Mary Gwyneth A. Tolentino
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November 20, 2024
CMSC 125 - B5L

ICS-OS Lab 01

Task 1: Install Docker and Docker-Compose

Docker Installation

```
gwy@LAPTOP-3UC7K3M1:~$ sudo docker run hello-world

Hello from Docker!
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
 1. The Docker client contacted the Docker daemon.
 2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
    (amd64)
 3. The Docker daemon created a new container from that image which runs the
    executable that produces the output you are currently reading.
 4. The Docker daemon streamed that output to the Docker client, which sent
it
    to your terminal.

To try something more ambitious, you can run an Ubuntu container with:
 $ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker ID:
 https://hub.docker.com/

For more examples and ideas, visit:
 https://docs.docker.com/get-started/

gwy@LAPTOP-3UC7K3M1:~$
```

Docker Compose Installation

```
gwy@LAPTOP-3UC7K3M1:~$ docker compose version
Docker Compose version v2.29.7
gwy@LAPTOP-3UC7K3M1:~$
```

Task 2: Clone the repository and explore the source tree

```
gwy@LAPTOP-3UC7K3M1:/mnt/c/Users/Gwy/Desktop$ git clone https://github.com/s
rg-ics-uplb/ics-os.git ics-os-mgat
Cloning into 'ics-os-mgat'...
remote: Enumerating objects: 3557, done.
remote: Counting objects: 100% (408/408), done.
remote: Compressing objects: 100% (195/195), done.
remote: Total 3557 (delta 216), reused 405 (delta 213), pack-reused 3149 (fr
om 1)
Receiving objects: 100% (3557/3557), 26.02 MiB | 634.00 KiB/s, done.
Resolving deltas: 100% (2368/2368), done.
Updating files: 100% (227/227), done.
gwy@LAPTOP-3UC7K3M1:/mnt/c/Users/Gwy/Desktop$
```

Git Checkout and Branch

```
gwy@LAPTOP-3UC7K3M1:/mnt/c/Users/Gwy/Desktop$ cd ics-os-mgat/
gwy@LAPTOP-3UC7K3M1:/mnt/c/Users/Gwy/Desktop/ics-os-mgat$ git checkout -b lab01
Switched to a new branch 'lab01'
gwy@LAPTOP-3UC7K3M1:/mnt/c/Users/Gwy/Desktop/ics-os-mgat$ git branch
* lab01
  master
gwy@LAPTOP-3UC7K3M1:/mnt/c/Users/Gwy/Desktop/ics-os-mgat$
```

