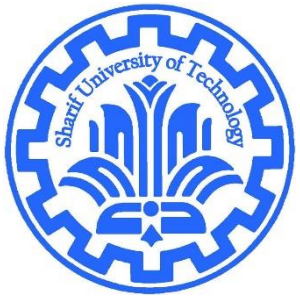

Sharif University of Technology

Department of Computer Engineering

Operating Systems

Linux Kernel Compilation and System Calls

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First Steps in Ubuntu Server

- Now you are logged in to your VM, you have to install some prerequisites
- Make sure your VM is connected to the Internet, then run these commands:
  - sudo apt update
  - sudo apt install git fakeroot build-essential ncurses-dev xz-utils libssl-dev bc flex libelf-dev bison
- Based on your internet connection it takes few minutes to download required files from the internet!

Compiling Linux Kernel

- You can download any kernel version (above v4) and compile it.
- Type these commands in terminal (we use kernel 5.12.10):
  - wget https://cdn.kernel.org/pub/linux/kernel/v5.x/linux-5.12.10.tar.xz
  - tar –xvf linux-5.12.10.tar.xz
  - cd linux-5.12.10

Compiling Linux Kernel

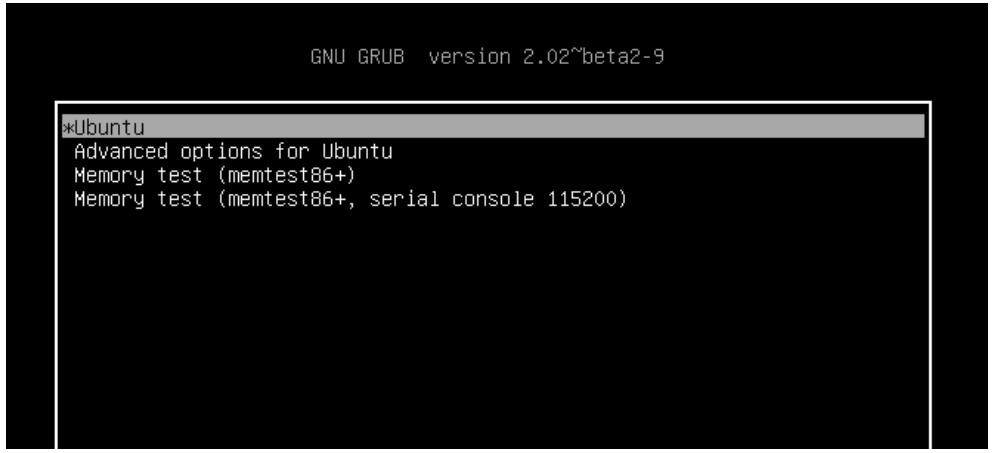
- Now you can compile your kernel
- Use “make help” command to get familiar with the following procedure
- Create .config file by using this command:
    - make menuconfig -jX
- In the above command, X is the number of CPU cores you reserve for running.
- Be careful about the settings in this step. Exit and Save after all.
    - If not sure about preferences, just Exit & Save.

Compiling and Installing Kernel

- It’s time to compile your kernel:
  - make –jX && sudo make modules_install -jX
    - Where X is number of your CPU cores
- Wait about 30 minutes ~ 2 hours, depending on your system.
- Congrats! Your own customized Linux kernel is installed. Just a few commands left.
  - sudo cp arch/x86/boot/bzImage /boot/vmlinuzNew
  - sudo grub-mkconfig -o /boot/grub/grub.cfg
  - sudo reboot

Booting Into Your Own Kernel

- In the “GRUB” select “Advanced options for Ubuntu” and then select your preferred kernel



Want to see kernel messages?

- Have some “printk” in your code and want to see the results? Try this:
  - dmesg
- If you want to clear “dmesg” use this:
  - sudo dmesg –C
  - sudo dmesg –c
- Also you can look at your kernel debug information here:
  - /var/log/kern.log

Want more speed?

- To speed up compilation procedure, you can use “ccache”
- First install “ccache” with apt-get:
  - sudo apt-get install ccache
- Then use this command to compile kernel with ccache:
  - make –jX CC=”ccache gcc”

Want to save and see your compilation logs at the same time?

- Use this command:
  - make –jX 2>&1 | tee /tmp/make-$(date +%Y%m%d-%H:%M:%S).log
- Compilation logs could be found here:
  - /tmp/

Want to start from scratch?

- Made a mistake? Want to start from beginning? Use this:
  - make distclean
  - Go to slide #4

Still have a problem?

- Try this:
  - https://docs.kernel.org/
- Use CW forum and ask your questions!