fair-ubuntu-centre Documentation

Release 14.04-32bit

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This project automatically configures a server for a Digital Library. Client computers for students/users are then installed through PXE netboot. The server contains a number of offline educational resources, together with the full Ubuntu software repositories.

This documentation is intended for technicians working in the field to deploy and maintain such Digital Libraries.

This is the Ubuntu 14.04 edition

CHAPTER 1

Contents

1.1 Setting up a server

1.1.1 Server requirements

The following items are necessary for setting up a server:

- Data drive (1-2TB) preloaded with all of the data
- A server, should be a machine with a decent memory, CPU, and stable fans
- A USB flash containing default Ubuntu Desktop (14.04 32-bit)
- A USB flash containing the FAIR installscripts
- If previously installed, copy the old configuration of the centre to installscripts/config/local/name-of-site

1.1.2 Installation procedure

1. Install Ubuntu 14.04 32-bit on the server, choose to erase everything if there is already something there. Call the user and the password something that was agreed that other technicians can know (not the school).
2. Shutdown the server after installation
3. Insert the data hard drive on secondary SATA port
4. Boot the system and log in
5. Insert USB with installation scripts
6. Make sure that the hard drive is mounted, you can use command "mount" or click the hard drive's icon in the application bar, bottom left
7. Now open a terminal, CTRL+ALT+T
8. Type `sudo bash` to get a command line with administration privileges
9. Go where the USB flash is mounted: `cd /path/to/usb-flash`, for instance "/media/fair/installscripts".

10. Go to the "installscripts" folder, for instance, `cd fair-ubuntu-centre`. This folder should contain "install.sh", the main program that transforms the newly installed Ubuntu desktop to an ICT centre server.
11. Remember that you can always type `ls` to see the contents of a folder.
12. Run `./install.sh` and the installation begins. There might be questions during the end of the installation, but the first part will take some minutes, so you can go for tea.
13. At the end, the installation asks for a "Local overlay", that means that specific configurations for this centre is added. It will ask about each folder that it finds in "installationscripts/config/local". This should include the centre, that you are working on.

1.1.3 Creating a new local overlay

1. Go to the installscripts/config/local folder:

```
bash
cd installscripts/config/local
```

2. Look at what's there and select a previous centre where the setup is most similar to the one you are doing and copy that one:

```
cp -R other-centre new-centre
```

3. Re-run the last part of the install.sh job:

```
cd ../../
./install.sh 98-local.sh
```

Changing the local configuration

If you need to change files in the local configurations, you should read the documentation for creating local configurations. But the overall idea is this:

1. Make changes to the files
2. Re-run the last part of the install.sh job:

```
cd ../../
./install.sh 98-local.sh
```

Re-running the local configuration on all machines

If you have already installed all machines and have made ammendments (e.g. added a new standard program, user or printer driver), you can re-run the post-installion by running this command on the server:

```
cd /media/fair/usb-flash/path/to/installscripts/
python scripts/deploy/rerun_postinstall.py
```

Warning: Only machines that are switched on and correctly attached to the network will be affected.

Machines that cannot boot from network

Create a CD / USB flash with gPXE. You can obtain the .iso file from:

http://rom-o-matic.net/gpxe/gpxe-#.0.1/contrib/rom-o-matic/

- Copy the .iso image to a USB flash, this will overwrite everything of the USB:
- Insert flash, it may be automatically mounted so should be unmounted if it's mounted.
  - To see what is mount: `mount`
  - To unmount: `umount /dev/sdX1`
  - To copy: `sudo dd bs=4M if=Downloads/gpxe.iso of=/dev/sdX`
- Now the flash is bootable

Otherwise, burn the iso to a CDR, but remember that you should burn an *image* not a file.

1.1.4 After installing

Make sure that you have copied the contents of the installscripts to "/root/" so another technician can know what was used for the installation:

```
cd /media/fair/usb-flash/path/to/installscripts/
cp -R . /root/
```

Make sure to also copy the configuration overlay, for instance:

```
cd /media/fair/usb-flash/path/to/installscripts/config/local
cp -R . /root/
```

1.1.5 Installing clients (student computers)

Make sure that network booting is enabled in the BIOS. When booting from the network, select the `Automatic Ubuntu install` option which will install everything without asking questions.

