Private Cloud Media Server Project

Advanced Implementation and System Administration Report

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LinkedIn

Abstract

This project demonstrates the deployment of a private cloud media server using VirtualBox, Ubuntu Server, and Nextcloud. It includes secure HTTPS access, external storage integration, real-time document editing with OnlyOffice, user and group access controls, automated backups with email alerts, and monitoring with Netdata. The implementation simulates real-world enterprise IT operations and showcases skills in Linux system administration, service automation, Docker, and secure network configuration.

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Chapter 1: Introduction

1.1 Project Description

Building a private cloud media server using VirtualBox, Ubuntu Server, and Nextcloud to simulate enterprise file sharing, collaboration, monitoring, and backups — all within a secure and virtualized local environment.

1.2 Objectives

- Host a Nextcloud server locally
- Enable HTTPS, file sharing, and document editing
- Add monitoring and backups
- Simulate enterprise admin tasks

1.3 Scope

- Local VM-based deployment using VirtualBox
- LAMP stack, MariaDB, Nextcloud, OnlyOffice
- External storage integration
- Netdata monitoring, automated backups with email alerts

1.4 System Architecture Diagram

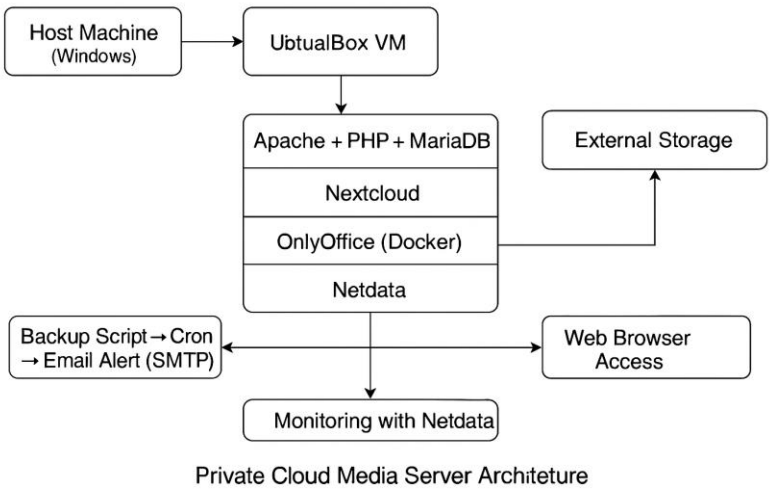


Figure 1: Private Cloud Media Server Architecture

Chapter 2: Implementation

2.1 System Setup

Install **Ubuntu Server 22.04 LTS** in **VirtualBox**, which will act as your **private cloud media server**.

2.1.1 Prerequisites:

✓ *Download VirtualBox*

https://www.virtualbox.org/wiki/Downloads

Install the latest version based on your OS (Windows/macOS/Linux).

✓ *Download Ubuntu Server ISO (22.04 LTS)*

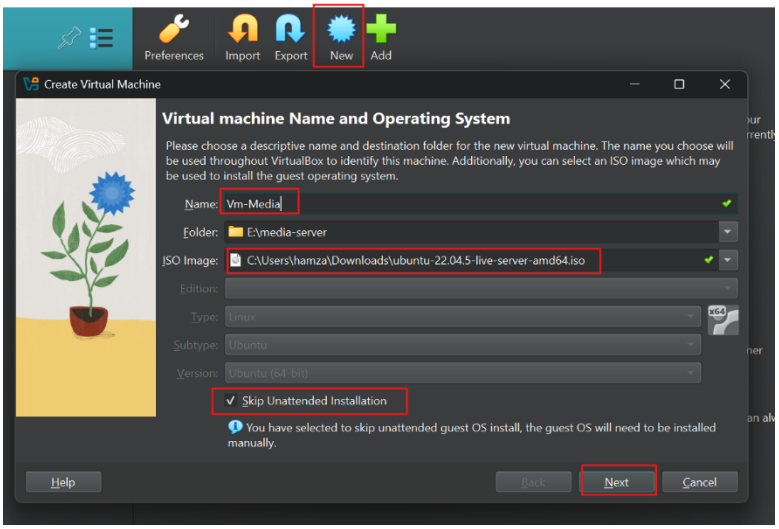
https://ubuntu.com/download/server

- File: ubuntu-22.04.4-live-server-amd64.iso
- Save it somewhere safe — we'll use this ISO to boot the VM.

2.1.2 Creation the Virtual Machine:

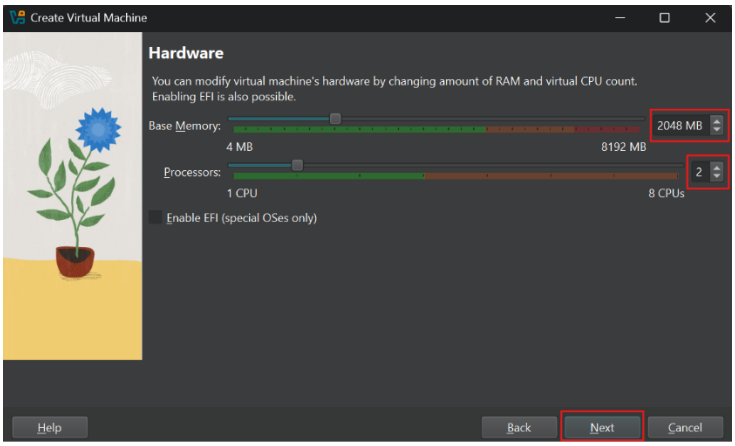
Open VirtualBox → Click **"New"**

Field	Value
Name	media-vm
Type	Linux
Version	Ubuntu (64-bit)

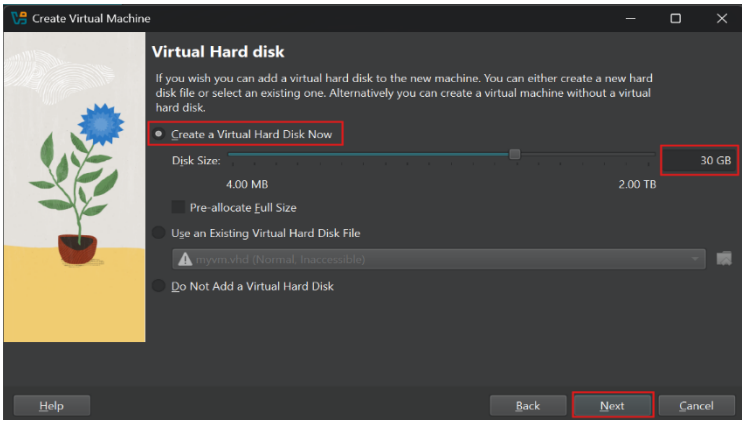


- *Configure hardware*

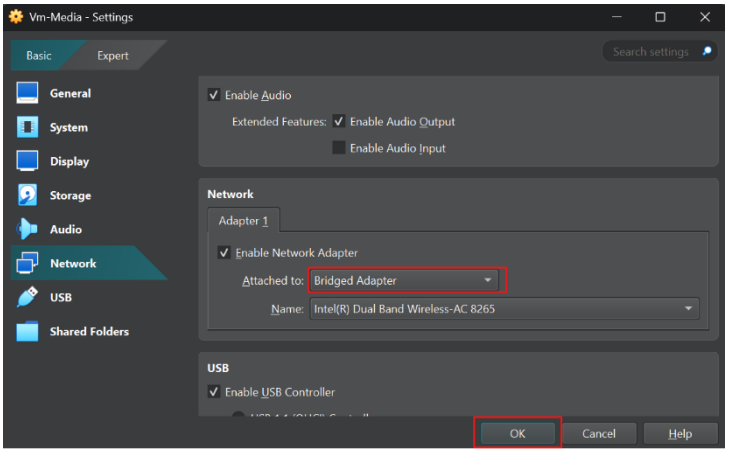
Setting	Value
RAM	2048 MB (minimum)
CPU	2 CPUs
Disk	30 GB (VDI, dynamically allocated)



- *Mount Ubuntu ISO:*
  - In **Settings > Storage**
  - Under **Controller: IDE**, click **Empty**
  - Click CD icon on right → **Choose a disk file**
  - Select the **Ubuntu Server ISO** you downloaded



- *Network Configuration*
  - In **Settings > Network**
  - Adapter 1: **Bridged Adapter**

