Operating Systems – Laboratory

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For SDip in Embedded Systems Engineering

Laboratory Assignment #1

OBJECTIVES:

1) Learn how to install Linux on your own PC/laptop as a guest OS under VirtualBox hypervisor
2) Boot up and configure Linux on your own computer
3) Learn how to seamlessly work between Linux and Windows (copy and paste etc.)
4) Get familiar with a Linux Desktop environment and some key applications.
5) Get started with using the Linux **terminal** (bash shell)

INSTRUCTIONS:

- Students will provide **individual** submissions (however, learning/study cooperation is encouraged)
- Students can be asked to demonstrate their solutions.
- A short report **document** file (pdf) must be submitted to describe the operation or your solution and to comment on any problems encountered etc. (see Addendum 1 for details)

SUBMISSION:

Students will submit via SULIS (EE5012 page) by 23:59 hours, Wednesday 30th January 2019.

The submission will be a short report to confirm that you have **Lubuntu 18.04** (or other Linux) running as a guest operating system on **VirtualBox**, as follows:

- **Submit a single short report to the format defined in Addendum 1 (pdf format)**

Assignment assessment weightings:

Assignment #1	**10% of module …. this assignment**
Assignment #2	10% of module
Assignment #3	10% of module
Assignment #4	10% of module

There will be a compulsory exam question in the final exam based on the laboratory assignments.

INSTRUCTIONS

This laboratory assignment is a session to help students in getting started on using Linux on your home computer or laptop.

NOTE - if you are already familiar with Linux or UNIX you should still do this assignment; so as to go through the learning exercise of installing VirtualBox and adding Linux (Lubuntu) as a guest operating system. However, for the rest of the module you can use any suitable version/flavour of UNIX for the various assignment exercises; including for example: Linux, BSD, Apple OS X etc. However, please discuss your proposed configuration with the lecturer.

STEP 1 Install VirtualBox hypervisor on your personal machine

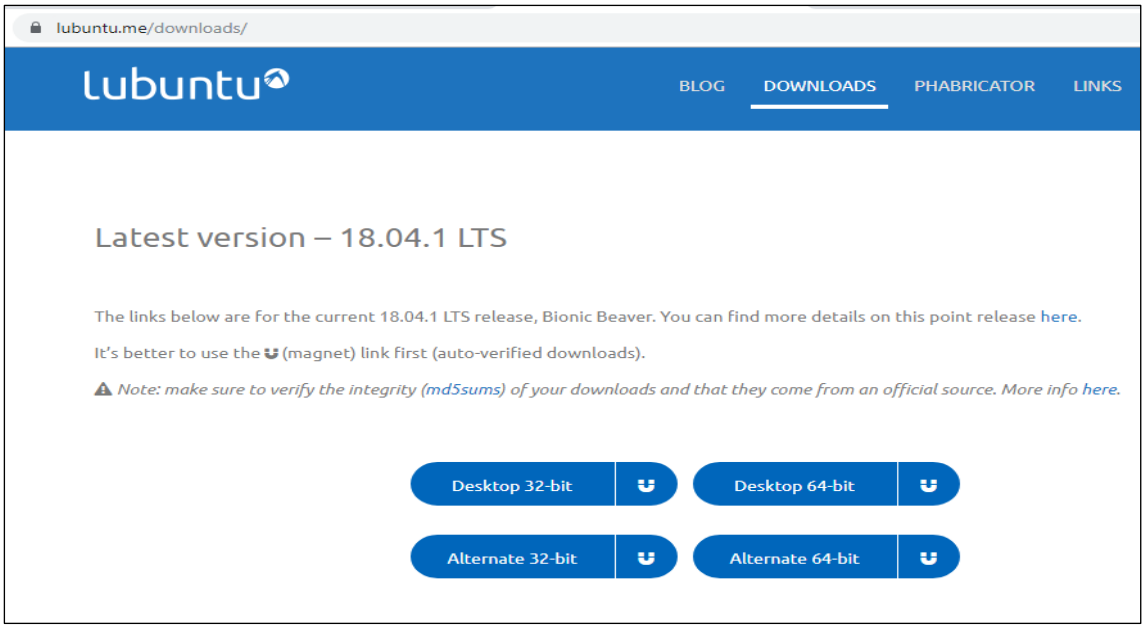
Please note that these instructions are for Windows 7/8/10 based host OS!

