ECE 458/750: Assignment 1 Part B:

Guide to Setup and Play the Password Game on a Virtual Machine

You will be downloading and running a virtual machine (VM) that has a password game pre-installed on it. The game is on a locally hosted website within the VM. The game features a set of instructions on the sidebar and a website where you need to guess the password to advance to the next level.

Please note that you will be writing and running password attack code for this assignment. We are having you run the game in a VM for everyone's safety.

You need to:

1. Download the vdi file
2. Setup a Virtual Machine. We recommend one of:
    a. VirtualBox (https://www.virtualbox.org/)
    b. UTM
3. Start the VM and open a web browser.
4. Play the game - see Playing the Game section near the end of the document

Installing the VM

This guide is designed for students using Apple Silicon or Windows operating systems. If you use Linux, you can import the .vdi file directly into VirtualBox and bypass the hardware emulation steps entirely. For any questions, please do not hesitate to ask on the course's Piazza.
Irrespective of what VM platform or OS you are using, read the 'Playing the Game' section at the end of this document.

VM installation for Apple Silicon Users (using UTM)

NOTE: Oracle's VirtualBox website offers means to download VirtualBox for Apple Silicon as well. For the TA, using VirtualBox on Apple Silicon was a daunting experience in the past and so she has not tested this game against a VM hosted through VirtualBox. However, if you think this works better for you, that's great - there is no restriction on which platform you use to set up your VM. If you choose to use UTM, follow the steps below. If you choose to use VirtualBox for Apple Silicon, you would have to navigate the setup on your own.

1. Core Installation and Virtual Machine Creation

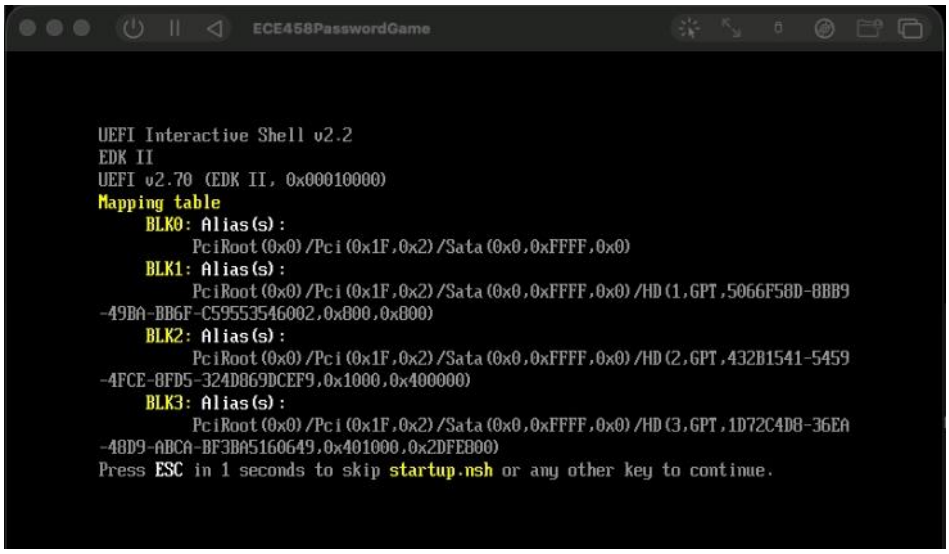
This guide outlines the step-by-step procedures required to cleanly import and provision the virtual disk image (.vdi) within the UTM hypervisor framework on Apple Silicon hardware. It assumes you have installed UTM already. If not, you can install it from their official website. UTM is a free app that lets you run virtual machines and emulate different CPU architectures, allowing you to seamlessly run x86_64 Linux environments (such as the one required for this game) directly on your ARM-based Mac.

2. Select the `Emulate' workflow from the installation prompt. This forces an x86_64 CPU translation architecture required to interpret the pre-built assignment kernel.
3. Choose Linux as the operating system template sequence.
4. Allocate system hardware capacities: and choose 'Intel ICH9 based PC(2009, x86_64)', Provision a baseline configuration of 4096 MB (4 GB) of system memory, and 4 CPU cores (if you leave it at default it might be too slow).
5. On the Boot Image selection screen, change the dropdown menu to import existing drive, import the disk image by selecting the .vdi file shared with you.
6. Continue through shared directory configurations without adding files, then save and name the instance (e.g., 'ECE458PasswordGame').

2. Resolving the (possible) UEFI Boot Loop Issue

Upon initial power activation of the freshly imported virtual machine, users typically experience a failure mode where the initialization architecture loops endlessly into the EFI shell instead of mounting the main storage partition.

