Running AstroDMx Capture for Linux in a Virtual Linux machine on a Windows 10 computer. ***

The virtual machine will be an **Oracle VM VirtualBox** which is a **Level 2, or host hypervisor** that runs in a host operating system, as opposed to a **Level 1 hypervisor** that runs on the 'bare metal' hardware.

Windows 10 will be the **Host operating system** and **Lubuntu Linux** will be the **Guest operating system**.

Check to see if **virtualisation** is enabled on your Windows 10 computer by right-clicking on the Start button, or the taskbar, selecting **Task Manager** and select the **Performance** tab.

At the right-hand side of the window, underneath the CPU graph, there will be four columns. Look in the column labelled **Base speed**. The fifth item in this column will be Virtualisation, which will be enabled or not. If it is not enabled, turn off your computer. If it is enabled just carry on.

If virtualisation was not enabled, turn your Windows 10 computer back on and press F2 (or whatever is the Function key on your machine to enter the BIOS). Search for and enable virtualisation if it is not already enabled.

Download Oracle VM VirtualBox from:
https://www.virtualbox.org/wiki/Downloads

Click on **Windows hosts** and save the download file:
VirtualBox-6.1.2-135663-Win.exe

Then, from the same page on the website download the
VirtualBox 6.1.2. Oracle VM VirtualBox Extension Pack.
(Note that 6.1.2 is the version for both the VirtualBox and the Extension Pack at the time of writing). Make sure that they are both the same version, whatever version is current.

Run the **VirtualBox-6.1.2-135663-Win.exe** file which will install Oracle VM VirtualBox on your Windows 10 computer.

Double-click on the Oracle **VM VirtualBox Extension Pack** to install it in the Oracle VM VirtualBox Manager. This will allow, for example, the integration of the USB 3.0 (xHCI) Controller.

Download a Linux .iso file. It is best to use a relatively lightweight distribution. The example we use here is Lubuntu 18.04 a long-term support 'flavour' of Ubuntu Linux that can be downloaded at **https://lubuntu.me/downloads**. These instructions apply to this distribution. Others may differ in their details and suitability for virtualisation.

Launch Oracle VM VirtualBox Manager

Click on the '**New**' button.
You will be asked to Name the operating system.
Assuming you downloaded the Lubuntu .iso file, enter **Lubuntu** in the Name box. As you do so, you will note that the Type box becomes populated with **Linux** and the Version box becomes populated with **Ubuntu (64-bit)**. Click on the **Next** button.

You will now be on a page about Memory size. Just go with the default and click on **Next**.

You will now be on a page called **Hard disk**. Go with the default, which is **Create a virtual hard disk** now. Click on the **Create** button.

You will now be on a page called Hard disk file type. Go with the default which is **VDI (VirtualBox Disk Image)**. Click on **Next**.

You will now be on a page about Storage on Physical hard disk. Go with the default which is **Dynamically allocated**. Click on **Next**.

You will now be on a page called **File location and size**. Go with the default and click on **Create**.

You will see your new virtual machine **Lubuntu** at the left-hand side of the window. Click on the **Start arrow** button.

The VM Virtual machine will start and you will be asked to select a virtual optical drive.

Click on the icon to the right of the box. This will take you to the **Optical disk selector**.

Click on the **Add** button and navigate to the lubuntu .iso file.

Click on the file and select **Open**. Make sure that the **lubuntu .iso** file is highlighted in the Optical Disk Selector and click on **Choose**.

You will now be on a page called **Select start-up disk** and the lubuntu .iso file will have been selected. Click on the **Start** button. The installation of Lubuntu on the virtual machine will begin.

If English is pre-selected as it should be, press **Enter** and the installation will proceed after a countdown.

You may be presented with a small Lubuntu Live desktop with an Install Lubuntu icon on it, or you may have the option to install Lubuntu. Either way, select **Install Lubuntu**.

Now, just carefully follow the installation process, providing information when required. Do this carefully and slowly to make sure that you get the correct keyboard and location etc.

When you get to the **Updates and other software** page, make sure that **Normal installation, Download updates while installing Lubuntu, and Install third party etc...** are all checked and click on Continue. (or you could do a minimal installation that will only install the essentials. This would save space, and speed up the installation process somewhat. Choosing Normal installation however, will allow you to better explore the Linux distribution).

