USING SPATIAL INFORMATION TO SUPPORT DECISIONS ON SAFEGUARDS AND MULTIPLE BENEFITS FOR REDD+

STEP-BY-STEP TUTORIAL V1.0: CREATING AN OPEN FORIS XUBUNTU LIVE USB– THE BASICS GETTING STARTED WITH OPEN SOURCE

UN-REDD PROGRAMME

Food and Agriculture Organization of the United Nations

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The UN-REDD Programme is the United Nations Collaborative initiative on Reducing Emissions from Deforestation and forest Degradation (REDD) in developing countries. The Programme was launched in September 2008 to assist developing countries prepare and implement national REDD+ strategies, and builds on the convening power and expertise of the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP).

The United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) is the specialist biodiversity assessment centre of the United Nations Environment Programme (UNEP), the world's foremost intergovernmental environmental organisation. The Centre has been in operation for over 30 years, combining scientific research with practical policy advice.

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We welcome comments on any errors or issues. Should readers wish to comment on this document, they are encouraged to get in touch via: ccb@unep-wcmc.org.

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These training materials have been produced from materials generated for working sessions held in Tanzania with the National Forestry Resources Monitoring and Assessment of Tanzania, FAO Tanzania and Sokoine University, to aid the production of multiple benefits maps to inform REDD+ planning and safeguards policies using open source GIS software.

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Contents

1. Introduction

REDD+ has the potential to deliver multiple benefits beyond carbon. For example, it can promote biodiversity conservation and secure ecosystem services from forests such as water regulation, erosion control and non-timber forest products. Some of the potential benefits from REDD+, such as biodiversity conservation, can be enhanced through identifying areas where REDD+ actions might have the greatest impact using spatial analysis.

Open Source GIS software can be used to undertake spatial analysis of datasets of relevance to multiple benefits and environmental safeguards for REDD+. Open-source software is released under a license that allow software to be freely used, modified, and shared (http://opensource.org/licenses). Therefore, using open source software has great potential in building sustainable capacity and critical mass of experts with limited financial resources.

This tutorial provides a brief introduction to the preparation of a Live Linux USB key; a consistent, portable and efficient computing environment. The Live Linux distribution used here is the Open Foris Xubuntu Live (www.openforis.org/wiki), which is a customized version of the lightweight Xubuntu Linux distribution (www.xubuntu.org) with pre-installed GIS , image processing and other open source software. Using this kind of lightweight, pre-configured and standardized computing environment can be particularly useful during training sessions with various hardware.

2. Xubuntu – an open source operating system

2.1. Using Open Foris Xubuntu Live

Xubuntu is a lightweight version of the Ubuntu Linux operating system. It can be preferable to install Xubuntu on a live USB rather than using the windows environment:

- It provides access to a fully functional Linux operation system without the need of changing the current software configuration of a computer
- It can use the full potential (memory, CPU) of the machine on which it is being run
- The software is not installed on a hard disk of a single machine and is therefore portable

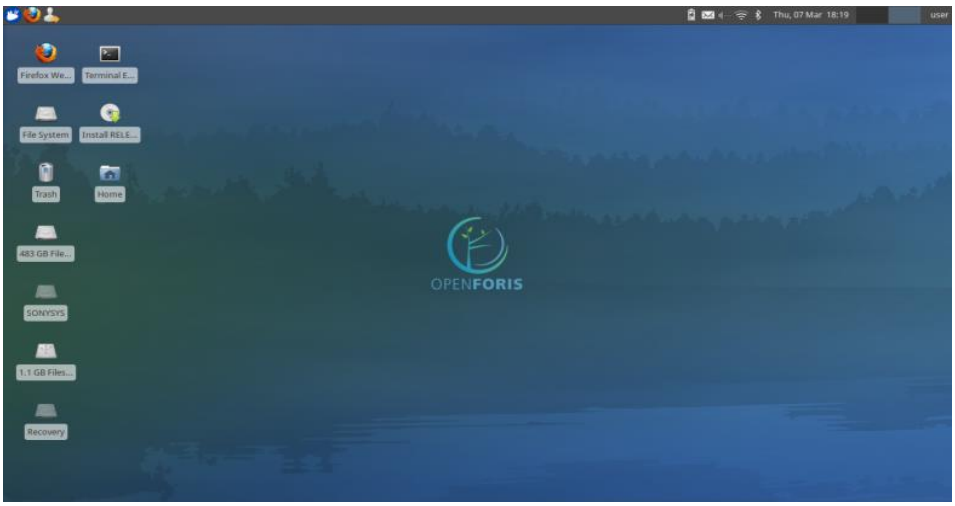


Figure 1: An example of a customised Open Foris Live desktop is presented above

In this tutorial, we focus on creating a live USB installation as that allows the user to save the changes they have made during a computing session. That is, the users can easily customize and save the changes in software configuration of the system as well as the look and feel of the operating system (keyboard layer, desktop settings etc.)

The Live Linux USBs can be created in several ways. In the following chapters we provide examples of the basic and advanced ways to generate the live systems. The main difference between these two is the way the changes are stored in the system. The single partition approach (Section 2.2) does save the changes, but the user cannot access them from outside of the live session. Alternatively, the user can create several partitions on the USB disk (Section 2.3) to allow external access to the data stored on the USB disk. This may be helpful, if the users need to share the results of the analysis with colleagues using other operating systems.