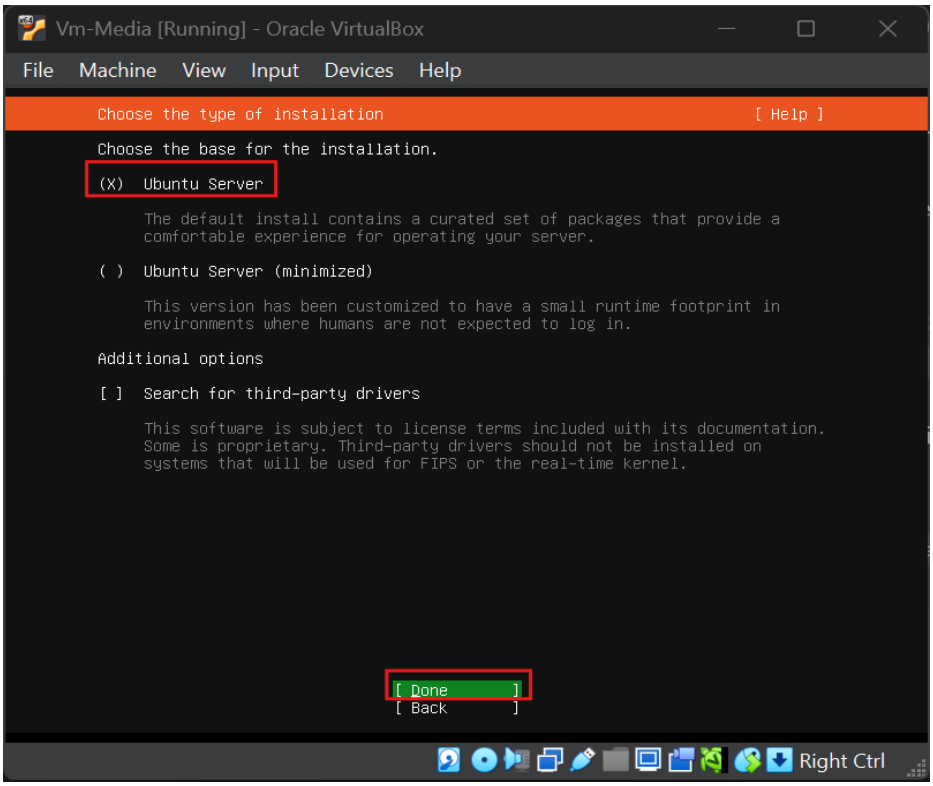


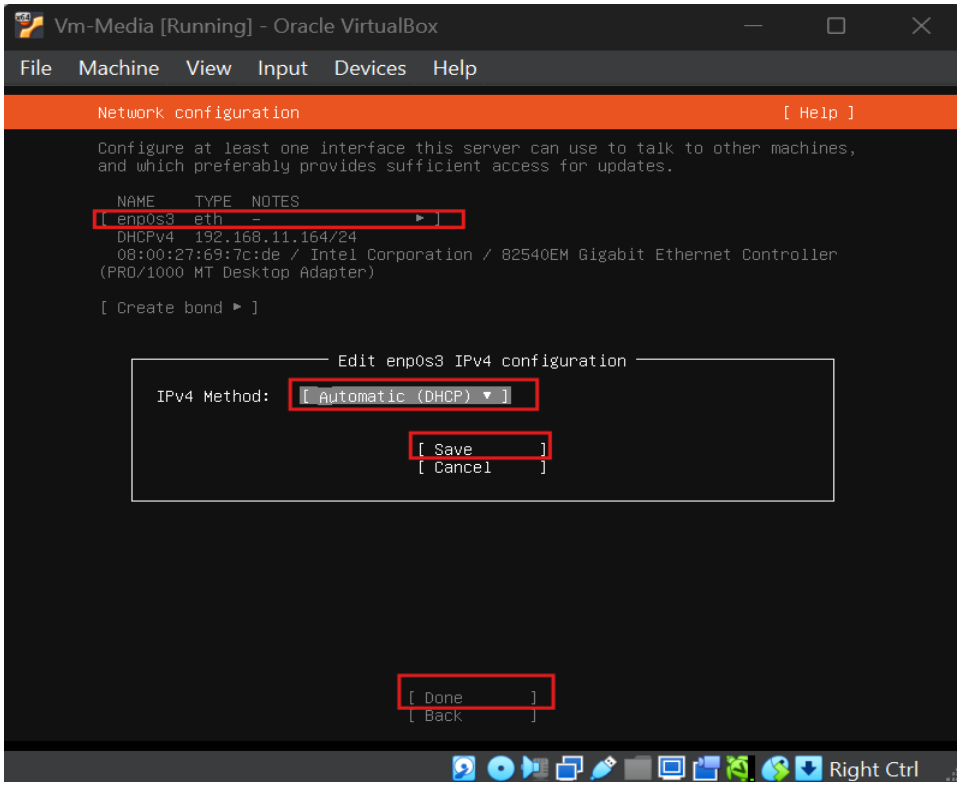
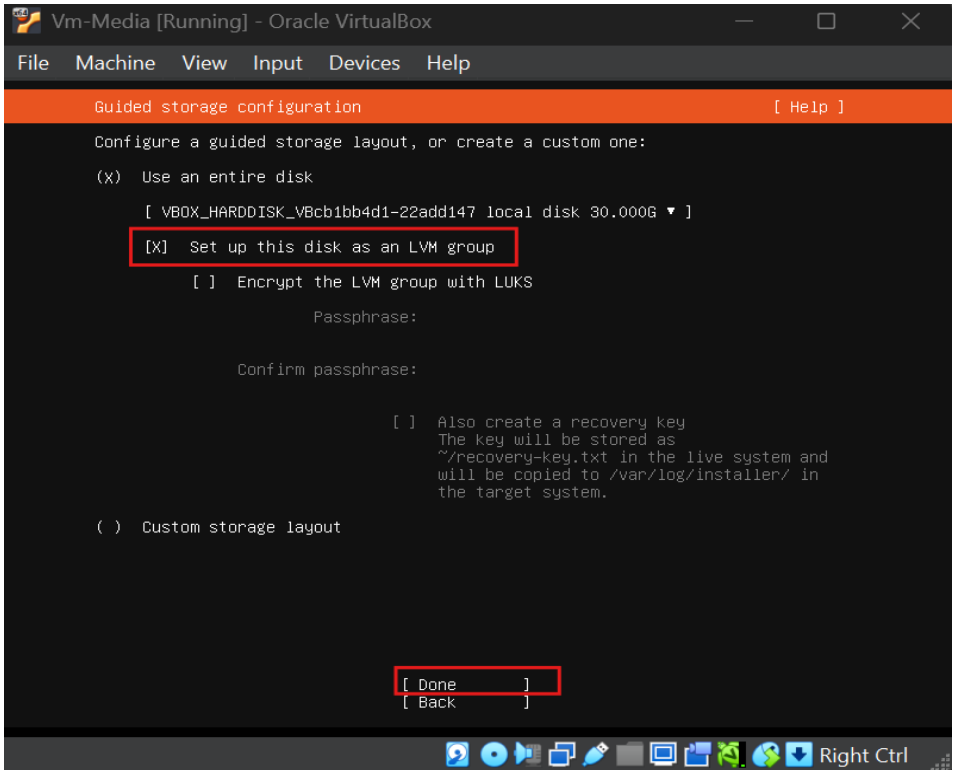
- *Start the VM*

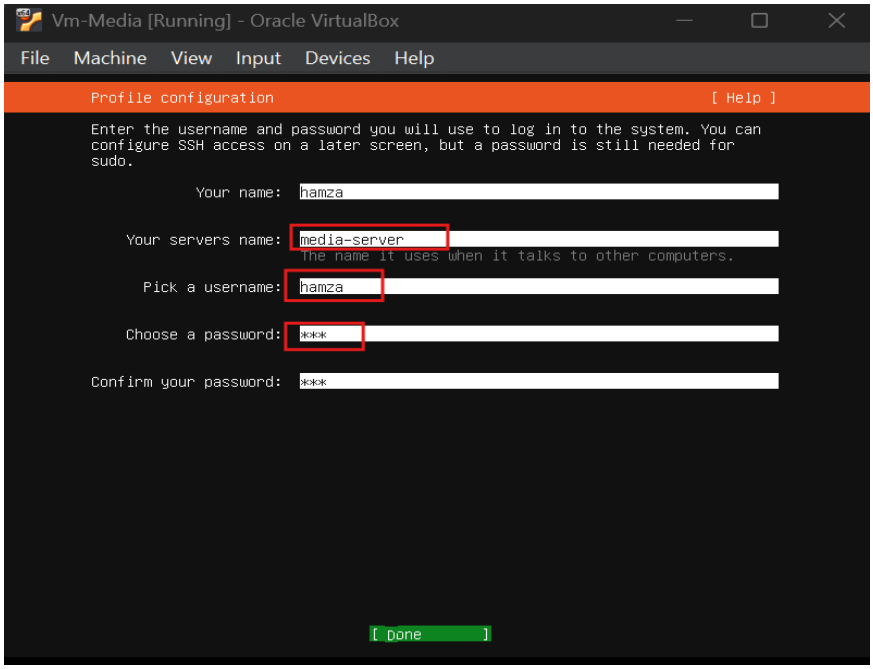
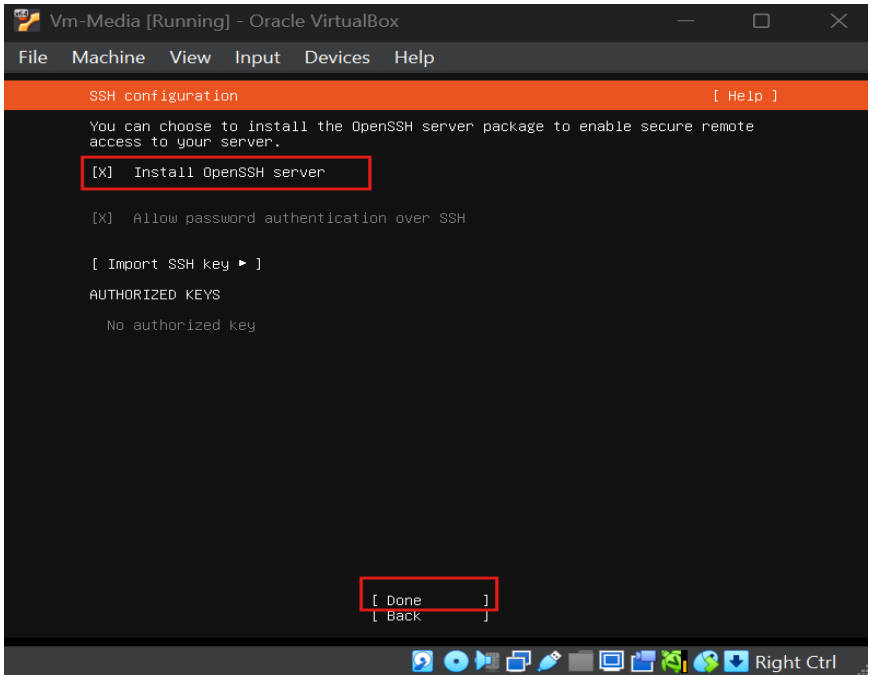
Click **Start**, and you'll enter the Ubuntu installer.