On the Installation type page go with the default which is **Erase disk and install Lubuntu**. Click on **Install Now**. (Don't worry, this is only happening inside the virtual machine).

A small window called **Write changes to disks?** Will appear. Click on **Continue**.

Depending on your earlier selection of language and keyboard, the next page called **Where are you?** should select the right place. If it does, click on **Continue**.

Then you will come to a page asking Who you are and requesting a password. Just enter a **user-name** and a **password you will not forget** and carry on. The installation of Lubuntu will proceed normally. Just wait until it is complete.

When you are told that the installation is complete, click on the **Restart Now button**. The Virtual machine will reboot and it will ask you to remove the installation medium, then press ENTER. **Just press ENTER**.

The virtual Lubuntu machine will boot up and ask for your password. Enter it and press **Enter**.

You will have a very small Lubuntu screen. Click on the **Start Button** (left of the panel (the taskbar is called the panel in Linux)). Select **Preferences and Monitor settings**. You will see that the resolution has been set to 800 x 600.

Use the drop-down menu to select the resolution that is right for your monitor. Look carefully through the options to make your selection. Then click on **Apply and Save**.

Then at the top of the screen, click on View and select Scaled mode. The menu at the top will disappear, but the panel at the bottom of the Lubuntu screen will be visible. Then **Click on the Right CRTL key and C** this may bring up a small window.

Select **don't show again**. You will now be able to switch between scaled view and the view with the top menu, just by typing the **Right-CTRL key and C** together.

It is possible that the Software Updater may present itself on the panel. This might be a good time to make sure that the Lubuntu installation is up to date. Click on the Software Updater, you will be asked for your password and the installation of the updates will take quite a few minutes.

Installing AstroDMx Capture for Linux.

Click on the **Browser** button on the panel of the Lubuntu screen. This will launch Firefox.

Type into the URL bar, **https://www.linux-astro-imaging.uk**

Navigate to **Linux Downloads.** Click on **AstroDMx Capture -Download Current Version.** Scroll down to the blue box **Linux 64-Bit.** Click on **astrodmx capture version 0.68.1 (x86-64) – Debian Installer**... (or whatever the current version is of the Debian installer)

Save the file. Firefox will save it to the downloads folder.
Close the browser.

Navigate to the Downloads folder using the File manager on the bottom panel. Inside the folder will be the **astrodmx capture install .deb file**.

Right click on the file and select **Gdebi Package Installer**.

The package installer will launch, and you will be able to see information about AstroDMx Capture for Linux. Just click on the **Install Package** button.

You will be asked for your password. Enter it and press Enter or click on OK. The installation will begin. When it has completed, click on **Close** and also close the window.

To save space on your virtual machine, you can now delete the installer package from Downloads and empty the Rubbish Bin if you so wish.

Logout by clicking on the Start button and selecting Logout and then Shutdown.

Restart the virtual machine, enter your password and log back in. (It should be noted that shutting down and restarting is not strictly required, it should be enough simply to logout and then log back in, however, sometimes this can produce unpredictable results).

Click on the Start button and you will find that a new category called **AstroImaging** has been created, and within it **AstroDMx Capture** has been installed.

Creating a Shared folder

We now need to create a shared folder between the Windows host machine and the Linux virtual machine so that results can be sent to it rather than filling up the limited space in the Virtual machine. Also, the results in the Shared Folder will be available for your Windows stacking software etc. to work on. I created a new folder called **SHARE** in the Videos folder of the Win10 machine. In **Properties** of the folder I set it to **Share for Everyone**.

In the virtual machine press **Right-CTRL and C** if necessary, to make **File; Machine; View; Input; Devices and Help** visible at the top of the window. Select **Devices** and click on **Insert Guest Additions CD image**.

This mounts **VBox_GAs_6.1.2** on the desktop (and in the file manager) and this can be opened in the file manager. The path to this can be seen at the top of the file manager folder. It will be something like **/media/username/VBox_GAs_6.1.2** where user-name is whatever user-name you created (The name you log into the virtual machine with).

NOTE: In lines below, the **Δ** symbol represents a space and is included to show where a space should be typed.

