

TUTORIAL

S&F - Store & Forward Setting up an SSH server

PLAYER ONE / PLAYER ZERO



Introduction
Install SSH on LINUX via virtual machine on PC
Install virtual machine
Install SSH Server on LINUX
Generate SSH keys
Adapt SSH keys to latest UBUNTU version
Adding audio content to the SSH server
Implementing S&F (Rsync) in SSH
Store & Forward module (Rsync)



Introduction

Install SSH on LINUX
via
virtual machine on PC

Install virtual
machine

Install SSH
Server on LINUX

Generate
SSH keys

Adapt SSH keys to
latest UBUNTU
version

Adding audio content
to the SSH server

Implementing
S&F (Rsync)
in SSH

Store & Forward
module (Rsync)

TABLE OF CONTENTS


1. INTRODUCTION	3
2. INSTALLING SSH ON LINUX VIA VIRTUAL MACHINE ON PC	4
2.1 Tools Required.....	4
3. VIRTUAL MACHINE INSTALLATION (VIRTUAL BOX)	5
4. INSTALLING SSH SERVER ON LINUX.....	19
5. GENERATING SSH KEYS.....	21
6. SSH KEY ADAPTATION TO LATEST UBUNTU VERSION	24
7. ADDING AUDIO CONTENT TO THE SSH SERVER.....	25
8. IMPLEMENTING S&F (Rsync) IN SSH	25
9. STORE AND FORWARD MODULE (Rsync)	27


1. INTRODUCTION


The **Store and Forward (S&F)** module allows **PLAYER** devices (**Player ONE** and **Player ZERO**) to download remote audio content to local storage media (USB/uSD).

When it is active, it checks a remote location that hosts audio content on a daily basis, compares it to the current content stored on local media (USB/uSD) and, if necessary (if differences are detected), syncs the local content to make it an exact copy of the remote content. This is a safe method of playing content on the device during working hours (during the day), storing it on local media without the risks associated with real-time streaming.

The Store and Forward utility for remotely synchronising music content uses the Rsync (Remote Synchronization) tool.

 **This tutorial, focused exclusively on verification tests of the tool, is based on the synchronisation of a content folder with a PLAYER (Player ONE or Player ZERO) via a LINUX-based SSH server with a virtual machine on a Windows 11 PC as host.**

 **ECLER recommends using a virtual private server (VPS) as a professional solution for the implementation of Store and Forward.**

 **From now on, in this tutorial, we will use the word PLAYER to refer to both the Player ONE and Player ZERO models.**



Introduction

Install SSH on LINUX
via
virtual machine on PC

Install virtual
machine

Install SSH
Server on LINUX

Generate
SSH keys

Adapt SSH keys to
latest UBUNTU
version

Adding audio content
to the SSH server

Implementing
S&F (Rsync)
in SSH

Store & Forward
module (Rsync)

2. INSTALLING SSH ON LINUX VIA VIRTUAL MACHINE ON PC

! This functionality may require IT knowledge, so we recommend enlisting the support of a specialised technician.

! To set up cloud-based Store and Forward, a VPS (Virtual Private Server) service must be contracted to obtain a public IP and access the SSH server via the Internet.

💡 Before putting this tutorial into practice, we recommend reading it beforehand to avoid implementation errors.

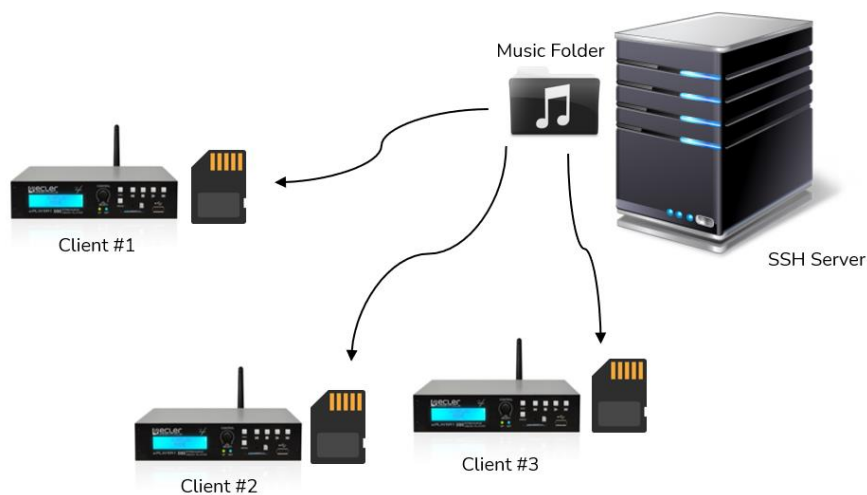


Figure 1: Standard media synchronisation (the one used in this Tutorial).

2.1 Tools Required

- **VIRTUALBOX Oracle Software.**

On a PC with Windows 10 or 11, download and install the VirtualBox software with administrator permissions to create a Linux-based virtual machine; this will allow generation of the SSH server that will manage the Rsync synchronisation with the PLAYERS on the Network.

- **UBUNTU O.S.**

Download the Ubuntu operating system (the LTS version).

Click on the corresponding image to access the desired tool:



Introduction

Install SSH on LINUX
via
virtual machine on PC

Install virtual
machine

Install SSH
Server on LINUX

Generate
SSH keys

Adapt SSH keys to
latest UBUNTU
version

Adding audio content
to the SSH server

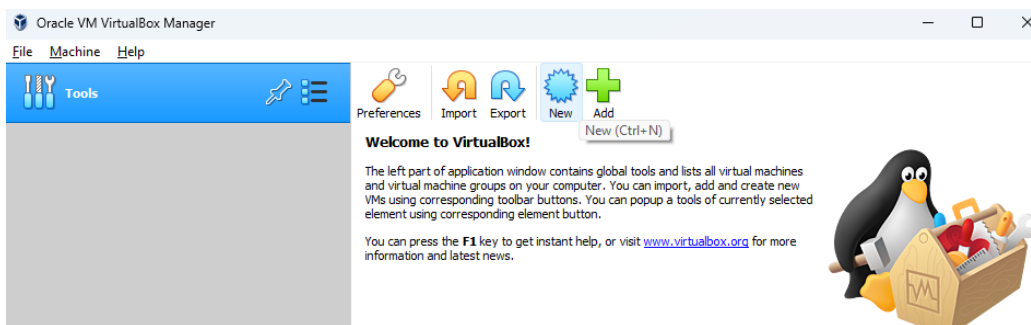
Implementing
S&F (Rsync)
in SSH

Store & Forward
module (Rsync)

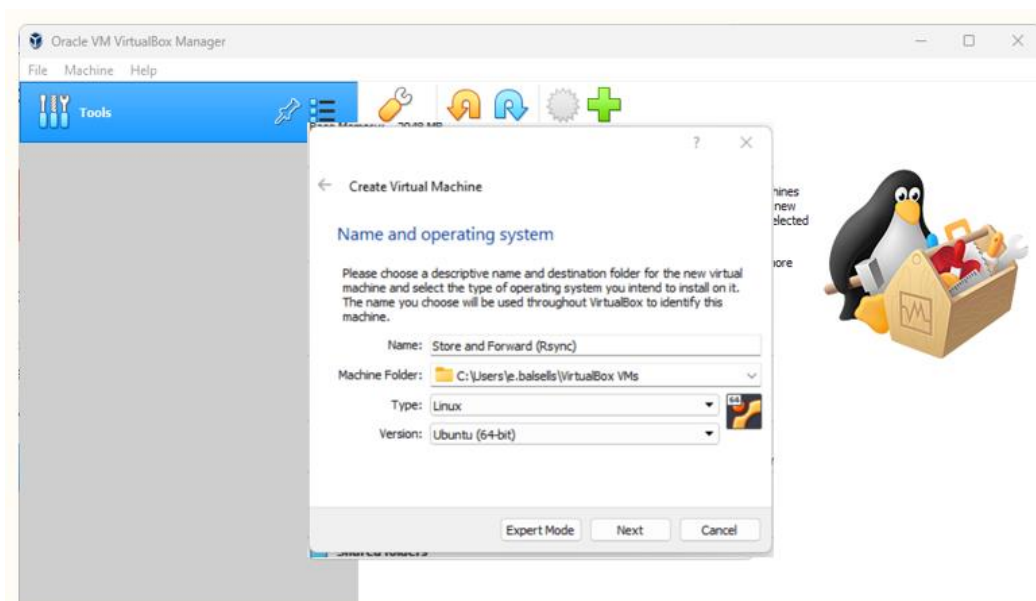
3. VIRTUAL MACHINE INSTALLATION (VIRTUAL BOX)

We are going to load the UBUNTU operating system in the VirtualBox virtual machine.

1. Open VirtualBox as an Administrator and click “NEW”.

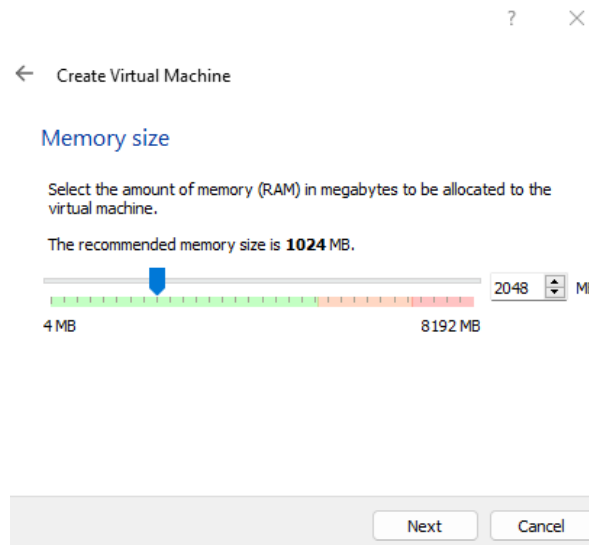


2. Name: enter a name for the virtual machine.
 Machine Folder: indicate the folder location.
 Type: indicate the system type (Linux.)

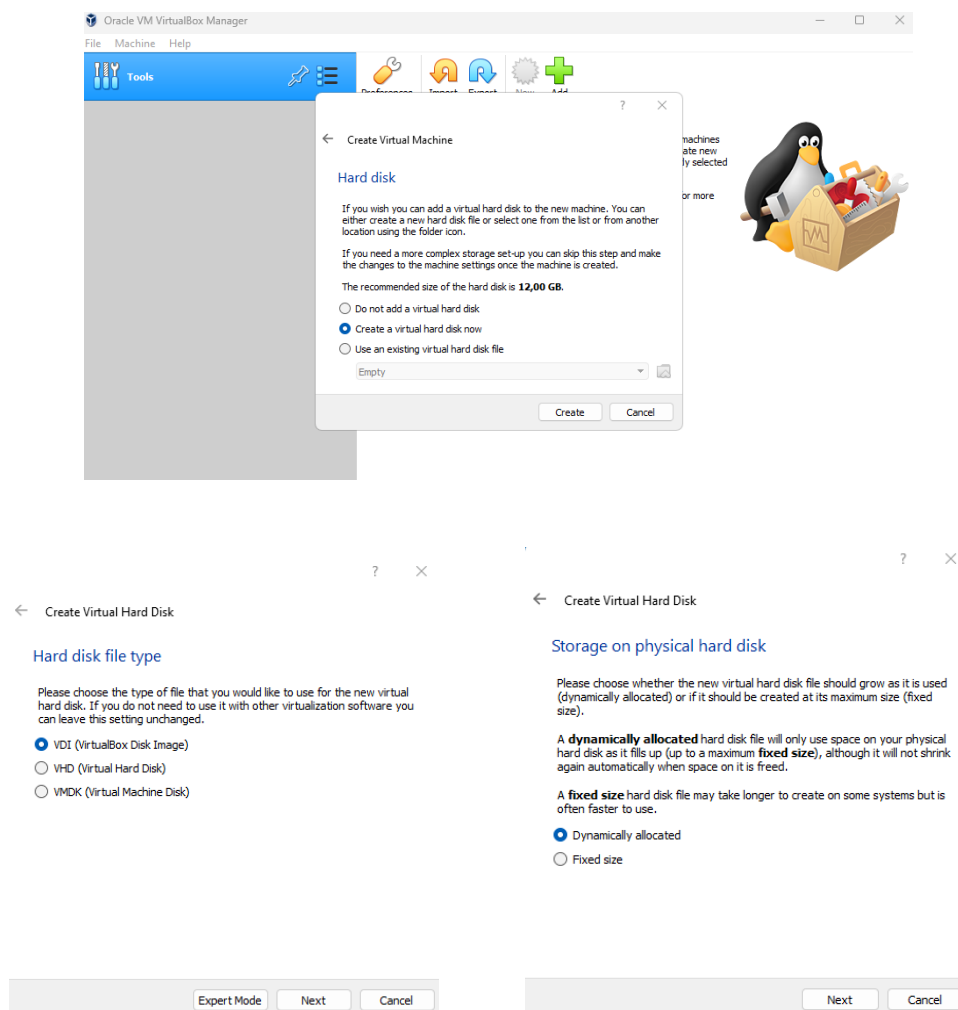


Introduction	Install SSH on LINUX via virtual machine on PC
Install virtual machine	Install SSH Server on LINUX
Generate SSH keys	Adapt SSH keys to latest UBUNTU version
Adding audio content to the SSH server	Implementing S&F (Rsync) in SSH
Store & Forward module (Rsync)	