2.1.3 Install Ubuntu Server (22.04)

Follow these steps in the installer:

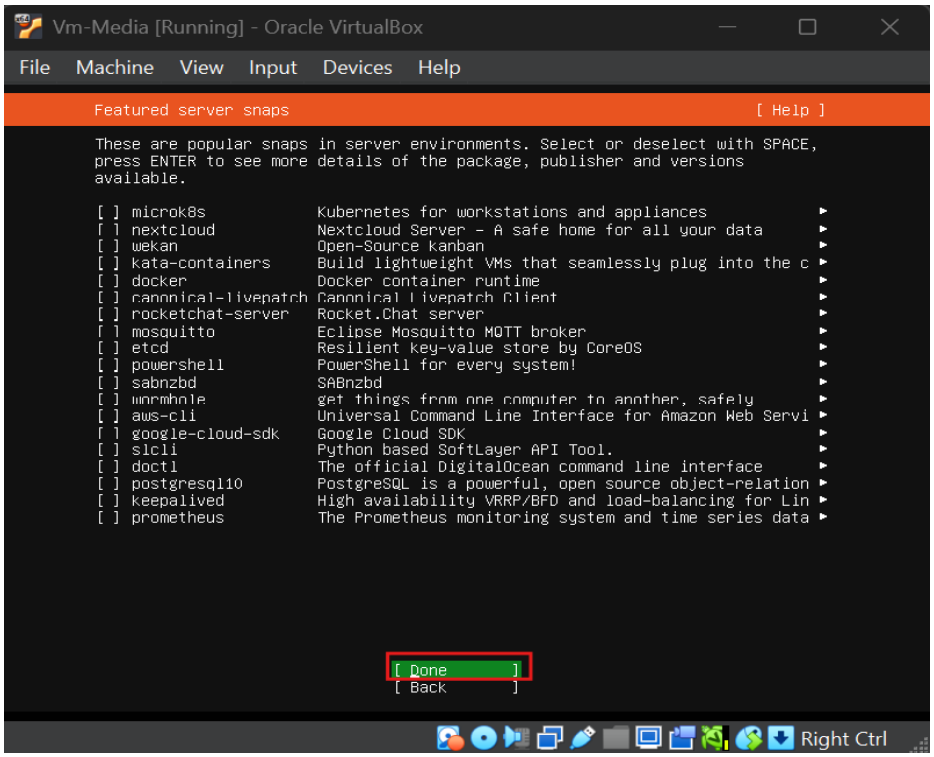
Step	Instruction
Language	Choose **English** (or your preferred)
Install Type	Select **Ubuntu Server** 

Network	Leave as default (automatic IP by DHCP) 
Storage	Use the entire disk with **LVM** (recommended) 

Profile	Username: hamza, Password: your_password 
Server Name	media-server
SSH	☑ Install OpenSSH server 

Snap Apps

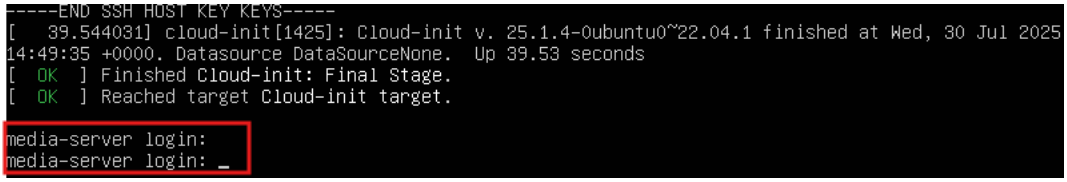
❌ Skip unless needed



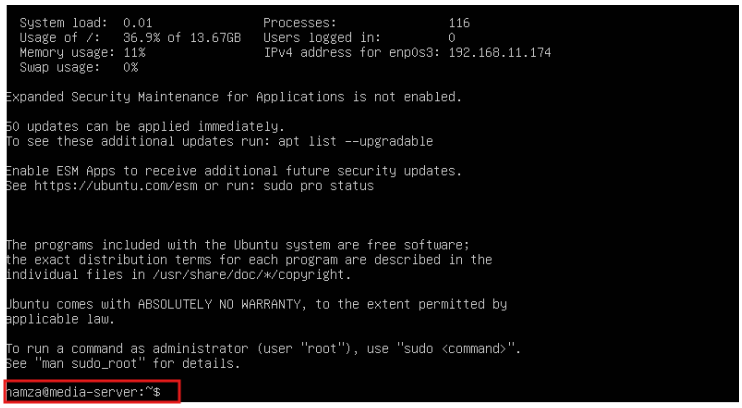
After setup, reboot the VM and **remove the ISO** from VirtualBox to avoid boot looping.

Once your VM is running and you see a login prompt like:

media-server login:



After enter login and password:



2.2 Server Configuration

2.2.1 Install LAMP Stack (Apache, MariaDB, PHP)

Nextcloud needs:

- **Apache** (web server)
- **MariaDB** (or MySQL)
- **PHP** (with specific modules)

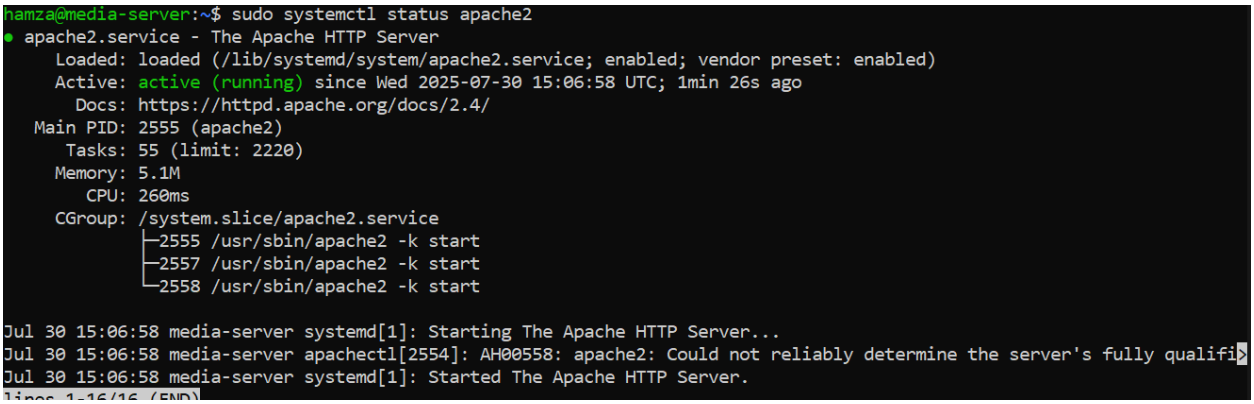
We'll install and configure all of this manually — this gives you **full control.**

2.2.2 Install Apache Web Server

sudo apt install apache2 -y

✅ After install:

sudo systemctl status apache2



You should see it running.

Test in your browser:

👉 Visit http://<your-server-ip>

You should see the **"Apache2 Ubuntu Default Page"**

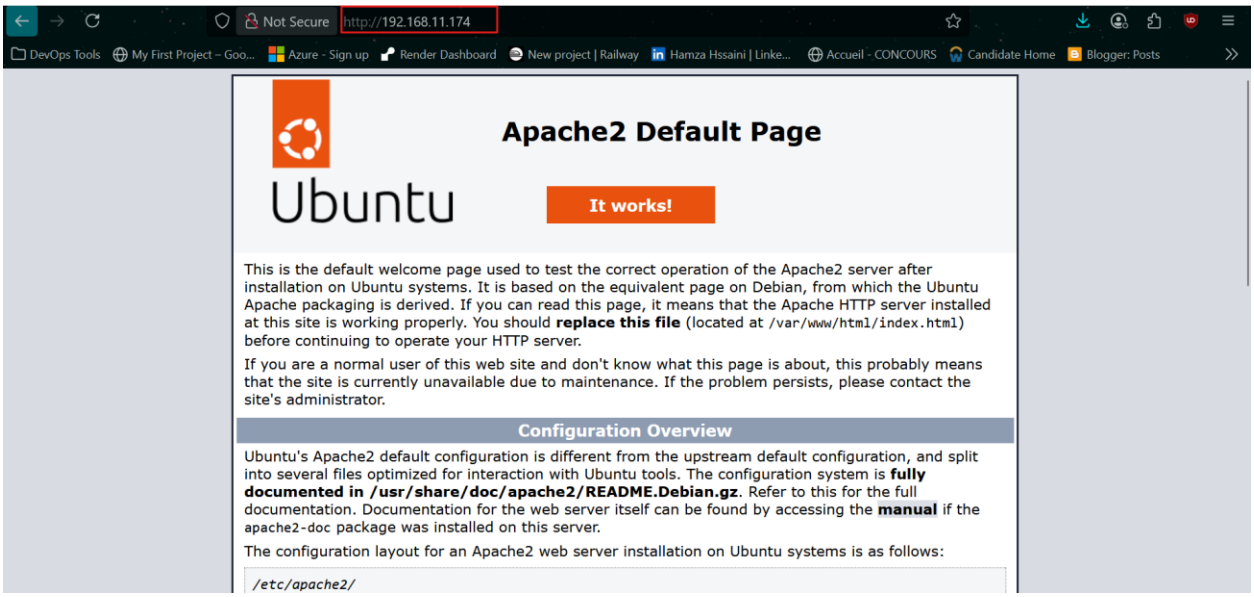


Figure 2: Apache2 Web Server Running on media-server

2.2.3 Install MariaDB (Database Server)

sudo apt install mariadb-server -y

Then secure the installation:

sudo mysql_secure_installation

During prompts:

- Set root password? **Yes**
- Remove anonymous users? **Yes**
- Disallow root login remotely? **Yes**
- Remove test database? **Yes**
- Reload privileges? **Yes**

```
Disallow root login remotely? [Y/n] y
 ... Success!

By default, MariaDB comes with a database named 'test' that anyone can
access.  This is also intended only for testing, and should be removed
before moving into a production environment.

Remove test database and access to it? [Y/n] y
 - Dropping test database...
 ... Success!
 - Removing privileges on test database...
 ... Success!

Reloading the privilege tables will ensure that all changes made so far
will take effect immediately.

Reload privilege tables now? [Y/n] y
 ... Success!

Cleaning up...

All done!  If you've completed all of the above steps, your MariaDB
installation should now be secure.

Thanks for using MariaDB!
```

✅ Then verify:

sudo systemctl status mariadb

```
● mariadb.service - MariaDB 10.6.22 database server
     Loaded: loaded (/lib/systemd/system/mariadb.service; enabled; vendor preset: enabled)
     Active: active (running) since Wed 2025-07-30 15:13:13 UTC; 4min 27s ago
       Docs: man:mariadbd(8)
             https://mariadb.com/kb/en/library/systemd/
    Process: 3570 ExecStartPre=/usr/bin/install -m 755 -o mysql -g root -d /var/run/mysqld (code=exited, status=0/SUCCESS)
    Process: 3571 ExecStartPre=/bin/sh -c systemctl unset-environment _WSREP_START_POSITION (code=exited, status=0/SUCCESS)
    Process: 3574 ExecStartPre=/bin/sh -c [ ! -e /usr/bin/galera_recovery ] && VAR= ||   VAR=`/usr/bin/galera_recovery`; [ $? -eq >
    Process: 3613 ExecStartPost=/bin/sh -c systemctl unset-environment _WSREP_START_POSITION (code=exited, status=0/SUCCESS)
    Process: 3615 ExecStartPost=/etc/mysql/debian-start (code=exited, status=0/SUCCESS)
   Main PID: 3603 (mariadbd)
     Status: "Taking your SQL requests now..."
      Tasks: 9 (limit: 14654)
     Memory: 61.7M
        CPU: 2.825s
     CGroup: /system.slice/mariadb.service
             └─3603 /usr/sbin/mariadbd
```

2.2.4 Install PHP and Required Modules

Run this full command:

```
sudo apt install php8.1 libapache2-mod-php8.1 php8.1-mysql php8.1-gd php8.1-curl php8.1-xml php8.1-mbstring php8.1-zip php8.1-intl php8.1-bcmath php8.1-imagick -y
```

After Installation:

Verify PHP is working:

```
php -v
```

```
hamza@media-server:~$ php -v
PHP 8.1.2-1ubuntu2.22 (cli) (built: Jul 15 2025 12:11:22) (NTS)
Copyright (c) The PHP Group
Zend Engine v4.1.2, Copyright (c) Zend Technologies
    with Zend OPcache v8.1.2-1ubuntu2.22, Copyright (c), by Zend Technologies
hamza@media-server:~$
```

Restart Apache:

```
sudo systemctl restart apache2
```

Create a PHP test page:

```
echo "<?php phpinfo(); ?>" | sudo tee /var/www/html/info.php
```

```
hamza@media-server:~$ echo "<?php phpinfo();?>
" | sudo tee /var/www/html/info.php
<?php phpinfo();?>
```

Open in your browser:

```
http://<your-server-ip>/info.php
```

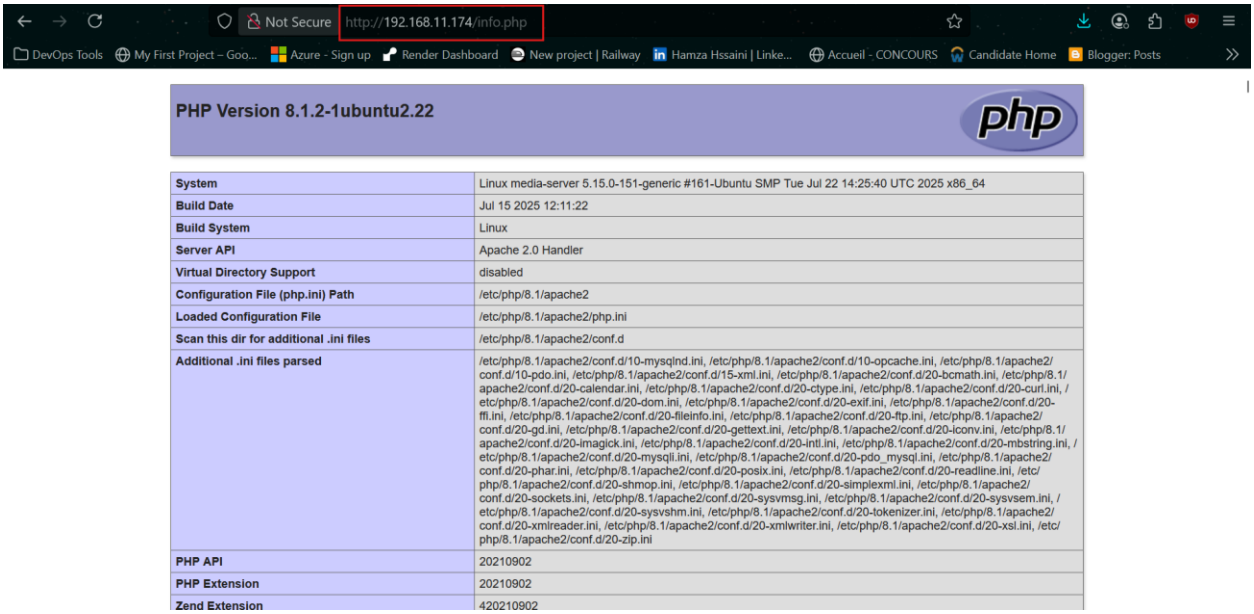


Figure 3: Browser showing PHP Info page

2.2.5 Install & Configure Nextcloud

2.2.5.1 Prerequisites Recap

You should already have:

- ✅ Apache installed
- ✅ MariaDB installed & secured
- ✅ PHP 8.1 and modules installed
- ✅ Apache working at: http://<your-vm-ip>
- ✅ SSH access from your Windows machine
- ✅ phpinfo() working (optional)

2.2.5.2 Create MySQL Database for Nextcloud

🔧 Commands:

```
sudo mysql -u root -p
```

(Enter your MariaDB root password)

Then run each SQL line:

```
CREATE DATABASE nextcloud;
```

```
CREATE USER 'hamza_user'@'localhost' IDENTIFIED BY 'Hamza@123321;';
```

```
GRANT ALL PRIVILEGES ON nextcloud.* TO 'hamza_user'@'localhost';
```

FLUSH PRIVILEGES;

EXIT;

```
hamza@media-server:~$ sudo mysql -u root -p
Enter password:
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 37
Server version: 10.6.22-MariaDB-0ubuntu0.22.04.1 Ubuntu 22.04

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> CREATE DATABASE nextcloud;
Query OK, 1 row affected (0.012 sec)

MariaDB [(none)]> CREATE USER 'hamza_user'@'localhost' IDENTIFIED BY 'Hamza@123321;'
    -> ;
Query OK, 0 rows affected (0.092 sec)

MariaDB [(none)]> GRENT ALL PRIVILEGES ON nextcloud.* TO 'hamza_user'@'localhost';
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to you
use near 'GRENT ALL PRIVILEGES ON nextcloud.* TO 'hamza_user'@'localhost'' at line 1
MariaDB [(none)]> GRANT ALL PRIVILEGES ON nextcloud.* TO 'hamza_user'@'localhost';
Query OK, 0 rows affected (0.026 sec)

MariaDB [(none)]> FLUSH PRIVILEGES;
Query OK, 0 rows affected (0.025 sec)

MariaDB [(none)]> EXIT;
```