1) Download latest **VirtualBox** from this link https://www.virtualbox.org/wiki/Downloads by choosing the first option Windows hosts

2) Install **VirtualBox** by double-clicking the setup file and follow the prompts to install
    - During the installation keep all of the options set to their default

STEP 2 Install Lubuntu Guest OS using VirtualBox Hypervisor

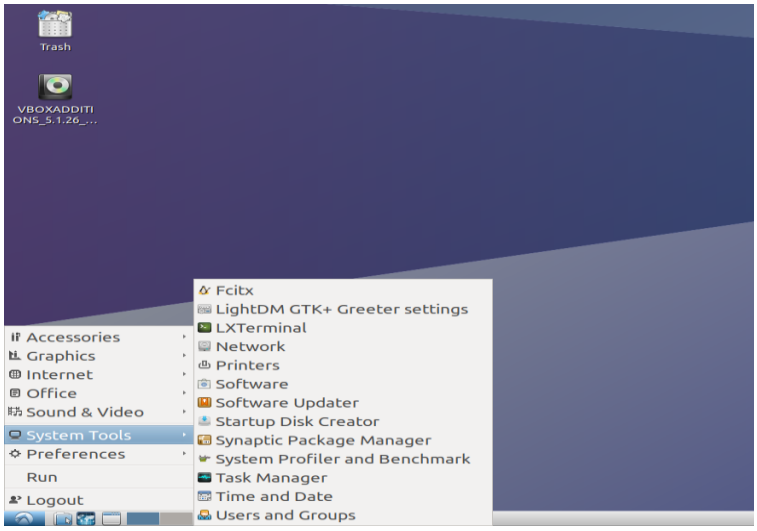
1) Download **Lubuntu** 18.04.1 from
2) https://lubuntu.me/downloads/



Install **Lubuntu** guest operating system along with Guest Additions as shown on this video tutorial https://www.youtube.com/watch?v=ariaTXg1CQI (Video also available on SULUS → Module resources)

You can keep the size of the Virtual Machine disk at 20GB and default language English (Irish) for keyboard layout. Choose username according to your name or student ID and select a simple password that you can remember at any time. For example username ("John Smith"), password ("password")

3) Once you are finished with the video tutorial install the tools needed for the EE5012 module.
   - First, update your brand new installation if you haven't done so:
     Invoke Terminal in Lubuntu by pressing Ctrl+Alt+T or click on Menu → System Tools → LXTerminal



   - In LXTerminal type the command:
     sudo apt-get update && sudo apt-get upgrade and press Enter.

Lubuntu will ask pro your password and then it will update and install the latest packages available for your system.

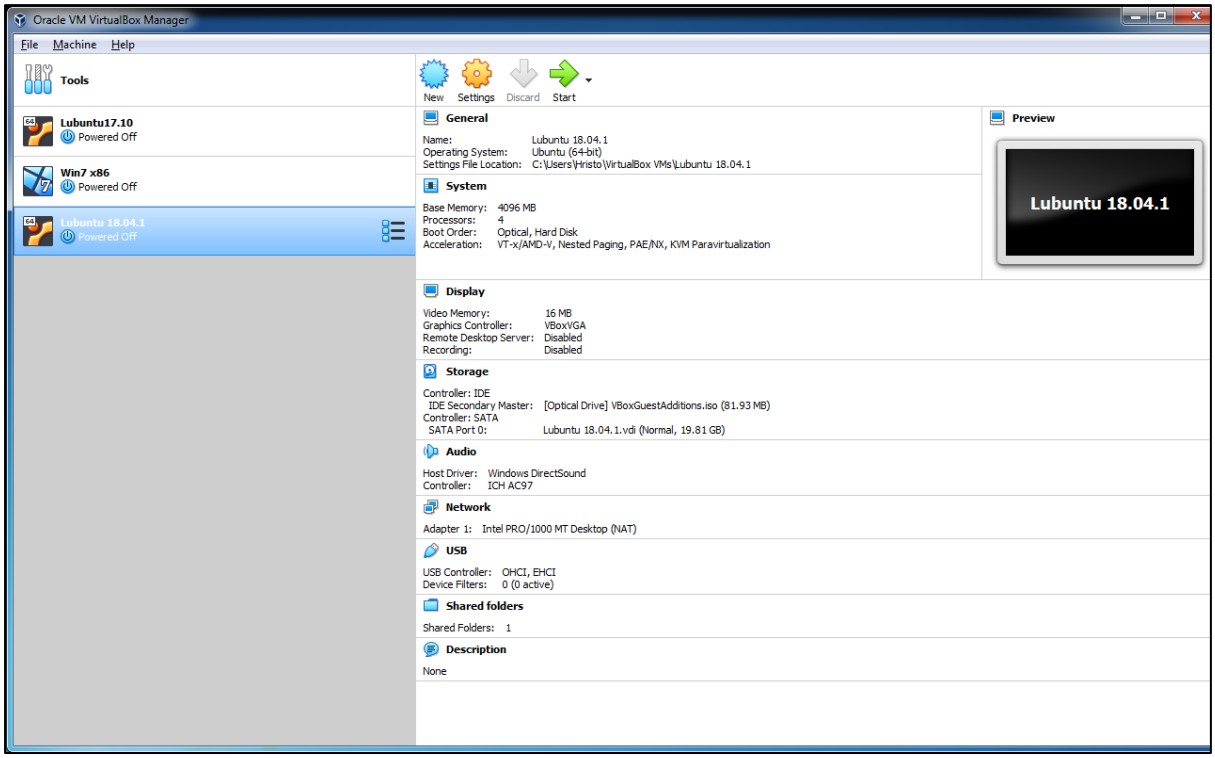
- Install *GCC, DKMS* and *BUILD-ESSENTIAL* packages.
  In LXTerminal execute the following command:
  sudo apt-get install dkms gcc build-essential