From the Lubuntu **Start button** launch a terminal. It is in **System tools** and is called **LXTerminal**) and type into it **cdΔ/media/username/Vbox_Gas_6.1.2**

(Note that spaces are significant such as after cd in the line above, but only where shown. If you get an error message, you have probably missed a space, or put one in where not required. Just type it again correctly).

Then type **sudoΔaptΔinstallΔgccΔmakeΔperl**

You will need to type your password if asked.

When you are asked Do you want to continue [Y/n] enter **y**

After it has finished this task; then type **sudoΔ./VboxLinuxAdditions.run**

(Don't forget the dot . In the above line). It will take some time for the computer to complete these tasks.

VBox_GAs_6.1.2 can be unmounted from the desktop from within the File manager when it is no longer required.

Creating a shared folder in Lubuntu, that can be accessed by the Lubuntu Linux virtual guest machine and the Windows 10 host machine.

Using the file manager on the Lubuntu panel, create a folder called **SHARE** in the Linux home directory (Folders are called Directories in Unix). It will have the **path /home/username/SHARE**.

Press **Right-CTRL and C** if necessary to make **File; Machine; View; Input; Devices and Help** visible at the top of the window.

Then click on **Machine and Settings**.

Click on **Shared Folders** and then highlight Machine Folders. Then click on the **icon like a folder with a + sign** to add a shared folder.

Click on **Folder Path**: and navigate to the folder created earlier in Windows (In this case SHARE in the Win10 machine Videos folder).
Click on the **SHARE** folder and then **Select Folder**.
Click on **Auto-mount**
Then in **Mount point**: enter the path to the shared folder as noted above:
/home/username/SHARE
Click on **Make Permanent** and then **OK**.

From the Linux **Start button**, select **System Tools** and then **Users and Groups**. Click on **Manage Groups**
A window containing **Groups available on the system** will appear.

Search for **vboxsf** in the list, **double click on it** and another window with **Group vboxsf Properties** will appear.

Check the box by the user-name and click **OK**
You will need to enter your password.
Enter it then click on **Close** and then **Close** again.

From the Linux Start button select Logout and Shutdown.

Start the virtual machine and it will have a shared folder, visible on the desktop as well as being in the home folder. It should be noted that anything put into the shared folder can **only** be deleted from the Windows side.

Configuring AstroDMx Capture for Linux to write its data to the shared folder.

Launch AstroDMx Capture

Click on **Options and Setup Output Format.**

The Save Folder is shown and can be changed. Click on **Change** and navigate to the shared folder in the home folder of Linux file system. Click on **Open** and the save folder will be changed.

Close the virtual machine from the **Start button, Logout and Shutdown**.

Enabling the USB controllers in the Virtual machine

When the **VM VirtualBox Manager** has been launched but the virtual Lubuntu machine **is NOT running:**

Click on **Settings, USB** and make sure that the **Enable USB Controller** is checked and make sure that the **USB 3.0 (xHCI)** Controller is selected.

Before a USB camera can be used in the virtual machine, the USB camera has to be passed through to the virtual machine.

With the virtual machine running, press **Right-CTRL and C** if necessary, to make **File; Machine; View; Input; Devices and Help** visible at the top of the window.

Plug your imaging camera into a USB port.

Click on **Devices, USB** and select your camera from the list.

That camera will then be available for AstroDMx Capture to use.

It should be noted that UVC cameras appear in the list but will not work properly. They are also listed as webcams and if selected there, will be usable but could cause instability, but will be restricted and only offer MJPEG.

Finally, it should be noted that for any given camera to be usable in a VM VirtualBox virtual Linux machine, that camera's Windows driver **MUST first of all be installed on the Windows 10 host machine.**

If the instructions are followed as presented here, it is possible to run AstroDMx Capture for Linux in a Windows 10 computer and to capture data that can be processed in the Windows Host machine.

Naturally, the performance of the Virtual machine and the software running in it, will depend on the specifications of the Windows 10 machine, particularly the type of hard drive (an SSD will give better performance), the CPU and the available RAM. The more powerful the computer, the better the performance.

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Although these instructions pertain to a **Windows 10 Host operating system**. The procedures should work fine with **macOS**. The should be no need to check for virtualisation being enabled in macOS. When '**Right-CTRL and C**' is mentioned, this should be replaced by '**Left-command and C**'. It should also be noted that the **version** of Oracle VM VirtualBox may change, but this should present no problem.