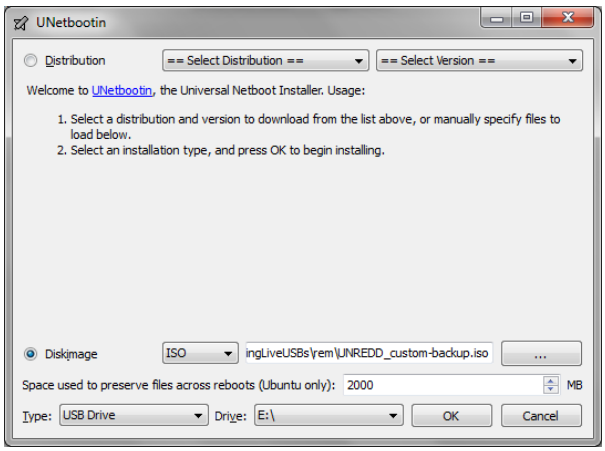
2.2. Creating a live USB with a single partition from an existing ISO image

The advantage of this method is that it is the simplest option for creating a Live USB. The USB stick has only one partition (i.e. the plugged USB stick appears as a single drive in the computer. The disadvantage is that all changes introduced during a Live session are stored in a persistent file which is not easy to access from outside of a Live session. If this method is used it may be preferable to use a relatively small USB drive (e.g. 8 GB) and use a second USB for data or store any data on a hard drive. Alternatively see Step 2.3. which explains how to create a Live USB drive with separate partitions for the data and the operating system.

An ISO image containing a Live Linux system is required for creating the live USB. This tutorial does not describe how to create an ISO image but uses an existing Open Foris Xubuntu Live ISO image developed by FAO for the GIS and image processing capacity development training sessions. This ISO image is available for download at www.openforis.org/iso/OpenForisXubuntu-latest.iso.

An ISO image cannot be copied to the USB directly; some additional software is required to burn the image onto the USB and to make it bootable. One method is to use the '**Unetbootin'** Installer available at http://unetbootin.sourceforge.net/. Different versions are available for Windows, Linux and Mac OS.

2.2.1. From a Windows operating system



a. Plug in an empty USB disk (Preferably at least 8GB)

b. Remove any other USB devices to avoid confusion in the next steps

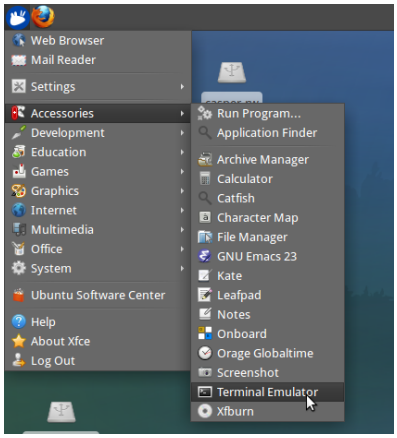
c. Double click on the **UNetbootin Installer**

d. Click on **Diskimage**

e. Browse to the location of The downloaded ISO image

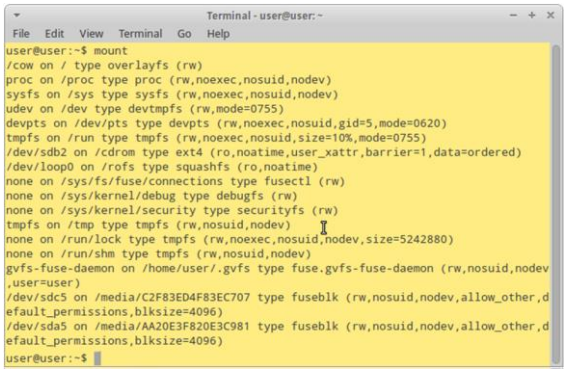
f. Set the space to preserve files across reboots to 2000
g. Make sure 'type' is set to USB Drive
h. Chose the drive letter of the USB device to install the live software on
i. Click **OK**

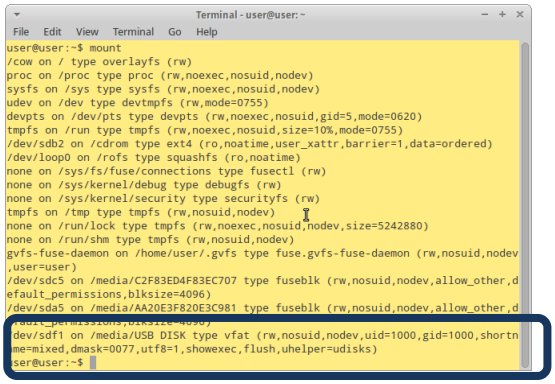
******IMPORTANT*** DOUBLE CHECK to make sure you have the right drive letter** (there should only be one choice if all other USB devices have been removed)*



2.2.2. From a Linux operating system

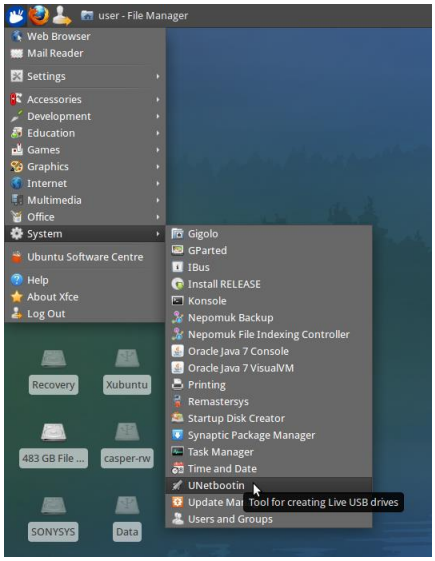
a. Either logon to a Linux computer or start up the computer in Linux from an existing live USB
DO NOT plug in the USB that you want to make into a live USB
b. Open a terminal window
c. In the terminal window type '**mount**' to see what drives are currently mounted



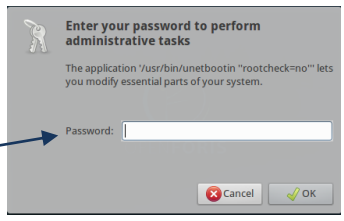


d. Plug in the new USB stick and the new drive should open in the file manager window