- Install *manpages-dev* packages to provide your system with manual pages about using GNU/Linux for development and POSIX compliant system for development.
  sudo apt-get install manpages-dev manpages-posix-dev

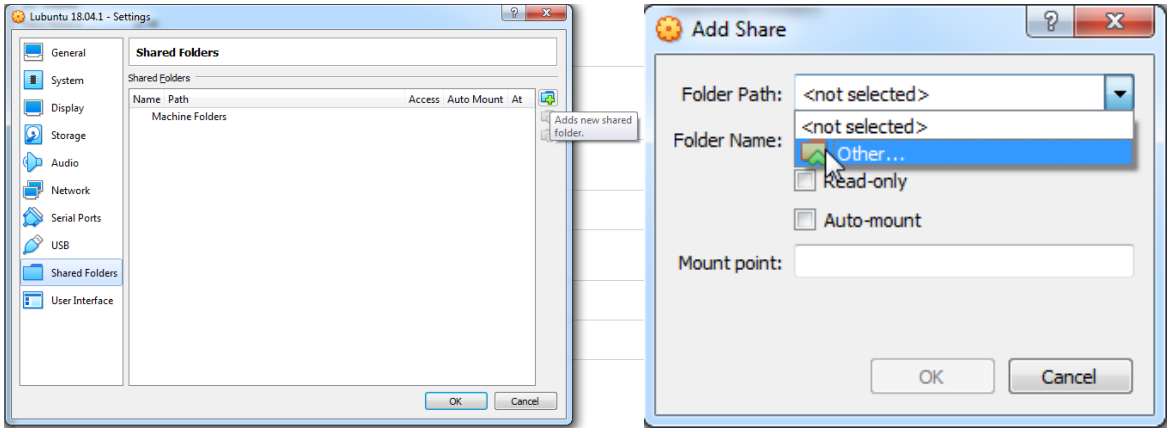
- Install *glibc-doc* and *glibc-doc-reference* packages to provide you with the explanation of the implementation of the standard "C" library and the GNU "C" library reference manual.
  sudo apt-get install glibc-doc glibc-doc-reference