- In the next step, we indicate **the main memory (RAM)** that our **virtual machine** will have. **This should be set to 2GB (2048MB).**

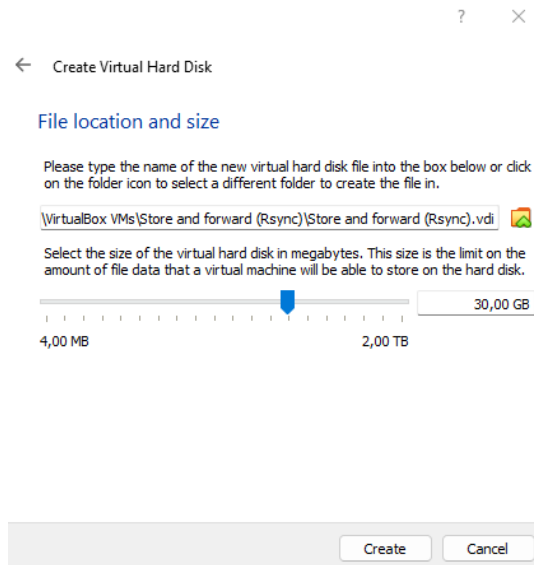


- Now we will create a **“virtual” hard disk**, which will essentially be a folder that will occupy space on the physical hard disk dynamically.

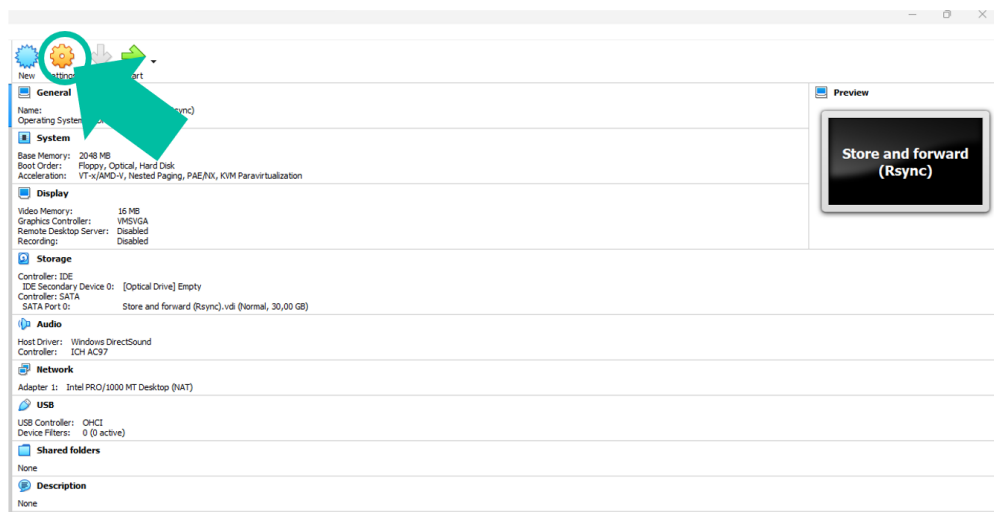


	Introduction
virtual machine on PC	Install SSH on LINUX via
machine	Install virtual machine
Server on LINUX	Install SSH
SSH keys	Generate SSH keys
version	Adapt SSH keys to latest UBUNTU
to the SSH server	Adding audio content
in SSH	Implementing S&F (Rsync)
module (Rsync)	Store & Forward

We must also **indicate** the **usable space limit** that we wish to apply; in this particular case we will use a 30GB limit.



Our virtual machine overview is almost ready, now we must **configure** it.

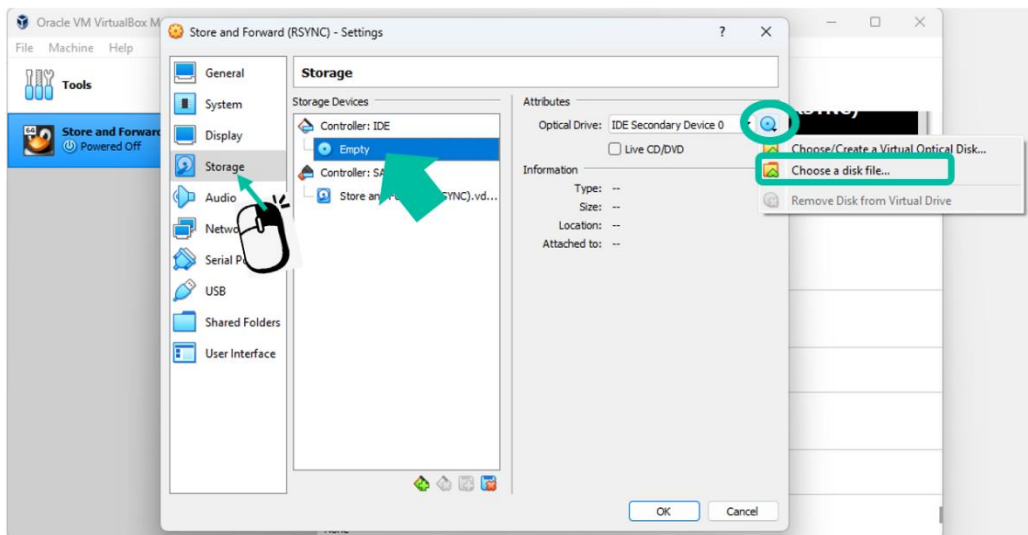


	Introduction
	Install SSH on LINUX via virtual machine on PC
	Install virtual machine
	Install SSH Server on LINUX
	Generate SSH keys
	Adapt SSH keys to latest UBUNTU version
	Adding audio content to the SSH server
	Implementing S&F (Rsync) in SSH
	Store & Forward module (Rsync)

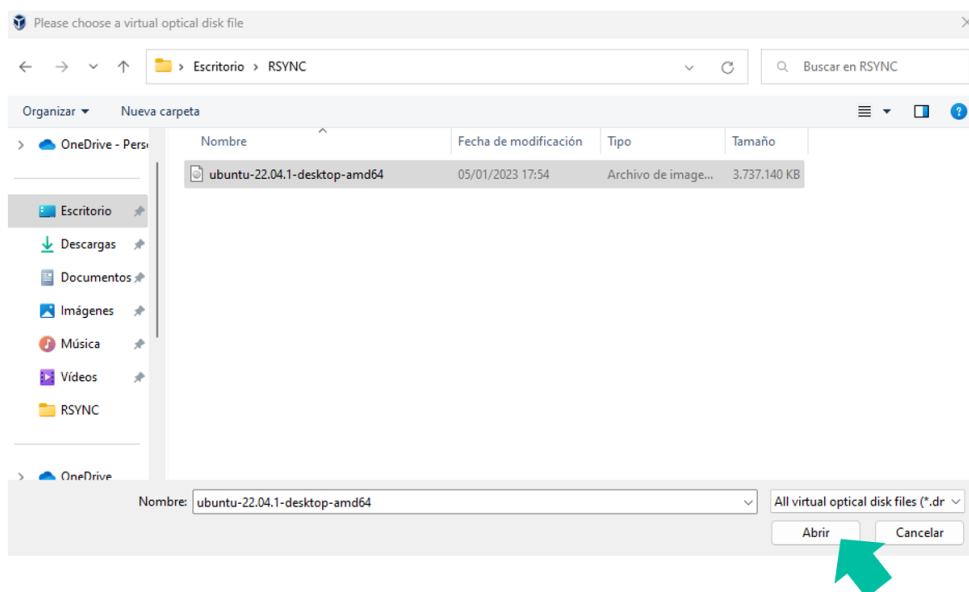
5. The following menu will appear, in which you must:

Place the cursor over “Storage”, click the right mouse button and select “Empty”.

A drop-down menu will open and in Attributes, click on the blue disk to the right of “Optical Drive”.

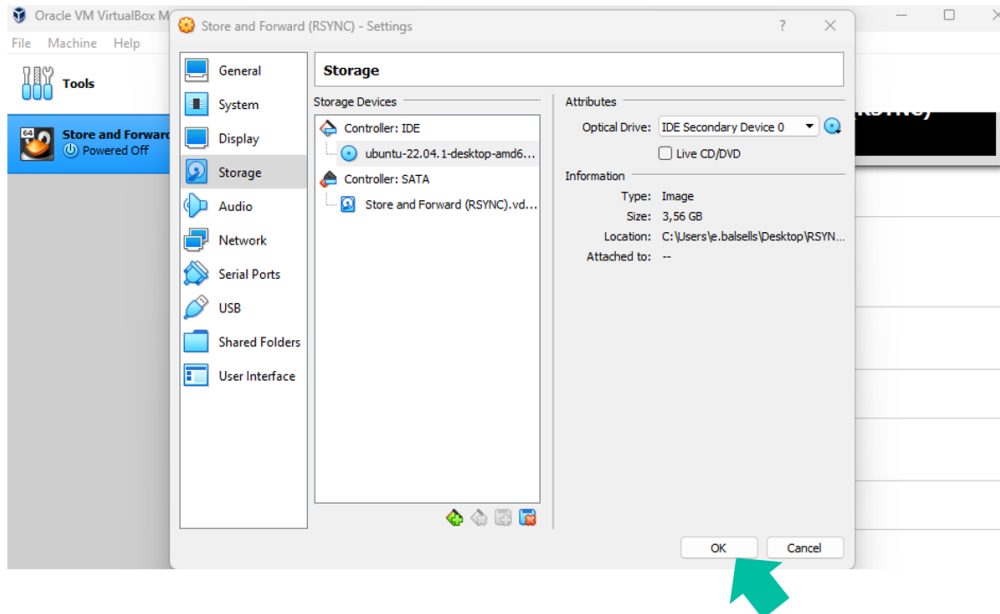


Locate the Ubuntu file you downloaded earlier and click “Open”.



- Introduction
- Install SSH on LINUX via virtual machine on PC
- Install virtual machine
- Install SSH Server on LINUX
- Generate SSH keys
- Adapt SSH keys to latest UBUNTU version
- Adding audio content to the SSH server
- Implementing S&F (Rsync) in SSH
- Store & Forward module (Rsync)

Once the file is loaded, **click OK**.



6. Virtual machine NETWORK configuration.

In this step we will **configure the network adapter to create an additional physical network** to the one present on the PC, which **will be used in Ubuntu where the SSH Server will be hosted**.

We recommend **configuring the associated network on the PC you are using with a FIXED IP** rather than a dynamic one (DHCP).

The Router must be **correctly configured in DHCP mode**, so that it assigns a **different IP to that of the PC**, which will be the one used by the Virtual Machine.

We recommend **using a wired network to the configured PC**, with **no additional network or WiFi active during this process**.