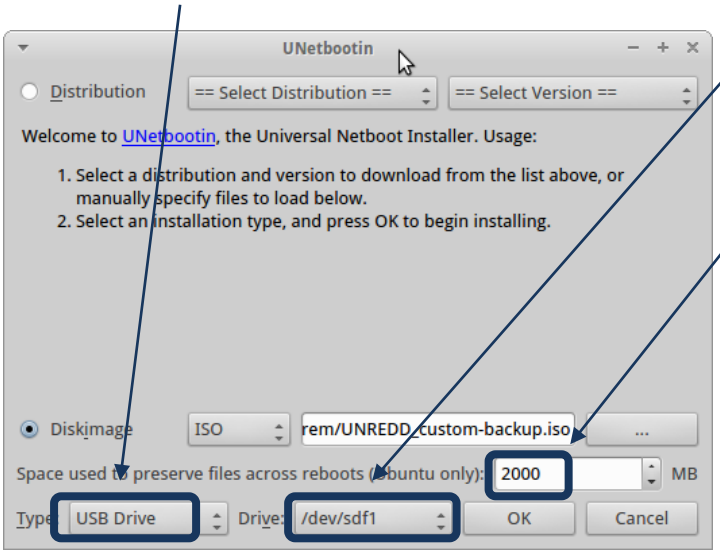
e. In the terminal window type '**mount**' again and see the addition of the USB that has just been added. *In this example it is mounted as /sdf1*



f. From the system menu click on
g. **System >>>UNetbootin**
h. Provide the super-user password. If you are running the Open Foris Xubuntu Live, the password is '**user**'



i. Set **Type** to **USB Drive**



j. Click on **Drive** to drop down the choice of drives. Pick the drive identified in the above step for the USB *i.e. In this example /dev/sdf1*

k. Set preserve files across reboots to 2000 *(this is the maximum it will actually preserve)*

******IMPORTANT*** This will overwrite the drive so make sure it is the right drive letter***

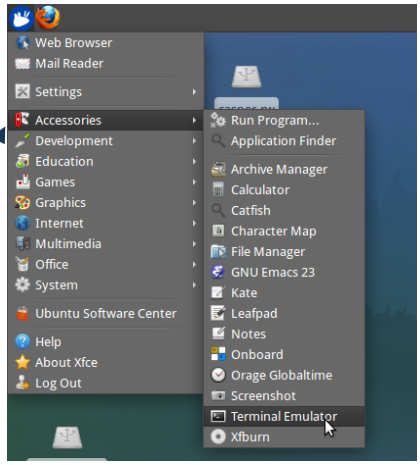
l. Click **OK**

2.3. Creating a live USB with multiple partitions from an existing ISO image (Linux only)

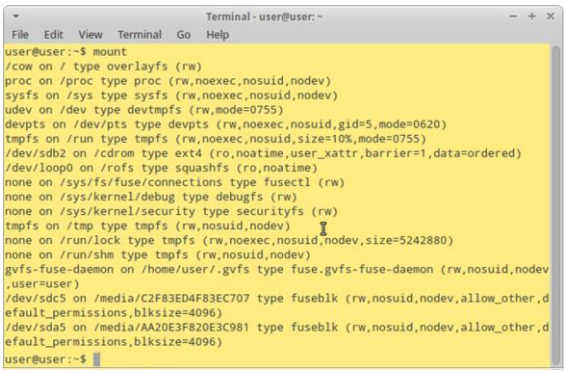
2.3.1. Remove existing partitions from the USB stick

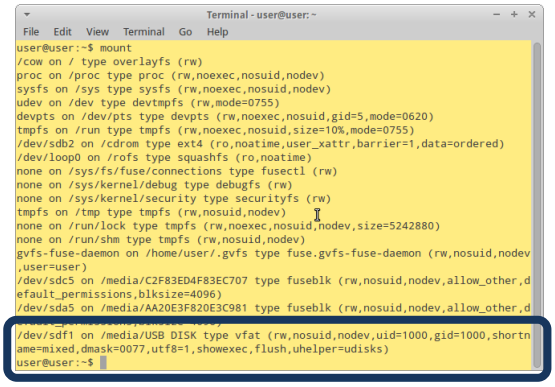
a. Either logon to a Linux computer or start up the computer in Linux from an existing live USB
DO NOT plug in the USB that you want to make it to a live USB

b. Open a terminal window



c. In the terminal window type '**mount**' to see what drives are currently mounted





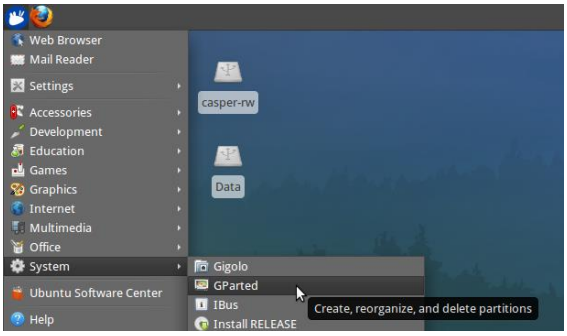
d. Plug in the new USB stick

e. The new drive should open in the file manager window

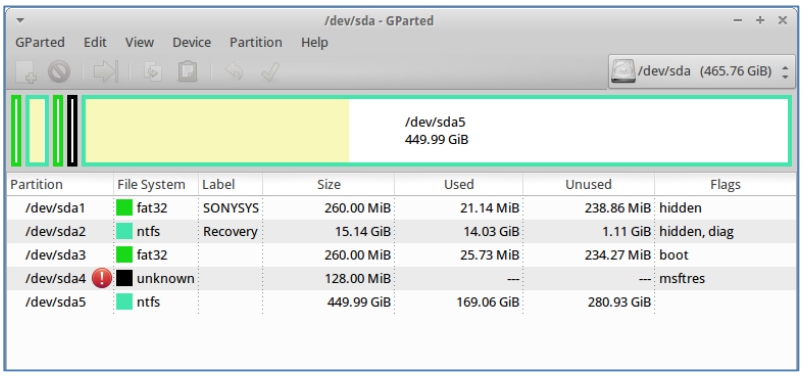
f. In the terminal window type "mount" again and see the addition of the USB that has just been added. *In this example it is mounted as /sdf1*