Figure 4: Nextcloud MySQL Database and User Created

2.2.5.3 Download and Install Nextcloud

Commands:

cd /tmp

wget https://download.nextcloud.com/server/releases/latest.zip

sudo apt install unzip -y

unzip latest.zip

sudo mv nextcloud /var/www/html/

Set ownership and permissions:

sudo chown -R www-data:www-data /var/www/html/nextcloud

sudo chmod -R 755 /var/www/html/nextcloud

```
hamza@media-server:~$ cd /tmp
hamza@media-server:/tmp$ wget https://download.nextcloud.com/server/releases/latest.zip
--2025-07-31 13:00:24--  https://download.nextcloud.com/server/releases/latest.zip
Resolving download.nextcloud.com (download.nextcloud.com)... 5.9.202.145, 2a01:4f8:210:21c8::145
Connecting to download.nextcloud.com (download.nextcloud.com)|5.9.202.145|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 267161531 (255M) [application/zip]
Saving to: 'latest.zip'

latest.zip                53%[================>                ] 136.01M  6.71MB/s    eta 12s
```

```
hamza@media-server:/tmp$ sudo mv nextcloud/ /var/www/html/
hamza@media-server:/tmp$ sudo chown -R www-data:www-data /var/www/html/nextcloud/
hamza@media-server:/tmp$ sudo chmod -R 755 /var/www/html/nextcloud/
hamza@media-server:/tmp$
```

Figure 5: Nextcloud Downloaded and Moved to Web Root

2.2.5.4 Apache Configuration for Nextcloud:

Create a new Apache config file:

```
sudo nano /etc/apache2/sites-available/nextcloud.conf
```

Paste this config inside:

```
<VirtualHost *:80>
   ServerAdmin admin@local
   DocumentRoot /var/www/html/nextcloud/
   ServerName media.local

   <Directory /var/www/html/nextcloud/>
      Options +FollowSymlinks
      AllowOverride All
      Require all granted
   </Directory>

   ErrorLog ${APACHE_LOG_DIR}/nextcloud_error.log
   CustomLog ${APACHE_LOG_DIR}/nextcloud_access.log combined
</VirtualHost>
```

Save with CTRL+O, Enter, then CTRL+X.

Enable site & required modules:

sudo a2ensite nextcloud.conf

sudo a2enmod rewrite headers env dir mime

sudo systemctl reload apache2

```
hamza@media-server:/etc/apache2/sites-available$ sudo a2ensite nextcloud.conf
Enabling site nextcloud.
To activate the new configuration, you need to run:
  systemctl reload apache2
hamza@media-server:/etc/apache2/sites-available$ sudo a2enmod rewrite headers env dir mime
Enabling module rewrite.
Enabling module headers.
Module env already enabled
Module dir already enabled
Module mime already enabled
To activate the new configuration, you need to run:
  systemctl restart apache2
hamza@media-server:/etc/apache2/sites-available$ systemctl restart apache2
==== AUTHENTICATING FOR org.freedesktop.systemd1.manage-units ===
Authentication is required to restart 'apache2.service'.
Authenticating as: hamza
Password:
==== AUTHENTICATION COMPLETE ===
hamza@media-server:/etc/apache2/sites-available$
```

Figure 6:Apache Virtual Host Configured for Nextcloud

2.2.5.5 Access Nextcloud in Browser

Open in browser:

http://<your-server-ip>/nextcloud

You'll see the Nextcloud **setup page**:

- Create an **admin account**
- Fill database info:
    - DB user: hamza_user
    - DB pass: Hamza@123321;
    - DB name: nextcloud
    - Host: localhost

Click **Install**.

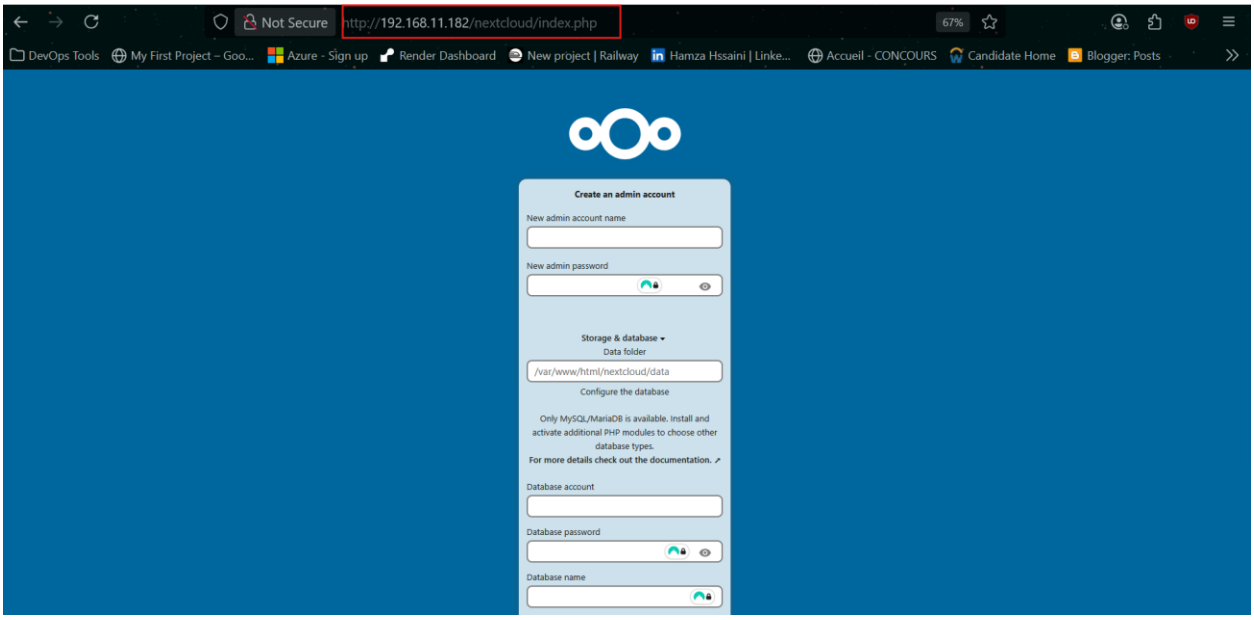


Figure 7: Nextcloud Web Installer

2.2.5.6 (Optional) Cleanup phpinfo page

Remove the test page:

```
sudo rm /var/www/html/info.php
```

2.3 Advanced Features

2.3.1 Enable HTTPS (Self-Signed Certificate) in Nextcloud

To secure Nextcloud on a local server, I generated a self-signed SSL certificate using OpenSSL and configured Apache to serve HTTPS traffic on port 443. Although browsers warn about self-signed certificates, this provides encryption for local testing and development environments.

2.3.1.1 Create SSL Certificate and Key

Run the following command to create a self-signed SSL certificate:

```
sudo openssl req -x509 -nodes -days 365 -newkey rsa:2048 \
-keyout /etc/ssl/private/nextcloud.key \
-out /etc/ssl/certs/nextcloud.crt
```

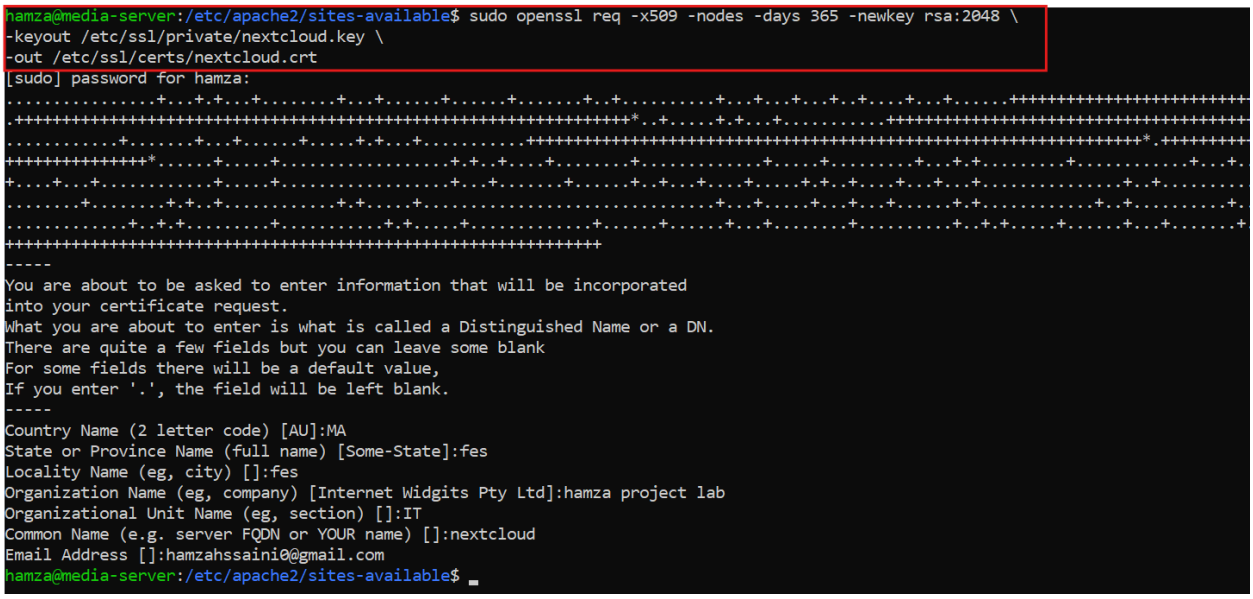


Figure 8:Generating Self-Signed SSL Certificate for Nextcloud

2.3.1.2 Create an SSL Virtual Host for Apache

Create a new file:

```
sudo nano /etc/apache2/sites-available/nextcloud-ssl.conf
```

