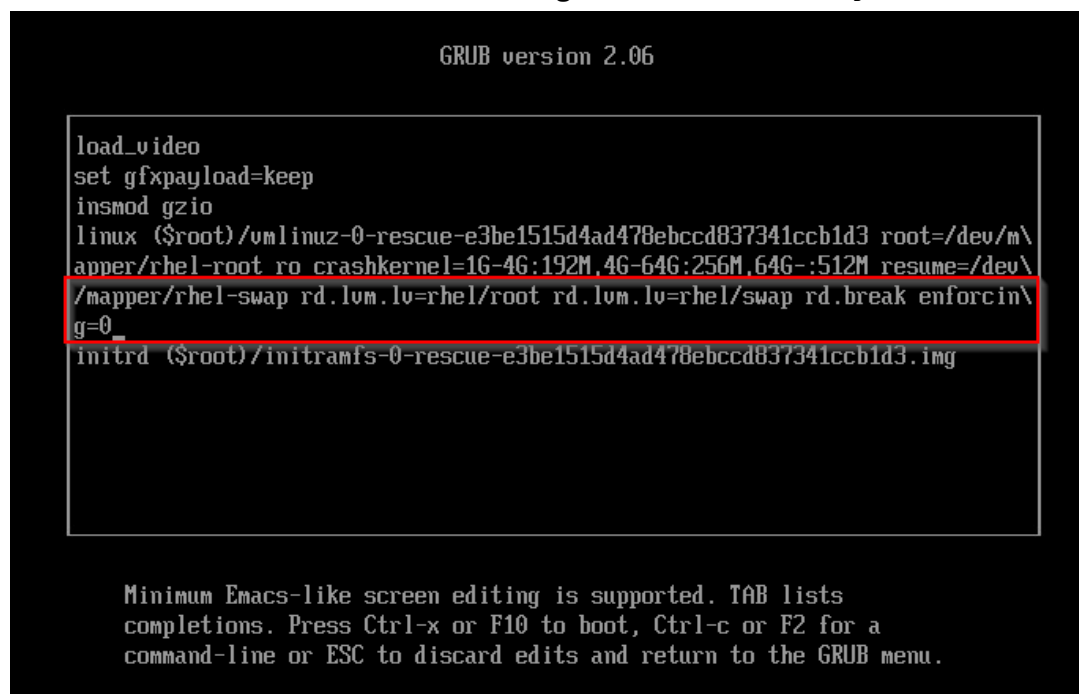
Screenshot 4: Old root password hash



```
jsantiago@jason-workstation: ~$ sudo grep 'root' /etc/shadow | cut -d: -f2
[sudo] password for jsantiago:
$6$cY.FzPAA2CxawCfE$Mpk6JPaI9krICV4Dn6oiBoR6150hCeZ46j1/MRtIDJnBUKMXRn4aqbxX6E0dH0
xwV03FJ8.gZKq/7JgUmESwc0
jsantiago@jason-workstation ~]$
```

