## Raspberry Pi LTSP

### Userguide

**Section 6.2**

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Introduction

Pi-LTSP is a BASH script for installing setting up and managing an LTSP (Linux Terminal Server Project) fat client network for Raspberry Pis.
The system is designed to be run on a Debian Wheezy server with at least 20gb
of hard drive space and minimum of 10/100mb Ethernet card. 10/100/1000mb
Ethernet card is highly recommended if using any more than 4 clients.
Its main features are
  • Centralised operating system – The operating system for the Raspberry
Pi is stored centrally on the server. This master image is read-only for
the Raspberry Pi clients. This means that if the administrator wishes to
add new software or configuration changes to every Raspberry Pi, he just
modifies the master image.
• Network login – There is no user accounts stored locally on the Raspberry Pis. They are stored on the Server. This allows a student to sit down and log into any Raspberry Pi in the classroom (or even the school) and have access to all their files.
• Network files – As the user accounts are stored on the server, so are the student’s files and folder. This means if a teacher needs to collect a piece of work off a student, they can just grab it from the student’s home folder. It also means backing up is much simpler, just back up the entire /home folder on the server onto an external drive. This means coursework/controlled assessments can be easily and safely backed up in case of an unexpected hardware failure.

**Required hardware**

The system requires some specific hardware
• A server machine. This can be an old desktop machine. It is highly recommended it has a 10/100/1000mb Ethernet port and at least 100GB of available hard drive space.
• A network switch. At least 10/100mb switch. For any more than 4-6 clients, it is highly recommended a 10/100/1000mb switch or you may run into major bottlenecks in the network dramatically slowing down the clients.
• Ethernet cabling between the server to switch.
• Ethernet cabling between the switch and all the clients (Wi-Fi is not currently supported)
• Clients. The clients must be armhf based. The system was specifically designed for Raspberry Pi model Bs, revision 2 but may work with other armhf based clients.
Installation

Creating a Debian install disk

1. Visit [https://www.debian.org/distrib/netinst](https://www.debian.org/distrib/netinst)
2. If the server hardware is relatively old (4+ years) and you are unsure of its processor architecture, it is recommended you select the i368 option. This is also commonly known as 32 bit.
   If you know your server hardware has a 64 bit processor, then select amd64 option.
3. Click download
4. Copy the installer to a disk or USB drive
   a. On windows, right click the disk image and select burn to disk

Debian Installation

1. **It is recommended you print these instructions**
2. Insert the disk with Debian Wheezy on it disk into computer
3. Shutdown the computer
4. Hold the “Boot from CD” key or “Boot menu” key. This is commonly F3.
5. The Debian installer boot menu screen should appear, like below. Select “Graphical install”.

![Debian Graphical Install](image-url)
6. Select English

7. Select your country
8. Select your keyboard

![Configure the keyboard]

9. Enter a name for your server. This can be anything that isn't already used on your network. "Debian-server" is a good first server name.

![Configure the network]
10. Next we need to configure the hostname. It is recommended you use a name ending in ".local". For example "debianserver.local"

Configure the network

The domain name is the part of your internet address to the right of your host name. It is often something that ends in .com, .net, .edu, or .org. If you are setting up a home network, you can make something up, but make sure you use the same domain name on all your computers.

Domain name:

```
debianserver.local
```

11. Next we need to set up the Root user. The Root user is basically the administrator account. It has full access over the entire system. This password should be kept very secure!

Set up users and passwords

You need to set a password for 'root', the system administrative account. A malicious or unqualified user with root access can have disastrous results, so you should take care to choose a root password that is not easy to guess. It should not be a word found in dictionaries, or a word that could be easily associated with you.

A good password will contain a mixture of letters, numbers and punctuation and should be changed at regular intervals.

The root user should not have an empty password. If you leave this empty, the root account will be disabled and the system's initial user account will be given the power to become root using the "sudo" command.

Note that you will not be able to see the password as you type it.

Root password:

```
*********
```

Please enter the same root password again to verify that you have typed it correctly.

Re-enter password to verify:

```
*********
```
12. Next set up your first normal user. It is recommended to make this your name.