Introduction

Install SSH on LINUX via virtual machine on PC

Install virtual machine

Install SSH Server on LINUX

Generate SSH keys

Adapt SSH keys to latest UBUNTU version

Adding audio content to the SSH server

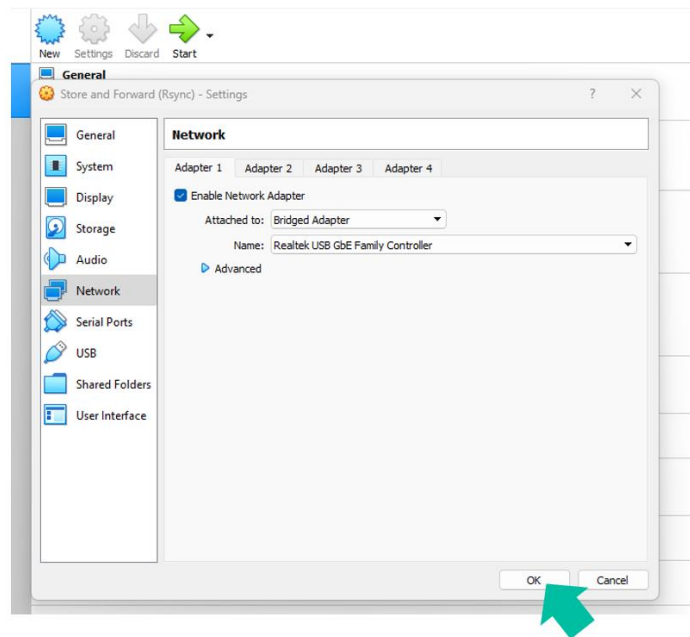
Implementing S&F (Rsync) in SSH

Store & Forward module (Rsync)

In the **Configuration** menu, select **“Network”** and under **Adapter 1**, check **“Enable Network Adapter”** to enable it.

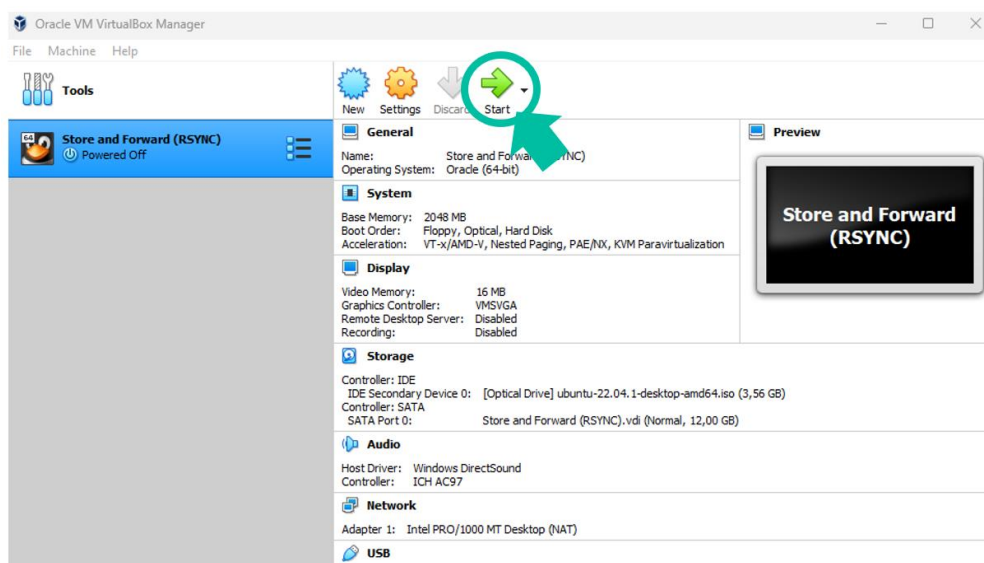
Next, in the **“Attached to”** drop-down list, select **“Bridged Adapter”**, and in **“Name”**, select your wired network card.

Lastly, click **OK**.



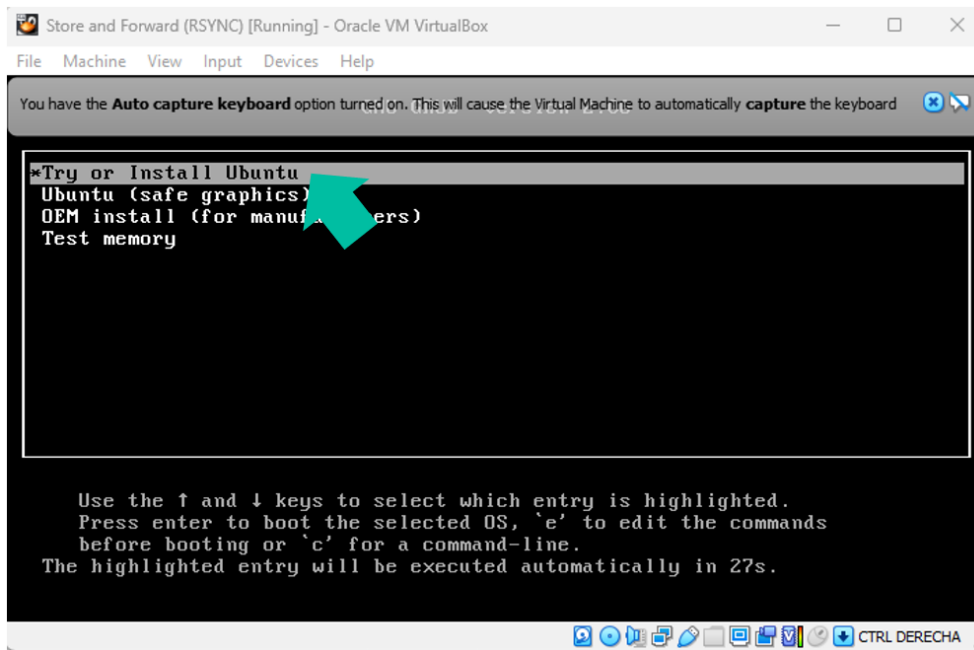
- The last step to enable a Linux operating system in the virtual machine is the **installation of the operating system**.

To start the installation, select **“Start”** after checking the previously configured virtual machine.

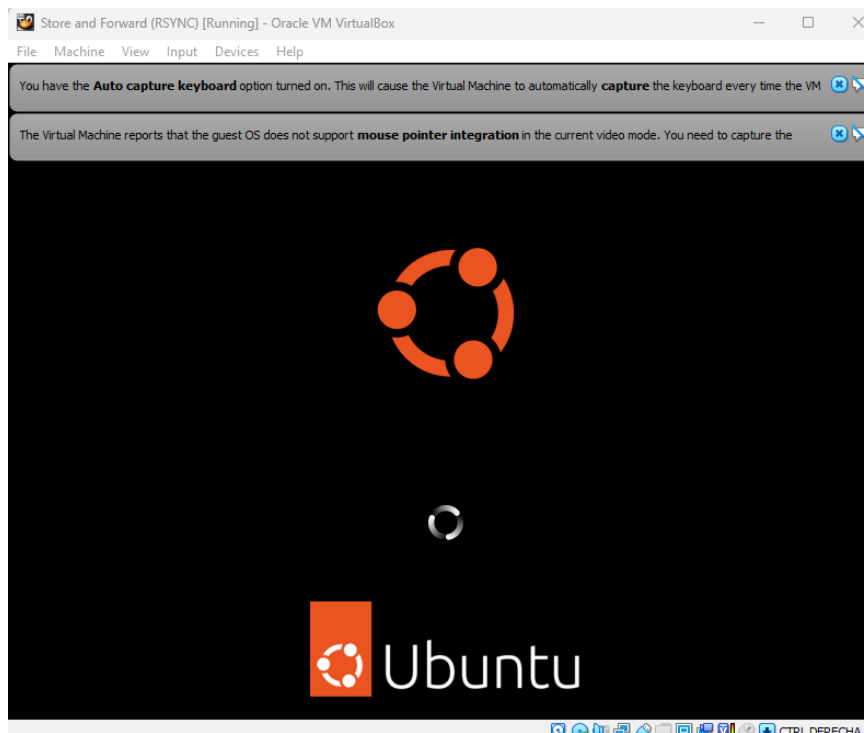


- Introduction
- Install SSH on LINUX via virtual machine on PC
- Install virtual machine
- Install SSH Server on LINUX
- Generate SSH keys
- Adapt SSH keys to latest UBUNTU version
- Adding audio content to the SSH server
- Implementing S&F (Rsync) in SSH
- Store & Forward module (Rsync)

The following screen will appear; select “Try or Install Ubuntu” then press ENTER.

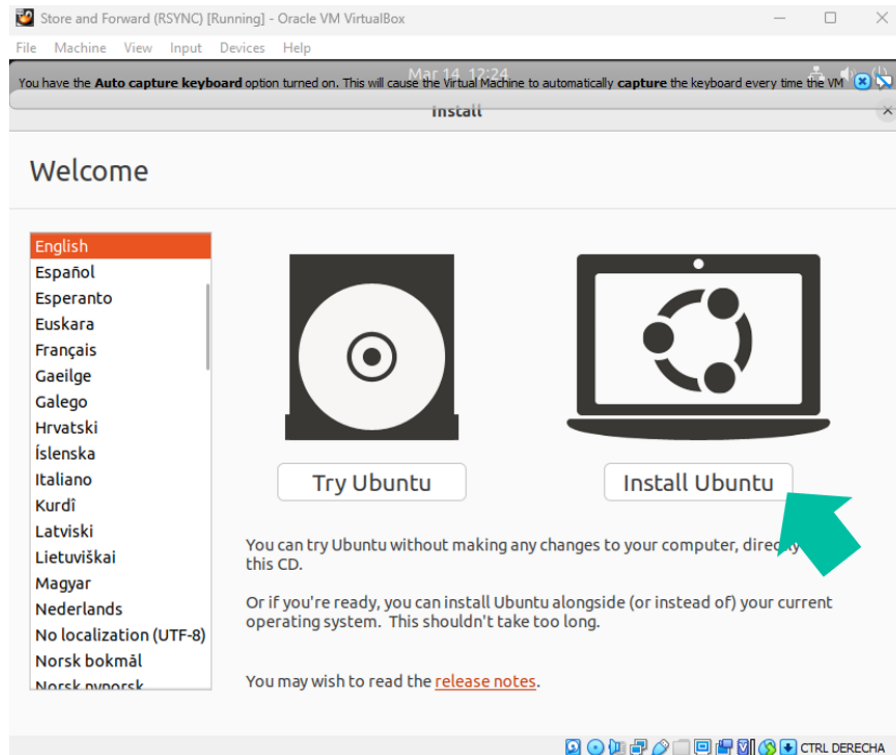


The system will load and the operating system configuration menu will open.

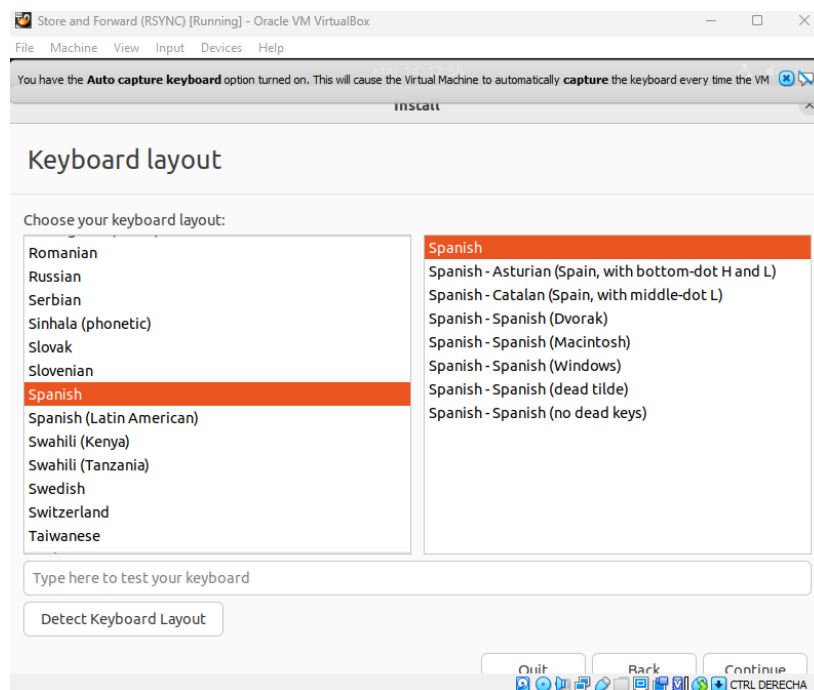


	Introduction
virtual machine on PC	Install SSH on LINUX via
machine	Install virtual machine
Server on LINUX	Install SSH Server on LINUX
SSH keys	Generate SSH keys
version	Adapt SSH keys to latest UBUNTU
to the SSH server	Adding audio content
in SSH	Implementing S&F (Rsync)
module (Rsync)	Store & Forward

Select the language and then select “Install Ubuntu”.