==== [Final Exam Screenshots 5] ====

Screenshot 5: GRUB screen after adding `rd.break enforcing=0`



```
GRUB version 2.06

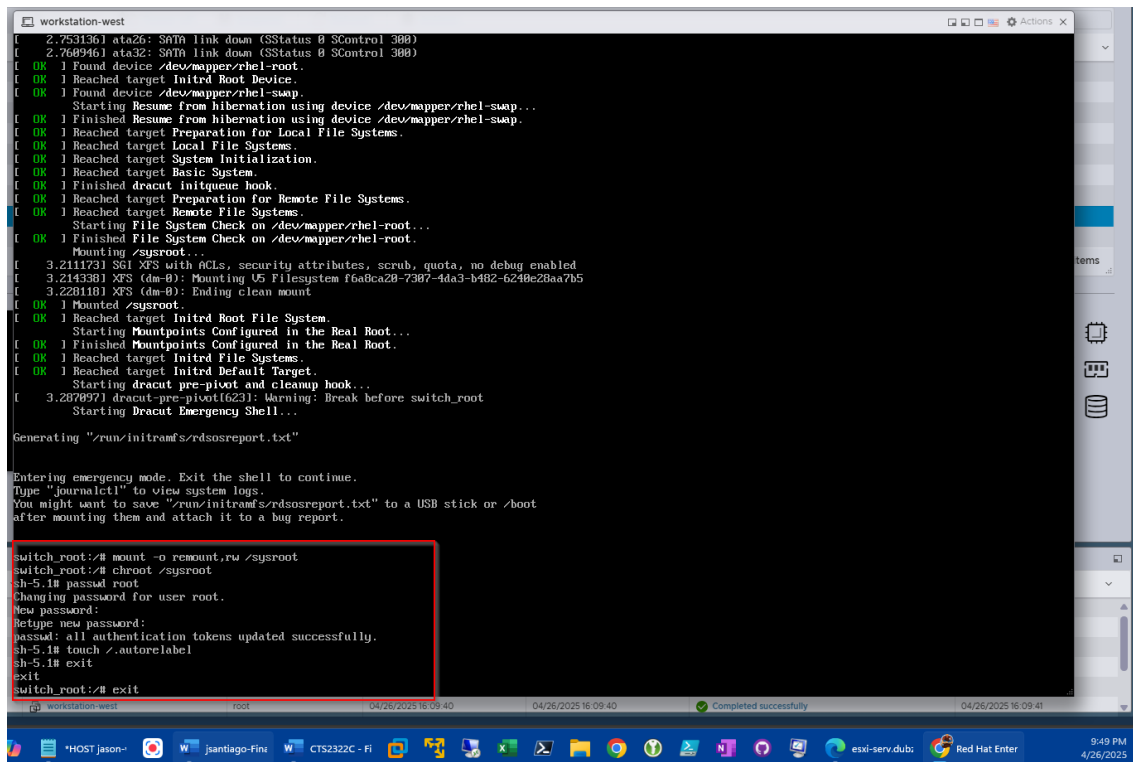
load_video
set gfxpayload=keep
insmod gzio
linux ($root)/vmlinuz-0-rescue-e3be1515d4ad478ebccd837341ccb1d3 root=/dev/m\
apper/rhel-root ro crashkernel=1G-4G:192M,4G-64G:256M,64G-:512M resume=/dev\
/mapper/rhel-swap rd.lvm.lv=rhel/root rd.lvm.lv=rhel/swap rd.break enforcing=0
g=0_
initrd ($root)/initramfs-0-rescue-e3be1515d4ad478ebccd837341ccb1d3.img

Minimum Emacs-like screen editing is supported. TAB lists
completions. Press Ctrl-x or F10 to boot, Ctrl-c or F2 for a
command-line or ESC to discard edits and return to the GRUB menu.
```