Paste this configuration (adjust IP and paths if needed):

```
<VirtualHost *:443>
  ServerAdmin admin@localhost
  ServerName nextcloud
  DocumentRoot /var/www/html/nextcloud
  SSLEngine on
  SSLCertificateFile /etc/ssl/certs/nextcloud.crt
  SSLCertificateKeyFile /etc/ssl/private/nextcloud.key
  <Directory /var/www/html/nextcloud>
    Options +FollowSymlinks
    AllowOverride All
    Require all granted
  </Directory>
```

ErrorLog ${APACHE_LOG_DIR}/nextcloud_error.log

CustomLog ${APACHE_LOG_DIR}/nextcloud_access.log combined

</VirtualHost>

```
 GNU nano 6.2                                        /etc/apache2/sites-available/nextcloud-ssl.conf
<VirtualHost *:443>
    ServerAdmin admin@localhost
    ServerName nextcloud

    DocumentRoot /var/www/html/nextcloud

    SSLEngine on
    SSLCertificateFile /etc/ssl/certs/nextcloud.crt
    SSLCertificateKeyFile /etc/ssl/private/nextcloud.key

    <Directory /var/www/html/nextcloud>
        Options +FollowSymlinks
        AllowOverride All
        Require all granted
    </Directory>

    ErrorLog ${APACHE_LOG_DIR}/nextcloud_error.log
    CustomLog ${APACHE_LOG_DIR}/nextcloud_access.log combined
</VirtualHost>
```

Figure 9:Creating Apache SSL Virtual Host for Nextcloud

2.3.1.3 Enable SSL Module and Site

Enable Apache's SSL features and the new virtual host:

```
hamza@media-server:/etc/apache2/sites-available$ sudo a2enmod ssl
Considering dependency setenvif for ssl:
Module setenvif already enabled
Considering dependency mime for ssl:
Module mime already enabled
Considering dependency socache_shmcb for ssl:
Enabling module socache_shmcb.
Enabling module ssl.
See /usr/share/doc/apache2/README.Debian.gz on how to configure SSL and create self-signed certificat
es.
To activate the new configuration, you need to run:
  systemctl restart apache2
hamza@media-server:/etc/apache2/sites-available$ sudo a2ensite nextcloud-ssl.conf
Enabling site nextcloud-ssl.
To activate the new configuration, you need to run:
  systemctl reload apache2
hamza@media-server:/etc/apache2/sites-available$ sudo systemctl reload apache2
hamza@media-server:/etc/apache2/sites-available$
```

Figure 10:Enabling SSL Module and Virtual Host in Apache

2.3.1.4 Test HTTPS Access

Now go to your browser and open:

https://nextcloud

⚠️ You'll see a browser warning like "Connection Not Secure" → click **Advanced > Accept Risk** to continue.

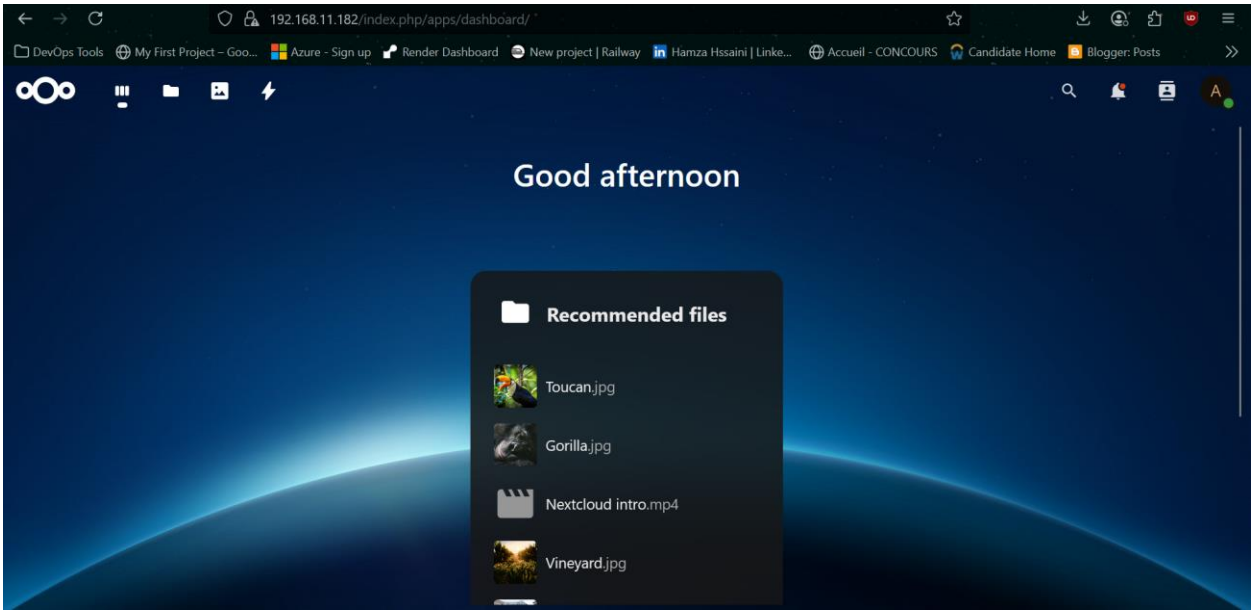


Figure 11:Nextcloud Dashboard Loaded via HTTPS

2.3.2 Connect External Storage in Nextcloud

To simulate enterprise setups, I added an external directory (/mnt/external-storage) to Nextcloud using the "External Storage Support" app. This allows users to access shared disks or mounted network folders. I granted permissions to the admin group and verified uploads were successful inside the external mount.

Simulate how real companies use Nextcloud to **integrate shared storage** like USB drives, NFS shares, or backup disks.

You'll mount a folder on your VM (like a second disk), and connect it to Nextcloud using the **"External Storage Support"** app.

2.3.2.1 Create a Directory for External Storage

In your Ubuntu VM:

```
sudo mkdir /mnt/external-storage
```

```
sudo chown -R www-data:www-data /mnt/external-storage
```

```
sudo chmod -R 770 /mnt/external-storage
```

This simulates a second drive mounted to your server.

```
hamza@media-server:/etc/apache2/sites-available$ sudo mkdir /mnt/external-storage
[sudo] password for hamza:
hamza@media-server:/etc/apache2/sites-available$ sudo chown -R www-data:www-data /mnt/external-storage
hamza@media-server:/etc/apache2/sites-available$ sudo chmod -R 770 /mnt/external-storage
hamza@media-server:/etc/apache2/sites-available$
```

Figure 12:Creating External Storage Directory in Ubuntu Server

2.3.2.2 Enable the "External Storage Support" App

1. Login to Nextcloud (as admin)
2. Go to: Apps (top right menu > "Apps")
3. Search for:

   External storage support

4. Click **Enable**

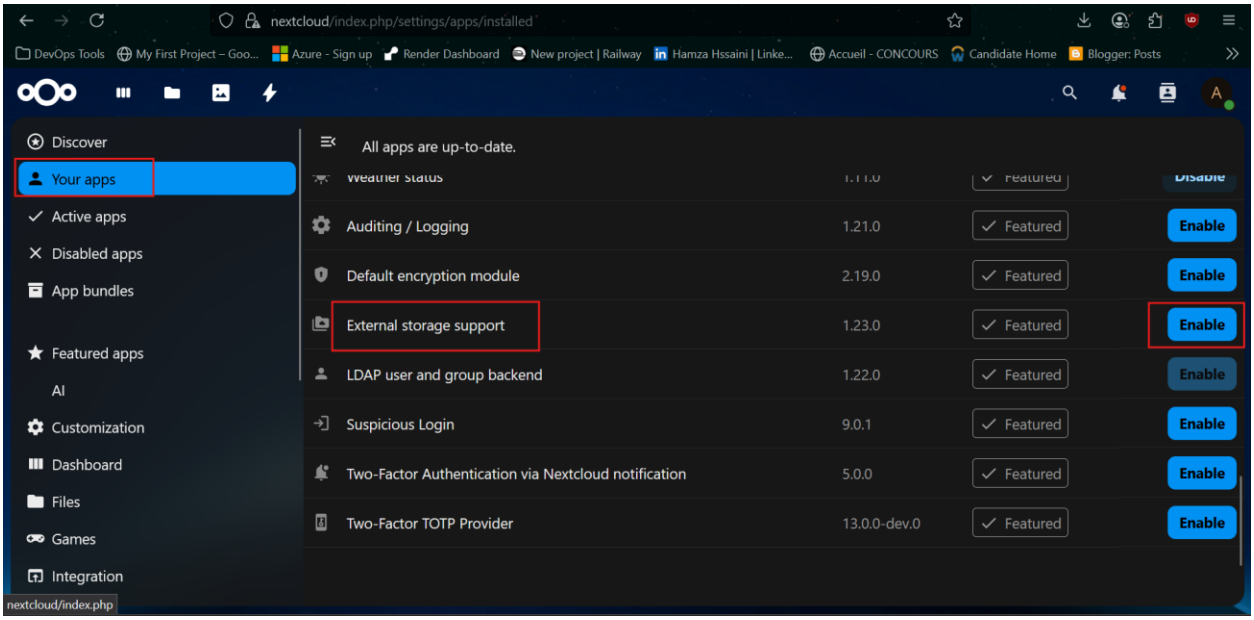


Figure 13: Enabling External Storage Support in Nextcloud

2.3.2.3 Add Local External Storage

1. Go to:
   Settings (bottom left) → Administration → External storages
2. Add a new external storage:

Option	Value
Folder name	ExternalDisk
External storage	Local
Configuration	/mnt/external-storage
Available for	admin or other users/groups