Screenshot Reference: UEFI Shell Interception



Resolution Procedure

1. power off the virtual machine instance using the red termination icon or the hardware menu overlay.
2. Open the primary configuration panel by right-clicking the VM thumbnail profile in the UTM interface side-menu and selecting 'Edit'.
3. Navigate to the System tab settings menu located on the left options list.
4. Locate the checkbox property explicitly designated as UEFI Boot.
5. Uncheck the UEFI Boot box to force the hypervisor into utilizing traditional Legacy BIOS emulation modes.
6. Save the modified machine properties and click the primary Run arrow to reboot the appliance into its persistent storage layer.

3. Optimizing Translation Layer Execution Speeds - Optional, follow only if your VM is too slow.

Because the virtual disk uses an x86_64 architecture design, executing its internal routines natively on Apple Silicon requires active instruction emulation. This incurs graphical and command-line execution overhead by default. Do the following micro-adjustments to ensure acceptable desktop responsivity:

- **System Processing Power:** Return to the VM configuration panel and select the System menu layout. Switch the 'CPU Cores' configuration rule from Default directly to a manual allocation of 4. This distributes concurrent translation loads across your Mac's physical cores.
- **Display Card Acceleration Drivers:** Click into the Display menu tab in the UTM editing pane. Swap the 'Emulated Display Card' configuration to virtio-ramfb or virtio-vga. Unchecking complex 3D GL hardware pipelines allows a lightweight software renderer to handle the desktop environment, preventing frame drops.

VM installation for Windows/Linux Users

This guide outlines the step-by-step procedures required to cleanly import the virtual disk image (.vdi) using VirtualBox. It assumes you have installed VirtualBox already. If not, you can install it from their official website. VirtualBox is a free tool that allows you to run virtual machines natively on your system. Please note that the chronology of the below instructions vary based on things like version, so read all of them before proceeding to create a VM.

1. Open VirtualBox and click the ‘New’ button to initiate a new virtual machine.

2. Enter a name for the instance (e.g., 'ECE458PasswordGame'), set the Type to ‘Linux’, and the Version to ‘Ubuntu (64-bit)’.

3. Allocate the system memory by setting the Base Memory to 4096 MB (4 GB).

4. On the Hard Disk screen, select ‘Use an existing virtual hard disk file’. Click the small folder icon to browse your computer and select the provided .vdi file.

5. Click "Create" (or ‘Finish’) to finalize the machine setup.

5. Optional: Before launching, select your new VM, click Settings, navigate to the System tab, and under ‘Processor,’ allocate 2 to 4 CPU cores for smoother performance.

