

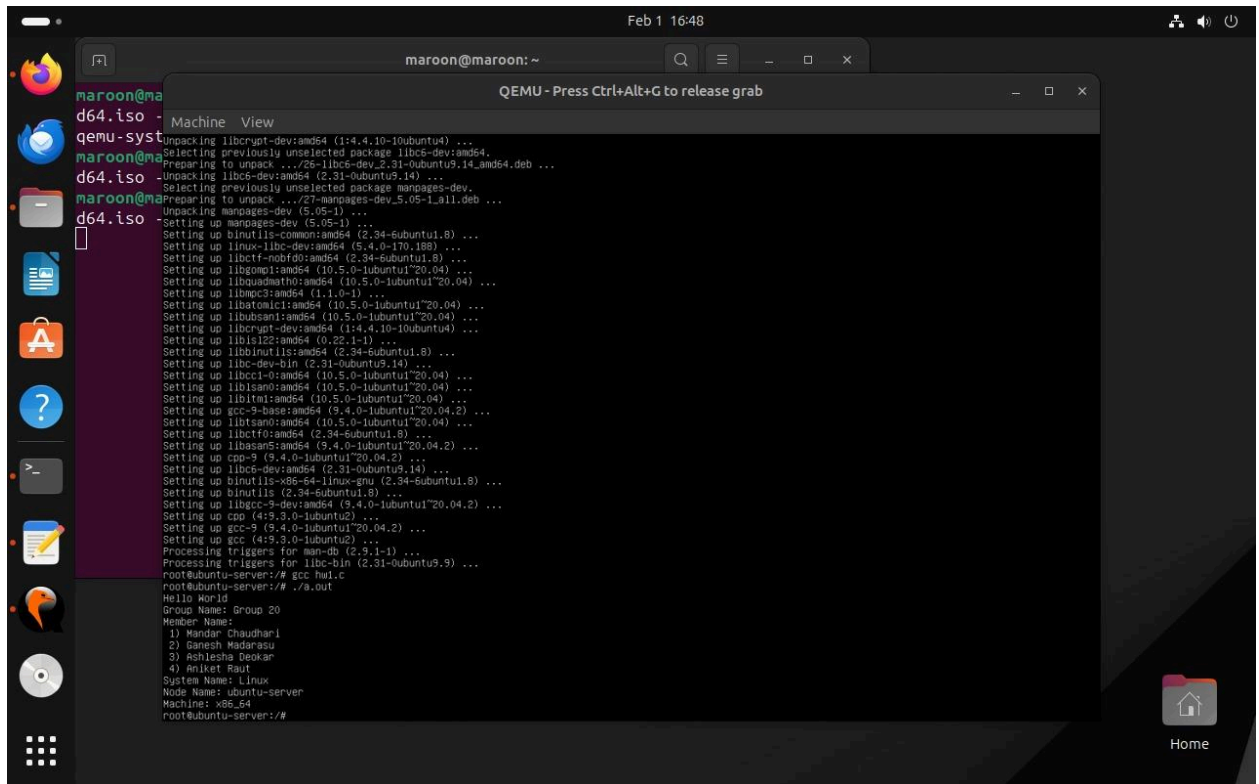
Assignment 1

Group 20:

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1. QEMU to emulate a Linux system on an x86_64 platform

- installing qemu
 - `sudo apt-get install qemu`
- create image
 - `qemu-img create -f qcow2 linux.img 10G`
- download the iso file
 - `wget -c`
`https://www.releases.ubuntu.com/focal/ubuntu-20.04.6-live-server-amd64.iso`
- start qemu server
 - `qemu-system-x86_64 -m 2048 -cdrom ubuntu-20.04.6-live-server-amd64.iso -boot d -drive file=linux.img, format=qcow2-accel tcg`
- open a new file
 - `nano hw1.c`
- Executing the c program
 - `gcc hw1.c`
 - `./a.out`



2. QEMU emulator for the RaspberryPi 4

- First install Git and the build dependencies
 - `sudo apt install git bc bison flex libssl-dev make`
- Navigate to the root of the cloned Linux kernel source directory
 - `git clone --depth=1 https://github.com/raspberrypi/linux`

Kernel configuration:

For Raspberry Pi 4 and 400, and Raspberry Pi Compute Module 4 default 32-bit build configuration:

- Navigate to the root of the cloned Linux kernel source directory
 - `cd /path/to/linux`
- Set environment variables for ARM64 architecture and the cross-compiler prefix
 - `export ARCH=arm64`
 - `export CROSS_COMPILE=aarch64-linux-gnu-`
- Make the default configuration for Raspberry Pi 4 (BCM2711)
 - `make bcm2711_defconfig`