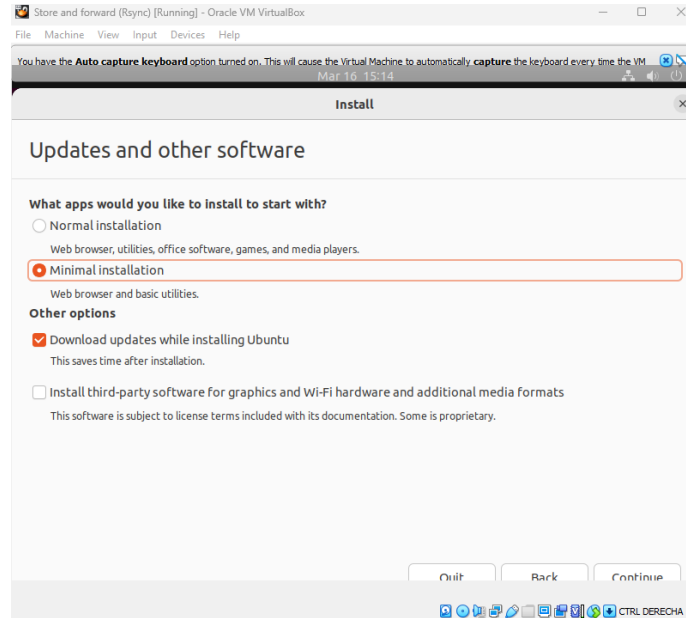


Select the keyboard layout language and click continue.



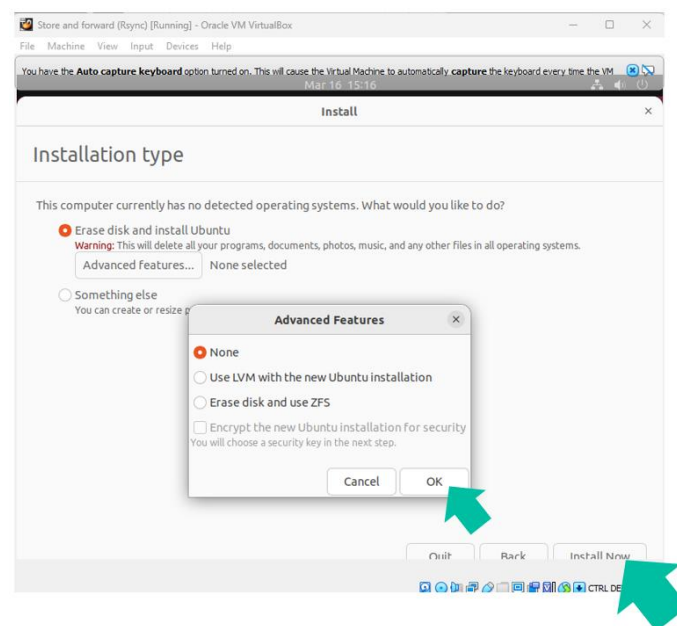
- Introduction
- Install SSH on LINUX via virtual machine on PC
- Install virtual machine
- Install SSH Server on LINUX
- Generate SSH keys
- Adapt SSH keys to latest UBUNTU version
- Adding audio content to the SSH server
- Implementing S&F (Rsync) in SSH
- Store & Forward module (Rsync)

The “Updates and other software” screen will appear; select “Minimal installation” and “Download updates while installing Ubuntu” and click Continue.



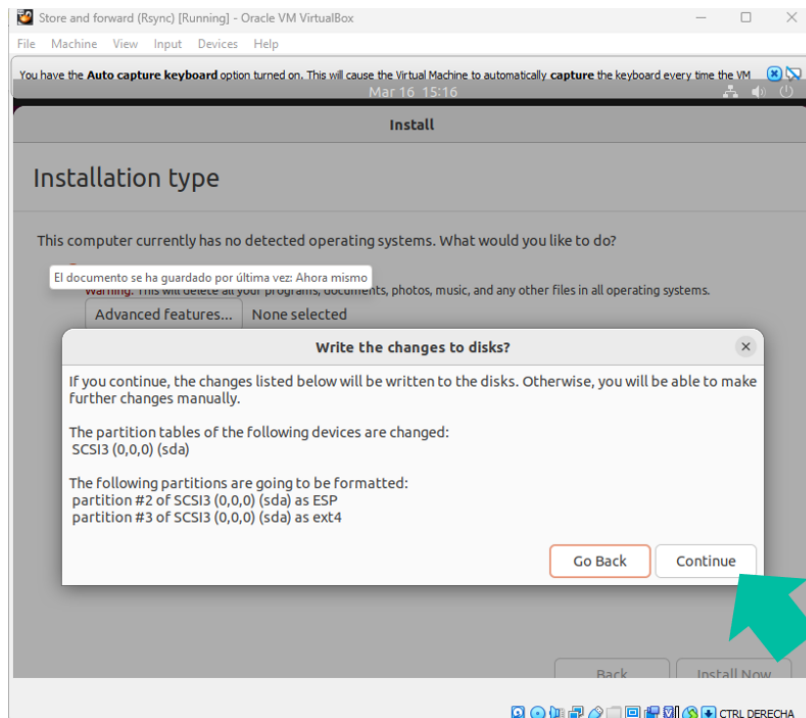
On the next screen that appears, select the type of installation. Select “Advanced Features”.

A new window will open, select “None” and click **OK** and then click on “Install now”.

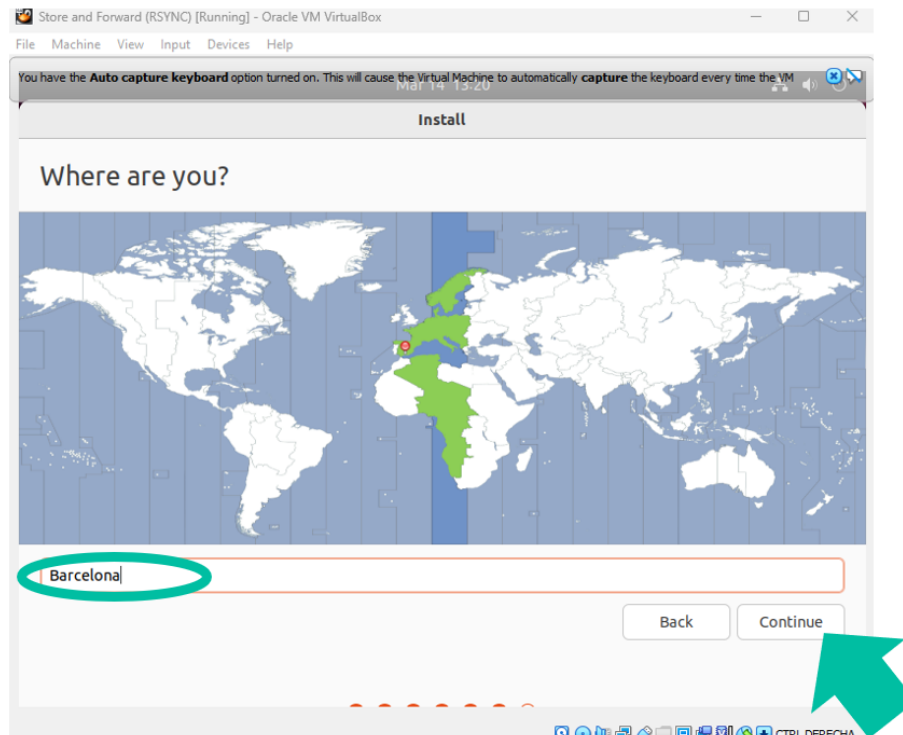


Introduction	Install SSH on LINUX via virtual machine on PC	Install virtual machine	Install SSH Server on LINUX	Generate SSH keys	Adapt SSH keys to latest UBUNTU version	Adding audio content to the SSH server	Implementing S&F (Rsync) in SSH	Store & Forward module (Rsync)
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An information box will appear, click **“Continue”**.

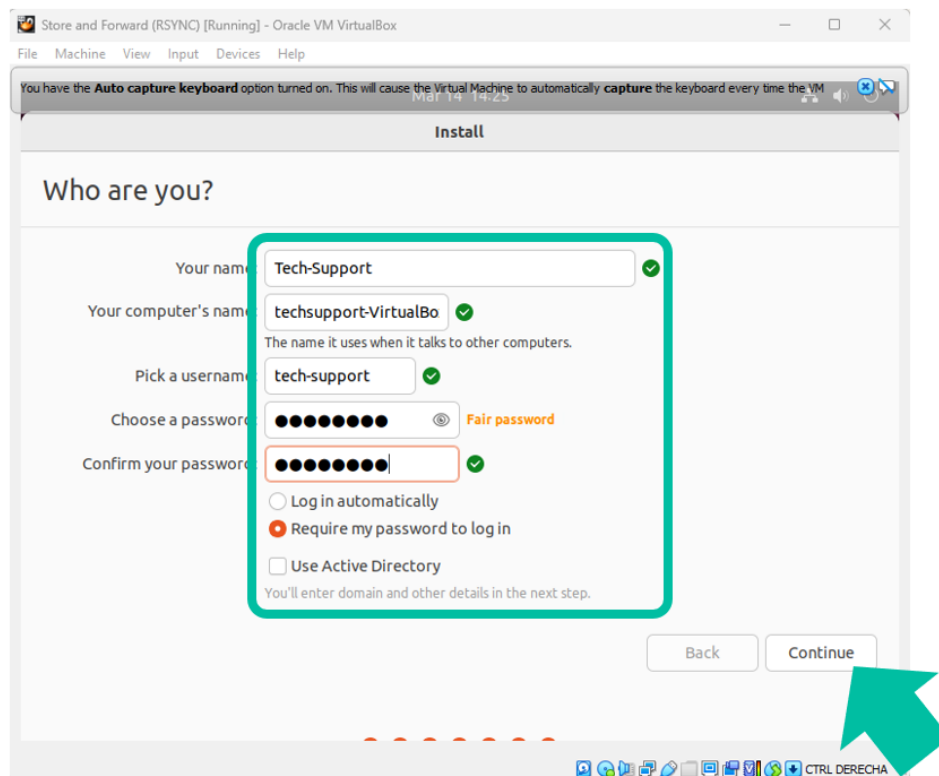


Enter your location and click **“Continue”**.

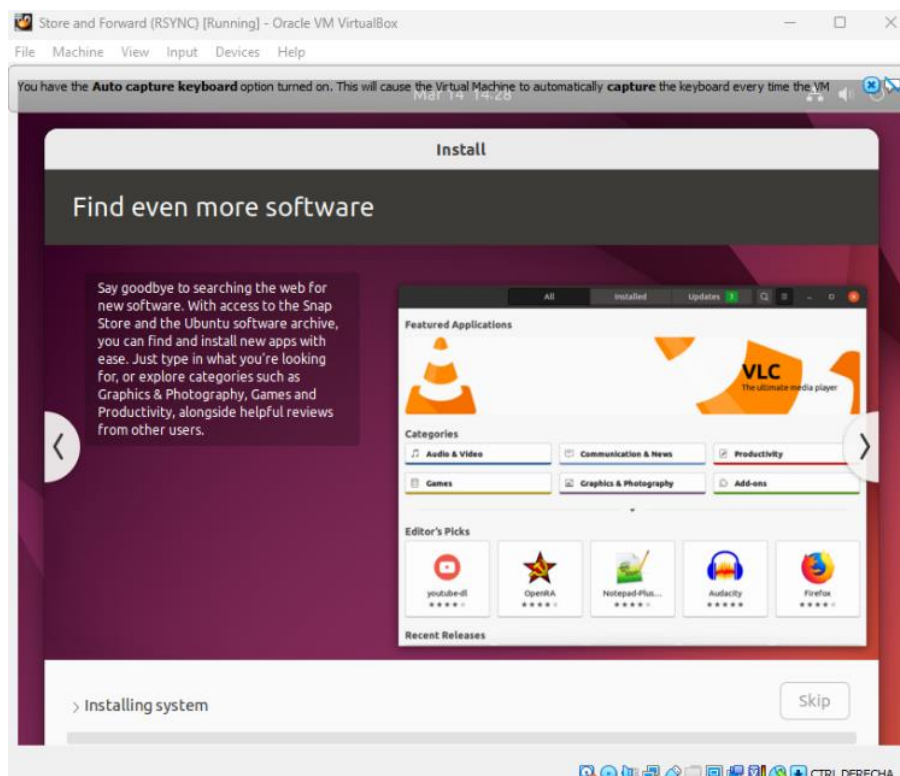


- Introduction
- Install SSH on LINUX via virtual machine on PC
- Install virtual machine
- Install SSH Server on LINUX
- Generate SSH keys
- Adapt SSH keys to latest UBUNTU version
- Adding audio content to the SSH server
- Implementing S&F (Rsync) in SSH
- Store & Forward module (Rsync)

Create your user profile and password and click "Continue".