6. Click Start to boot up your virtual environment.

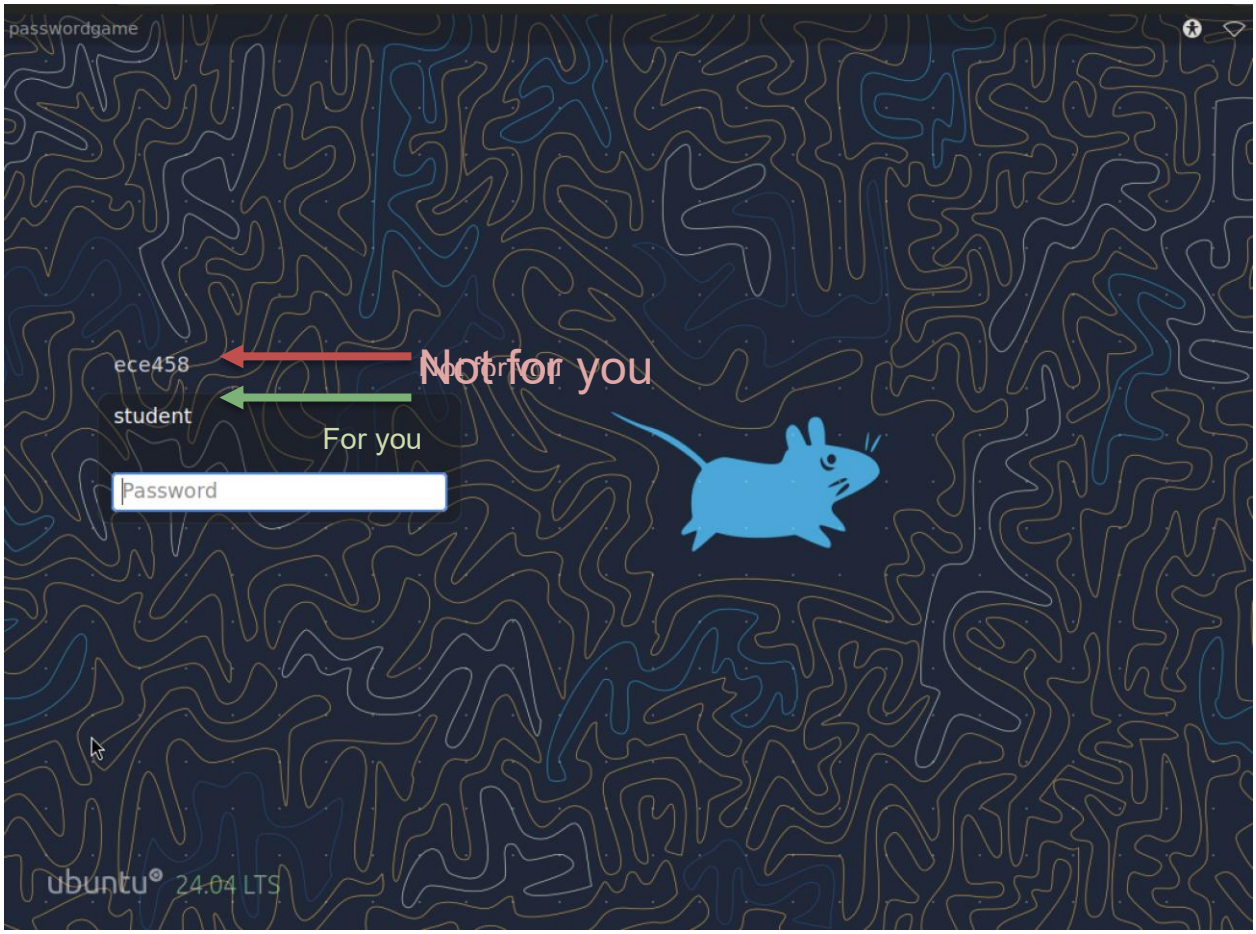
Playing the Game

Once you setup the VM, run it. For the first time of starting up the VM, it might take some time. You should be greeted with a screen that looks like such:

Your Username: student
Your Password: ece458student

You are able to play the game by logging into the ‘student’ user ONLY. Once you login in, the relevant applications for you would be Firefox Browser and Terminal.

To start up the game, follow the steps below.



1. open Firefox from the home screen. If double-tap does not open up the application, right click on the icon and select 'Execute'. Expect for it to take some time to open up.

2. Navigate to: http://localhost:8000. This is where the game runs. You can start playing the game once you see the landing page and type in your studentID.

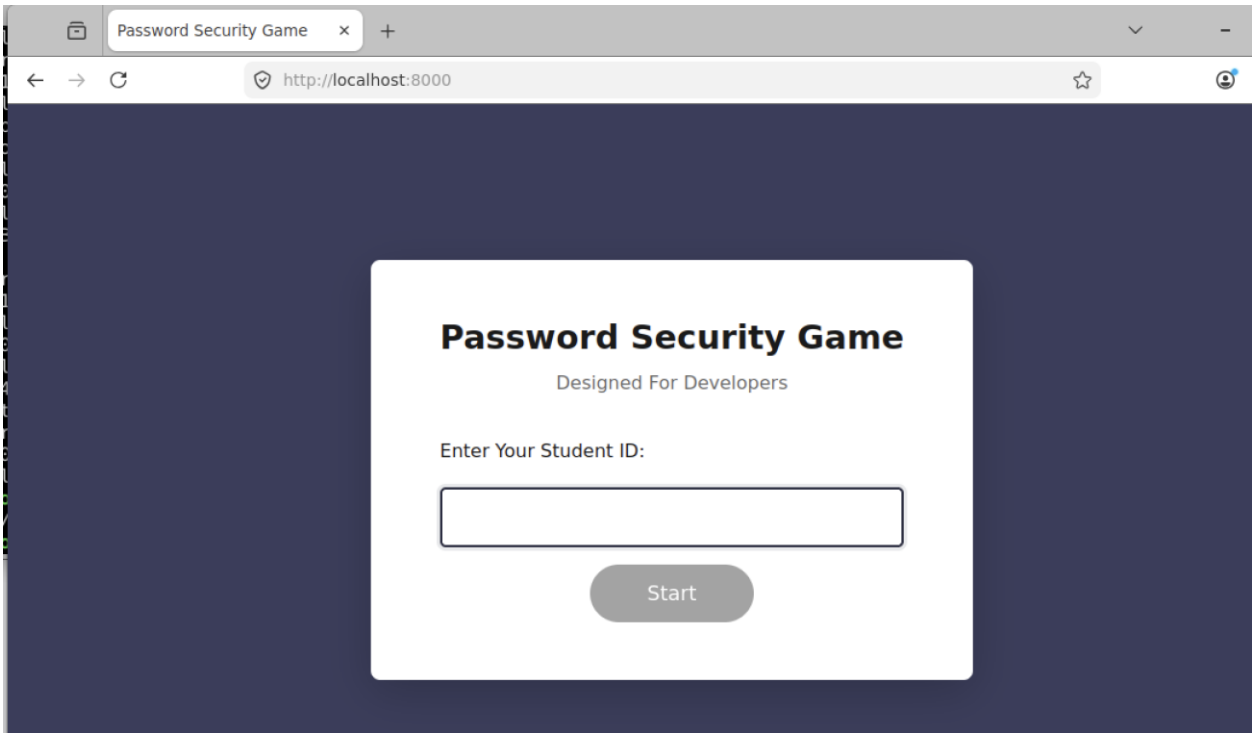
The Game's landing page should look like this:

