Guide to Environment Setup for Pintos

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Introduction:

This is an easy step-by-step guide to setup the environment for programming assignments.

These are just steps to follow to get you on the track, there are further information and explanation at the end of this document, which I encourage you to read.

Preparation:

- Download VirtualBox software for your host OS from [here](#). Make sure that the software runs after installation.
- Download the VM image from [here](#). This file is 4.3GB in size, so make sure that you have the time/battery when you want to download it. Since the file is on department's server, it would be faster if you do it on campus network.
- In VirtualBox software, from the File menu, choose "Import Appliance" and point to the downloaded "UB-pintos.ova". You do not need to change any other settings for this procedure. This will import the image and create a Virtual Machine on your computer. For this operation you need about 9GB free space. After this you can delete the original UB-pintos.ova.
- You are done! Now you can choose UB-Pintos from the left pane, and click on "Start", your virtual machine should now boot and get you to a login page:
  Username: os-class
  Password: cse421521
- Just to test if everything works, open a terminal once logged in (Ctrl+Alt+T), and enter:
  ```
  cd $PINTOSDIR/src/threads && make
  ```
  Remember that commands are case-sensitive. Once make is complete, run:
  ```
  cd build && pintos run alarm-multiple
  ```
  If you see a new window pop up and completion of the execution, you are good to go!

There is a lot to learn about navigating through Pintos code. First programming assignment starts shortly, and there is A LOT to do! So make sure everything works. Pintos code is large and complex with lots of modules (Though simple, but it still is an OS!). Though it is not necessary to understand every line, but you need to know what is going on, before you can think of how to improve implementation.

Take a thorough look at the Pintos manual (skipping parts that are specific to Stanford CS140, as our grading is slightly different) You will find answer to most of your questions there.

The VM Environment

For those that have not worked with a Linux machine before, Ubuntu graphical user interface is fairly simple. On the left panel, you can open applications or switch between them, just as taskbar. Through the top button you can search for your application, such as start button. To turn off or access system settings, you can click on the gear at the top-right corner.

Please attend the first recitation class for a quick head-start on navigating through Pintos source code.

What is an OS??

An operating system (OS) is system software that manages computer hardware and software resources and provides common services for computer programs. I.e. Ubuntu, Windows 10, Mac OS X, etc. And of course, you have taken this course to learn more about OS!

What is Pintos??

"Pintos" is a tiny, very limited, and educational operating system. It was created at Stanford University by Ben Pfaff in 2004. In this course, rather than using OS (as always), we want to focus on how an operating system is developed, and how it works. Pintos allows us to get a good insight on the main functionalities of an OS, without getting lost into complex structures of a real operating system.

Will we run Pintos on our computers??

No. Although it is possible to run Pintos on actual hardware, we only emulate Pintos.

What is VirtualBox??

VirtualBox is a cross-platform virtualization application, that allows you to run another operating system (Guest OS), on your currently running operating system (Host OS). Take a look here.

Will we run Pintos on VirtualBox??

Still no! Remember that the VirtualBox, allows you to virtualize your hardware, so inside a VirtualBox is still like a hardware. So it would be difficult to boot Pintos on VirtualBox, especially because we want to modify the source code, compile, and test it quite often.

Is Pintos only source code??

We will read, modify, and write a lot of Pintos source code. But we want to see it work! So we compile it and run it on an emulator (bochs/qemu). So the code actually runs as if it is on a x86 hardware. You see the boot messages, etc.

So why do we need VirtualBox??

VirtualBox is needed to run our custom UB-Pintos virtual machine. It is a Ubuntu 16, that has all the setups required to compile and run Pintos. Even if your host OS is Ubuntu, it is time consuming and tedious to setup an environment that can run Pintos. That is why we created this virtual machine image, and ask everyone regardless of their host OS, to install this image so we all work in the same environment.

Is my computer able to run VirtualBox??

It most probably is. The only case where you would not want to run VirtualBox is if you have a very old machine or less than 4GB of RAM.

Why is it so slow??

It is not supposed to be that way!

If you feel that your virtual machine is too slow and sluggish, there is something not correct.

- o Check in your BIOS setup and make sure virtualization is enabled.
- o Make sure your host OS is not taking too much burden. Try having other applications on your host OS closed.
- o Bring your computer to one of TAs in their office hours.

Do we run an OS on top of another OS, on top of another OS??

Yes! Your current OS (Host OS) will run VirtualBox, that runs the provided Ubuntu image (Guest OS), within which we run bochs/qemu to emulate a simple x86 system, running Pintos!