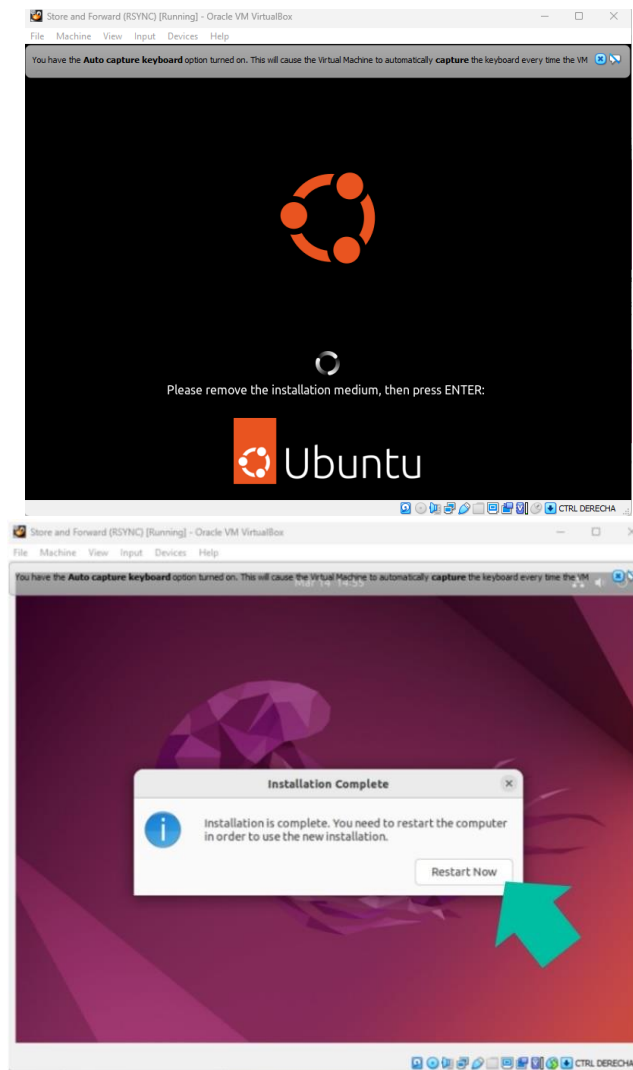


At this point the installation of the Ubuntu operating system will begin.

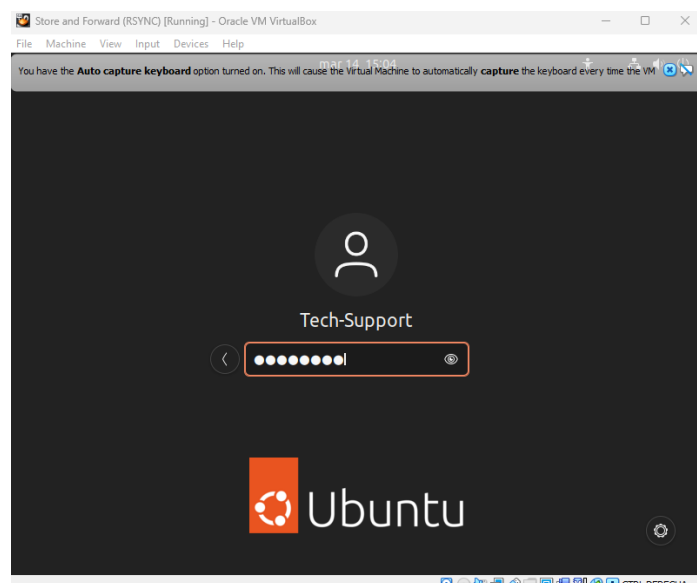


Introduction	Install SSH on LINUX via virtual machine on PC	Install virtual machine	Install SSH Server on LINUX	Generate SSH keys	Adapt SSH keys to latest UBUNTU version	Adding audio content to the SSH server	Implementing S&F (Rsync) in SSH	Store & Forward module (Rsync)
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Once finished, you will be prompted to reboot. Press "Enter".

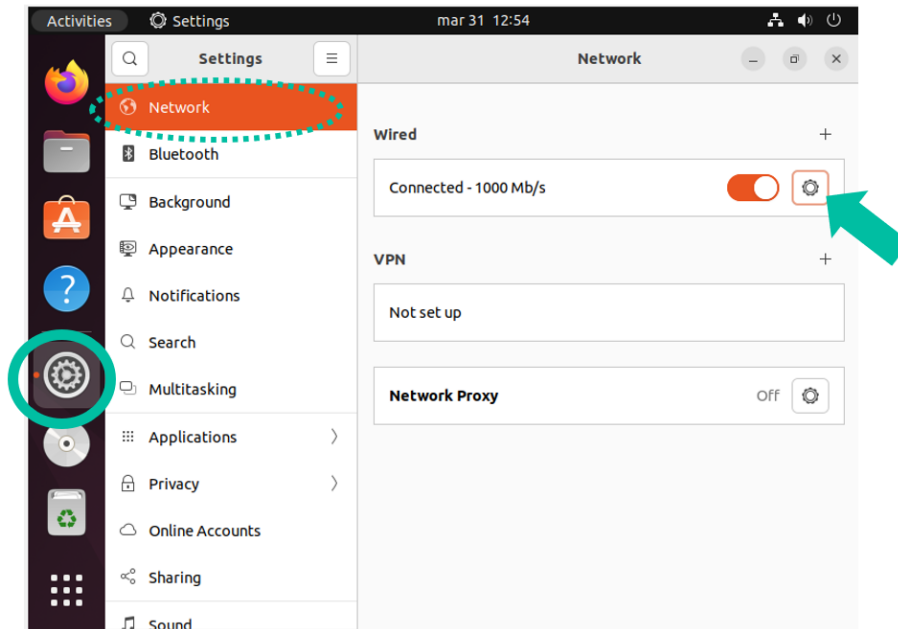


The programme will restart and will ask for the **user password**, type it and press "Enter".



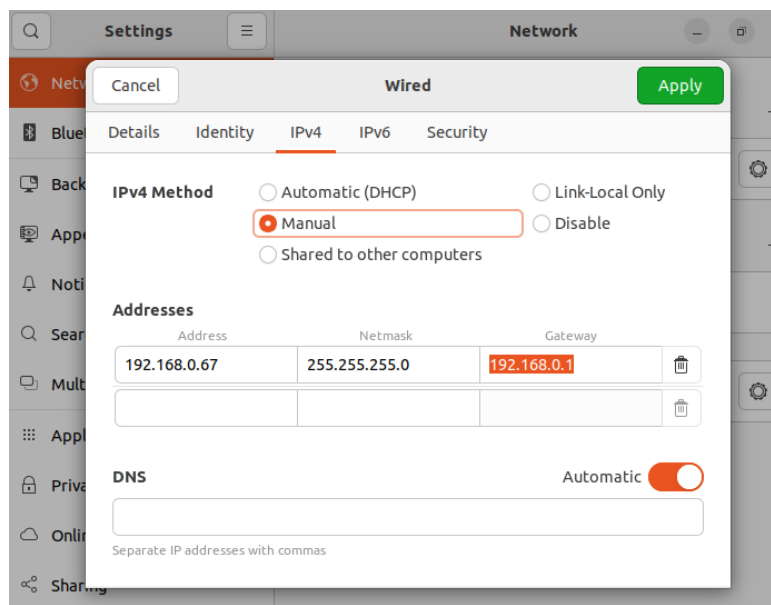
	Introduction
	Install SSH on LINUX via virtual machine on PC
	Install virtual machine
	Install SSH Server on LINUX
	Generate SSH keys
	Adapt SSH keys to latest UBUNTU version
	Adding audio content to the SSH server
	Implementing S&F (Rsync) in SSH
	Store & Forward module (Rsync)

8. You will now need to configure the NETWORK in Ubuntu.



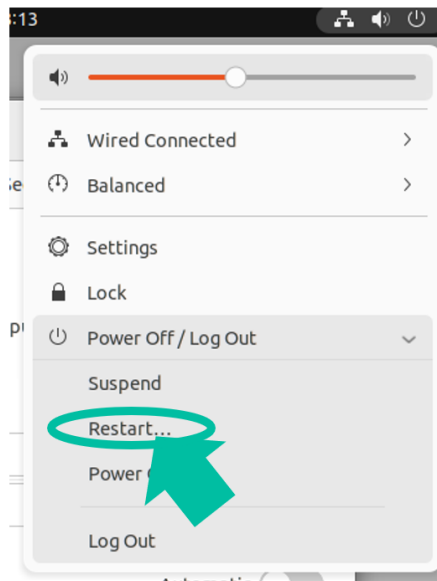
The next step is to configure a fixed IP according to the network where the configured PC is connected, which will be a "new" physical fixed IP as explained above. Finally, click on "Apply".

The physical IP must not be the same as the one used by your Windows computer.

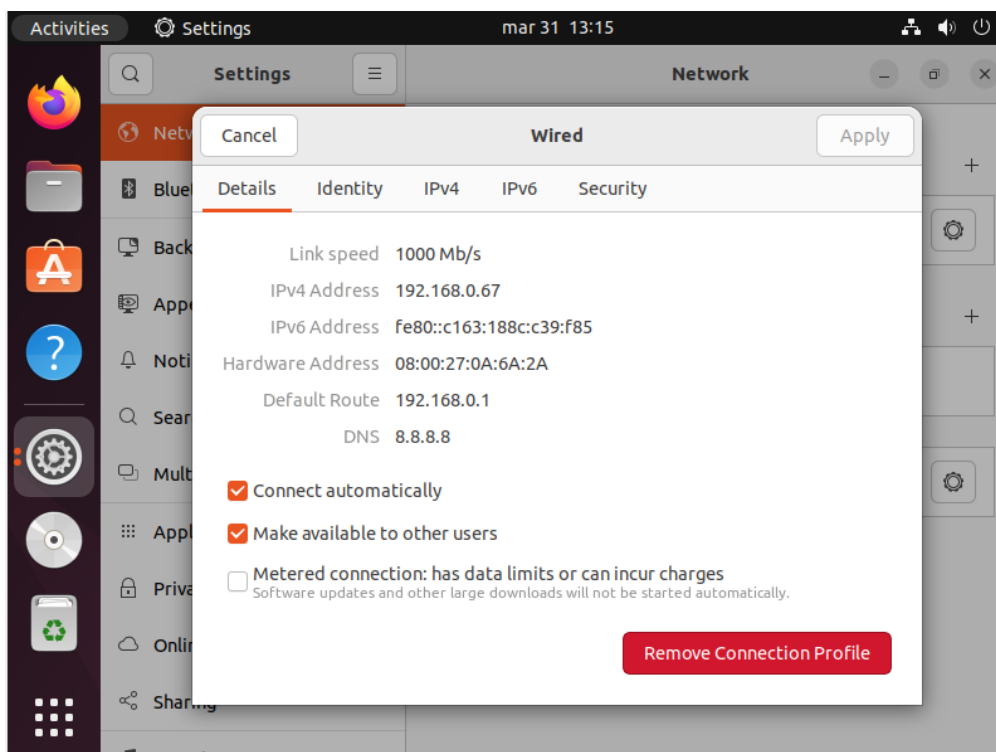


- Introduction
- Install SSH on LINUX via virtual machine on PC
- Install virtual machine
- Install SSH Server on LINUX
- Generate SSH keys
- Adapt SSH keys to latest UBUNTU version
- Adding audio content to the SSH server
- Implementing S&F (Rsync) in SSH
- Store & Forward module (Rsync)

Next, you will need to **restart Ubuntu**.