g. From the system menu
Click on **System >>>GParted**

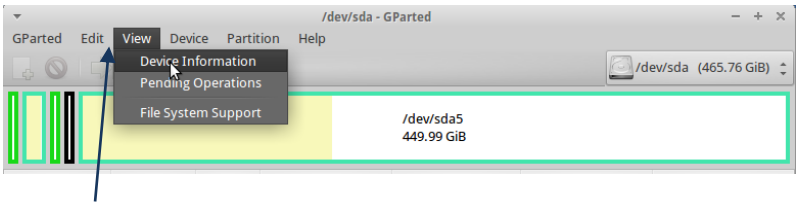
This programme will be used to format and partition the USB drive



******IMPORTANT NOTE*** Read and follow the instructions below VERY carefully. CHOSING THE WRONG DRIVE TO FORMAT COULD DELETE EVERYTHING FROM YOUR COMPUTER***

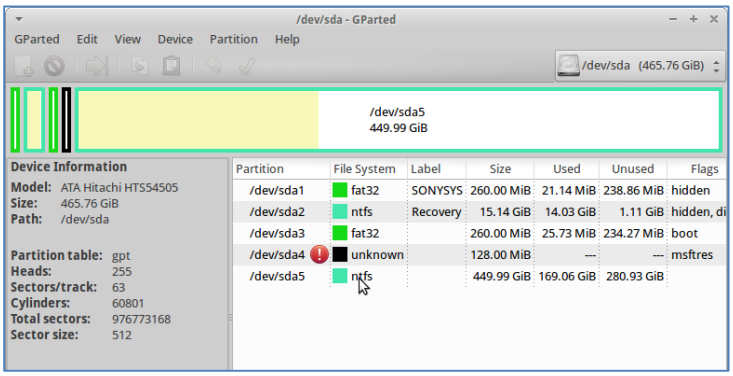


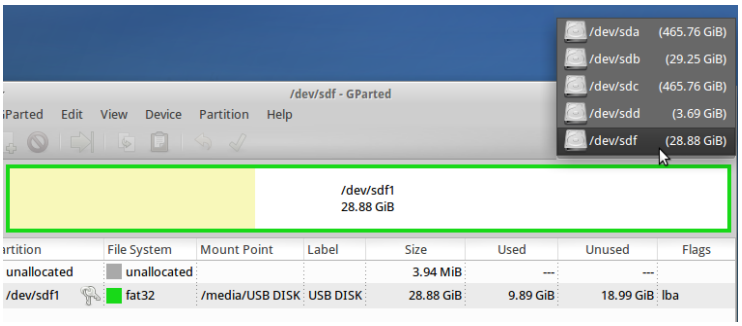
******WARNING*** GPARTED OPENS WITH THIS WINDOW WHICH IS THE HARDDRIVE OF YOUR COMPUTER. BE VERY CAREFUL***



h. From the view menu click **Device Information** so you can see the description of the disks

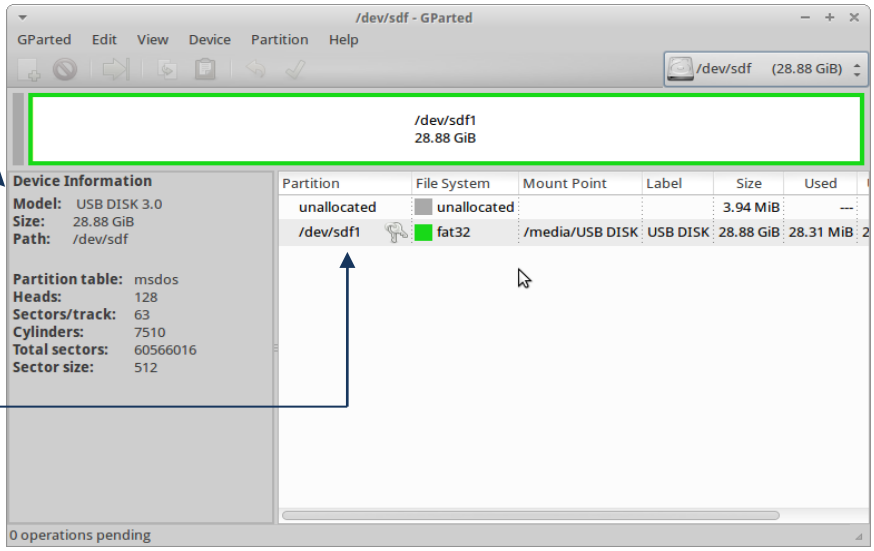
The information about the currently selected drive is now displayed





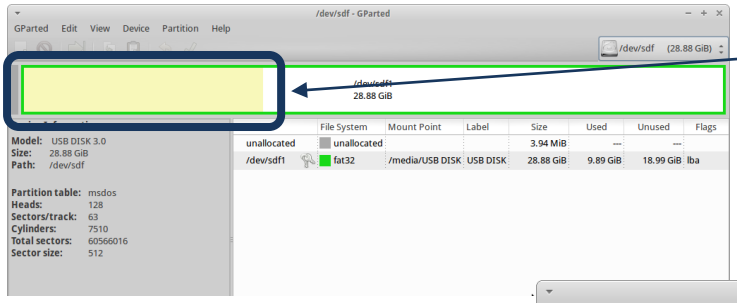
i. Change the drive to be the *USB stick (i.e. the drive letter identified in step f., In this example /dev/sdf)*