After the installation is completed, the client will reboot **but it's not yet finished!**

It will complete a *post-install* procedure, which is a custom script that will run, also installing additional software.

This process takes time, and even if you do not see any progress on the screen for up to 20 minutes, just let the script finish.

1.1.6 Verifying an installed client

It's important to check that the client has installed everything correctly, because an interruption during the unattended intallation will sometimes cause computers to be in a bad state.

Verify for instance:

- When logging in as a student, you receive the Gnome Classic desktop interface, which has the Applications + Places menu in the top left corner. Not the Unity desktop! If you are directed to the Unity desktop, log back out and select Gnome Fallback (Metacity) instead from the menu next to the username selection.
- That the `student` and `teacher` account are setup correctly, and that there is not password required for the `student` account.

- KA Lite videos are playing correctly.
- That the folder with *Materials For Students* is working and teachers can write to it.

1.2 Equipment check list

Do not forget packing this before departing!

Note: Never let equipment pass through the doors of the warehouse without writing down its ID!

1.2.1 Tools

- Cable crimps
- Screw drivers, hammer, pliers
- LAN testers

1.2.2 Accessories

Make sure that you know something in advance about the room, how many electrical outlets you have etc. You need to know how many metres of network cable that you need, and how many power extension cables.

- LAN cables
- Ethernet plugs for DIY cables
  - 2 for each computer
  - 2 for each switch connection
  - 2 for the server
  - 2 for printer
  - 10-20% extra for errors
- Power cables for desktop computers and screens
- Power supplies for laptops
- VGA cables
- Extension cables
- Good mood
- Projector + long VGA cable and power cable
- Switch + Serial port (room for computers + server + printer + connection between switches)
- Cable clips
- Lots of plastic strips to fixate loose cables
- Labels and pen

Optional

- UPS + UPS power cable
- Speakers

1.2.3 Spare parts

Note: It's best to setup and test the server before going. In case you are unable to test the server, make sure to bring an extra server or server data hard drive.

Warning: Computers can be broken in transport. Typically, 1 or 2 machines may be dead on arrival. You should bring one or two extra computers.

Note: Remember to update the inventory! When you are bringing spare parts out, and when you are bringing unused spare parts or broken computers back.

Not everything may go as planned, and its lighter to carry spare parts than spare computers.

- RAM
- Extra hard drives SATA+IDE
- Graphics cards (in case Nvida / ATI drivers are buggy)

1.2.4 Computers

- Teacher computer (+ screen & keboard if not using a laptop)
- Server (+ screen if not laptop)
- Clients (+ screens if not laptop). Bring a couple of extras in case you experience problems.
- Keyboards + Mice (remember to note USB & PS-2 ports on computers!)

1.3 How-to

1.3.1 Sharing an internet connection

1.3.2 Cloning hard drives

In order to obtain a data drive for the server, clone a **master** (or **source**) hard drive onto a **target**. There is nothing special about the master, just that it's a hard drive that you keep safe such that other hard drives can be cloned from it.

Tip: Keep your hard drives labeled with a version (or date). Confusion can be quite costly timewise.

Warning: Never deploy your last master copy, it is recommendable to have 2 master copies.

Tip: Before using the a disk copy in a school, consider setting up the server at your own location and testing it there.

As of 2018, the data footprint is roughly 550 GB.

Cloning to same capacity disk

If - say - you have a `source` disk with a 1 TB capacity and you are cloning to a `target` that is also a 1 TB drive, you should use a SATA docking station. This is the much faster option.

In order to optimize the chances for correct copies, make sure to monitor the copying process in case of electrical blackouts. You may also use a UPS to protect against both blackouts and power surges. If you cannot get a UPS, a power surge protector is also helpful, in cases where the SATA docking station is affected by power surges.

Copying to different capacity disk

A step-by-step guide is provided below, but firstly some background…

Cloning to a *larger* `target`: If - say - you have a `source` disk with a 1 TB capacity and you are cloning to a `target` that is 2 TB, you can clone with a SATA docking station, but you will *not* be able to use the disk at its 2 TB capacity afterwards, it will report as a 1 TB file system (the size of the `source` file system).