13. Then set the name for the new account.
14. Also set a password for your user.

Set up users and passwords

A good password will contain a mixture of letters, numbers and punctuation and should be changed at regular intervals.

Choose a password for the new user:

********

Please enter the same user password again to verify you have typed it correctly.

Re-enter password to verify:

********

15. It is recommended for this server you start off with a computer with no other operating systems installed on it or a hard drive you don’t mind deleting everything off. Selecting the first option here “Guided – use entire disk” will format the entire hard drive.

Partition disks

The installer can guide you through partitioning a disk (using different standard schemes) or, if you prefer, you can do it manually. With guided partitioning you will still have a chance later to review and customise the results.

If you choose guided partitioning for an entire disk, you will next be asked which disk should be used.

Partitioning method

Guided - use entire disk
Guided - use entire disk and set up LVM
Guided - use entire disk and set up encrypted LVM
Manual
16. Select your hard drive. (Normally only 1 option here)

17. Select "All files in one partition". This will set everything up on a single partition making it easier to manage.
18. Select “Finish partitioning and write changes to disk”.

19. And confirm the changes.
20. Next, select the your country again for use with the package manager. It will normally correctly guess for you.

21. Select the top of the list, in my case, ftp.uk.debian.org.

22. If your school uses an HTTP proxy to access the internet, enter it here. If unsure, check with your school technician before plugging the server into
a school network.

23. Select "No" for popularity contest.

24. In software selection, select “Debian desktop environment”, “Print server”, “SSH server” and “Standard system utilities”. If your server is
running off a laptop, also select “Laptop”.

25. It then needs to set up Grub, the bootloader. Select yes to install it on the MBR
26. That completes the install, remove your install CD and hit continue.

27. You will then be presented with the main login screen, click your username and enter your password.
28. To install Pi-LTSP, we need to launch a terminal. First select activities (top left)

29. Next select applications and scroll down to find a terminal.

30. Enter the command and enter root password you created earlier
    $ su
This switches the terminal to a root terminal (administrator terminal).

31. Enter the below command
   $ wget http://git.io/nntbdiw -O Pi_ltsp && sh Pi_ltsp
   This downloads the installation script and runs it. (Case sensitive)
   To launch the control script at any later time, just type
   $ sh Pi_ltsp

Pi-ltsp script usage

The menu options are as follows
• **Full** - Full installs a full version of the system. It should be only run once! Ever! It is the first command you run as most others won't work without it!

• **Change-IP** - Run this if your servers IP address changes or if you want to grab the most recent SD card image from the repository

• **Install-Program** - Use this to install any additional packages you want on your Raspberry Pis. The full package name is required! Just like if being done with apt-get install

• **Update-All** - Updates all packages on the server and on the Raspberry Pi. Basically apt-get update && apt-get upgrade for server and Raspberry Pis

• **Manage-Users** - Launches the graphical user management system to add users, remove users and reset passwords.

• **Epoptes-Menu** - Use for install epoptes classroom management software, for adding a new "teacher" account
  
  o **Install** - Installs epoptes daemon onto the Raspberry Pis and the Epoptes client onto the server.
  
  o **Epoptes-Launch** – Launches the Epoptes control client for teachers

  o **Epoptes-admin** – Used to add a new teacher user account to Epoptes. It is required

• **User-groups** - Functions for fixing users permissions.
  
  o **Add-teacher** - Used to add a teacher to the teacher group, a group able to access file uploads
  
  o **Graphics-fix** - Fixes all the graphically accelerated applications for all users, e.g. MCPI.

• **Pi-control-menu** - Use for installing Picontrol classroom management software
  
  o **Enable/update-Picontrol** - Installs Picontrol or runs an update on it, fetching most recent version
  
  o **Disable-Picontrol** - Uninstalls Picontrol

• **NBD-options** - Displays NBD dialog allowing you to switch between NBD and NFS

• **NBD-recompress** - Forces a NBD OS recompression. Do this if using NBD and you make a change outside of Pi-LTSP to the image

• **Other**
  
  o **Collect work** – A simple pupil work collection system
  
  o **Extra-software** – A collection of auto-installers for Pi software

  o **NBD-compress-disable** – Temporarily disable NBD compression

  o **NBD-compress-enable** – Re-enable NBD compression

• **Update-Pi-LTSP** - Fetches the most recent version of the control script from Github
How to....

