Stuff that I did to create my image for KStars/Ekos on Raspberry Pi

Note: All terminal commands are in green. I have also provided clickable links to take you to useful websites.

The Following steps are done on your normal desktop or laptop, which I refer to in this document later as the “Remote Computer”

1. Download latest version of Ubuntu mate

<http://indilib.org/support/tutorials/139-indi-library-on-raspberry-pi.html>

<https://ubuntu-mate.org/raspberry-pi/>

1. Unzip the xz file. You may need special software to do this. I used the UnArchiver.
2. Open Terminal and navigate to the folder containing it. You can type cd and literally drag the folder icon of the folder containing the img file to the Terminal.
3. Insert the MicroSD card into your computer (You may need an adapter or two). It should mount.
4. Find out the path the drive is mounted on by typing the following into Terminal. This is EXTREMELY important because you will be using dd in the next line to copy the disc image to the SD Card and you want to be sure to do this to the correct drive. Note that dd stands for “Disk Destroyer” and it is called that for a reason! (It is often /dev/disk1 or /dev/disk2)

diskutil list

1. Use the dd command to copy the image file to the Sd card. Note that if is the input file and of is the output file. I added an r in the path using /dev/rdisk1 instead of /dev/disk1 and I also added bs=1m. Both of these will GREATLY speed up the process.

sudo dd if=ubuntu-mate-16.04-desktop-armhf-raspberry-pi.img of=/dev/rdisk1 bs=1m

Warning: check your drive number first using step 5!!!

1. This process will take awhile and will not give you feedback, when it completes, it will display the results in the Terminal and you will regain the prompt.
2. Before you remove the SD Card, You should edit this document in the edit the following file in the Pi-boot partition which should have automatically mounted after the imaging process:

/boot/config.txt to make sure that your PI will have a decent resolution even when an HDMI display is not connected.

With the following options:

hdmi\_force\_hotplug=1

hdmi\_group=2

hdmi\_mode=46 (1440 x 900@60Hz)

For the 3rd one, you can set your resolution to whatever you like. I set it to option 46 (1440 x 900) since that is my laptop resolution.

<https://www.raspberrypi.org/forums/viewtopic.php?f=91&t=19600>

<https://www.raspberrypi.org/documentation/configuration/config-txt.md>

1. Set your initial IP number to a static number in the same range as your laptop’s self-assigned IP address by following this tutorial so that your remote computer will be able to interface with the pi using VNC by directly connecting an Ethernet cable between them even if there is no internet or Wi-Fi available.

<https://pihw.wordpress.com/guides/direct-network-connection/>

These next few instructions will need to be done on the Raspberry Pi. You will need to connect a mouse, a keyboard, and an HDMI display.

1. Insert the SD Card and start the Raspberry Pi.
2. Run through the system setup. You need to create an account with administrator privileges. Also, you will want to choose the name of your computer system.
3. Once the setup is complete, you might want to set your login account to auto login.

<https://ubuntu-mate.community/t/auto-login-to-the-desktop/60>

Edit the greeter preferences file

sudo pluma /usr/share/lightdm/lightdm.conf.d/60-lightdm-gtk-greeter.conf

[SeatDefaults]

greeter-session=lightdm-gtk-greeter

autologin-user=username

1. Check to see that the SD card partition has been resized to use the full SD card (Click the big red button on the welcome screen.)
2. You might want to explore the operating system a bit, familiarize yourself with it, and customize it a bit. If not, you can do this later.
3. You will now want to join your wireless network using the GUI using the Wi-Fi icon at the top right of the screen so that you have access to the Internet and so that later it will remember your Wi-Fi network and it will then automatically connect to it. You may want to enter all of the Wi-Fi Networks you will be using at this time.
4. You **might** want to update the kernel. There is a lot of disagreement about that. Read up on this before doing it. Open a Terminal on the Pi.

sudo rpi-update (THIS IS OPTIONAL)

1. Run software updates

sudo apt-get update

sudo apt-get -y upgrade

sudo apt-get -y dist-upgrade

1. Possibly install Synaptic Package Manager for easy software install/removal

sudo apt-get install synaptic (THIS IS OPTIONAL)

1. A new issue is that SSH is disabled by default on new installations. An easy solution is executing these two commands to remove and reinstall it.

sudo apt-get purge openssh-server

sudo apt-get install openssh-server

1. To create a swap file to have artificial ram (if you are planning to use this with a Canon camera or other high memory application), you can follow these commands at this website

wget https://raw.githubusercontent.com/Cretezy/Swap/master/swap.sh -O swap

sh swap 2G

<https://github.com/Cretezy/Swap>

1. To view the Raspberry Pi Remotely, install RealVNC and enable it by running these commands:

curl -L –o VNC.deb https://www.realvnc.com/download/binary/latest/debian/arm/

sudo dpkg -i VNC.deb

sudo systemctl enable vncserver-x11-serviced.service

Your Raspberry Pi is now capable of being headless. You can go over to your remote computer (doesn’t matter what kind) and use a VNC client like Real VNC client to access your Pi remotely. If you are on the same network, you need to access it using the host name that you chose like this: hostname.local. You can also access it using the ip address if you have trouble with the hostname method. When you look on the PI, you can configure VNC settings using the VNC menu item at the top.

