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/
2. Unzip the xz file. Open Terminal and navigate to the folder containing it.
3. Insert the micro SD card, and use dd to copy the image file to the Sd card. (Assuming you have a mac—I don't know how to do it on PC)
   sudo dd if=ubuntu-mate-16.04-desktop-armhf-raspberry-pi.img of=/dev/rdisk1 bs=1m
   Warning: Use diskutil list FIRST in Terminal to verify that the SD Card is disk1 and double check both the path to the SD Card (of) and the path to the file (if). DO NOT do this without checking; you could destroy your OS. You should also probably unmount the SD card first if it mounted when you plugged it in.
4. 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.
5. 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
   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
   (The reason we are doing this is because when you connect via VNC from the remote computer and there is no HDMI device attached, you want it to have a decent resolution)
6. 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.

7. Insert the SD Card and start the Raspberry Pi.
8. You need to create an account with administrator privileges.
9. Set your login account to auto login.
   https://ubuntu-mate.community/t/auto-login-to-the-desktop/60

   Edit the file /usr/share/lightdm/lightdm.conf.d/60-lightdm-gtk-greeter.conf

   [SeatDefaults]
   greeter-session=lightdm-gtk-greeter
   autologin-user=username

10. Resize the partition to use the full SD card (Following the instructions in the little welcome box that popped up)
11. 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.
12. Change your host name to be whatever you want in both files:
    sudo pluma /etc/hostname
    sudo pluma /etc/hosts
    and then restart your Raspberry Pi.
    http://askubuntu.com/questions/9540/how-do-i-change-the-computer-name
13. 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.
14. Open a Terminal on the Pi. Update the kernel to the latest version. (I thought this was just for Rasbian, but Ubuntu-MATE documentation recommended it too, so I don't know)
    sudo rpi-update
15. Run software updates
    sudo apt-get update
    sudo apt-get upgrade
16. Install vino for VNC (or some similar vnc server that lets you see the real desktop from a remote computer. I had trouble with tightvnc server, it was always giving me a new session and not letting me see the desktop)
    sudo apt-get install vino
17. Configure Vino to set the access password and other options. It will bring up a dialog box where you can set them.
    vino-preferences
18. Set vino to accept unencrypted connections (if you get an error when trying to connect from your favorite client on your remote computer)
    gsettings set org.gnome.Vino require-encryption false
19. Add Vino to startup applications using the GUI. You will find the ability to add startup applications in the menus at the top. You want to start: /usr/lib/vino/vino-server

Your Raspberry Pi is now capable of being headless (if you restart it—Vino needs to be running). You can go over to your remote computer (doesn't matter what kind) and use a 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.

20. 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.

21. Install samba so that you can share files to your other computer using smb.
    sudo apt-get install samba
22. 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*
23. Edit the configuration file so that you get all the settings you want. I just share the homes directory so that I can access all the user files.
    Helpful: http://www.linuxveda.com/2015/01/01/install-samba-server-ubuntu/

24. 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 kstars-bleeding
    sudo apt-get install kstars-bleeding-dbg indi-dbg
    Not: the last one is optional but recommended. It makes debugging easier.
25. Install the General Star Catalog if you plan on using the simulators to test
    sudo apt-get install gsc
26. If your icons look really weird when you open Kstars, you might need to install the oxygen icon theme
    sudo apt-get install oxygen-icon-theme
27. 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
28. Optionally edit the configuration file for astrometry.net.
    http://astrometry.net/doc/readme.html

29. 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

30. 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.
31. 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/
32. One problem I ran into early on was that I could not download the addons or get images because it said klauncher was not running. I finally found that if I launched kded5 from a terminal, they worked. So I added it to my startup applications. I did NOT encounter this problem with kstars, only with kstars bleeding. (I think this has been fixed now)
33. 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
34. I removed brltty because it was causing a startup error and I don't need it at all since I don't need braille support on this device.
    sudo apt-get remove brltty
35. 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
    Also note, that I had trouble getting it to run with the launcher file. I made my own.
36. 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.