Cloning to a *smaller* `target`: This is **not** possible with a SATA docking station.

When you have different capacity `source` and `target`, the best method is to copy file-by-file using mounted filesystems. You do this by connecting both drives with a USB dock. Use USB 3.0 if available, it is much faster (the USB plug in your computer is usually colored blue for 3.0 ports). You can also connect both drives to the motherboard using a SATA cable.

When both drives are connected, you may have to format the destination drive. It should be labeled `FAIR` and the file system must be `ext4`.

After both drives have been mounted, observe that `source` and `target` are mounted as `FAIR` and `FAIR1`, but which is which? You have to find out manually. The file systems of both drives have identical labels `FAIR`, but the operating system makes sure to mount them in separate locations.

Warning: Before you copy, make sure that you know which is the source and which is the target. Be aware that they can swap if you unplug drives or reboot the computer.

Glossary

- **Drive**: When we just say "drive", we mean the whole drive and not something specific.
- **Partition table**: A drive will always have one single partition table, which says where the partitions are located.
- **Partition** A section of a hard drive. If you use Windows, you can recall it has **drive letters** such as `C:\`. This actually denotes a partition. On Unix and Linux, partitions can be found anywhere in a different tree structure.
- **Mounting**: A partition is *mounted* on to the root file system, meaning that for instance, you can have a path called `/media/username/drive-label` and it's our way of saying that when you read or write files anywhere in that hierarchy.

- **Formatting**: The action of formatting something means to create a new file system on a partition.
- **File system**: A file system is a certain way of organizing files and folders on a partition. Different operating systems use different file systems. On Linux, the most normal system is called `Ext4`.
- **Device node**: When a file system isn't mounted, it is often refered to by its *device node*, such as `/dev/sda1`. This is a special path where you cannot put files or folders. But you can use it to refer to a partition or drive. The disk itself doesn't have a number and appears like `/dev/sda`, and each partition is refered to by a number, for instance `/dev/sda3`.

Step-by-step

1. Start by plugging in the `source` drive. It will be available in the location `/media/<username>/FAIR`. You can verify by running this from command line:

   ```
   ls /media/<username>/FAIR  # Replace <username> with your username.
   ```

   This should display a list of files, such that you can verify that the `source` drive is indeed *mounted* here. If you want to see which drives are currently mounted, and where, run:

   ```
   lsblk  # Lists all devices and partitions and where they're mounted
   mount # This lists everything mounted but is a bit harder to read
   ```

2. You need to format a new partition on the `target` drive. Use the **Disks** program that is installed by default in Ubuntu. The partition should be labeled `FAIR` and the file system must be `Ext4`. If there is something already on the drive, the easiest option is to use the *Format Disk* option, which will generate a new *partition table*, on to which you can add a partition using the entire capacity of the drive.
3. After formatting the `target` partition, make sure that it is mounted. You can also use the **Disks** program to mount the partition. Use the `lsblk` command to see which drives and partitions are mounted.
4. When both `source` and `target` drives are mounted and ready, you must use the `rsync` command to copy files. The program makes it possible to resume in case you are interrupted. This is crucial, becase depending on the USB or SATA connection, the copying process can take as much as 12 hours, and you may experience power cuts.

   The command is as follows, assuming that `source` is mounted in `/media/<username>/FAIR`!!

   ```
   # This command replaces $USER with your username automatically.
   rsync -av --stats /media/$USER/FAIR /media/$USER/FAIR1
   ```

1.3.3 Setting up a Wireless center

> **Warning:** It is not recommended to do Wireless centers, as the installation and booting from networks have been proven very difficult.