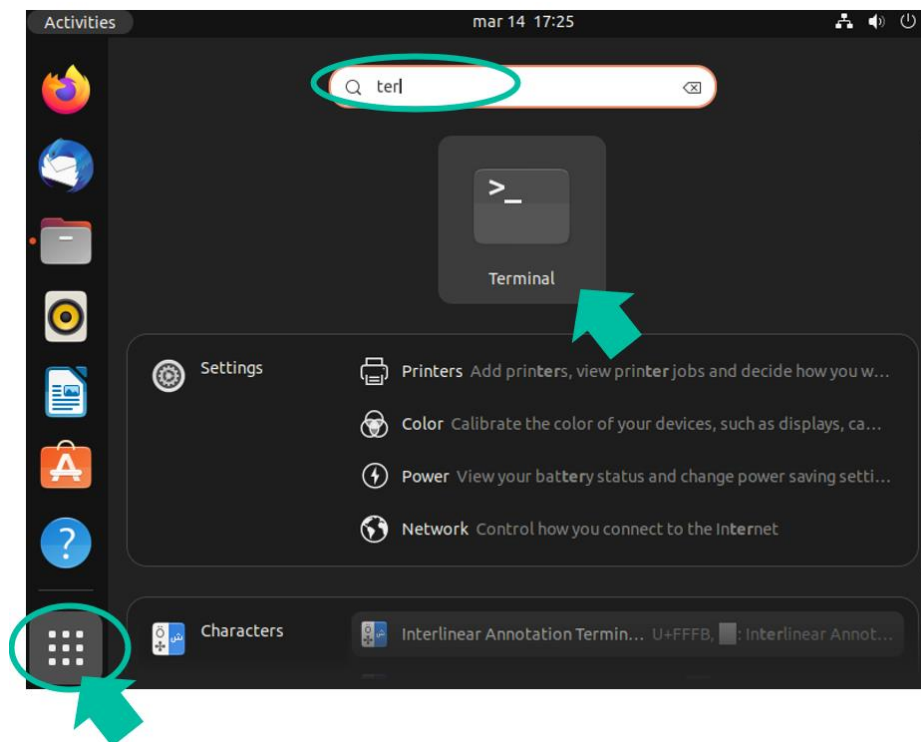


Finally, once rebooted, **log back in with your username and review the network configuration in detail** to make sure that it has been applied correctly.



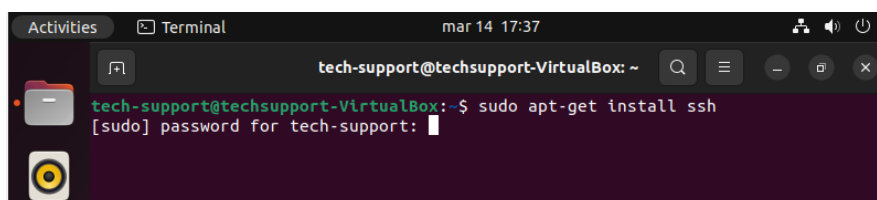
	Introduction
	Install SSH on LINUX via virtual machine on PC
	Install virtual machine
	Install SSH Server on LINUX
	Generate SSH keys
	Adapt SSH keys to latest UBUNTU version
	Adding audio content to the SSH server
	Implementing S&F (Rsync) in SSH
	Store & Forward module (Rsync)

4. INSTALLING SSH SERVER ON LINUX



It is necessary to install the SSH package on Linux. To do this, type the following command and press ENTER:

```
sudo apt-get install ssh
```



Next, type the password that will be requested and then press ENTER.

Linux has its own security system that does **not allow the password you type to be displayed**, although it does process it.

- Introduction
- Install SSH on LINUX via virtual machine on PC
- Install virtual machine
- Install SSH Server on LINUX
- Generate SSH keys
- Adapt SSH keys to latest UBUNTU version
- Adding audio content to the SSH server
- Implementing S&F (Rsync) in SSH
- Store & Forward module (Rsync)

Once the command has been processed after entering the password, type "y" in lowercase and then press "Enter".

```

Activities  Terminal  mar 14 17:38
tech-support@techsupport-VirtualBox: ~
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer required:
chromium-codecs-ffmpeg-extra gstreamer1.0-vaapi i965-va-driver
intel-media-va-driver libaac3 libaom3 libass9 libavcodec58 libavformat58
libavutil56 libbdplus0 libblas3 libbluray2 libbs2b0 libchromaprint1
libcodec2-1.0 libdav1d5 libflite1 libgme0 libgsm1
libgstreamer-plugins-bad1.0-0 libigdgmm12 liblilv-0-0 libllvm15 libmfx1
libmysofa1 libnorm1 libopenmpt0 libpgm-5.3-0 libpostproc55 librabbitmq4
librubberband2 libserd-0-0 libshine3 libsnappy1v5 libsord-0-0 libstrat0-0
libstr1.4-gnutls libssh-gcrypt-4 libswresample3 libswscale5 libudfread0
libva-drm2 libva-wayland2 libva-x11-2 libva2 libvdpau1 libvidstab1.1
libx265-199 libxvidcore4 libzimg2 libzmq5 libzvt-common libzvt0
mesa-va-drivers mesa-vdpau-drivers pocketsphinx-en-us systemd-hwe-hwdb
va-driver-all vdpau-driver-all
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
ncurses-term openssh-client openssh-server openssh-sftp-server
ssh-import-id
Suggested packages:
keychain libpam-ssh monkeysphere ssh-askpass molly-guard
The following NEW packages will be installed:
ncurses-term openssh-server openssh-sftp-server ssh ssh-import-id
The following packages will be upgraded:
openssh-client
1 upgraded, 5 newly installed, 0 to remove and 305 not upgraded.
Need to get 755 kB/1.664 kB of archives.
After this operation, 6.179 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
  
```

The following screen will appear:

```

Activities  Terminal  mar 14 17:42
tech-support@techsupport-VirtualBox: ~
Selecting previously unselected package ssh-import-id.
Preparing to unpack ../5-ssh-import-id_5.11-0ubuntu1_all.deb ...
Unpacking ssh-import-id (5.11-0ubuntu1) ...
Setting up openssh-client (1:8.9p1-3ubuntu0.1) ...
Setting up ssh-import-id (5.11-0ubuntu1) ...
Setting up ncurses-term (6.3-2) ...
Setting up openssh-sftp-server (1:8.9p1-3ubuntu0.1) ...
Setting up openssh-server (1:8.9p1-3ubuntu0.1) ...

Creating config file /etc/ssh/sshd_config with new version
Creating SSH2 RSA key; this may take some time ...
3072 SHA256:plkVXZEKtNHAAQt7uLR4haukaYlOUOI/NBsjQgSneI root@techsupport-Virtua
lBox (RSA)
Creating SSH2 ECDSA key; this may take some time ...
256 SHA256:T4F5bB+vjqjXGACHxgajIoL17Bt/q09jEK5xL3ToAs root@techsupport-Virtua
lBox (ECDSA)
Creating SSH2 ED25519 key; this may take some time ...
256 SHA256:l+4FCBzFu0VMJcwfqvu7g+jvNY5yvs7YLM40laMKVY root@techsupport-Virtua
lBox (ED25519)
Created symlink /etc/systemd/system/sshd.service → /lib/systemd/system/ssh.serv
ice.
Created symlink /etc/systemd/system/multi-user.target.wants/ssh.service → /lib/
systemd/system/ssh.service.
rescue-ssh.target is a disabled or a static unit, not starting it.
ssh.socket is a disabled or a static unit, not starting it.
Setting up ssh (1:8.9p1-3ubuntu0.1) ...
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for ufw (0.36.1-4build1) ...
tech-support@techsupport-VirtualBox:~$
  
```

- Introduction
- Install SSH on LINUX via virtual machine on PC
- Install virtual machine
- Install SSH Server on LINUX
- Generate SSH keys
- Adapt SSH keys to latest UBUNTU version
- Adding audio content to the SSH server
- Implementing S&F (Rsync) in SSH
- Store & Forward module (Rsync)

5. GENERATING SSH KEYS

! It is very important to perform this step correctly; please pay attention before processing the data.

In this **example** we will use the administrator username: `Tech-Support`.

Use the command `ssh-keygen -m PEM` to generate the keys and press ENTER directly in response to each question (without typing anything).

```
tech-support@techsupport-VirtualBox:~$ cd
tech-support@techsupport-VirtualBox:~$ ssh-keygen -m PEM
Generating public/private rsa key pair.
Enter file in which to save the key (/home/tech-support/.ssh/id_rsa):
```

Without typing anything, press the ENTER key 3 times, i.e. leaving the fields for:

1. "enter file in which...", press ENTER.
2. "enter passphrase...", press ENTER
3. "enter same passphrase...", press ENTER.

```
Enter file in which to save the key (/home/tech-support/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
```

At this point, the **public keys will be generated and displayed on the screen.**

```
tech-support@techsupport-VirtualBox:~$ ssh-keygen -m PEM
Generating public/private rsa key pair.
Enter file in which to save the key (/home/tech-support/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/tech-support/.ssh/id_rsa
Your public key has been saved in /home/tech-support/.ssh/id_rsa.pub
The key fingerprint is:
SHA256:LrxdGzEzI4qKGLTWfjcmqXRzopEzAAUEFdQI7T9C13M tech-support@techsupport-Vir
tualBox
The key's randomart image is:
+---[RSA 3072]-----+
|BO=+
|. o .
|..
|..o . o E
|=* * + oS *
|o+O Oo.o . *
|o+ =..+ . o
|+oo. + . o
|o.. . .
+-----[SHA256]-----+
tech-support@techsupport-VirtualBox:~$
```



Introduction

Install SSH on LINUX
via
virtual machine on PC

Install virtual
machine

Install SSH
Server on LINUX

Generate
SSH keys

Adapt SSH keys to
latest UBUNTU
version

Adding audio content
to the SSH server

Implementing
S&F (Rsync)
in SSH

Store & Forward
module (Rsync)

Add the public keys to the authorised keys with the following command and then press ENTER:

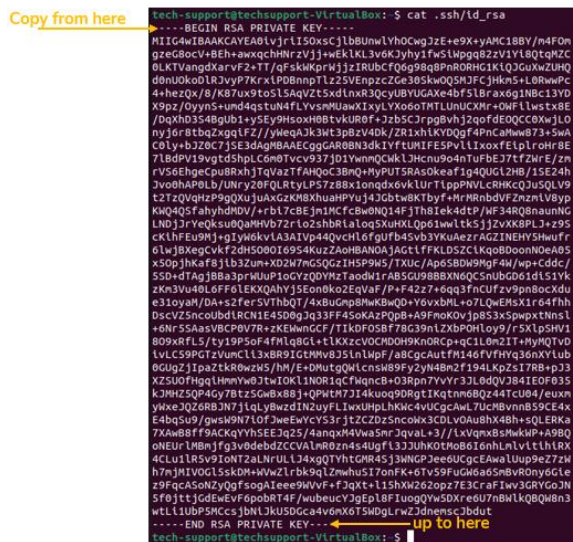
```
cat .ssh/id_rsa.pub >> .ssh/authorized_keys
```

You may view the private key that you need to enter in the Store and Forward configuration page of the PLAYER:

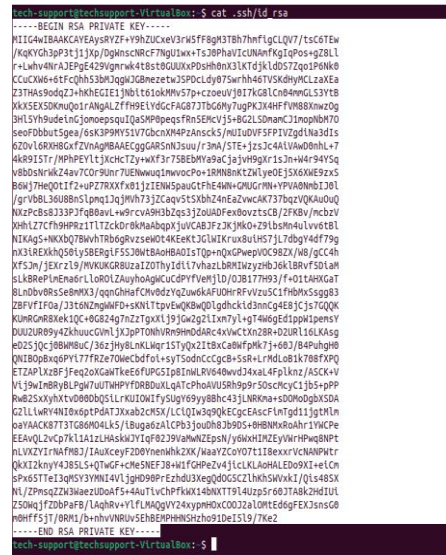
```
cat .ssh/id_rsa
```

Copy the complete text, from "-----BEGIN RSA..." by dragging the cursor to the end, to "...PRIVATE KEY-----".