The device information should now show that it is looking at the USB drive



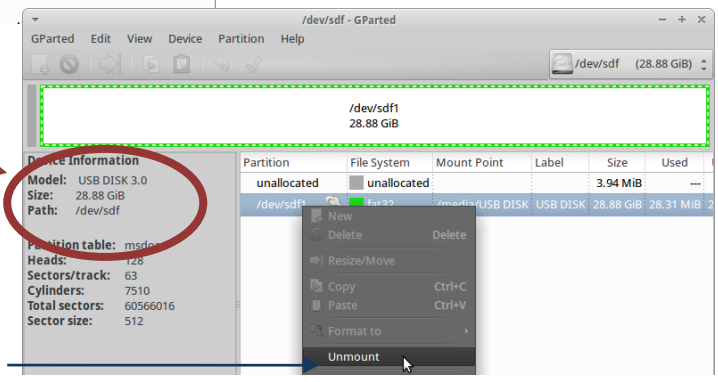
The drive currently has 1 fat32 partition (sdf1) with 28.88GB space and a small amount of unallocated space

******WARNING*** THE NEXT STEPS WILL REFORMAT AND DELETE ANYTHING OFF YOUR USB DRIVE SO DO NOT CONTINUE IF YOU ARE NOT USING AN EMPTY USB OR ARE NOT WANT TO OVERWRITE ANY DATA STILL ON THE USB***

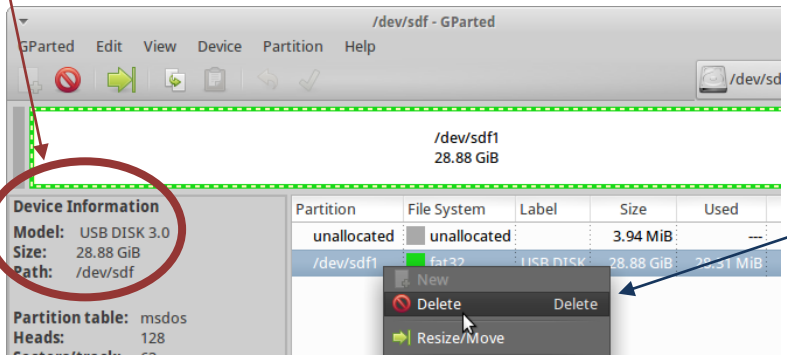


The area in yellow tells you that this USB stick is NOT empty and you may not wish to continue with formatting it as any data will be lost

******WARNING*** AGAIN – Double check that it is the USB drive***

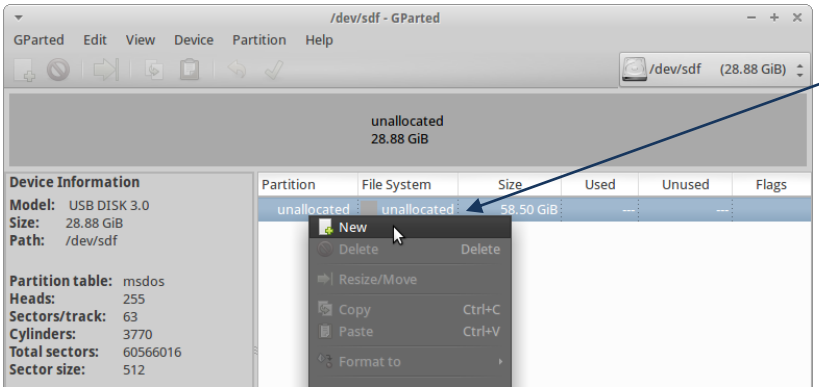


j. Right click on any existing partitions and **Unmount** them



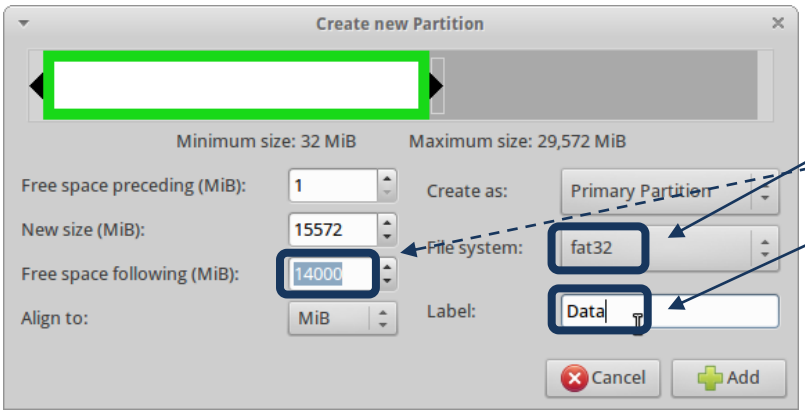
k. Then right click on the existing partitions and **Delete** them