Task 3: Build ICS-OS Kernel

```
root@10a08cc6e875: /    gwy@LAPTOP-3UC7K3M1: /mr
 => [ics-os-build internal] load build definition from Dockerfile
                    0.1s
 => => transferring dockerfile: 328B
                    0.1s
 => [ics-os-build internal] load metadata for docker.io/library/ubuntu:16.04
                    4.4s
 => [ics-os-build internal] load .dockerignore
                    0.1s
 => => transferring context: 2B
                    0.0s
 => [ics-os-build 1/4] FROM docker.io/library/ubuntu:16.04@sha256:1f1a2d56de1d604801a9671f30
1190704c25d604a416f5  25.7s
 => => resolve docker.io/library/ubuntu:16.04@sha256:1f1a2d56de1d604801a9671f301190704c25d60
[+] Building 1071.4s (9/9) FINISHED                                  docker:default
 => [ics-os-build internal] load build definition from Dockerfile                0.1s6
 => => transferring dockerfile: 328B                                             0.1s
 => [ics-os-build internal] load metadata for docker.io/library/ubuntu:16.04     4.4s.
 => [ics-os-build internal] load .dockerignore                                   0.1s
 => => transferring context: 2B                                                  0.0s
 => [ics-os-build 1/4] FROM docker.io/library/ubuntu:16.04@sha256:1f1a2d56de1d604801  46.2s
 => => resolve docker.io/library/ubuntu:16.04@sha256:1f1a2d56de1d604801a9671f30119070  0.0s
 => => sha256:b6f50765242581c887ff1acc2511fa2d885c52d8fb3ac8c4bba131f 3.36kB / 3.36kB  0.0s
 => => sha256:58690f9b18fca6469a14da4e212c96849469f9b1be6661d2342a 46.50MB / 46.50MB  39.2s2
 => => sha256:b51569e7c50720acf6860327847fe342a1afbe148d24c529fb81df105e3 857B / 857B  0.3s
 => => sha256:da8ef40b9ecabc2679fe2419957220c0272a965c5cf7e0269fa1aeeb8c5 528B / 528B  0.6s5
 => => sha256:1f1a2d56de1d604801a9671f301190704c25d604a416f59e03c04f5 1.42kB / 1.42kB  0.0s
 => => sha256:a3785f78ab8547ae2710c89e627783cfa7ee7824d3468cae6835c9f 1.15kB / 1.15kB  0.0s
 => => sha256:fb15d46c38dcd1ea0b1990006c3366ecd10c79d374f341687eb2cb23a2c 170B / 170B  1.2s
 => => extracting sha256:58690f9b18fca6469a14da4e212c96849469f9b1be6661d2342a4bf01774  6.5s
 => => extracting sha256:b51569e7c50720acf6860327847fe342a1afbe148d24c529fb81df105e3e  0.0s
 => => extracting sha256:da8ef40b9ecabc2679fe2419957220c0272a965c5cf7e0269fa1aeeb8c56  0.0s
 => => extracting sha256:fb15d46c38dcd1ea0b1990006c3366ecd10c79d374f341687eb2cb23a2c8  0.0s
 => [ics-os-build 2/4] RUN apt-get update                                       105.2s
 => [ics-os-build 3/4] RUN apt-get install -y build-essential nasm qemu-kvm tcc git  909.9s
 => [ics-os-build 4/4] RUN mkdir -p /home/ics-os                                 0.8s
 => [ics-os-build] exporting to image                                            4.3s
 => => exporting layers                                                          4.2s
 => => writing image sha256:8c88473d1c3bdfdc6c7f487abc30d8e229a70045f0d4decddf4a50354  0.0s
 => => naming to docker.io/library/ics-os-ics-os-build                           0.0s
 => [ics-os-build] resolving provenance for metadata file                        0.1s
root@10a08cc6e875:/#
```