STEP 3 Setup Shared Folder between host OS and Lubuntu

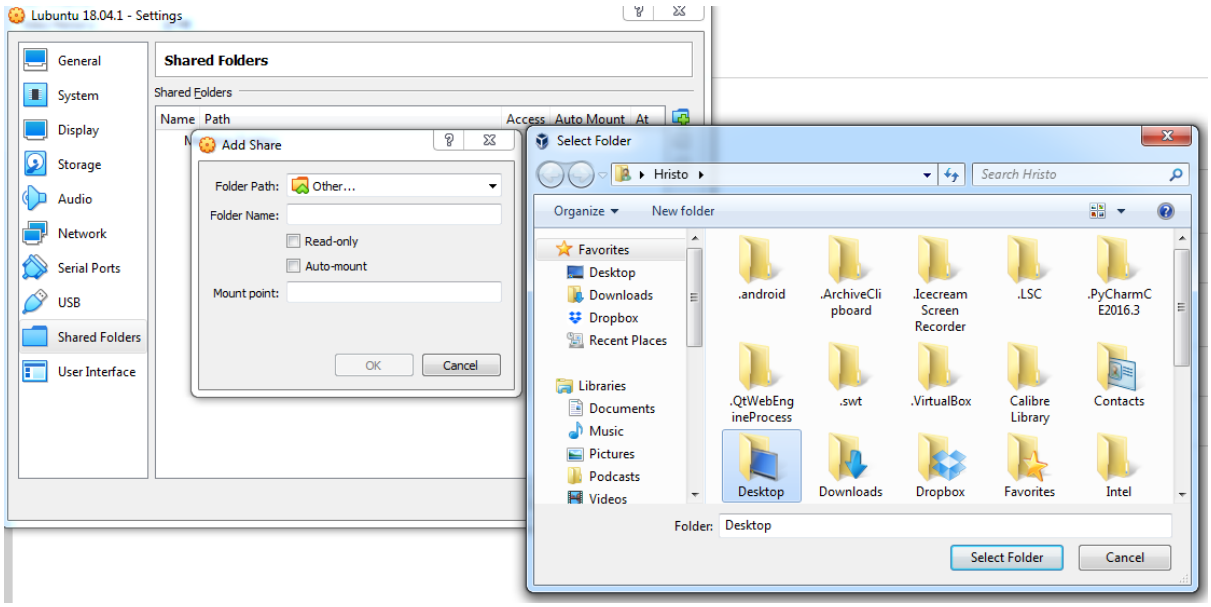
1) Open VirtualBox and highlight Lubuntu 18.04.1 VM



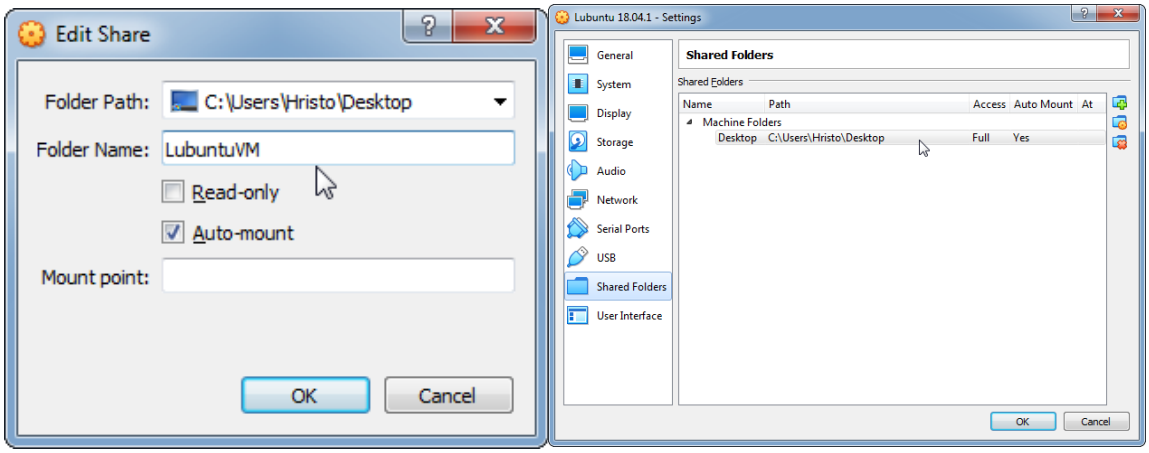
2) Select/press Settings → Shared Folders → Drop-down arrow → Other



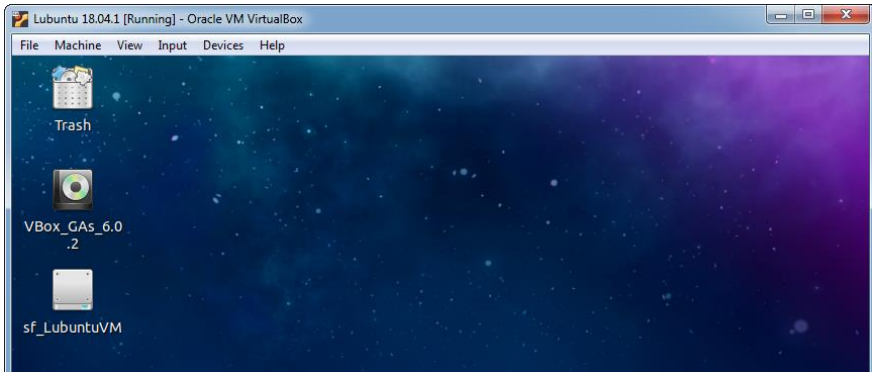
3) Select a location in your host OS for the shared folder (for example Desktop) and press Select Folder button.