Prerequisits

- A wireless access point (AP) with bridging enabled, i.e. not acting as a router
- Server connected to AP.
- Server configured with a local overlay for wireless setups.
- mini.iso prepared on a USB for booting clients before installing

  - Obtain mini.iso: http://archive.ubuntu.com/ubuntu/dists/trusty/main/installer-i386/current/images/netboot/
- Copy the .iso image to a USB flash, this will overwrite everything of the USB:
  - Insert flash, it may be automatically mounted so should be unmounted if it's mounted.
    * To see what is mount: `mount`
    * To unmount: `umount /dev/sdX1`
    * To copy: `sudo dd bs=4M if=Downloads/mini.iso of=/dev/sdb`
  - Now the flash is bootable

Installing a client

- Turn on the machine, press for instance F12 and choose to boot from USB
- Press TAB to edit the first "Install" option for Ubuntu
- Delete the `quiet` part.
- Put: `ks=http://192.168.10.1/ks.cfg ksdevice=WLAN0`
- When installing, you should be able to choose the wireless network that you have configured

Configuring DIR-635 access points

1. Reset the device
2. Attach to a machine and obtain DHCP from the AP
3. Connect to `192.168.0.1`
4. Setup an un-encrypted wireless, DO NOT REBOOT YET
5. Go to Network
   1. Disable DHCP
   2. Disable DNS relay
   3. Give the router a static IP, i.e. `192.168.10.2` (must be unique to your network!)
6. Go to Advanced and disable features you know are useless.
7. Reboot device
8. Connect to server on one of the Switch ports, not the internet/WAN port

Tip: Use two access points and configure them on separate channels.

Booting from the network

Once the server is installed, and the network is ready, you need to boot from the network.

However, as computers do not support TFTP via WIFI, you need to:

1. Boot from a USB flash

2. Tell the Ubuntu installation program (debinstall) where to find the configuration for automatic installations, and to configure the WIFI in order to retrieve this list.

Creating the bootable USB flash

Retrieve the mini.iso for installing Ubuntu, one which is from the same date as the data drive, but never newer!

- 14.04: http://archive.ubuntu.com/ubuntu/dists/trusty/main/installer-i386/current/images/netboot/

Warning: The USB flash you use will be overwritten!

Once downloaded to your Ubuntu/Linux computer:

Run the command `df -h` and notice which device name corresponds to your USB. If you get this wrong, you can overwrite your hard drive. The device name is `/dev/sdX`, where X is some letter. `/dev/sda` is your hard drive.

Make sure that no programs are using or blocking the USB flash. Run the command `mount` to see what drives are in use. If you see your USB flash's device name, run the command `umount /dev/sdX1` to *unmount* it.

When you know the device name of the USB, run the following command:

```
dd if=/path/to/iso of=/dev/sdX bs=4096
```

Booting the flash

As you are booting from the flash, you have to edit the default entry by adding the following lines:

```
ks=http://192.168.10.1/ks.cfg ksdevice=wlan0 netcfg/wireless_essid=FAIR
```

Tip: Do not start too many machines, because the wireless network easily gets congested. 5-10 machines is often the limit.

1.4 Troubleshooting Q&A

1.4.1 File system errors on boot

If either the server or student computers are complaining during boot:

- If the BIOS battery is dead, the clock of the computer will reset on reboot. This causes the filesystem to produce errors because timestamps of files are in the future. Resolution: Replace the BIOS battery on the motherboard.
- Electrical blackouts may cause unclean shutdowns of file systems. Select the option to fix the hard drive.

If you want information about a file system error, go to maintenance mode and run this command:

```
# Check all filesystems from /etc/fstab in verbose mode
sudo fsck -A -V
```

1.4.2 Network problems

Symptom: Clients are not able to connect or boot because of network issues. This typically means that while booting, the computer hangs for several minutes with the Ubuntu logo.

If the server is up, and you know that it is accessible directly from its screen and keyboard, then problems are likely caused by network cables or switches. If all computers are unable to connect, try these options:

- Make sure network cables are properly plugged in.
- Check that the switches are on.
- Use a LAN tester to check cables, especially the one from the server.
- Check that cables are not causing loopbacks, for instance if a network cable is connected to a switch at both ends.

1.4.3 Blackouts

While installing the server

The installation can be safely resumed and will pick up from where it left. Just boot the default Ubuntu and re-locate and start `install.sh`, following the normal instructions.

While installing a client

If the installation is disturbed in the first phase, installing the base system (before rebooting the client), then you need to restart "Automatic Ubuntu install".