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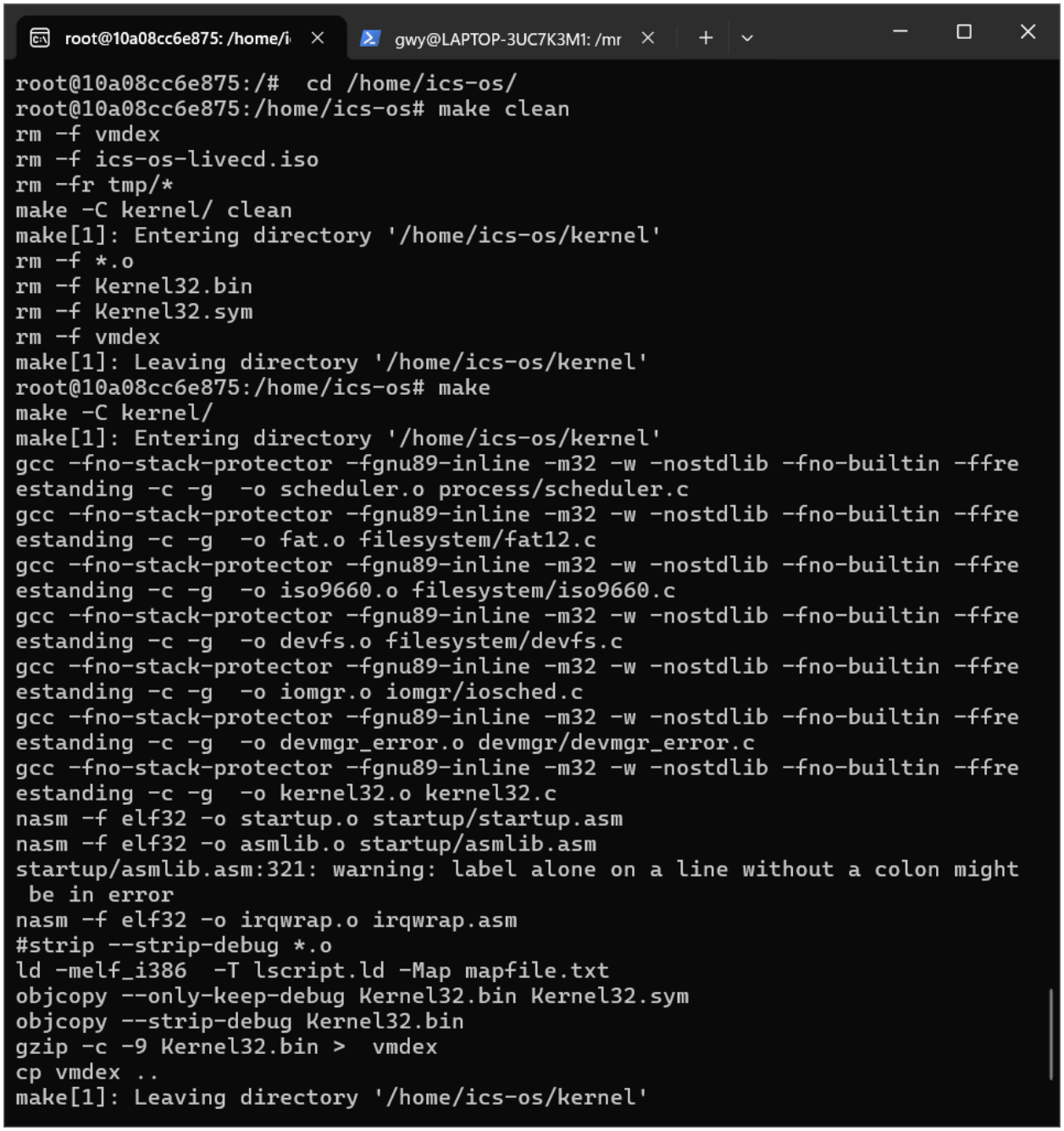
Root shell inside the container



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Task 4: Create the disk and boot ICS-OS

```
root@8b45afd5f25a:/home/ics-os# exit
exit
gwy@LAPTOP-3UC7K3M1:/mnt/c/Users/Gwy/Desktop/ics-os-mgat/ics-os$ sudo make floppy
rm -fr tmp
mkdir tmp
cp -r vmdex tmp
scripts/gen-help.sh
cp  base/* tmp
mkdir -p tmp/apps
mkdir -p tmp/tcc1
mkdir -p tmp/lib1
cp apps/* tmp/apps/
cp sdk/* tmp/tcc1/
cp lib/* tmp/lib1/
cp grub.img ics-os-floppy.img                #copy an image with grub
sudo rm -fr mnt
sudo mkdir mnt
sudo mount ics-os-floppy.img mnt -tmsdos -oloop
sudo cp -r tmp/* mnt/
sudo umount mnt
sudo chmod 666 ics-os-floppy.img
rm -fr tmp/
gwy@LAPTOP-3UC7K3M1:/mnt/c/Users/Gwy/Desktop/ics-os-mgat/ics-os$
```

GRUB boot menu

```
gwy@LAPTOP-3UC7K3M1:/mnt/c/Users/Gwy/Desktop/ics-os-mgat/ics-os$ make boot-floppy
qemu-system-i386 -net nic,model=rtl8139 -soundhw pcspk -fda ics-os-floppy.img -boot a -m 64M

                                                                mg' and probing guessed raw.
                                                                 raw images, write operations on

                                                                estrictions.
                                                                lease set a backend using '-mach

                                                                twork
```

QEMU

Machine View

GRUB version 0.92 (639K lower / 64384K upper memory)

ICS Operating System

Use the ↑ and ↓ keys to select which entry is highlighted.
Press enter to boot the selected OS, 'e' to edit the
commands before booting, or 'c' for a command-line.