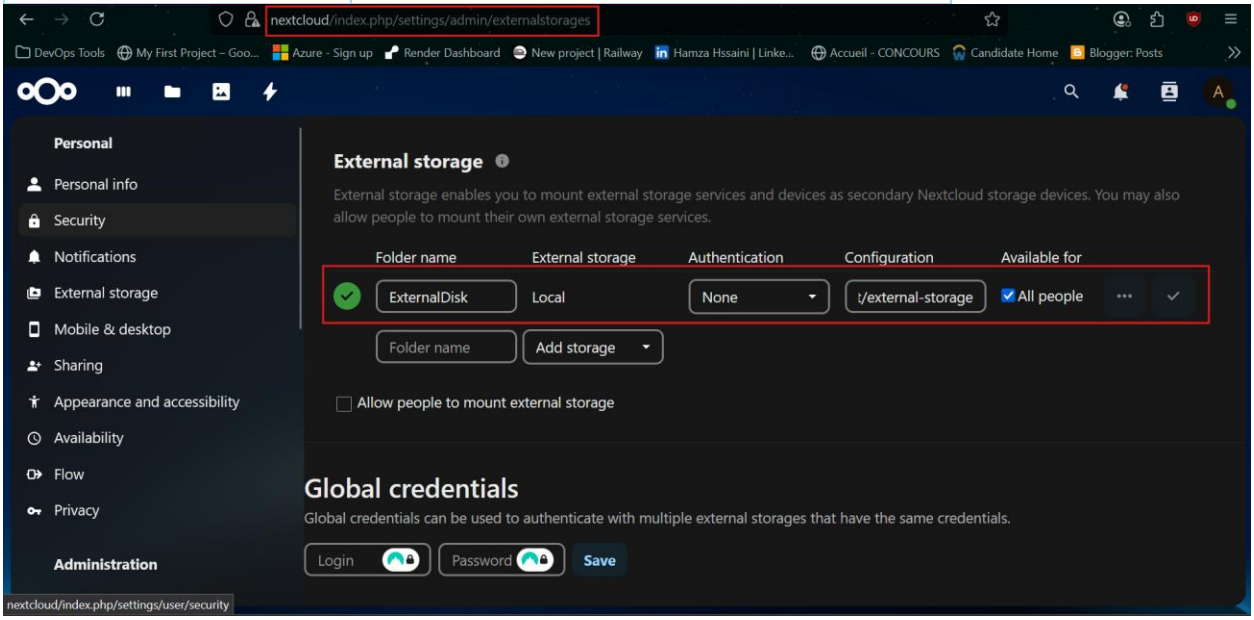


Figure 14: Configuring External Storage in Nextcloud

2.3.2.4 Test the Mount

1. Go to the **Files** section of your Nextcloud
2. You should see a new folder named ExternalDisk
3. Try uploading a small file into it

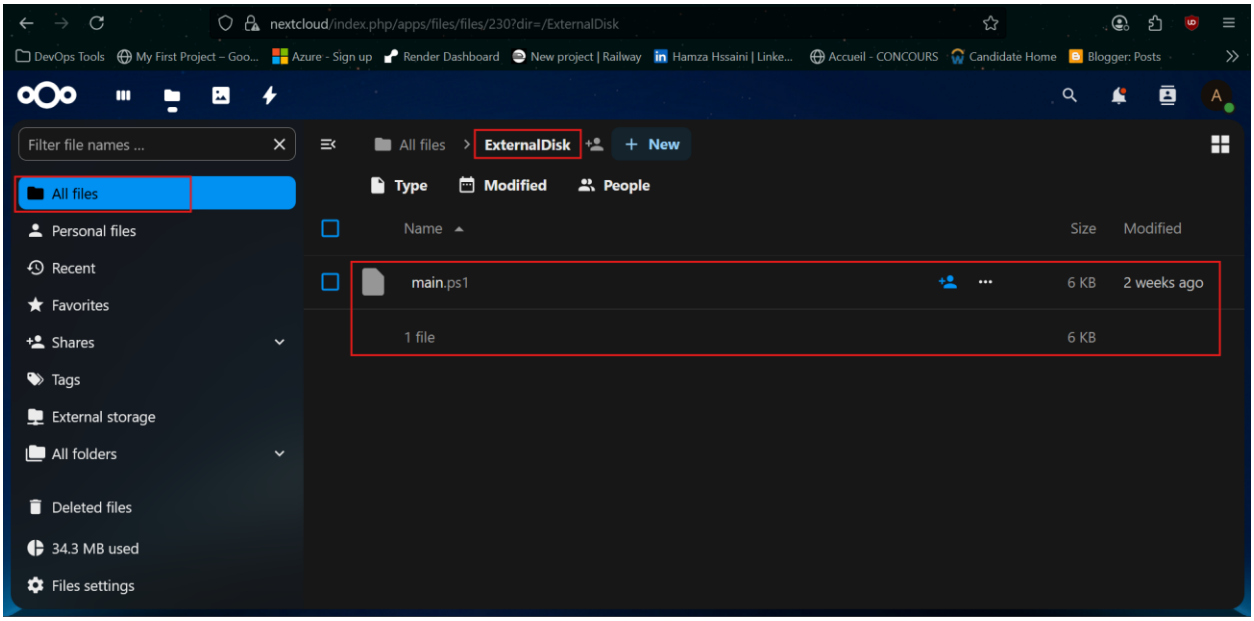
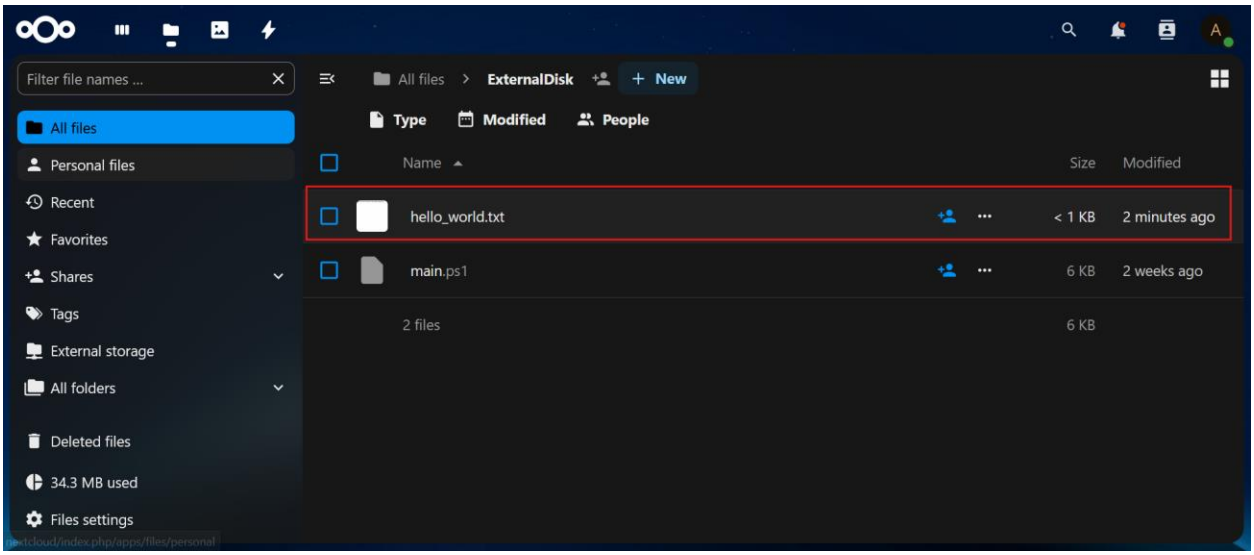


Figure 15: Uploading a File to External Storage

Create file inside external-storage folder from the server:

```
root@media-server:/mnt/external-storage# nano hello_world.txt
root@media-server:/mnt/external-storage#
```

Verification from the page nextcloud:



2.3.3 Create Multiple Users and Sharing Rules

To simulate a real-world business scenario, we implement user and group management in Nextcloud. This includes:

- Creating multiple users
- Grouping users by department or role
- Configuring sharing rules and permission levels
  This demonstrates that you can manage user access like an IT administrator in an enterprise.

2.3.3.1 Create Multiple Users

1. Log in to Nextcloud as the **admin** user.
2. Go to the **top-right menu > accounts**.
3. Click **"+ New account"** and fill out:
   - Username: employee1, employee2, etc.
   - Password: (Choose something simple for demo purposes)
   - Group: Type a group name like IT (it will auto-create it if it doesn't exist)
   - Set quota: e.g., 1 GB
4. Click **"Add new account"**.