CTS2322C – FINAL EXAM

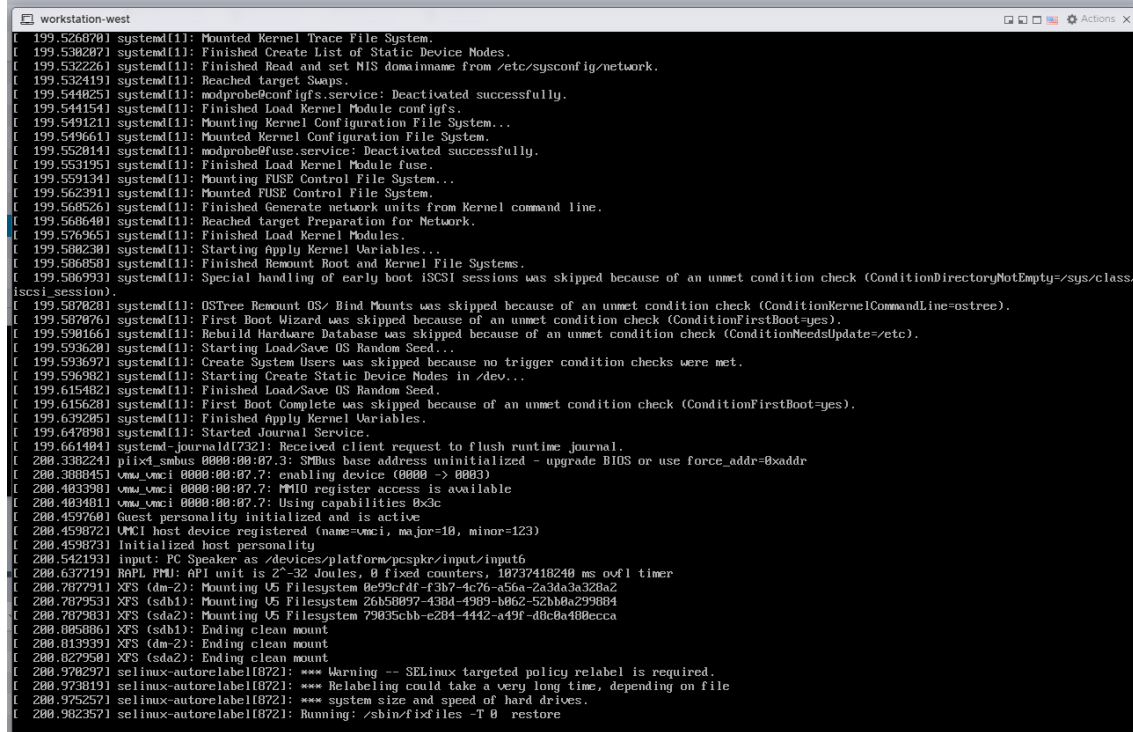
==== [Final Exam Screenshots 6] ====

Screenshot 6: Commands run in sysroot



The screenshot shows a terminal window titled 'workstation-west' displaying boot logs. The logs indicate the system has reached the 'Emergency Shell' due to a 'Break before switch_root' warning. A red box highlights the following commands and their output:

```
switch_root:# mount -o remount,rw /sysroot
switch_root:# chroot /sysroot
sh-5.1# passwd root
Changing password for user root.
New password:
Retype new password:
passwd: all authentication tokens updated successfully.
sh-5.1# touch /.autorelabel
sh-5.1# exit
switch_root:# exit
```