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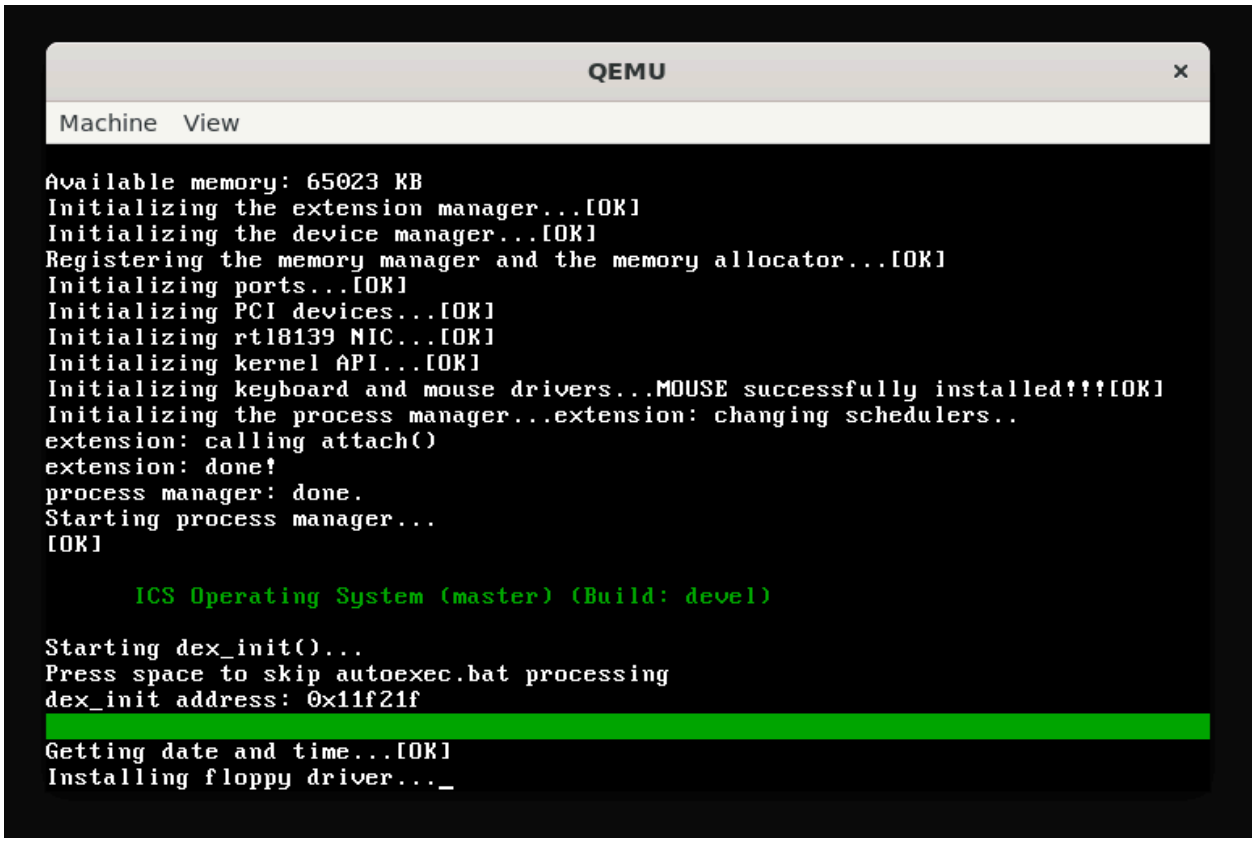