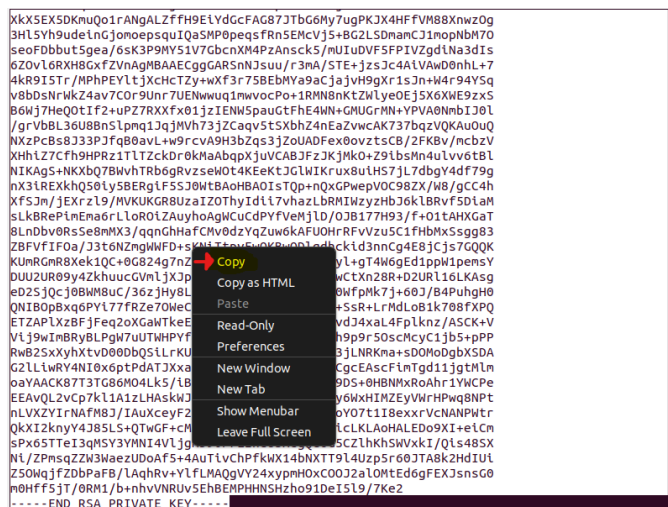
Unselected text



Selected text



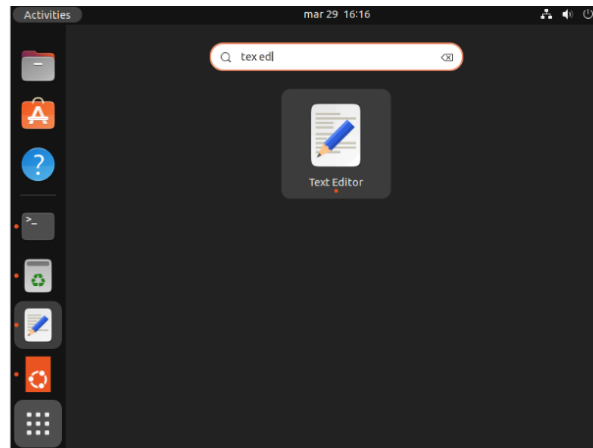
Copy the selected text:



! Save the copied key in a text file for later use in the S&F module of your PLAYER, as detailed later.

Introduction	Install SSH on LINUX via virtual machine on PC	Install SSH on LINUX machine	Install SSH Server on LINUX	Generate SSH keys	Adapt SSH keys to latest UBUNTU version	Adding audio content to the SSH server	Implementing S&F (Rsync) in SSH	Store & Forward module (Rsync)
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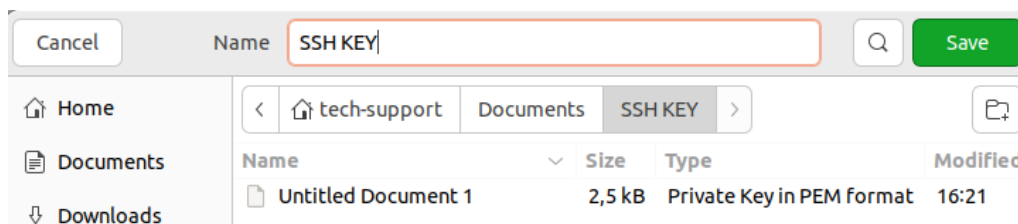
To save it, open the "Text Editor" application.



Click the **right mouse button**, paste the copied text and save it in the Documents folder.



We advise you to send this file by email or keep it at hand so that you may paste the key as detailed in the S&F section of the PLAYER.



We also advise you to **copy and paste the keys into a txt. file to have them at hand when you implement them in the PLAYER**, as the default location will be the following:
Username Admin <home/.ssh>



Please do not touch or edit the original files.




If you want to apply **multiple users with different content groups**, we recommend that you refer to the Content Groups section of the [Player One](#) or [Player Zero](#) user manual .

	Introduction
	Install SSH on LINUX via virtual machine on PC
	Install virtual machine
	Install SSH Server on LINUX
	Generate SSH keys
	Adapt SSH keys to latest UBUNTU version
	Adding audio content to the SSH server
	Implementing S&F (Rsync) in SSH
	Store & Forward module (Rsync)

6. SSH KEY ADAPTATION TO LATEST UBUNTU VERSION

New versions of Linux have made the RSA algorithms used by PLAYERS obsolete.

The PLAYER Store & Forward LOG will display an error message as follows:



The screenshot shows a window with tabs for 'General', 'Remote Source', 'Local Target', and 'Log'. The 'Log' tab is active, displaying the following text:

```
Key is a ssh-rsa key
Write key to '/tmp/saf-dropbear.key'
username=Tech-Support
hostname=192.168.0.67
timeout=25
port=22
source=/home/documents/bgm
target=/media/usb/

ssh: Connection to Tech-Support@192.168.0.67:22 exited: No matching algo hostkey
rsync: connection unexpectedly closed (0 bytes received so far) [receiver]
rsync error: error in rsync protocol data stream (code 12) at io.c(226) [Receiver=3.1.3]
```

The error message "No matching algo hostkey" is highlighted with a red box.

In this case, to allow the execution of PLAYER RSA, it is necessary to modify the server configuration.

To resolve this quickly, use the following command in the server terminal:

```
sudo sh -c 'echo "HostKeyAlgorithms +ssh-rsa" >> /etc/ssh/sshd_config'
sudo sh -c 'echo "PubkeyAcceptedAlgorithms+=ssh-rsa" >> /etc/ssh/sshd_config'
sudo systemctl restart sshd
```



Introduction

Install SSH on LINUX
via
virtual machine on PC

Install virtual
machine

Install SSH
Server on LINUX

Generate
SSH keys

Adapt SSH keys to
latest UBUNTU
version

Adding audio content
to the SSH server

Implementing
S&F (Rsync)
in SSH

Store & Forward
module (Rsync)

7. ADDING AUDIO CONTENT TO THE SSH SERVER.

The next step is to **place the audio content on the SSH server for each specific user or content group**. A folder will thus be created in the main directory of each content group in order to have music media compatible with the PLAYER, which you may host in the folder to be synchronised and which may be transferred via online downloads, email, links, etc.

For example, you may create a download link to a cloud-based file platform containing such media. Example path: `home/documents/bgm/`



You can use the Firefox browser to download it.



Remember to have Ubuntu connected to the network with Internet access, as without an Internet connection you will not be able to launch the content synchronisation.

8. IMPLEMENTING S&F (Rsync) IN SSH

HOST (the host is the IP address of the SSH server so that it can be indicated to the PLAYER



In the case of an external connection, you may need an IT technician to access the **PLAYER through the communication port**; please provide that person with the necessary information, such as the IP address of the Host or MAC address of the device.

The following steps will describe **how to get the necessary information for later entry into the PLAYER**.

1. How do I determine the IP address of the Host?

First, you need to install the network package.

- Open the terminal application.
- Type: `sudo apt install net-tools` and press ENTER.
- Enter the **password ADMIN** (not visible) and press ENTER.

```
tech-support@techsupport-VirtualBox:~$ sudo apt install net-tools
[sudo] password for tech-support:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
 net-tools
0 upgraded, 1 newly installed, 0 to remove and 165 not upgraded.
Need to get 204 kB of archives.
After this operation, 819 kB of additional disk space will be used.
Get:1 http://es.archive.ubuntu.com/ubuntu jammy/main amd64 net-tools amd64 1.60
+git20181103.0eebece-1ubuntu5 [204 kB]
Fetched 204 kB in 1s (268 kB/s)
Selecting previously unselected package net-tools.
(Reading database ... 178889 files and directories currently installed.)
Preparing to unpack .../net-tools_1.60+git20181103.0eebece-1ubuntu5_amd64.deb ...
Unpacking net-tools (1.60+git20181103.0eebece-1ubuntu5) ...
Setting up net-tools (1.60+git20181103.0eebece-1ubuntu5) ...
Processing triggers for man-db (2.10.2-1) ...
tech-support@techsupport-VirtualBox:~$
```

- In the terminal, type: `ifconfig` and press ENTER



Introduction

Install SSH on LINUX
via
virtual machine on PC

Install virtual
machine

Install SSH
Server on LINUX

Generate
SSH keys

Adapt SSH keys to
latest UBUNTU
version

Adding audio content
to the SSH server

Implementing
S&F (Rsync)
in SSH

Store & Forward
module (Rsync)

```

tech-support@techsupport-VirtualBox: ~
tech-support@techsupport-VirtualBox:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 192.168.0.67 netmask 255.255.255.0 broadcast 192.168.0.255
inet6 fe80::c163:188c:c39:f85 prefixlen 64 scopeid 0x20<link>
ether 08:00:27:0a:6a:2a txqueuelen 1000 (Ethernet)
RX packets 2029 bytes 240443 (240.4 KB)
RX errors 0 dropped 23 overruns 0 frame 0
TX packets 407 bytes 47722 (47.7 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

```

The IP of the SSH server in this example is the same as the one we configured [earlier](#). In our example: 192.168.0.67.

To avoid transcription errors, we recommend that you take a **screenshot of the data**, which you must provide to the IT technician in charge of maintaining the network where the PLAYER is installed.

2. Communication port

By default it is number 22 in the SSH servers, but if the IT technician advises that you cannot use this port where the PLAYER is located, they must tell you the port that you can use to enter the number in the S&F module of the PLAYER, as well as to authorise the complete connection of the IP Host (SSH server).

3. Folder

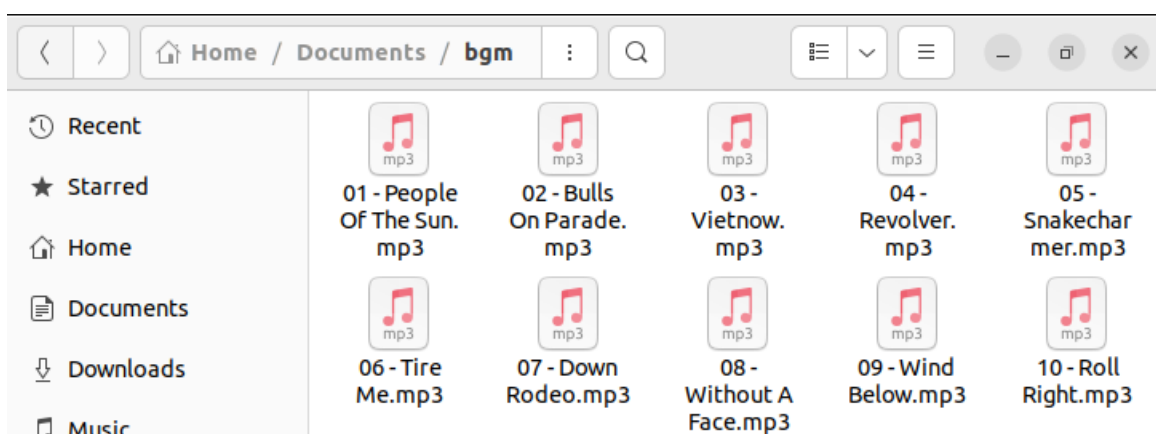
Where the SSH server's music media are located.

We recommend avoiding names with capital letters or symbols.

In our **example**: `/home/tech-support/Documents/bgm/`

- "tech-support" is the user name,
- "bgm" is the name of the folder we choose and must always be included in the path.

Linux differentiates between UPPERCASE and lowercase letters. If the path is entered incorrectly, the synchronisation will not be performed and will return an error in the LOG.



