### 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



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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### **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 (<u>http://opensource.org/licenses</u>). 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 (<u>www.xubuntu.org</u>) 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 <u>http://unetbootin.sourceforge.net/</u>. Different versions are available for Windows, Linux and Mac OS.

ĺ	🛱 UNetbootin	
	○ Distribution == Select Distribution == ▼ == Select Version	== ▼
	Welcome to UNetbootin, the Universal Netboot Installer. Usage:	
	<ol> <li>Select a distribution and version to download from the list above, or manual load below.</li> <li>Select an installation type, and press OK to begin installing.</li> </ol>	y specify files to
	Diskimage     ISO     ISO     IngLiveUSBs\rem\UNREDD_custom-backup.	iso
	Space used to preserve files across reboots (Ubuntu only): 2000	🔶 MB
	Iype:     USB Drive       ▼     Drive:       E:\     OK	Cancel

### 2.2.1. From a Windows operating system

- a. Plug in an empty USB disk (Preferably at least 8GB)
- 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
   <u>DO NOT</u> 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

File Edit View Terminal Go Help ser@user:-\$ mount cow on / type overlayfs (rw) roc on /proc type porc (rw,noexec,nosuid,nodev) ysfs on /sys type systs (rw,noexec,nosuid,nodev) dev on /dev type devtmpfs (rw,mode=0755) wyts on /dev/ts type devtps (rw,noexec,nosuid,size=10%,mode=0755) dev/slb2 on /run type tmpfs (rw,noexec,nosuid,size=10%,mode=0755) dev/slb2 on /run type tmpfs (rw,noexec,nosuid,size=10%,mode=0755) dev/slb2 on /rofor type squashfs (ro,noatime) one on /sys/kernel/security type securityfs (rw) one on /sys/kernel/security type securityfs (rw) mpfs on /run/shm type tmpfs (rw,nosuid,nodev) Vfs-fuse-daemon on /home/user/.gyfs type fuse.gyfs-fuse-daemon (rw,nosuid,nodev) user=user) dev/slo5 on /media/C2F8E5D4F83EC070 type fuselk (rw,nosuid,nodev,allow_other,d fault_permissions.blksize=2090	*	Terminal - user@user: ~	- + ×
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<pre>vts-ruse-aaemon on /nome/use//.gvts type ruse.gvts-ruse-aaemon (rw,nosuld,nodev user-user) dev/sdc5 on /media/C2F83ED4F83EC707 type fuseblk (rw,nosuid,nodev,allow_other,d fault_permissions.blksize=4096) dev/sdc5 e.g.(media/AADC2E200227003 type fuseblk (rw peruid pedus allow ather d dev/sdc5 e.g.</pre>	ione on /run/snm type tmpts	(rw,nosuld,nodev)	
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fault_permissions,blksize=4096	(dou/sdcE on (modia/C2E02ED4	E93EC707 tupo furablk (re posuid pode	w allow other d
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fault permissions blksize=4096)	fault permissions blksize=4	(196)	v,arrow_other,u
configuration in the second se	worduron	2004)	

- **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

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











#### i. Set Type to USB Drive

### 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
   <u>DO NOT</u> 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	🐧 Web Browser	
0		🧱 Mail Reader	<b>A</b> 2
	Click on System >>>GParted	🔀 Settings 🔹 🔸	
		C Accessories	casper-rw
		🖌 Development 🔹 🔸	
		Education	
	i nis programme will be usea	🚽 Games 🔹 🔸	
		🍪 Graphics 🔹 🕨	Data
	to format and partition	🗿 Internet 🔹 🔸	
		📕 Multimedia 🛛 🔸	
	the USB drive	🗑 Office 🔸	
		System 🔸	🖬 Gigolo
		🔋 Ubuntu Software Center	GParted
			IBus Create, reorganize, and delete partitions
		- Help	💿 Install RELEASE

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

. . . . .