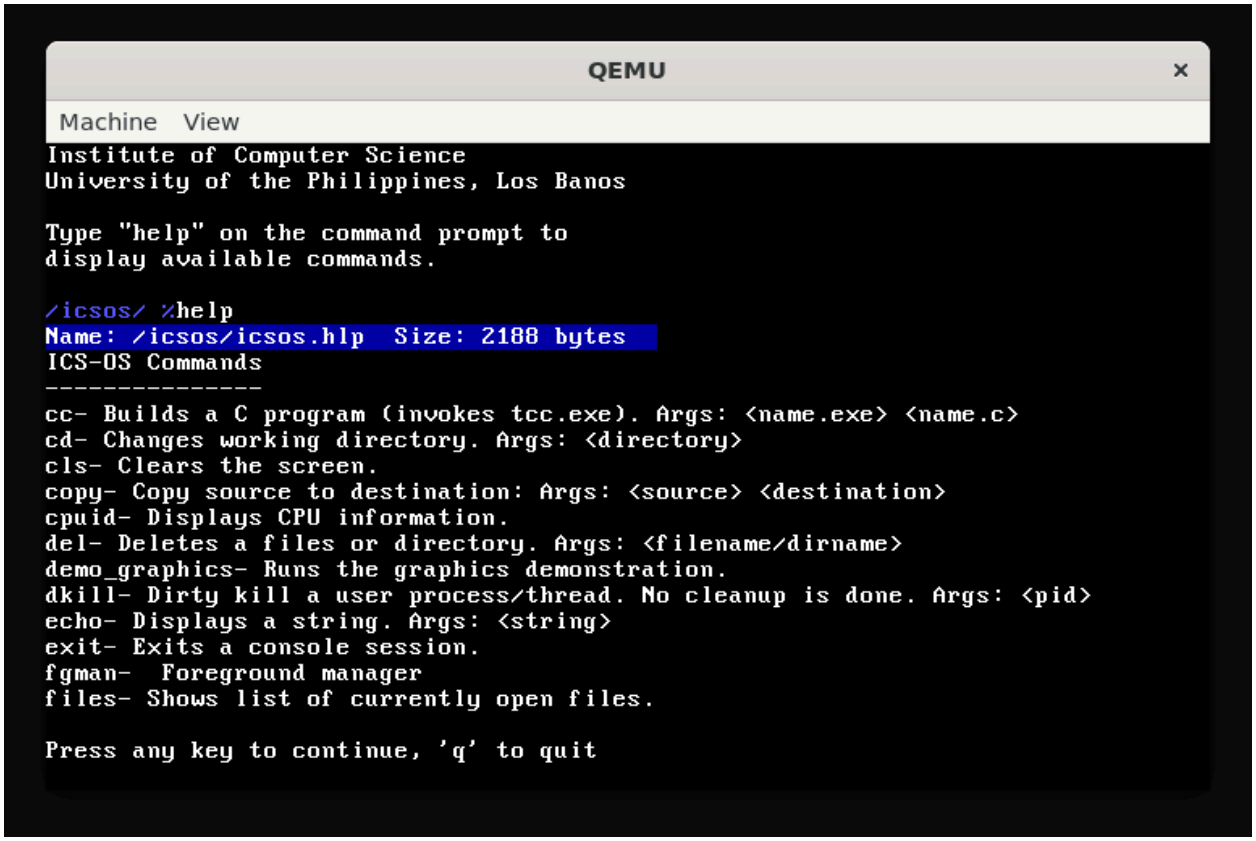
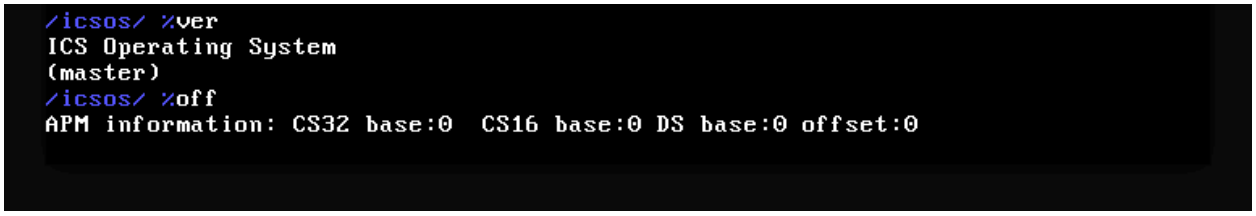
Boot ICS-OS