- Build the kernel
 - `make -j$(nproc)`
- make changes to configuration
 - make menuconfig (Enable all the Virt services in menu configuration)
- Running Qemu
 - `qemu-system-aarch64 \`
 - `-M virt \`
 - `-cpu cortex-a72 \`
 - `-m 2G \`
 - `-kernel /home/aniket/linux/arch/arm64/boot/Image \`
 - `-append "root=/dev/vda2 rw console=ttyAMA0,115200 rootwait" \`
 - `-drive`
 - `file=/home/aniket/linux/2022-01-28-raspbios-bullseye-arm64-lite.img,format=raw,id`
 - `=hd,if=none \`
 - `-device virtio-blk-device,drive=hd \`
 - `-netdev user,id=net0,hostfwd=tcp::5022-:22 -device`
 - `virtio-net-device,netdev=net0`

```

Machine View
[ OK ] Starting Authorization Manager...
[ OK ] Started User Login Management.
[ OK ] Started /etc/rc-local Compatibility.
[ OK ] Finished Permit User Sessions.
[ OK ] Started Getty on tty1.
[ OK ] Started Serial Getty on ttyAMA0
GNU nano $ cat hw1.c
#include <stdio.h>
#include <sys/utsname.h>

int main(){
    struct utsname sysInfo;
    uname(&sysInfo);

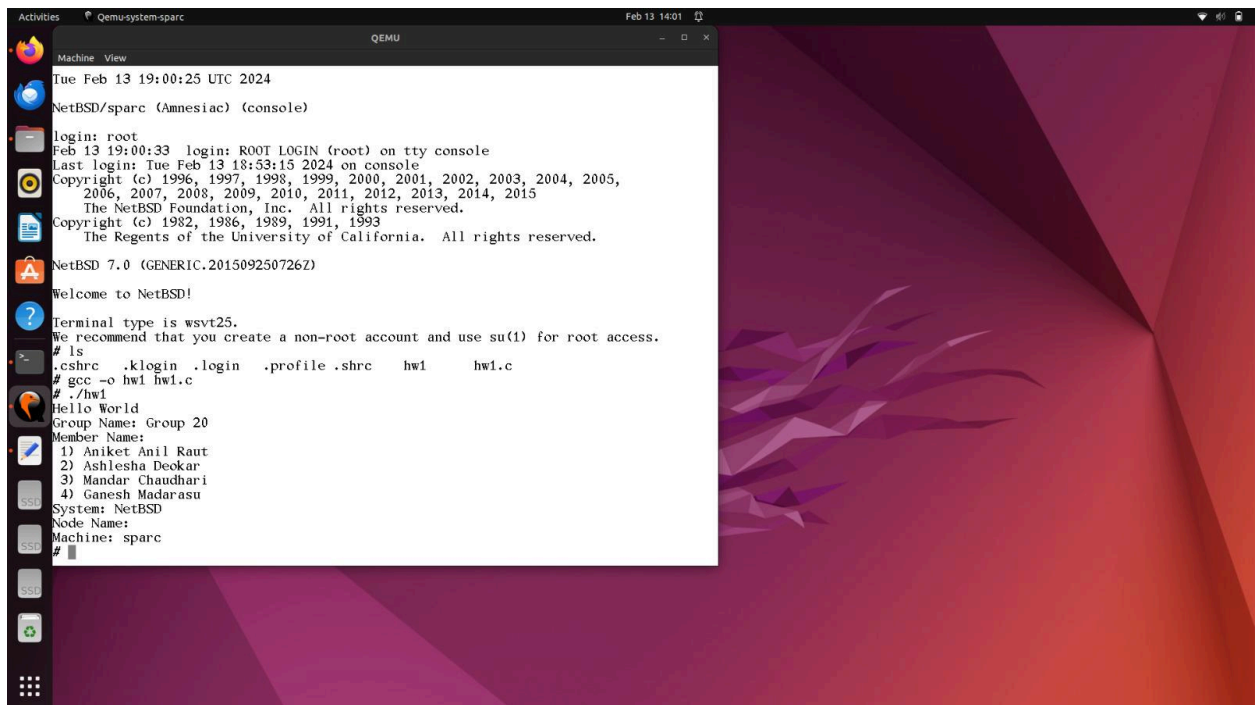
    printf("Hello World\n");
    printf("Group Number: Group 20\n");
    printf("Group Members:\n 1) Aniket Anil Raut\n 2) Ashlesha Deokar\n 3) Mandar Chaudhari\n 4) Ganesh Madarasa\n");
    printf("System Name: %s\n", sysInfo.sysname);
    printf("Node Name: %s\n", sysInfo.nodename);
    printf("Machine: %s\n", sysInfo.machine);

    return 0;
}

pi@raspberrypi:~$ ls
hw1.c
pi@raspberrypi:~$ gcc -c hw1.c
pi@raspberrypi:~$ ./hw1
Hello World
Group Number: Group 20
Group Members:
 1) Aniket Anil Raut
 2) Ashlesha Deokar
 3) Mandar Chaudhari
 4) Ganesh Madarasa
System Name: Linux
Node Name: raspberrypi
Machine: aarch64
pi@raspberrypi:~$
  