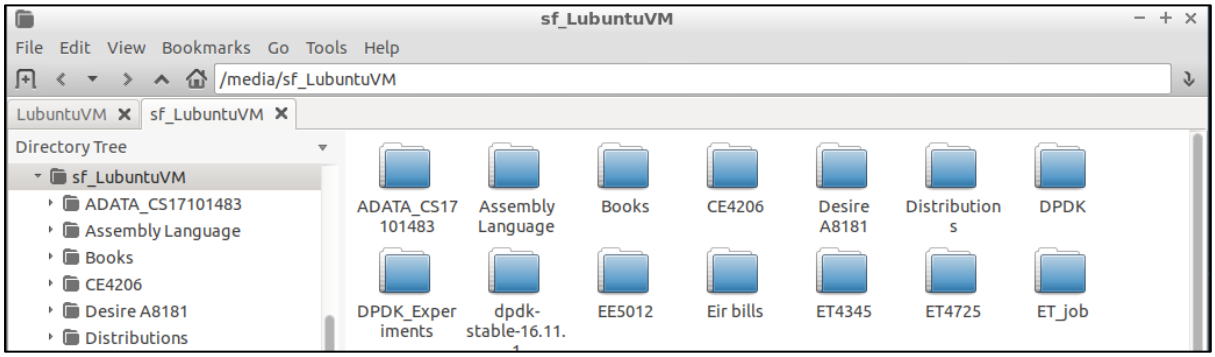
4) Check Auto-mount option, name your shared folder and press OK.



5) Start Lubintu Virtual Machine and observe the newly created folder **sf_LubuntuVM** on the Lubuntu Desktop.

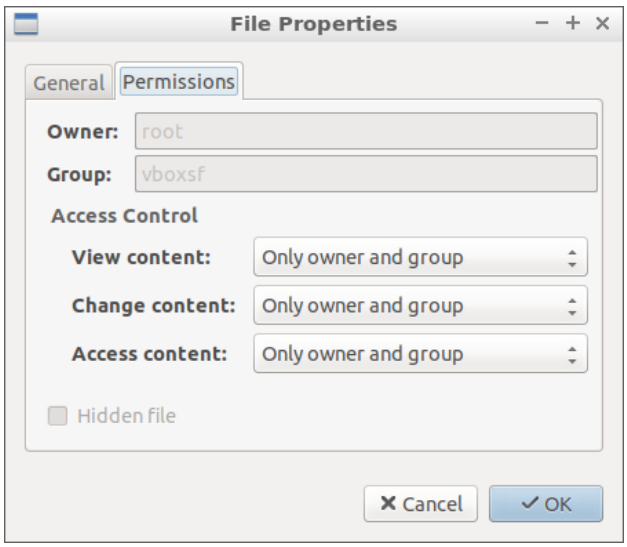


6) Double-click on **sf_LubuntuVM** folder and you will be able to browse your host machine from your Virtual Machine.



7) Create an actual folder in your host OS → Desktop to be used for exchange of file between host OS and Lubuntu 18.04 VM.

8) Adjust the permissions of **sf_LubuntuVM** in Linux.



You might be able to place files and folders inside **sf_LubuntuVM** folder in Linux but you are not able to modify or delete files unless you are logged in as **root** in Linux.

To be able to create, modify and delete files within the **sf_LubuntuVM** folder open the Linux terminal and execute the following commands:

sudo usermod -a -G vboxsf your_username_goes_here and press enter.

Provide your password and press enter again.

You can also transfer the ownership of the **sf_LubuntuVM** folder to your *username*.

sudo chown -R your_username_goes_here:users /media/sf_LubuntuVM/

STEP 4 Using Lubuntu 18.04.1

General familiarity

If this is your first time using Linux play around with the various desktop features. As a Microsoft Windows user you will have no difficulty at all in getting familiar with the desktop. Just invest a little time in gaining familiarity.