If the installation is disturbed after the first reboot, you can do this to save time:

```
# Press CTRL+ALT+F1
# Log in as teacher
# In the command line after logging in, type...
$ sudo bash
# cd /root
# bash rerun-postinstall.sh
```

1.5 Background

The primary goal of the project is to distribute open source software and open access knowledge and media repositories to remote areas with no internet connectivity, rather than wasting efforts on expensive mobile connectivity. More universally speaking, it could be said that the project attempts to do ICT4D but without any broadband internet connection in the actual deployments of the project.

Secondary or supplementary to the primary goal, we are seeking efficiency in terms of deploying new centres and maintaining existing ones. Because of this, the deployment effort mainly has to do with setting up the physical environment of the ICT centres and not the

The project provides the scripts necessary to configure a normal desktop installation of Ubuntu 14.04 to become a network server, TFTP install server, and HTTP intranet server for a variety of offline resources (hereunder the full Ubuntu repositories!).

In order to use the scripts, a (possibly external) hard drive must be created with a number of optional resources.

1.5.1 Currently

The 14.04 32bit setup is still deployed and maintained in Malawi as of April 2018.

Development efforts seek to take the project beyond FAIR's deployments and to modularize software features and server's resources at an individual centre level.

We are adding functionalities and documentation to support the workflow of technicians working in the field.

1.5.2 Roadmap

The next upgrade will contain 18.04 for 64 bit, furthermore:

- Replacing KA Lite with Kolibri
- Improving modular structures
- Separating installation and configuration steps: Supporting a workflow whereby servers are installed before arriving to their target destination.

1.5.3 Choice of Linux OS

The project is based on Ubuntu 14.04 LTS (with the edubuntu-desktop package installed by default). A basic policy is to use Ubuntu's LTS (Long-Term-Support) after it has been out for at least 6 months.

1.5.4 Discussion

We do aim a lot at providing backwards compatible setups. Experiences say that school computers are better off with less machine intensive Linux desktops, and that newer versions do not always provide better performance. For instance, we see that Ubuntu 10.04 is actually providing better responsiveness on older hardware (256 MB, <2 GHz CPU).

As much as Ubuntu, the Linux kernel, X drivers etc. are adding support for new hardware, older hardware is becoming less supported as the test audience shrinks.

Another alternative would be to add installation configurations that gave the choice of Lubuntu or Xubuntu desktops.

1.5.5 Philosophy

Everything in here is implemented in flat-out BASH scripts. It's not as if we didn't feel like using a different language, however to a new system administrator wanting to know what's going on, the choice of a scripting language identical to the command line will make the process of server installation and configuration more transparent.

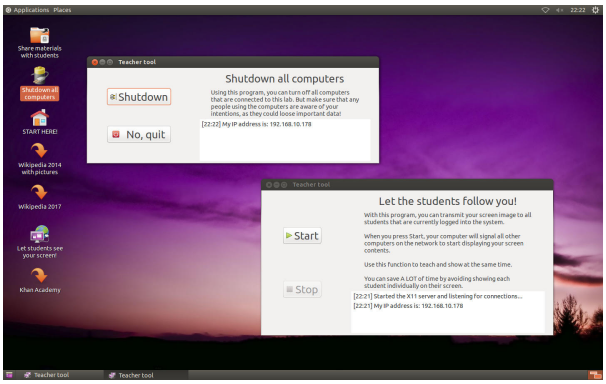
This project captures the efforts of FAIR in Malawi. As the number of ICT centres steadily grows, the project adds more efficiency and is improving its architecture to accomodate development of new features and future management of individual centre setups.

Fundamentally, these scripts deliver a fully-automated self-configuration of a default Ubuntu desktop to transform it into a server for the ICT centres, provided that it has access to a *data drive* containing a copy of the Ubuntu repositories. The server provides a fully functional Ubuntu repository combined with TFTP services for installing client desktops.

CHAPTER 2

Offline resources

In addition to LAN-managed installations of Ubuntu, the server can also provide a range of contemporary offline projects, such as KA Lite and Kiwix, together with an Intranet-like service that collects the various resources for internet browser access.