```

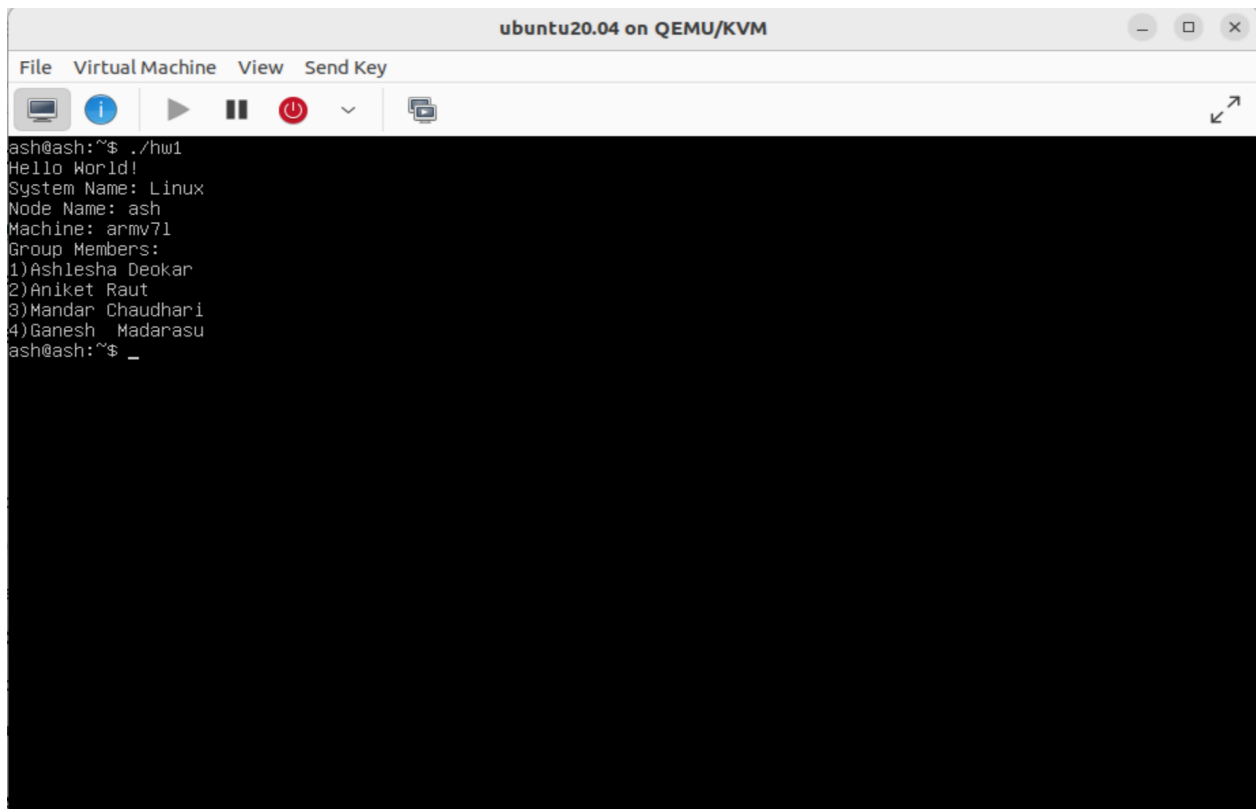
3. QEMU emulator for the LEON 3 processor

- For the leon3 processor, we used these links as reference:
 - <https://www.iram.fr/~blanchet/tutorials/netbsd-sparc-qemu.html>
- To download NetBSD
 - `mkdir ~/netbsd-sparc`
 - `cd ~/netbsd-sparc`
 - `wget \`
`https://archive.netbsd.org/pub/NetBSD-archive/images/7.0/NetBSD-7.0-sparc.iso`
 -
- Virtual Machine Creation
 - `cd ~/netbsd-sparc`
 - `qemu-img create -f raw ./netbsd7_sparc_hda.img 8G`
- running qemu
 - `sudo qemu-system-sparc -hda netbsd7_sparc_hda.img -m 256 -nographic \`
`-net nic -net tap,ifname=tap0,script=no,downscript=no`
- writing the c program
 - `sudo vi hw1.c`
- executing the program
 - `gcc -o hw1 hw1.c`
 - `./hw1`



4. QEMU emulator for the Beagle Bone Black

- install armv7l machine on ubuntu
 - `sudo apt-get install gcc-arm-linux-gnueabi`
- running c code
 - `arm-linux-gnueabi-gcc-static hw1.c -o hw1`
- checking the file format
 - `file hw1`
- installing the qemu user static
 - `sudo apt-get install qemu-user-static`
- executing the program
 - `./hw1`



```
ash@ash:~$ ./hw1
Hello World!
System Name: Linux
Node Name: ash
Machine: armv7l
Group Members:
1)Ashlesha Deokar
2)Aniket Raut
3)Mandar Chaudhari
4)Ganesh Madarasu
ash@ash:~$ _
```