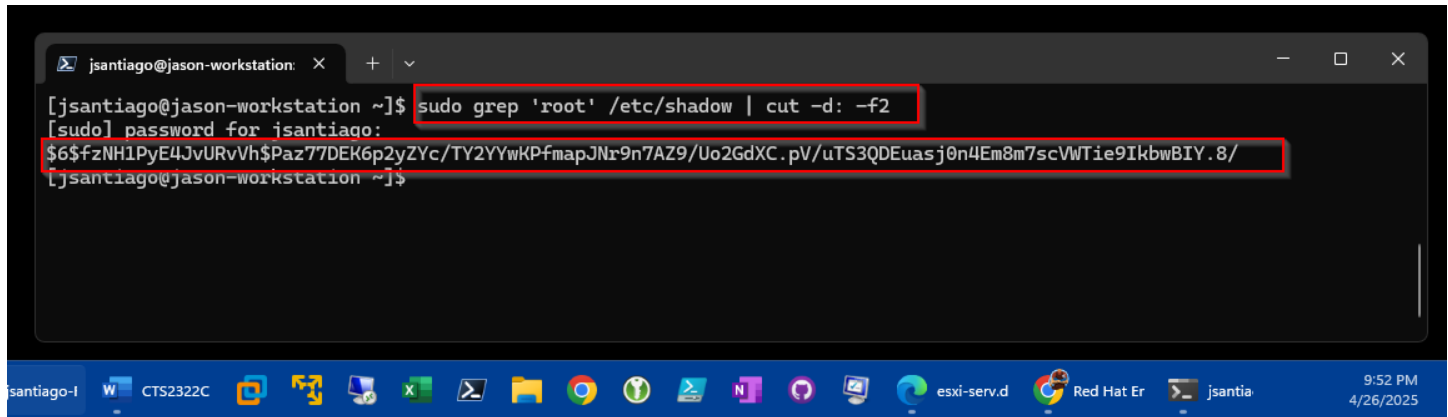
The screenshot continues the terminal output from the previous one, showing the system's progress during initialization. The logs include the following entries:

```
systemd[1]: Mounted Kernel Trace File System.
systemd[1]: Finished Create List of Static Device Nodes.
systemd[1]: Finished Read and set NIS domainname from /etc/sysconfig/network.
systemd[1]: Reached target Sysfs.
systemd[1]: modprobe@configfs.service: Deactivated successfully.
systemd[1]: Finished Load Kernel Module configs.
systemd[1]: Mounting Kernel Configuration File System...
systemd[1]: Mounted Kernel Configuration File System.
systemd[1]: modprobe@fuse.service: Deactivated successfully.
systemd[1]: Finished Load Kernel Module fuse.
systemd[1]: Mounting FUSE Control File System...
systemd[1]: Mounted FUSE Control File System.
systemd[1]: Finished Generate network units from Kernel command line.
systemd[1]: Reached target Preparation for Network.
systemd[1]: Finished Load Kernel Modules.
systemd[1]: Starting Apply Kernel Variables...
systemd[1]: Finished Remount Root and Kernel File Systems.
systemd[1]: Special handling of early boot iSCSI sessions was skipped because of an unmet condition check (ConditionDirectoryNotEmpty=/sys/class/iscsi/session).
systemd[1]: OSTree Remount OS/ Bind Mounts was skipped because of an unmet condition check (ConditionKernelCommandLine=ostree).
systemd[1]: First Boot Wizard was skipped because of an unmet condition check (ConditionFirstBoot=yes).
systemd[1]: Rebuild Hardware Database was skipped because of an unmet condition check (ConditionNeedsUpdate=/etc).
systemd[1]: Starting Load/Save OS Random Seed...
systemd[1]: Create System Users was skipped because no trigger condition checks were met.
systemd[1]: Starting Create Static Device Nodes in /dev...
systemd[1]: Finished Load/Save OS Random Seed.
systemd[1]: First Boot Complete was skipped because of an unmet condition check (ConditionFirstBoot=yes).
systemd[1]: Finished Apply Kernel Variables.
systemd[1]: Started Journal Service.
systemd-journald[732]: Received client request to flush runtime journal.
linuxd_smbus 0000:00:07:3: SMBus base address uninitialized - upgrade BIOS or use force_addr=0xaddr
linuxd_vmmci 0000:00:07:7: enabling device (0000 -> 0003)
linuxd_vmmci 0000:00:07:7: MMIO register access is available
linuxd_vmmci 0000:00:07:7: Using capabilities 0x3c
Guest personality initialized and is active
VMMCI host device registered (name=vmmci, major=10, minor=123)
Initialized host personality
input: PC Speaker as /devices/platform/vesa/vesa/input/input6
RAPL PMU: API unit is 2^-32 Joules, 0 fixed counters, 10737418240 ms ovrfl timer
XFS (dm-2): Mounting U5 Filesystem 0e99cfdf-f3b7-4c76-a56a-2a3da3a32ba2
XFS (sdb1): Mounting U5 Filesystem 26b58097-438d-4989-b062-52bba299804
XFS (sda2): Mounting U5 Filesystem 79035cbb-e204-4442-a49f-48c0a408becca
XFS (sdb1): Ending clean mount
XFS (dm-2): Ending clean mount
XFS (sda2): Ending clean mount
Warning -- SELinux targeted policy relabel is required.
Relabeling could take a very long time, depending on file
system size and speed of hard drives.
Running: /sbin/fixfiles -T 0 restore
```