Install the entire system

1. Select Full
   This will download all required packages and software. It will then modify a number of configuration files and start building the Raspberry Pi operating system.

2. This can take up to an hour.
3. When jack2D dialog option comes up, select no.

4. Next you will be asked if you want to use NBD or NFS. Both are technologies used to

5. Next a dialog will open asking about your IP address. This is important. This will be the IP address added to the configuration file of the SD cards for the Raspberry Pis. It will default to the server’s current IP address. If you intend to use a different IP address later, select no and enter your
intended IP address.

6. Next, enter the username you use for your default teacher account. In my case this is “Andrew”.
This is key for later as it adds that user to the teachers system user group, giving you permission to access FTP upload files and Epoptes.

7. Next, a dialog box asking if you want to use NBD will be displayed. NBD is highly recommended over NFS, it is much faster, speeding up client
loading speed of applications sometimes by up to 300%. The trade-off
tough is every change, the operating system must be recompressed,
which can take up to 5 minutes. It can be easily enabled later with the
“NBD-options” section in the main menu.

8. The system should now be installed. A folder has been created in
/root/piBoot
This folder contains all the boot files that a Raspberry Pi needs to boot off
your new server install.
9. If you ever change your IP address, use the change-IP in the script to
update your Raspberry Pi firmware and also to reset the IP address. If you
do not have internet access on your new network, follow the “Connection
timed out error” guide in troubleshooting to manually change the
configuration file the Raspberry Pi checks for the address of the server.
10. Copy the contents of the piBoot folder onto a formatted (fat32) SD card.
You can also just copy the files on top of an already prepared normal
Raspberry Pi SD card. The software also contains a mini boot menu that
allows you to switch to this local SD card image.

**Install a program**
If you want another program to be added other than those already included by
default, you can add it by entering its name into the install program function. It is
recommended you first try installing the program normally on a normal
Raspberry Pi using “apt-get install programname”
You only need to enter the programname, the entire apt-get install isn’t required
1. Select Install-program

![Screenshot of installation options]

2. Enter the name of the required software. Remember, this is the package name, the same name normally used with apt-get install. For example gimp.

![Screenshot of package selection]

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3. Check that this is the correct application. Enter “y” and hit enter to proceed if you are sure.

4. The software application will be downloaded from the Raspbian software repository and installed.

**Update everything**
Selecting update-everything will run “apt-get update” (updates all package lists) followed by “apt-get upgrade” on both the server and on the Raspberry Pi operating system. It is good to do this every few months to download important software patches and bug fixes.

**Rebuild entire operating system**
Rebuild entire operating system will delete the Raspberry Pi operating system and rebuild operating system. This can be helpful if you by mistake break an important system file or you want to remove all added software and start again. This step is also done in full install.

**Important** - This will **not** delete any pupil’s home folders or files they have created. These are stored in a separate location.

**Managing users**
The recommended method for managing users is through the graphical user management console provided with Debian. This tool is easy to use but requires you to be running a windows manager. (If you are using a screen with your server, then this is not an issue).
Creating a new user

1. Select "Manage-users"

2. To add the user, click the plus button in the bottom left of the window.
3. Then enter the required details and click create

4. The user is now created. It is disabled without a password by default, so next, add a password
5. Fill in the required password details and hit change. Your user is now active and ready to log in on the Raspberry Pi.

6. By default, the user accounts window does not add the user to required groups. To fix this, simply run “Graphics-Fix” inside the “User-Groups” submenu.
Change a user's password

1. Select "Manage-users"

2. Select the user you want to modify and click the password section
3. Now enter your new password and hit change

Install PiControl

1. Select the submenu "Pi-control-menu"
2. To install, select “Enable/update-Picontrol”

3. If you later wish to disable picontrol, you can disable it with the “Disable-Picontrol” option.
NBD-options

NBD is a newer method for transferring the operating system across the network to the Raspberry Pis. It’s big difference over NFS (an older technology) is the operating system is compressed with NBD, dramatically reducing the amount of data needed to be sent over the network. It uses on average 40% of the network bandwidth used by NFS.