TEXT EDITOR

Click on the LXDE logo and go to **Accessories -> Leafpad**

The **Leafpad** editor is a simple text editor that we can be used in the laboratory sessions. For practice, write a small document using the **Leafpad** text editor and save the document.

INTERNET BROWSER

Click on the LXDE logo and click on the web browser logo (world map). This brings you into the Mozilla Firefox browser; now see if you can Google something!

Also try clicking on the LXDE logo and click on **Internet** in drop-down menu and you mayl have a list of browsers to choose from.

TERMINAL

Click on the LXDE logo and click on **System Tools** in the dropdown menu. Select the **LXTerminal** and you will now have a terminal window open on your screen.

An easier way of opening a terminal is simply to type the **Ctrl-Alt-t** key sequence.

When in the terminal try out some simple **bash shell** commands e.g. **whoami**, **ls**, **ps, uname** etc.

If you are wondering what a command does and how to use its options, type in terminal *man command*. For example *man ls* and press Enter. Try it and see all options available.

SHUTTING DOWN LUBUNTU 18.04
Do not abruptly turn off VirtualBox or turn off the actual PC as this may corrupt some of your Lubuntu files.

While in Lubuntu press MENU → Logout and you will be presented with the following screen:

Choose whatever you want to do next and click the desired option.

OFFICE

The open source community has developed applications that are functionally comparable to the well-known **Microsoft Office** suite. The best know example is **LibreOffice** (forked from OpenOffice in 2010). There are popular open-source word processor applications such as **Libre Office Writer** and **AbiWord**. The **AbiWord** is a lightweight application and thus is bundled with the LXDE Desktop, however **Libre** is more commonly used in practice.

As an exercise, at your desktop, open the **Office** application, select **AbiWord** and write a short sample document.

Note: AbiWord is written in C++ and is currently based on GTK+ (formerly GIMP Toolkit). The name "AbiWord" is derived from the root of the Spanish word "abierto", meaning "open".

If you wish you might also play with the **Gnumeric** spreadsheet application which is available in LXDE. (Gnumeric is part of the GNOME Free Software Desktop Project.)

SHARE DATA WITH WINDOWS

You can seamlessly move text, files etc. between Windows and Ubuntu by copying and pasting. Try this out! (You may need to first copy something from Windows and paste to Ubuntu to get the feature initialised).

This feature of seamless sharing (copy, paste etc.) is important if you are already familiar with a Windows environment and you are now learning Linux for the first time. This makes it easy to write your lab reports, and do backups etc., in a familiar Windows environment.

ARCHIVING YOUR FILES

Always remember to save any of your personal files to your own personal storage, e.g. Dropbox; as permanency of your data on the PC cannot be assumed.

ADDENDUM 1

The Document File

The submission for this laboratory project will be in the form of a document file. Note, the document does not at all need to be long and wordy – it can be a **very short**, concise document; but it must be of good quality, to the standard of a small technical report, and presented as listed below:

1) The file will be submitted as a **PDF** file.

2) The document must have the following exact section titles:

Installation of VirtualBox
Briefly state the type of your laptop PC and a short specification to say: size of memory, disk size, processor type, and type and version of the operating system. State that you have successfully installed VirtualBox and note any difficulties you might have had in doing this. Say what specific version of VirtualBox you have installed.

Installation of Linux as a guest OS
State that you have successfully installed Lubuntu Linux and note any difficulties you might have had in doing this. Say what specific version of Lubuntu Linux you have installed.

Setting up Lubuntu
State if your Lubuntu worked straight 'out of the box', or did you need to make any special configurations to get it working on your PC.

Using Lubuntu
State what specific applications you have used in Lubuntu e.g. editor, browser etc. Can you share data between Lubuntu and Windows?

Using terminal commands
State that you have successfully run the LXTerminal. State some commands that you have used. For the **uname -a** command show what specific result you see on the screen; do this by including a screen shot (or shot of window area) in your report to show the result.

Shutting down Lubuntu
State that you can successfully use **Suspend** to stop Lubuntu and then to run it again.

Plan for remaining assignments
Now that you have Lubuntu working, say if you intend using this as the OS for your remaining assignments; or else do you intend to use another flavour of UNIX/Linux, and if so say what is you intended platform.

Concluding comments
Make some concluding comments to summarise; for example say if everything worked well, or if you had special difficulties etc. Say if you spent a lot of time on this assignment or otherwise.

NOTE: A student can lose up to 30% of assignment marks for a badly written report.

END