	Introduction
virtual machine on PC	Install SSH on LINUX via
machine	Install virtual machine
Server on LINUX	Install SSH Server on LINUX
SSH keys	Generate SSH keys
Adapt latest UBUNTU version	Adapt SSH keys to latest UBUNTU version
to the SSH server	Adding audio content to the SSH server
Implementing S&F (Rsync) in SSH	Implementing S&F (Rsync) in SSH
Store & Forward module (Rsync)	Store & Forward module (Rsync)

4. Username

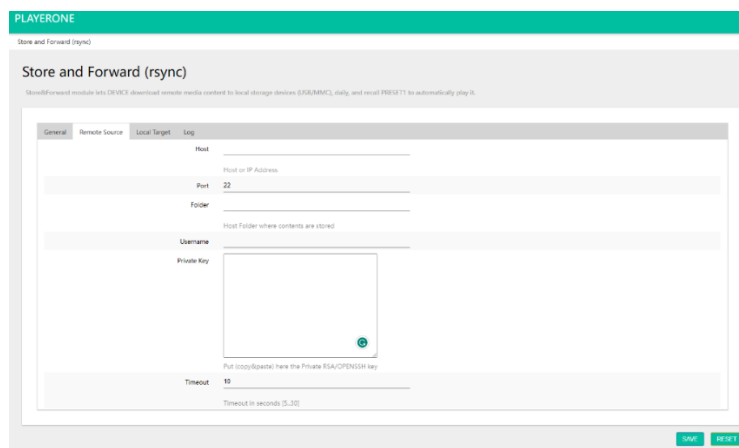
You must **enter the user with which you configured the virtual machine**, in this case the user ADMIN: tech-support

5. Private key

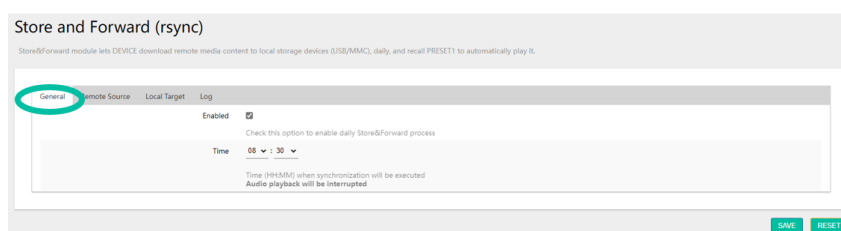
You must **access the txt. file into which you copied the key** that you generated in our SSH Server.

9. STORE AND FORWARD MODULE (Rsync)

Now that you have all the **necessary data** to implement the configuration, **you will implement it in the S&F module of your PLAYER.**



1. General



- **Enabled:** In this section, activate the S&F Module (Rsync) by checking the box.
- **Time:** this is a **very important** point, it is where the exact time of media synchronisation between our SSH server and the PLAYER is configured so that Rsync does the rest automatically.
- Next, please press

It is very important that both the PLAYER and the SSH server have continuous network access during media synchronisation. Otherwise, the LOG module will show a synchronisation error message.

	Introduction
virtual machine on PC	Install SSH on LINUX via
machine	Install virtual machine
Server on LINUX	Install SSH Server on LINUX
SSH keys	Generate SSH keys
Adapt SSH keys to latest UBUNTU version	Adapt SSH keys to latest UBUNTU version
to the SSH server	Adding audio content to the SSH server
S&F (Rsync) in SSH	Implementing S&F (Rsync) in SSH
Store & Forward module (Rsync)	Store & Forward module (Rsync)

2. Remote Source

Lastly, you must fill in all the data previously covered in this section.

! Make sure that all parameters are entered correctly.

! Remember to press **SAVE** when you have finished configuring each tab.

💡 For your convenience, you can resize the "private key" text field to your liking.

	Introduction
	Install SSH on LINUX via virtual machine on PC
	Install virtual machine
	Install SSH Server on LINUX
	Generate SSH keys
	Adapt SSH keys to latest UBUNTU version
	Adding audio content to the SSH server
	Implementing S&F (Rsync) in SSH
	Store & Forward module (Rsync)

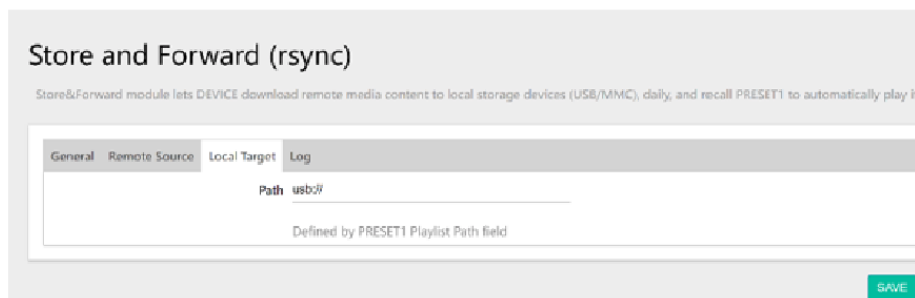
In our example:

- **Host:** 192.168.0.67
- **Port:** 22
- **Folder:** /home/tech-support/Documents/bgm
- **Username:** tech-support
- **Private Key:** That you saved previously.
- **Timeout:** 25 sec.

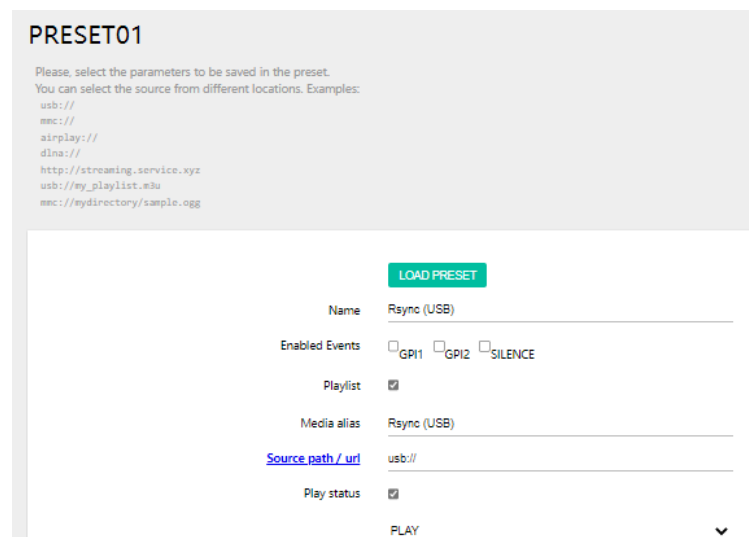
3. Local Target

In this section, you will indicate where Rsync will synchronise the files it receives from the SSH server, either on a USB stick or SD card inserted in the PLAYER, in FAT32 format.

- a) Indicate the Path you wish to use, which you will later configure in the associated PRESET1. In this example: `usb://`




- b) PRESET 1 of our PLAYER is configured, so that the files from our USB or SD can be played.

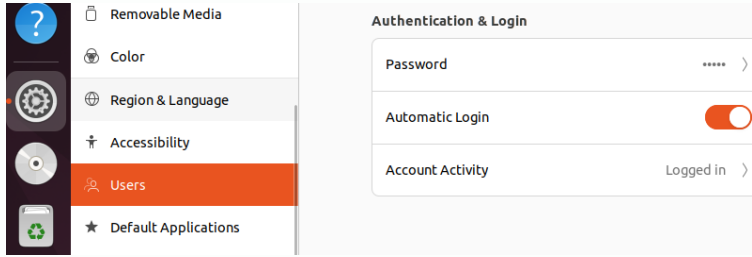


	
Introduction	Install SSH on LINUX via virtual machine on PC
Install virtual machine	Install SSH Server on LINUX
Generate SSH keys	Adapt SSH keys to latest UBUNTU version
Adding audio content to the SSH server	Implementing S&F (Rsync) in SSH
Store & Forward module (Rsync)	

c) Press  to save the Preset.

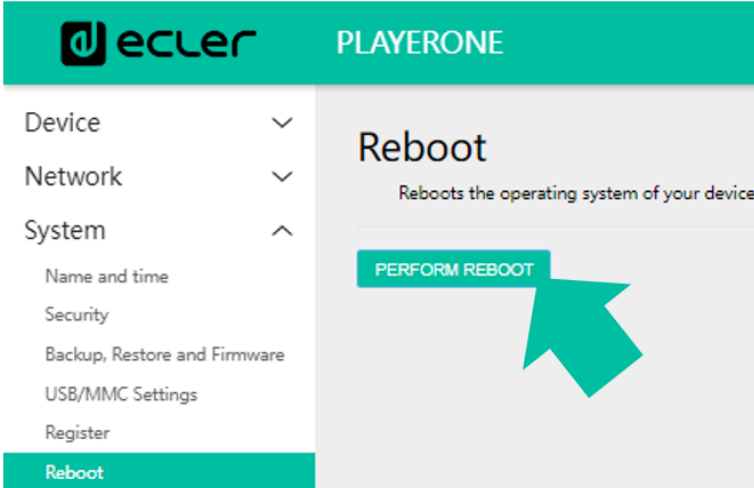
d) You must check that all the parameters are correctly saved, that the SSH server is operating and that there are no power settings that might disable it.

 We recommend leaving "Automatic login" enabled in Ubuntu




The screenshot shows the Ubuntu system settings interface. On the left, a sidebar lists various settings categories: Removable Media, Color, Region & Language, Accessibility, Users (highlighted in orange), and Default Applications. The main area displays the 'Authentication & Login' settings. It includes a 'Password' field with a strength indicator, an 'Automatic Login' toggle switch which is turned on (red), and an 'Account Activity' section showing 'Logged in'.

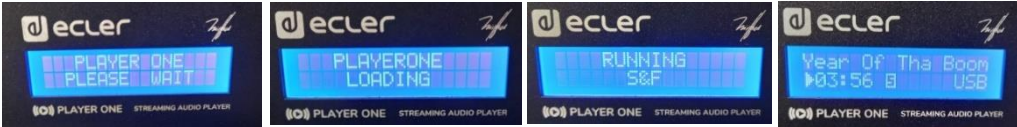
e) Restart the PLAYER.



The screenshot shows the ecler PLAYERONE web interface. On the left, there is a navigation menu with categories: Device, Network, System, and Reboot (highlighted in green). Under the 'System' category, several options are listed: Name and time, Security, Backup, Restore and Firmware, USB/MMC Settings, Register, and Reboot. The main content area is titled 'Reboot' and contains the text 'Reboots the operating system of your device'. A large green button labeled 'PERFORM REBOOT' is visible, with a green arrow pointing to it.

The S&F module starts automatically and will start to dump and playback the contents to the storage previously indicated.

 Example of display in Player ONE (Player ZERO does not have a display and must therefore be monitored via the Web App).



The four screenshots show the progression of the Player ONE boot process on a small display.
 1. The first screen shows the ecler logo and the text 'PLAYER ONE PLEASE WAIT'.
 2. The second screen shows 'PLAYER ONE LOADING'.
 3. The third screen shows 'RUNNING S&F'.
 4. The fourth screen shows the track information 'Year Of The Boon', a progress indicator '03:56', and the source 'USB'.
 Each screen also features the ecler logo and the text 'PLAYER ONE STREAMING AUDIO PLAYER' at the bottom.

	Introduction
	Install SSH on LINUX via virtual machine on PC
	Install virtual machine
	Install SSH Server on LINUX
	Generate SSH keys
	Adapt SSH keys to latest UBUNTU version
	Adding audio content to the SSH server
	Implementing S&F (Rsync) in SSH
	Store & Forward module (Rsync)

f) Lastly, check the PLAYER's LOG to make sure that everything is correct.

Store and Forward (rsync)

Store&Forward module lets DEVICE download remote media content to local storage devices (USB/MMC), daily, and recall PRESET1 to automatically play it.

General Remote Source Local Target **Log**

```

Key is a ssh-rsa key
Wrote key to '/tmp/saf-dropbear.key'
username=tech-support
hostname=192.168.0.67
timeout=25
port=22
source=/home/tech-support/Documents/bgm/
target=/media/usb/
ssh:
Host '192.168.0.67' key accepted unconditionally.
(ssh-rsa fingerprint sha1!! 33:d3:61:3c:3b:f9:b0:55:13:7b:d9:8d:ca:fa:b2:7d:25:9a:e8:c6)

receiving incremental file list
deleting __init__.py
./

sent 60 bytes  received 375 bytes  96.67 bytes/sec
total size is 44,793,254  speedup is 102,972.00
    
```

	Introduction
Install SSH on LINUX via virtual machine on PC	Install SSH on LINUX via virtual machine on PC
Install virtual machine	Install SSH Server on LINUX
Generate SSH keys	Adapt SSH keys to latest UBUNTU version
Adding audio content to the SSH server	Implementing S&F (Rsync) in SSH
Store & Forward module (Rsync)	


Introduction
Install SSH on LINUX via virtual machine on PC
Install virtual machine
Install SSH Server on LINUX
Generate SSH keys
Adapt SSH keys to latest UBUNTU version
Adding audio content to the SSH server
Implementing S&F (Rsync) in SSH
Store & Forward module (Rsync)



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