EPL421 Systems Programming Lab Environment

For EPL421 lab sessions, you should set up a personal UNIX/Linux machine using **Oracle VirtualBox** and **Ubuntu Server**. This virtual machine (VM) gives you administrator access through sudo, allowing safe practice with C programming, processes, permissions, filesystems, package installation, and other operating-system concepts without changing their main computer.

Ubuntu Server is recommended. A graphical Ubuntu Desktop environment is not necessary for this course; you will work mainly in the terminal.

Downloads

1. **VirtualBox Platform Package**
   Download and install the version for your operating system:
   https://www.virtualbox.org/wiki/Downloads
2. **Ubuntu Server LTS ISO**
   Download the current Ubuntu Server Long-Term Support ISO image:
   https://ubuntu.com/download/server

Keep the downloaded Ubuntu .iso file. It will be used to install Ubuntu inside VirtualBox.

Create the virtual machine

1. Open VirtualBox and select New.
2. Enter a name, such as *EPL421-Ubuntu* (you can keep the pre-selected VM folder)
3. Select:
   - ISO Image: Select the downloaded Ubuntu Server .iso file
   - OS: Linux
   - OS Distribution: Ubuntu
   - OS Version: Ubuntu (64-bit)
4. Uncheck the “Proceed with Unattended Installation” so you can specify virtual hardware in the next step.
5. Allocate memory:
   - Recommended: 2048 MB (2 GB) RAM
   - Use 4096 MB (4 GB) if the host computer has sufficient memory.
6. Allocate processors:
   - Recommended: 2 CPUs, if available.

7. Create a virtual hard disk:
    - Set the maximum disk size to 10 GB. A dynamically allocated 10 GB disk does not immediately occupy 10 GB on your real computer. It grows gradually as Ubuntu uses storage, up to a maximum of 10 GB.
8. Click finish to terminate the setup stage.

Setup the Network Adapter

1. Select the VM and click Settings.
2. Select the Network section.
3. Under Adapter 1:
    - Check Enable Network Adapter.
    - Set Attached to to Bridged Adapter.
    - In Name, select the network interface normally used to access the Internet, such as the computer's Wi-Fi or Ethernet adapter.
4. Click OK.

Why use Bridged Adapter?

With a Bridged Adapter, VirtualBox connects the VM directly to the physical network adapter of the host computer. The VM requests its own IP address from the network's DHCP service, just like a separate physical computer.

This configuration is useful for EPL421 because it:

- Gives the VM direct network access for installing packages and updates.
- Allows you to use SSH from you host terminal, editor, or IDE to work on the Linux VM.
- Allows the lab instructor or other classmates to connect to services running in the VM during relevant networking or systems-programming exercises, subject to local network policies.
- More closely resembles a real UNIX machine connected to a network.

Install Ubuntu Server

1. Start the VM by selecting Start.
2. The installation process starts and the progress is displayed in new window.
3. Select the preferred language and keyboard layout.

4. Keep the default network settings unless instructed otherwise.
5. When prompted for storage configuration:
    - Choose Use an entire disk.
    - Select the virtual disk created for EPL421-Ubuntu.
    - Accept the proposed storage layout.
6. Create a user account:
    - Choose a username you will remember. You can use your university username.
    - Choose a strong password.
    - This account will be allowed to use administrator commands with sudo.
7. When asked about optional server software:
    - Select Install OpenSSH server since you want to connect from the host computer later.
    - Do not select additional server packages.
8. Complete the installation and choose Reboot Now.
9. If VirtualBox asks to remove the installation medium, press Enter. The VM should then boot into Ubuntu Server.

First commands after login

Log in with the username and password created during installation. Then update the system:

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sudo apt update
sudo apt upgrade
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