Task 5: Run ICS-OS commands



Run two commands



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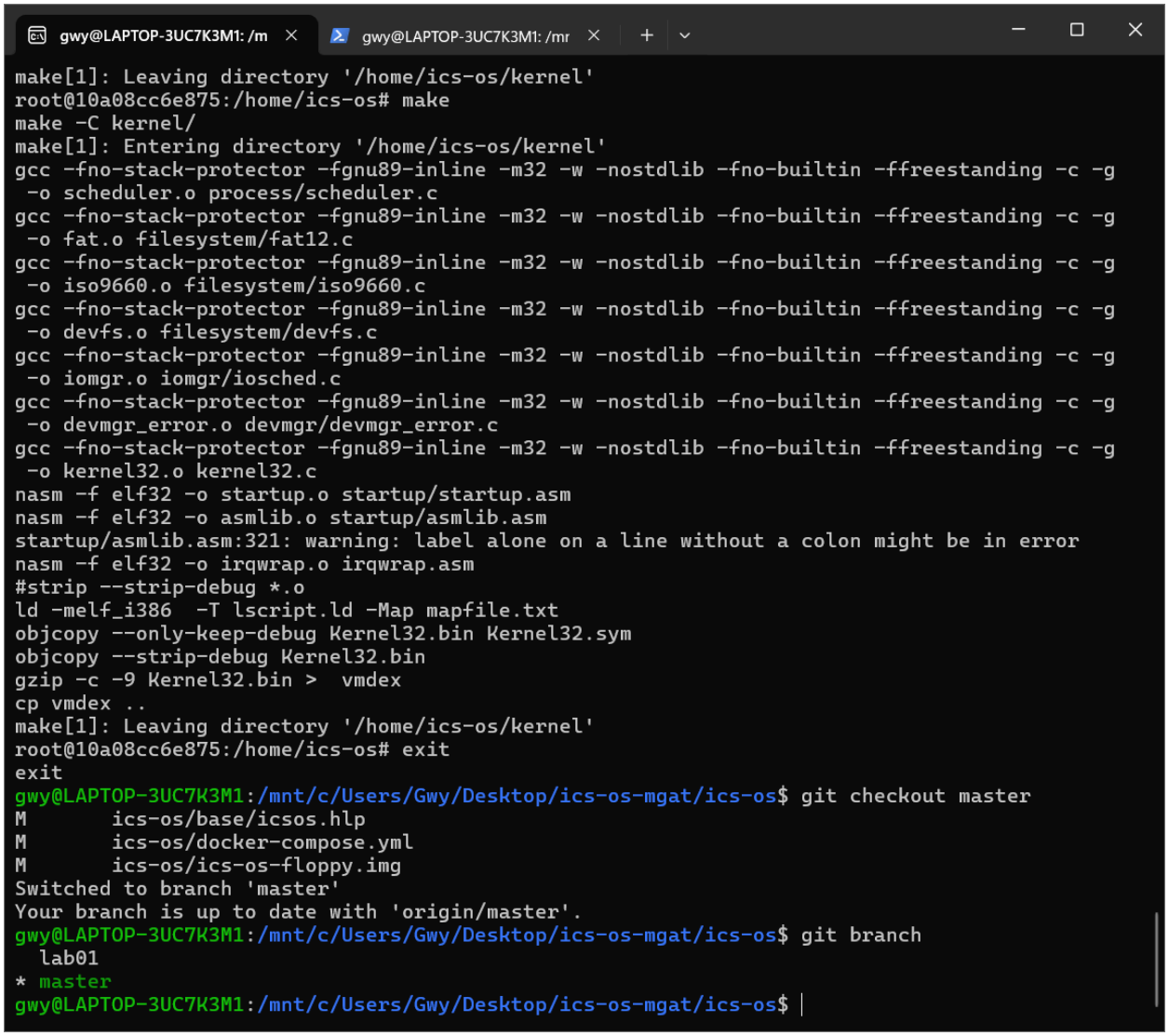
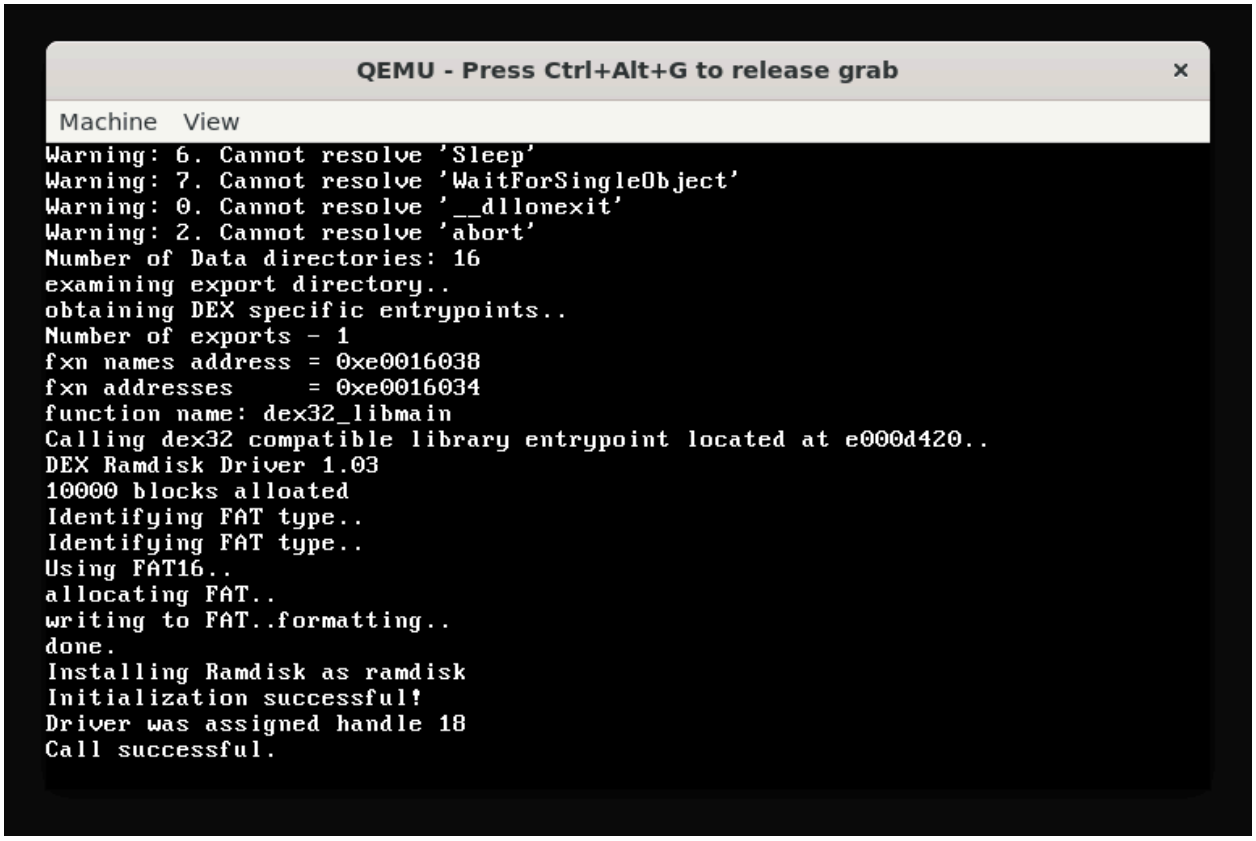
Task 6: Cleanup