Teacher tool
Shutdown all computers
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No, quit
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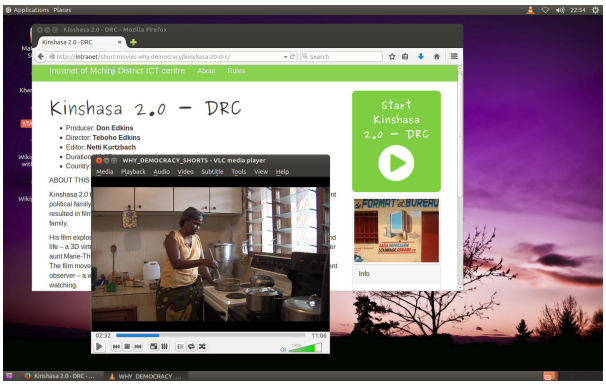
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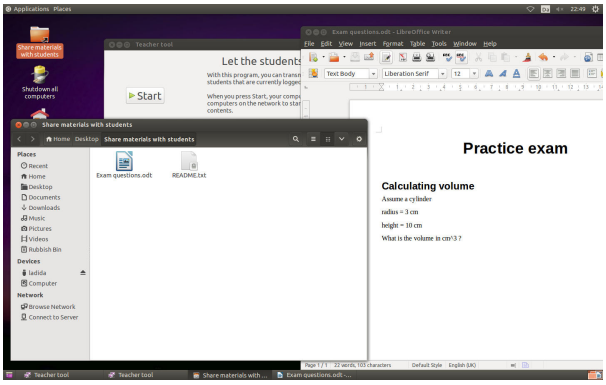
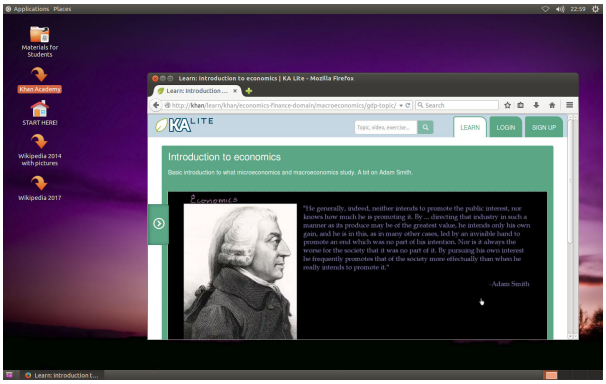
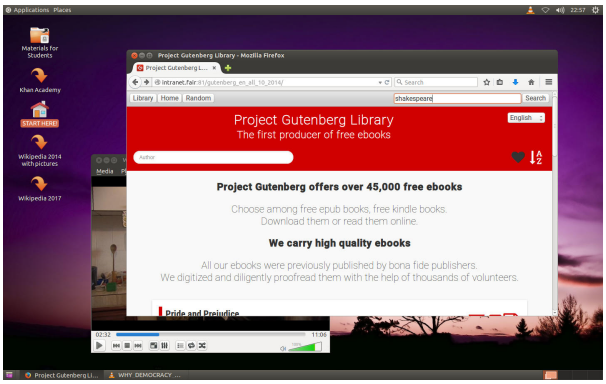

Practice exam
Calculating volume


Introduction to economics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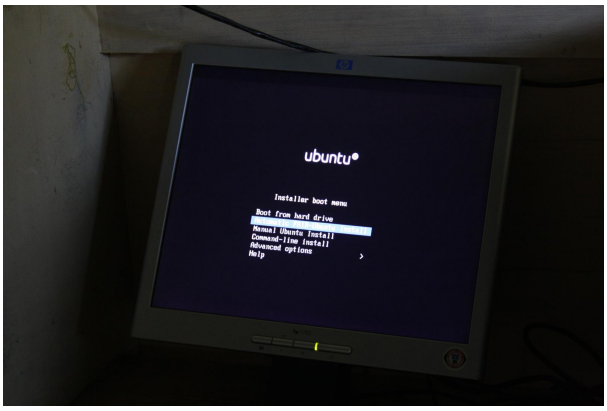
ubuntu
Installer boot menu
Boot from hard drive
Manual Ubuntu install
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Help

CHAPTER 3

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- search