				/dev/sda5 449.99 GiB			ala ala ala a			
rtition	File System	Label	Size	Used	Unused	Flags	***И	VARNI	NG**	* GPARTED
/dev/sda1	fat32	SONYSYS	260.00 MiB	21.14 MiB	238.86 MiB	hidden	OPEN		тн тн	
/dev/sda2	ntfs	Recovery	15.14 GiB	14.03 GiB	1.11 GiB	hidden, diag	OFLI	45 001		
/dev/sda3	fat32		260.00 MiB	25.73 MiB	234.27 MiB	boot	WHIC	CH IS 1	THE H.	ARDDRIVE C
/dev/sda4 🌒	] 📕 unknown		128.00 MiB		-	msftres	VOU			
/dev/sda5	ntfs		449.99 GiB	169.06 GiB	280.93 GiB		CARE	EFUL	IPUTE	<u>:R</u> . BE VERT
				449.99 GiB						
<b>h.</b> Fro	 om the v formatic	view me	enu click <b>E</b> t the	Device Infor	mation SO Edit View Devic	YOU CAN SC( /dev ce Partition Help	e the des	scripti	on of	the disks
<b>h.</b> Fro The inf current	 om the v formatic tly selec	view me on abou cted driv	enu click <b>E</b> t the re	Device Infor	Edit View Devic	YOU CAN SE( /dev ce Partition Help	e the des	scripti	on of	the disks - +
<b>h.</b> Fro The inf current is now	formatic tly selec	view me on abou sted driv ed ~	enu click <b>E</b> t the re	Device Infor	Edit View Devic	YOU CAN SC( /dev ce Partition Help	e the des /sda - GParted /dev/sda 449.99 G	scripti	on of	the disks - +
<b>h.</b> Fro The inf current is now	formatic formatic tly selec displaye	view me on abou ted driv ed —	enu click <b>E</b> t the re	Device Infor	tormation so Edit View Devic Edit View Devic Edit View Devic Comparison Attachitachi HTS54505 465.76 GiB Comparison Co	you can see	e the des /sda - GParted /dev/sda 449.99 G File System L fat32 S ntfs fat32 S fat32 S fat32 S fat32 S	a5 SONYSYS 266 Recovery 1 266 122 44	Size 0.00 MiB 21 5.14 GB 1 0.00 MiB 25 8.00 MiB 19.99 GiB 16	Used         Unused         F           L14 MiB         238.86 MiB         hidd           4.03 GiB         1.11 GiB         hidd           5.73 MiB         234.27 MiB         boot           9.06 GiB         280.93 GiB         msft

:

•

The device information	▼ GParted Edit View Device Pa	/dev/sdf - GParted		- + ×
should now show that it is			<u>[]</u>	dev/sdf (28.88 GiB) 🛟
looking at the USB drive		/dev/sdf1 28.88 GiB		
The drive currently has 1 fat32 partition (sdf1) with	Device Information Model: USB DISK 3.0 Size: 28.88 GiB Path: /dev/sdf Partition table: msdos Heads: 128 Sectors/track: 63 Cylinders: 7510 Total sectors: 60566016 Sector size: 512	Partition File System unallocated unalloc /dev/sdf1 💮 fat32	ated /media/USB DISK USB DISK	Size Used 1 3.94 MiB K 28.88 GiB 28.31 MiB 2
amount of unallocated space				
	0 operations pending			
	o operations perions			-
	•••••	• • • • • • • • • • • • • •	•••••	•••••
***WARNING*** THE NEXT ST	EPS WILL REFORMAT	AND DELETE ANY	THING OFF YOUR	USB DRIVE
SO <u>DO NOT CONTINUE</u> IF YOU	ARE NOT USING AN E	MPTY USB OR ARE	NOT WANT TO C	OVERWRITE
ANY DATA STILL ON THE USB				
/dev/sdf-GPa	rted	- * × The area	ı in yellow tells ya	ou that <u>this</u>
Graned Edit View Device Partition Help	/dev	(28.88 GIB) : USB stick	k is <u>NOT empty</u> ar	nd you may
28.8	icelf1 8 GiB	not wish	to continue with	formatting
File System Model: USB DISK 3.0 unallocated unallocated unallocated	Mount Point Label Size Used I ed 3.94 MiB	Jnused Flags it as any	data will be lost	
Partilio tabi: modos Hardia: 128 Sectorstra: 128 Cylindera: 7310 Total sector: 60556016 Sectorsize: 512	GParted Edit	/dev/sdf View Device Partition Help	- GParted	- + x
***14/4 DAUA/C***		15 E 19 2	(day (edf)	/dev/sdf (28.88 GiB) 💲
AGAIN - Double check that			/dev/sd1 28.88 GiB	
it is the USB drive	Disce Informati Model: USB DIS Size: 28.88 BB Path: /dev/sdf Path: /dev/sdf Path: /dev/sdf	Partition unallocated /dev/sd1 Res	File System Mount Point Labe unallocated Kast22 /media (USB DISK USB I v ete Delete	Size         Used         I           3.94 MiB          I           DISK         28.88 GiB         28.31 MiB         2
<b>j.</b> Right click on any partitions and <b>Unmoun</b> y	y existing Sectors/track: Cylinders: Total sectors: Sector size: t them	33 7510 5056016 512 ♥ Ras 512 ♥ For Unr	ay Ctri+C te Ctri+V mat to , nount	
·	/dev/sdf - GParted			
GParted Edit View Device Partition H	lelp	/dev/sd		
	/dev/sdf1 28.88 GiB		<b>k.</b> Then right cli	ck on partitions
Device Information Model: USB DISK 3.0 Size: 28.88 GiB	File System Label	Size Used .94 MiB	and Delete t	hem
Partition table: msdos	Delete Delete			
Heads: 128	Resiže/Move			



