Setting up Your NASM Environment

1 Overview

Before we start work on our first Assembly Assignment, we need to build our coding / testing environment. We will code in NASM assembly, doing so within a Debian Linux machine. I will provide instructions on setting up a Debian Linux virtual machine within VirtualBox, and then installing NASM. For a frustration-free experience, you will need a machine with at least 10 GB of free disk space and 2 GB of RAM.

Here is a high-level sequence of steps that we will take:

1. Download **32-bit Debian Linux**
2. Download VirtualBox
3. Install VirtualBox on your computer of choice
4. Create a **32-bit virtual machine** within VirtualBox and install Debian Linux on your new VM
5. Install the required packages within the Debian VM (to support program editing, compiling, and testing)
6. Install NASM
7. Configure your local NASM work environment

2 Detailed Instructions

OK, let's get down to the nitty gritty. Follow these steps. If you have any questions or experience any problems along the way, reach out for help as soon as possible. We will use our NASM environment regularly throughout the semester! I recommend starting the Debian download first, as the file is approximately 3.5 GB, so it may take some time to fully download. Skip the the virtual machine install first, and start the Download. Then come back and start setting up your virtual machine.

2.1 VirtualBox Installation / Config

1. Download VirtualBox from `https://www.virtualbox.org/wiki/Downloads` (download the package for your platform - the majority of you will want an OS X or Windows installer). By default the VB site will nudge towards downloading VirtualBox v6. That is fine. If you already have version 5 (latest is 5.2.26). That's also fine.
2. Also download the Extension Pack. Be sure to download the extension pack that matches your version of VirtualBox (the installer should prompt you to do this anyway).
3. While the installer is downloading, read the user documentation available at: `https://www.virtualbox.org/wiki/End-user_documentation` pay particular attention to installation/configuration details for your type of machine & host OS (installing on a Windows or MacOS machine)
4. Once the installer download completes, install virtualbox on your machine.

5. After installation is complete, Launch VirtualBox and select "Preferences". Under Preferences, select "Extensions". Click the plus icon and navigate the the Extension pack that you downloaded earlier

6. Create a new Linux Virtual Machine:

   (a) Select Linux, Debian 32-bit as the machine type

   (b) Depending upon how much physical memory your machine has, select an appropriate amount of RAM (If you can, choose something around 4 GB, but do not set this too high if you do not have much physical RAM. If your machine only has 4GB of physical memory, then I would suggest setting your VM memory to 1 GB (maybe 2GB, but don't try to multi-task when your VM is running).

   (c) Create a new Virtual Disk (VDI). I recommend creating an 80 GB Dynamically allocated disk. This will allow your disk to grow as large as 80GB, but will only increase in size as your VM actually allocates disk space (you'll only use space that you actually need).

7. After the VM is created, make the following additional settings changes before you beging the installation process:

   (a) Under the General - Advanced Tab, I recommend setting the shared clipboard to be bidirectional (so you can copy & paste between VM and Host OS)

   (b) Under the General - Advanced Tab, I recommend setting Drag and Drop to be bidirectional also

   (c) Under the System - Motherboard Tab, disable floppy disk, set the chipset to PIIX3, and Enable I/O APIC

   (d) Under the System - Processor Tab, Depending upon how many cores your physical machine has, I recommend the number of CPUs be set to 2 (but make this less than the physical number!). Enable PAE/NX here.

   (e) Under the Display Tab, set Video Memory to something around 32MB and Acceleration to Enable 3D

   (f) Under the Storage Tab, select the IDE Controller (the empty optical disk icon) & then click on the Optical Disk icon next to the IDE Master under Optical Drive. Select "Choose Virtual Optical Disk File..." and navigate to the Debian ISO file that you downloaded (Note Well: if the download is not complete, you will have to wait).

2.2 Debian Installation / Config

1. Download the ISO image for 32-bit Debian from the following URL: `https://cdimage.debian.org/debian-cd/current/i386/iso-dvd/debian-11.0.0-i386-DVD-1.iso`

   (this may take some time, so be patient!)