2.3.2. Create 3 new partitions (Data, Xubuntu and casper-rw)

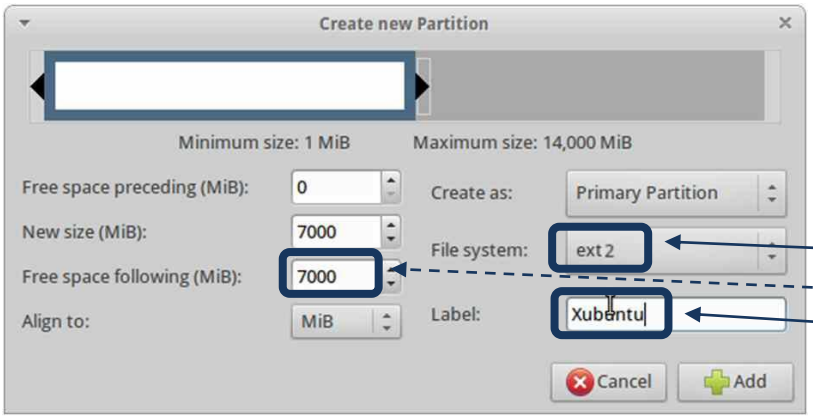


a. Right click on the **unallocated partition** and click **New**

The Windows OS can only see the 1st partition on a USB drive so the 'Data' partition is created first in order to be seen in both the Windows and Linux environments

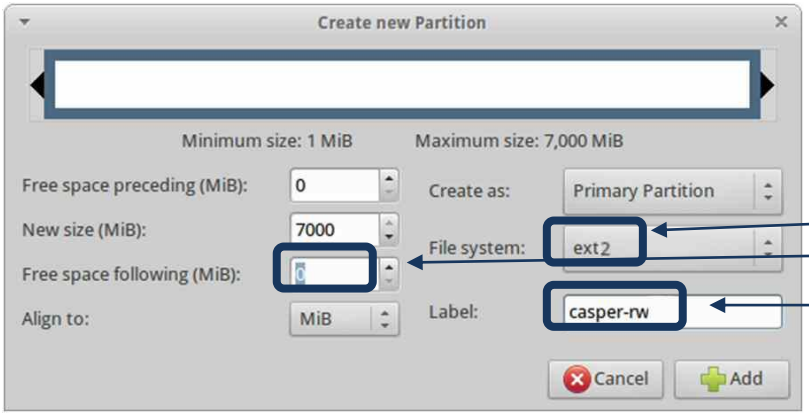


b. Create the 1st partition as:
'Fat32'
'14000'
'Data'



c. Right click on the **unallocated partition** again and click **New**

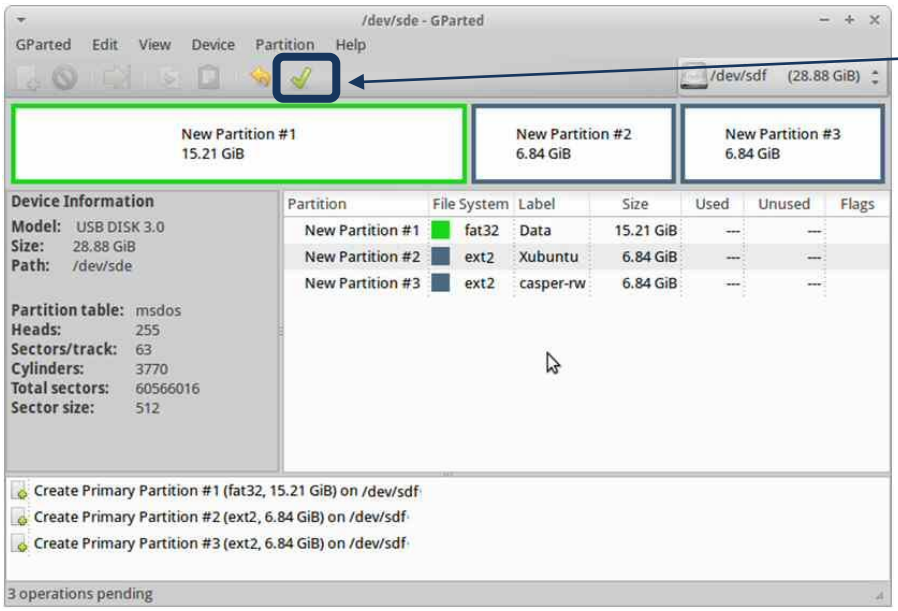
d. Create the 2nd partition as:
'ext2'
'7000'
'Xubuntu'



e. Right click on the **unallocated partition** again and click **New**

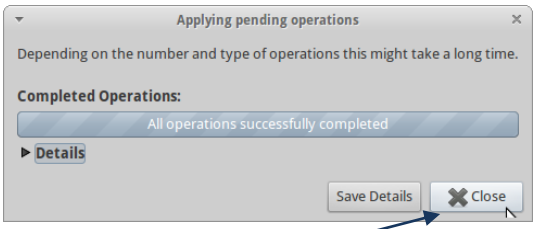
f. Create a 3rd partition as
'ext2'
'0'
'casper-rw' *(this one has to be all in lower case)*

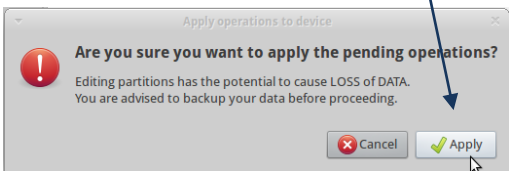
******WARNING*** ONCE TICK AND APPLY HAVE BEEN PRESSED THERE IS NO GOING BACK AND ANY DATA ON THE USB DRIVE WILL BE DELETED – THIS CANNOT BE UNDONE***