CTS2322C – FINAL EXAM

==== [Final Exam Screenshots 7] ====

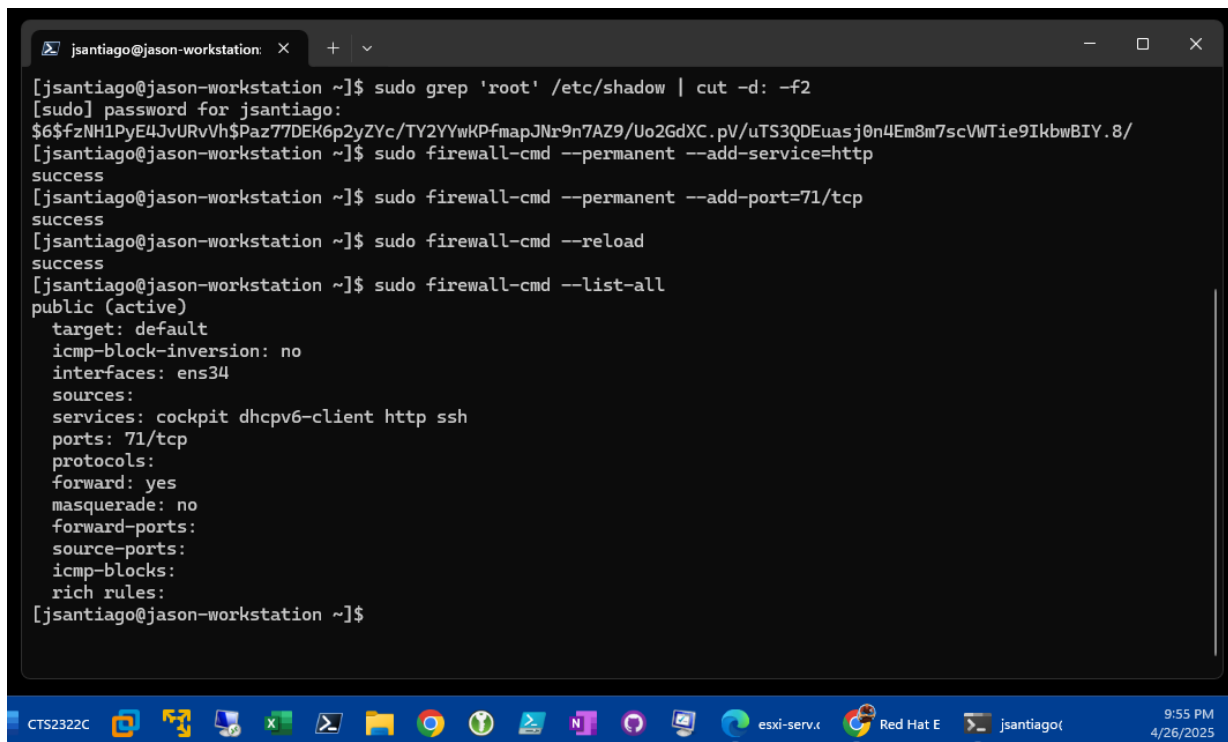
`grep 'root' /etc/shadow



A terminal window titled 'jsantiago@jason-workstation' shows the command `sudo grep 'root' /etc/shadow | cut -d: -f2` being executed. The output is a long alphanumeric string: `6fzNH1PyE4JvURvVh$Paz77DEK6p2yZYc/TY2YYwKPfmapJNr9n7AZ9/Uo2GdXC.pV/uTS3QDEuasj0n4Em8m7scVWTie9IkbwBIY.8/`. The terminal window is part of a desktop environment with various application icons at the bottom and a system tray showing the time as 9:52 PM on 4/26/2025.

==== [Final Exam Screenshots 8] ====

Firewall commands and firewall-cmd --list-all output



A terminal window titled 'jsantiago@jason-workstation' shows a series of firewall commands and their outputs. The commands are: `sudo grep 'root' /etc/shadow | cut -d: -f2`, `sudo firewall-cmd --permanent --add-service=http`, `sudo firewall-cmd --permanent --add-port=71/tcp`, `sudo firewall-cmd --reload`, and `sudo firewall-cmd --list-all`. The output of the last command shows the firewall is in 'public (active)' mode with various settings like target, interfaces, and services. The terminal window is part of a desktop environment with various application icons at the bottom and a system tray showing the time as 9:55 PM on 4/26/2025.

CTS2322C – FINAL EXAM

====[Part 5]====

"I thought the course was very useful. The labs helped me understand real Linux system tasks like partitioning, setting up LVM, fixing boot problems, and working with firewalls and SELinux. It was hands-on and gave me a lot more confidence with system administration.

One thing I think could help is adding a few more walkthroughs or troubleshooting tips when things go wrong, especially during the rescue boot or SELinux parts.

I also plan to use what I learned with Apache (httpd) to host my Cyber Range web app at home, so the material directly connects to my future projects.

Overall, I think the course was well-designed and definitely helped me build real-world skills. Thanks for a good semester."