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



### 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 🔛 Mail 🔀 Setting 🔹 Run Progra C Accessories 🖌 Developm 👼 Education Application Finde c. Type 'mount' to check the drive letter that the USB is 🛃 Ga mounted to. It should show 3 partitions Games G Games G 🌀 Interr 驔 Multir Character Map
   File Manager
   GNU Emacs 23 Terminal - user@ File Edit View Terminal Go Help Edit View Terminal Go Help Ruser:-5 mount on / type overlayfs (rw) on /proc type proc (rw,noexec,nosuid,nodev) is on /sys type sysfs (rw,noexec,nosuid,nodev) is on /sys type sysfs (rw,noexec,nosuid,gid=5,mode=0620) is on /run type tmpfs (rw,noexec,nosuid,size=10%,mode=0755) //sodb on /croin type ext4 (ro,noatime,user\_xattr,barrier=1,data= //loopD on /rofs type squashfs (ro,noatime) on /sys/skrenel/sebug type debugfs (rw) on /sys/kernel/sebug type debugfs (rw) on /sys/kernel/seturity type securityfs (rw) is on /run type tmpfs (rw,nosuid,nodev) is on /run/shm type tmpfs (rw,nosuid,nodev) 🍯 Office Kate Kate Erafpad Erafbad ð Libuntu Softw dered) 🮯 Orage Globa 🖬 Sc 🖭 Terminal Emulator Xfburn P n /media/C2F83ED4F83EC707 type fuseblk (rw missions blksize=4096) X Se media/USB DISK type vfat (rw,nosuid,nodev,uid=1000,gid=1000,s sk=0077,utf8=1,showexec,flush,uhelper=udisks) d. From the system menu click on System >>>UNetbootin Gigolo I IBus e. Provide the super-user password. If you are elp bout Xfce running the Open Foris Xubuntu Live, the password is Enter your password to perform administrative tasks 'user' 、 The application '/usr/bin/unetbootin ''rootcheck you modify essential parts of your system. Password: e Mar Tool for creating Live USB drives

🔇 Cancel 🛛 🏑 OK



- 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 <u>partition number</u> is picked for your USB

i. Click OK



- j. Click Exit to finish (Do <u>NOT</u> 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 Is

-	1	rerminal - user@user: /	media/Xubuntu	
File Edit	View Terminal	Go Help		
user@user user@user user@user	:~\$ cd /media/ :/media\$ cd Xubu :/media/Xubuntu	untu/ \$ ls		
casper-rw extlinux.d install user@user [sudo] pa: user@user	isolinux isolinux.s conf lost+foum md5sum.tx :/media/Xubuntu ssword for user :/media/Xubuntu	menu.c32 ys preseed d README.diskde t syslinux.cfg \$ sudo rm casper- :	ubnfilel.txt ubninit fines ubnkern ubnpathl.txt rw	ubuntu

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 Is** (and see that the casper-rw file is deleted)

The 3<sup>rd</sup> 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.

I. 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