2. Once the download is complete, launch VirtualBox and start the Debian Virtual Machine that you created in the previous section. Make sure that you performed the final step in the VirtualBox section (adding the debian installer ISO file to the VM's Optical Drive.

3. When the machine boots, select "Graphical Install" to use the GUI installer.

4. When prompted, use the following settings (unless you know what you are doing and want to do something else):

   (a) Host Name: debian
   (b) Domain Name: internal
   (c) Root Password: toor
   (d) Username: nasm
   (e) Password: nasm
   (f) Disk Partitioning: Guided - Use Entire Disk
   (g) Partitioning: All files in one partition
   (h) Partitioning: When asked "write the changes to disk?" go with "yes"
   (i) Installation Software: When asked to "Scan another CD/DVD?" go with "no"
   (j) Installation Software: When asked if should "Use a network mirror?" go with "yes" and set mirror to "deb.debiian.org"
   (k) Leave HTTP proxy blank (unless you know you need this)
   (l) Your answer to "Popularity Contest" is entirely up to you.
   (m) When prompted for Software Selection - leave the choices as is
   (n) When asked if should install the GRUB boot loader to the master boot record - go with "yes"
   (o) For boot loader location, with /dev/sda

5. Once installation is complete, reboot. Log in as nasm.

6. Select "Activities" in the upper left corner of your desktop & type "synaptic" in the search bar

7. Launch Synaptic and mark the following for installation (click in the little box next to the name):

   (a) linux-headers-5.10.0-8-686
   (b) nasm
   (c) build-essential
   (d) make
   (e) gdb

8. Once all of the above have been selected, click on "Apply Changes" and let the install happen. You will be prompted to insert the Debian Install DVD, do this by clicking the VirtualBox Menu: Devices - Optical Drives - and select the Debian install ISO file (this will emulate literally inserting a DVD). You'll be able to install the packages after doing this.

9. Under Activities, select the File Cabinet icon to open the File System viewer. Look for the Debian Installer disk in the left sidebar and click the eject icon and eject the install disk.

10. Under the VirtualBox Devices menu, Select "Insert Guest Additions CD. Don't select "run" in the window that pops up, you need to be an administrator to successfully install the guest additions.

11. Under the Activities Menu, search for Terminal, and launch a terminal window. In the terminal become root (the system administrator) via the following command: `su` type the root password when prompted. Next type: `cd /media/cdrom0` and then `sh VBoxLinuxAdditions.run` (press enter after each one). You should see some text fly by. At the end, you should not see any mention of errors. If you do, come to me for help.

12. If the above went OK, shutdown the machine. The last thing is to set up a shared directory to allow you to pass files to/from your virtual machine, and the host machine (makes passing assignment files back and forth possible). Under the VirtualBox setting for yor Debian machine, select "Storage" and then "Shared Folders". Click the plus icon and select a folder path on you host machine where you want the virtual machine to have access. The Folder Name is the name that you will see on your virtual machine. I recommend making the folder automount. When you boot your machine, your shared folder will appear in the directory: `/media/`. It will prepend the name `sf_` to your shared folder. For example, if I shared a directory called `jochen`, then my folder would appear thus: `/media/sf_jochen`.

13. Boot the machine and log in as nasm. Let's set some permissions to allow to use the attached shared folder. Open a terminal again and become root using the `su` command. Then use the command `/sbin/vigr` to edit the system group folder. When the command starts, it will ask to to set a preference for which editor to use - go with the default. Next, move to the bottom line, where you see `vboxsf:x:999:` add to the end of the line, so it reads: `vboxsf:x:999:nasm` Press control-x to save the file. Then type the command `/sbin/vigr -s` and basically do the same thing all over again (you are editing a different file though). Save this second file with control-x. Log out of the nasm user account and then log back in again. At this point, you should be ready to start working in NASM.

3 Links to Helpful Resources

Here are some links to documentation or other helpful resources.

- Debian Installation Guide:
  `https://www.debian.org/releases/stable/i386/`
- VirtualBox User Guide:
  `https://www.virtualbox.org/manual/UserManual.html`
- NASM Documentation (for release 2.15.05):
  `https://www.nasm.us/xdoc/2.15.05/html/nasmdoc0.html`