1. You will also want to configure a wireless network hotspot that will work even if you don’t have wifi at your observing site. You can follow this tutorial: <http://askubuntu.com/questions/490950/create-wifi-hotspot-on-ubuntu>

But note, on mine, I had to do a “hotspot” not “infrastructure” and I did not have to do the terminal commands at the end. Also this method resulted in my Pi wanting to always create a network instead of going with an existing one.

Another note, I have since come up with a better solution for this, but I haven’t written down the instructions clearly yet. I have made a desktop icon that you can click to start up a wireless hotspot network and another one that disables it.

1. Install samba so that you can share files to your other computer(s).

sudo apt-get install samba

1. Install caja-share so that you can easily share the folders you want.

sudo apt-get install caja-share

1. Add yourself to the user group who can use samba where user-name is actually your user name you use to log in to the Pi.

sudo smbpasswd -a *user-name*

1. To share the folders you want, all you need to do is right click on them and click “Sharing Options.”
2. Install Kstars and Ekos bleeding edge

<http://www.indilib.org/download/ubuntu.html>

sudo apt-add-repository ppa:mutlaqja/ppa

sudo apt-get update

sudo apt-get install indi-full

sudo apt-get install indi-full kstars-bleeding

sudo apt-get install kstars-bleeding-dbg indi-dbg

Not: the last one is optional but recommended. It makes debugging easier.

1. Install the General Star Catalog if you plan on using the simulators to test

sudo apt-get install gsc

1. Install Astrometry.net for offline plate solves

sudo apt-get install astrometry.net

1. Set up the Astrometry. Net for offline plate solves <http://indilib.org/about/ekos/alignment-module.html>

Download the packages listed on the page that are appropriate to your setup and then

sudo dpkg -i astrometry-data-\*.deb

1. Optionally edit the configuration file for astrometry.net.

<http://astrometry.net/doc/readme.html>

1. Install PHD2 (if you want it. I installed it but haven’t used it yet.) <https://launchpad.net/~pch/+archive/ubuntu/phd2>

sudo apt-add-repository **ppa:pch/phd2**

sudo apt-get update

sudo apt-get install phd2

1. Set up launchers for your programs and/or put them in the Startup applications. Note that you should probably get rid of programs from the startup commands that you do not need. Very Helpful: <https://gnomeshell.wordpress.com/2011/08/28/manage-the-startup-applications/>

I would add a launcher for indiserver with your default configuration of devices, since then it will start INDI automatically in case you want to use another computer to control your equipment and don’t want to always run KStars on the Pi.

1. If any of your devices are USB Serial or use the tty USB port structure for connection, you will want to assign a udev rule, since when you plug them in, they are assigned ANY port number /tty/USB0, /tty/USB1, etc. This way, you don’t try to tell your mount to focus and you don’t tell your focuser to goto coordinates. (ask me how I know. . .)

The finished file goes in /etc/udev/rules.d

<http://hintshop.ludvig.co.nz/show/persistent-names-usb-serial-devices/>

1. Another issue I ran into was that my serial connection to my mount was read only and I had to change the permissions every time I plugged it in or restarted it. I found a solution to this, removing a program called modemmanager (which I didn’t need anyway) and adding myself to the dialout group. And finally, I made sure the permissions would be good by adding udev rule to set the permissions when you plug something in.

sudo apt-get remove modemmanager

sudo usermod -a -G dialout $USER

(I added these two lines to my udev rule file from the previous step.)

KERNEL=="ttyUSB[0-9]\*",MODE="0666"

KERNEL=="ttyACM[0-9]\*",MODE="0666"

<http://askubuntu.com/questions/112568/how-do-i-allow-a-non-default-user-to-use-serial-device-ttyusb0>

1. I installed INDI Web Manager following these instructions so that I can use a web browser either on my Pi, or remotely to turn on and off INDI drivers and profiles

<http://indilib.org/support/tutorials/162-indi-web-manager.html>

sudo pip install indiweb

curl -o indiwebmanager.service https://raw.githubusercontent.com/knro/indiwebmanager/master/indiwebmanager.service

sudo pluma indiwebmanager.service

1. Edit this file to contain your user name. Then follow these commands

sudo cp indiwebmanager.service /etc/systemd/system/

sudo chmod 644 /etc/systemd/system/indiwebmanager.service

sudo systemctl daemon-reload

sudo systemctl enable indiwebmanager.service

1. One problem with a Canon camera is that it always tries to automount it. I tried to disable the automounting routine by editing dconf, by making udev rules, and by editing configuration files. But everything I have tried so far has not worked. Until we can figure this out, you will need to unmount a Canon camera right after you connect it so that KStars/Ekos can access it.