Editing files in the VM environment

Some levels of the game would require for you to run some simple python scripts that you would have to write. All required python packages are pre-installed for you, and you would only have to use the packages mentioned in the game's hints (displayed on the left panel). Installing additional packages is neither needed nor permitted. For writing the scripts, you can do so and execute them from your /home directory. You may use **nano** to write your scripts.

```
> nano <filename>.py
```

And to run, simply use



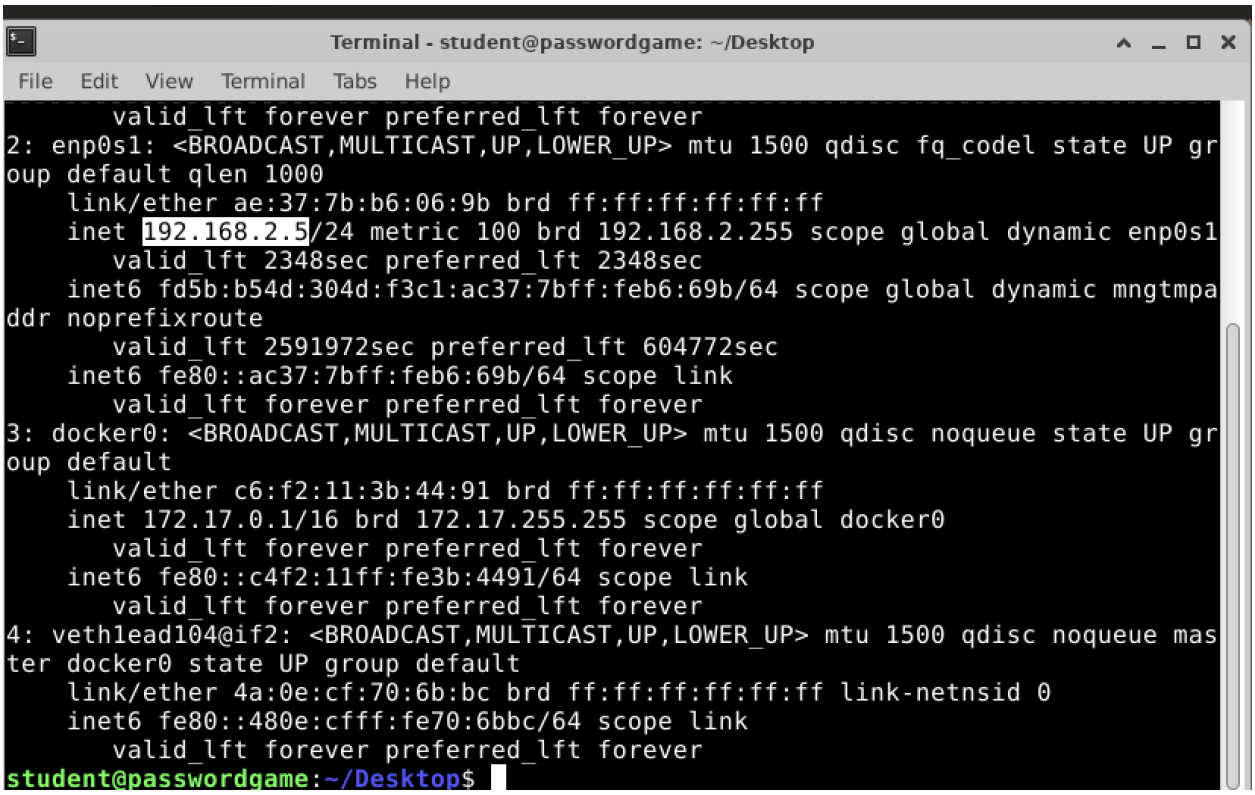

```
> python3 <filename>.py
```

To edit within nano, you can directly start typing once the editor is open. To save and exit your file, use Ctrl + O -> click enter -> Ctrl + X

If it is annoying to use nano and you're not used to it, you can type your python files on your local computer and copy them to your VM as well. Use the below commands to do so.
From your VM, type

```
> ip ad
```

And look for your VM's internet IP, which should look like this:



Then from your local computer's terminal, type the below command:

```
> scp -R /path/to/file/on/local student@VM_ip:/home/student
```

You might be prompted for your VM's password here. However, to edit things like session ID and hashes in your scripts, you would still need nano or vim editors so you can use the below guides to help you. Note that for this game, you will not need to know actions beyond copy-pasting, opening, saving, and closing a file.

Vim tutorial

Nano tutorial