The tradeoff though is the operating system image must be recompressed every time a change is made. This recompression normally takes up to 5 minutes. You can switch between them at any point with the NBD-options menu.

NBD-recompress

Forces NBD recompression to take place, this will take 5 minutes. If NBD is disabled it will do nothing.

Other

The other section contains some small configuration file changes and small additional applications and utilities.
Collect work
Collect work goes through every user account on the system and searches for a “handin” folder in the root of their home folder. (e.g /home/bob/handin). If it exists, it is copied to a folder on the teachers account called “submitted” with a folder for each students name.

Extra software
This section includes a set of auto installers for Raspberry Pi software. Installers for applications like Minecraft Pi, Libreoffice and Arduino are included.

NBD-compress-disable/enable
This option allows you to temporarily disable the auto recompress option while still keeping NBD enabled for the clients. It is very useful when making a large amount of changes to the Raspberry Pi operating system. It is remembered even if you close Pi_LTSP.
Troubleshooting

My Raspberry Pi is failing to reach login screen

This could be due to a number of reasons, most are caused by either there not actually being a physical connection to the server or the servers address being specified wrong in the configuration file.

I am getting “giving up” errors that look something like this

![Image](image_url)

This is normally caused by there not being a physical connection to the server; try checking that all Ethernet cables are plugged in. Remember USB Wi-Fi does not work, it must be a wired Ethernet cable.

I am getting a “connection timed out” error.

![Image](image_url)

This is normally caused by the server IP address being defined wrong in the "cmdline.txt" file on the SD card.
The Raspberry Pi knows what computer it is to try and boot off because the installation script adds the IP address of the server into the cmdline.txt file when it builds the SD card image. If your IP address changes, it then cannot find the server! To fix this, open the cmdline.txt file on the SD card in a text editor and look for “nfsroot=0.0.0.0” (0.0.0.0 being your previous IP address). Open a terminal on your server, type `su`, enter your password and type `ifconfig`. To find your IP address, in the list of network data, check image below
eth0  Link encap:Ethernet  HWaddr 00:15:5d:05:6d:16
    inet addr:10.0.5.155  Bcast:10.0.5.255  Mask:255.255.255.0
    inet6 addr: fe00::215:5dff:fe05:6d16/64 Scope:Link
    UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
    RX packets:9812172  errors:0  dropped:0  overruns:0  frame:0
    TX packets:18683196  errors:0  dropped:0  overruns:0  carrier:0
    collisions:0  txqueuelen:1000
    RX bytes:2369132028 (2.2 GiB)  TX bytes:24925933865 (23.2 GiB)

lo   Link encap:Local Loopback
    inet addr:127.0.0.1  Mask:255.0.0.0
    inet6 addr: ::1/128 Scope:Host
    UP LOOPBACK RUNNING  MTU:16436  Metric:1
    RX packets:152725  errors:0  dropped:0  overruns:0  frame:0
    TX packets:152725  errors:0  dropped:0  overruns:0  carrier:0
    collisions:0  txqueuelen:0
    RX bytes:9729089 (9.2 MiB)  TX bytes:9729089 (9.2 MiB)

Now that you have your IP address (in my case here, 10.0.5.155), you can modify the cmdline.txt file, replacing the “nfsroot=0.0.0.0” (or whatever your old IP address was) with your “nfsroot=New_address”.

**After users log in**

**Graphically accelerated applications do not work (like Minecraft)?**

This sometimes happens when users don’t have permission to talk directly with the graphics chip on the Raspberry Pi. This is because the user may not be in the “video” group. To fix this, simply run the **graphics-fix** option inside the **User-groups** submenu. This goes through each user, adding them to the correct groups. It should only be needed to be done once for all users. If you add more users, remember to run it again.