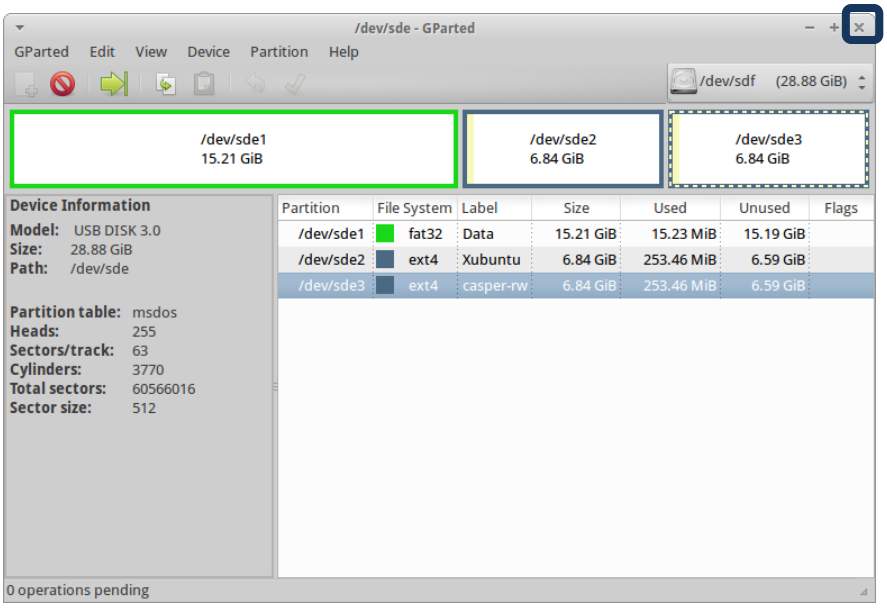
g. Click the **tick** to apply the changes to the USB drive

h. Click **Apply** to confirm





i. Click **Close**



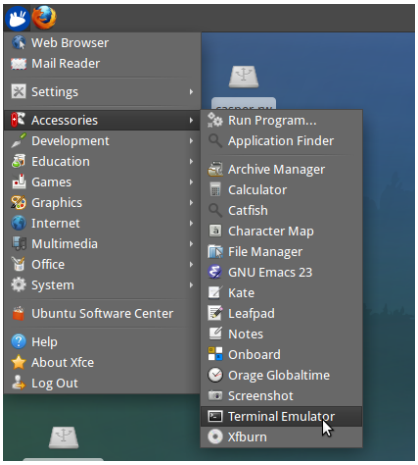
j. Close Gparted by clicking on the **'X'**

Formatting of the USB stick is now complete.

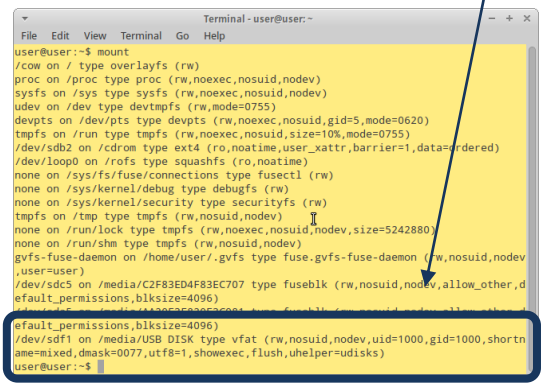
2.3.3. Creating the live USB from an existing ISO image on the Xubuntu partition

a. The USB stick was unmounted during the formatting so remove the USB stick and plug it in again (this will mount the 3 new partitions)

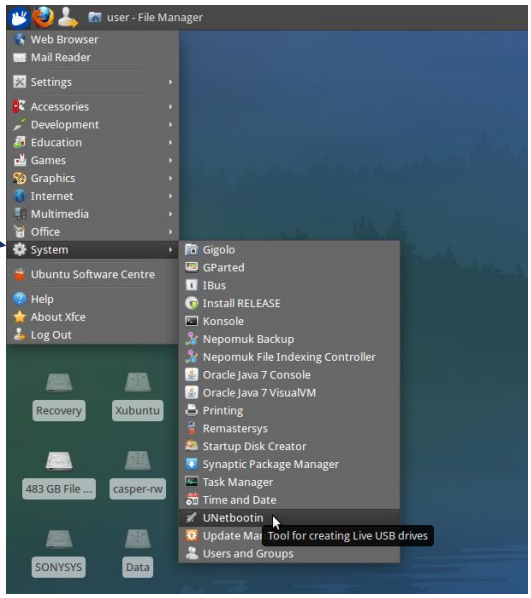
b. Open a terminal window



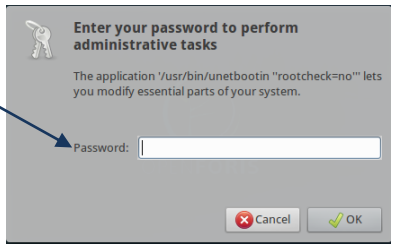
c. Type **'mount'** to check the drive letter that the USB is mounted to. It should show 3 partitions

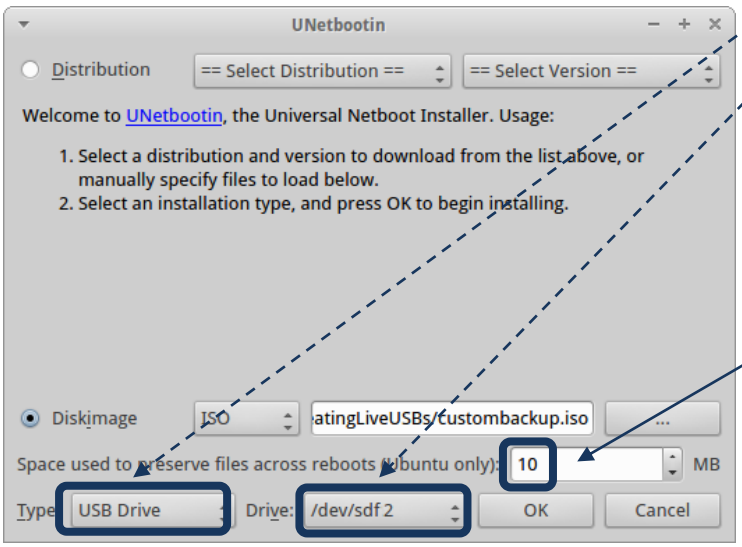


d. From the system menu click on **System >>>UNetbootin**



e. Provide the super-user password. If you are running the Open Foris Xubuntu Live, the password is '**user**'