REFLECTION

First, I installed the needed packages and entered all the necessary commands in the terminal. I was able to boot the ICS OS successfully. I was amazed and thought of the amount of time it took to work on the OS itself. Also, I realized that the process is the same as the one we did in the exercise in bootloading, although the OS there is much simpler. One question that crossed my mind was why the OS did not terminate when I typed “exit.” I needed to exit using the close tab. I captured a screenshot and attached it below.


QEMU - Press Ctrl+Alt+G to release grab
Machine View
Warning: 6. Cannot resolve 'Sleep'
Warning: 7. Cannot resolve 'WaitForSingleObject'
Warning: 0. Cannot resolve '__dllonexit'
Warning: 2. Cannot resolve 'abort'
Number of Data directories: 16
examining export directory..
obtaining DEX specific entrypoints..
Number of exports - 1
fxn names address = 0xe0016038
fxn addresses = 0xe0016034
function name: dex32_libmain
Calling dex32 compatible library entrypoint located at e000d420..
DEX Ramdisk Driver 1.03
10000 blocks alloated
Identifying FAT type..
Identifying FAT type..
Using FAT16..
allocating FAT..
writing to FAT..formatting..
done.
Installing Ramdisk as ramdisk
Initialization successful!
Driver was assigned handle 18
Call successful.