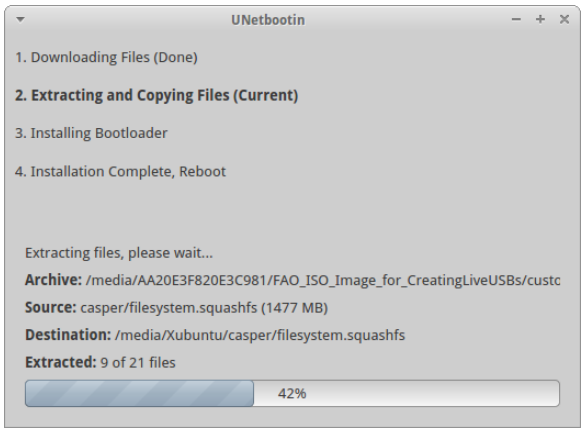
f. Set **Type** to **USB Drive**

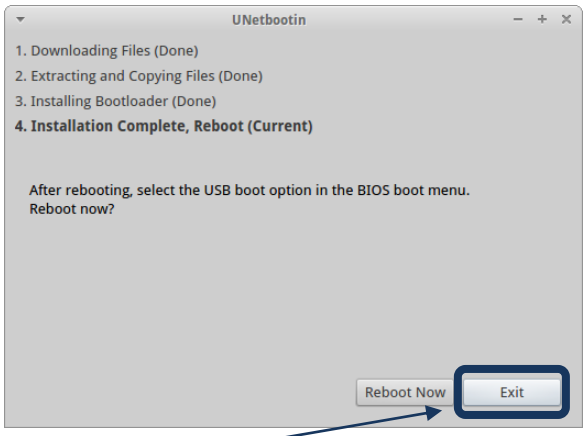
g. Click on **Drive** to drop down the choice of drives and pick the drive identified in the above step *i.e. In this example /dev/sdf2*

h. Set **the Space preserved across reboots** to **10** *(This is very small as the casper-rw partition will replace this later)*

******IMPORTANT*** This process overwrites the drive so make sure the right drive letter is selected and partition number is picked for your USB***

i. Click **OK**

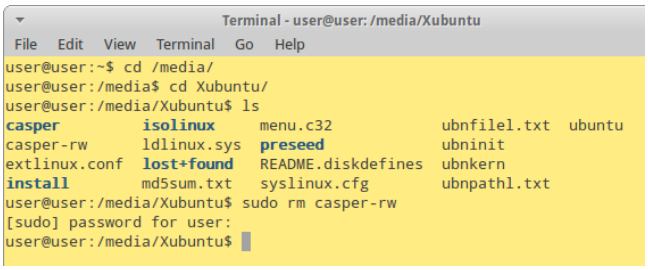




j. Click **Exit** to finish (Do NOT click Reboot Now)

k. In a **Terminal window** navigate to the Xubuntu partition on the USB drive by typing the following lines and hitting the **Enter** key after each line:

- Type **cd /media**
- Type **cd Xubuntu**
- Type **ls**



*A file called casper-rw should be in the listing. This is the 10b file created in **step h**.*
*Then type the following lines in the same terminal window and hit the **Enter** key after each line:*

- Type **sudo rm casper-rw**
- Type **user** *(the super-user password. If you are running the Open Foris Xubuntu Live, the password is 'user')*
- Type **ls** *(and see that the casper-rw file is deleted)*

The 3rd partition that was named 'casper-rw' in an earlier step replaces this file and its function is to preserve changes to software across reboots. This method has an advantage over the casper-rw file as it is not limited to 2000Mb.

l. The creation of the USB stick is now complete. Shut down the system and reboot with the new USB stick to check that it has been created successfully (see section 2.4)

There are a lot more complexities in creating live USB sticks from scratch, particularly in customizing the software installations and creating the ISO image. The above information provides users with a good starting point to work in this environment. Further information is available at:

- https://help.ubuntu.com/community/Installation/FromUSBStick
- https://wiki.ubuntu.com/LiveUSBPendrivePersistent?action=show&redirect=LiveUSBStick

2.4. Booting a computer from a live USB

When starting a computer normally, it runs with the operating system installed on its hard drive, e.g. Windows or Linux. When booting from a USB device, uses the operating system that is installed on the USB device. Booting from the USB is easy and should take less than 10 minutes depending on the hardware.

The computer will automatically start "normally" (i.e. boot from its hard drive) without even looking at any boot information that might be on the USB device. To boot the computer from the USB device follow the steps below:

- Shut down your computer
- Plug the bootable USB key in your computer
- Turn on the computer and read carefully the information on the first screen that appears after rebooting. Usually the screen displays a message such as "**F12 Boot options**", "**F2 Setting**", "**Press F10 to enter BIOS**" or similar. Typically, this message appears in the top or in the bottom of the screen.
- Immediately **press the indicated key/keys.** Each computer varies but one of those function keys, depending on the setting for your computer, will usually open the UEFI/BIOS and provide you with the possibility to change the order of the boot devices.
- If your computer starts normally i.e. does not boot from the USB, start from the beginning. Change the order of the boot devices in such a way, that the USB/External device option becomes the first (default) device.
- Hit the **Enter** key and the computer will then boot from the USB rather than using the operating system installed on the hard disk.

Unfortunately there are a few exceptions to these instructions for some computers. The steps to enable booting from a live USB may be a little more complicated and in a few exceptional cases may not work at all. If you have difficulties in booting your device, use the internet to find the specific instructions for your hardware. The following link may be useful for that:

http://pcsupport.about.com/od/fixtheproblem/a/biosaccess_pc.htm