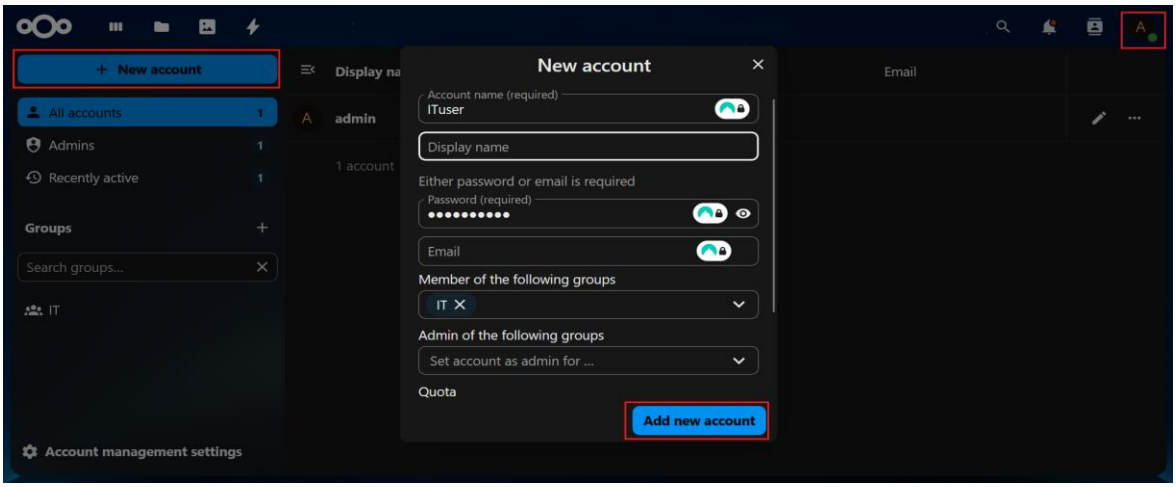


Figure 16: Admin creating users

➞ Repeat for multiple users (e.g., ituser, hruser, manager1).

2.3.3.2 Organize Users into Groups

💡 **Why Groups?**

In companies, resources are often shared based on departments or roles. Groups make it easier to control access.

1. For each user, assign them to a group:
    - IT users → IT
    - HR users → HR
    - Managers → Managers

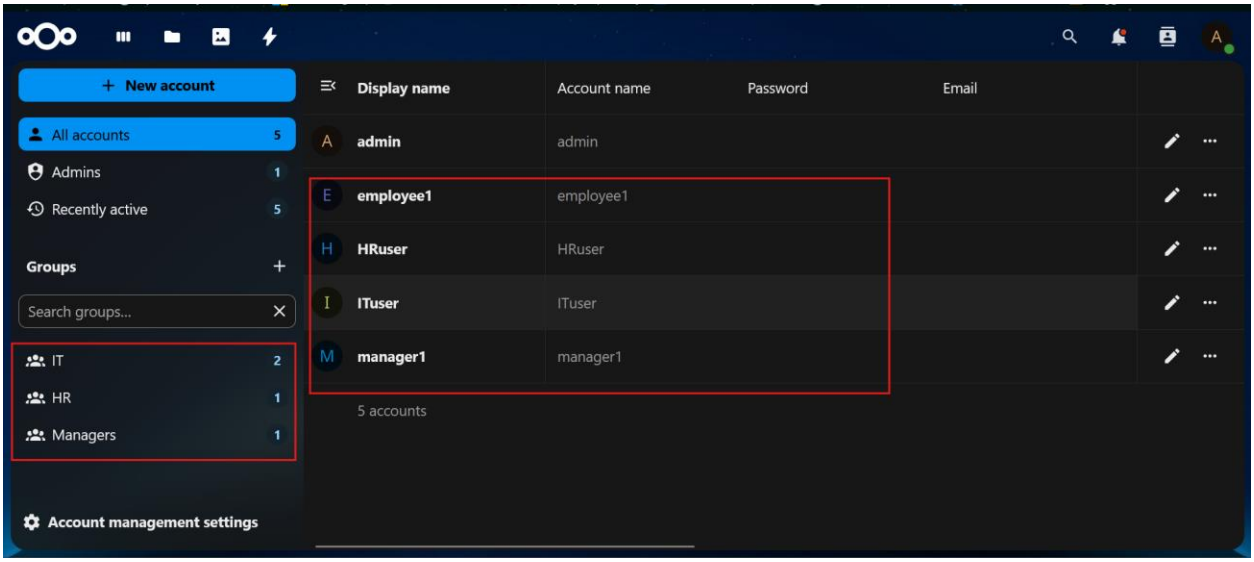


Figure 17: Group assignment

2.3.3.3 Test File Sharing Rules

- Login as employee1 (IT group)
    - Go to **Files**.
    - Click **"+" → New Folder**.
    - Name it: Team Files.
- Share the Folder with a Group
    - Click the **share icon** (right side of the folder).
    - Type **IT** and select the group.
    - Choose permission level:

- ✅ Allow editing
- ❌ Deny resharing (optional)
- ❌ Deny Deleting

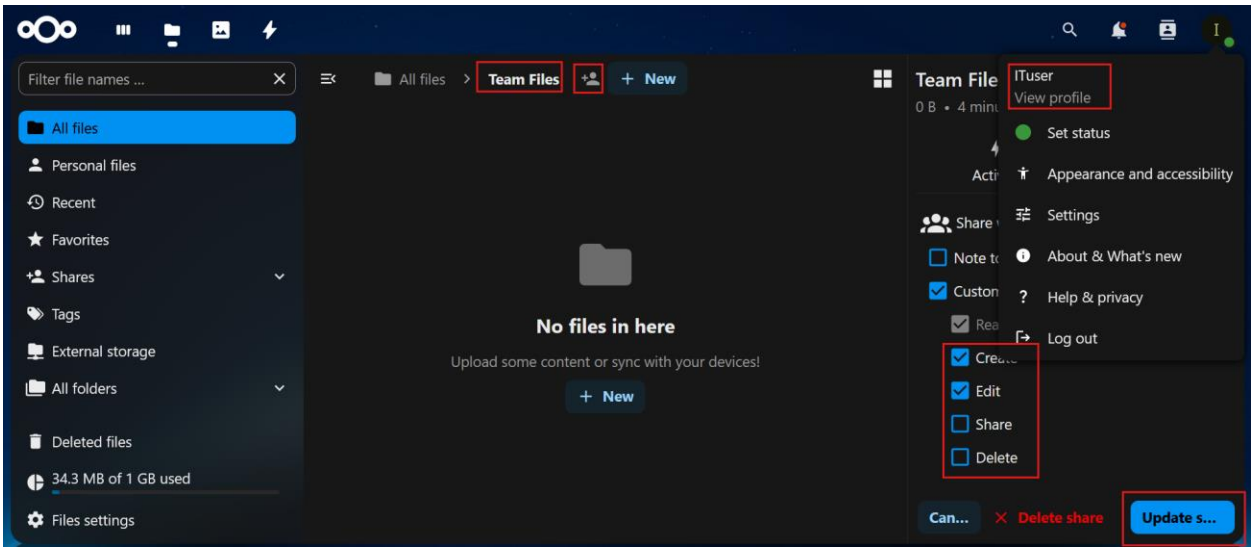


Figure 18: sharing interface with permissions

2.3.3.3 Login as Another IT User (employee1)

- Go to **Files**.
- You should see the Team Files folder shared by ITuser.
- Try uploading, editing, or reading a file based on permissions set.

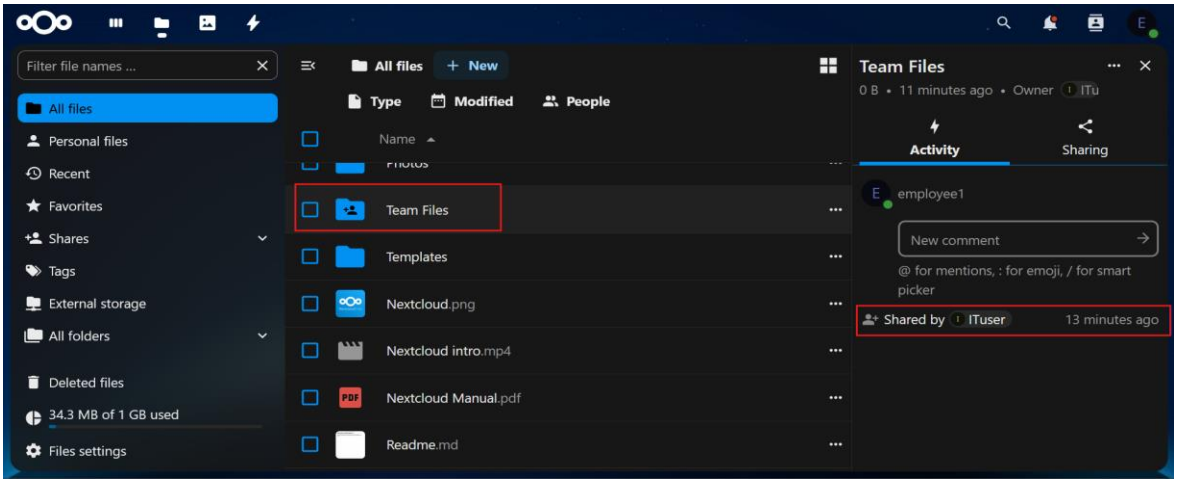


Figure 19: shared folder appearing in employe11's account

2.3.3.4 Login as HRuser (Not in IT group)

- Confirm that the Team Files folder is **not visible** to unauthorized users.

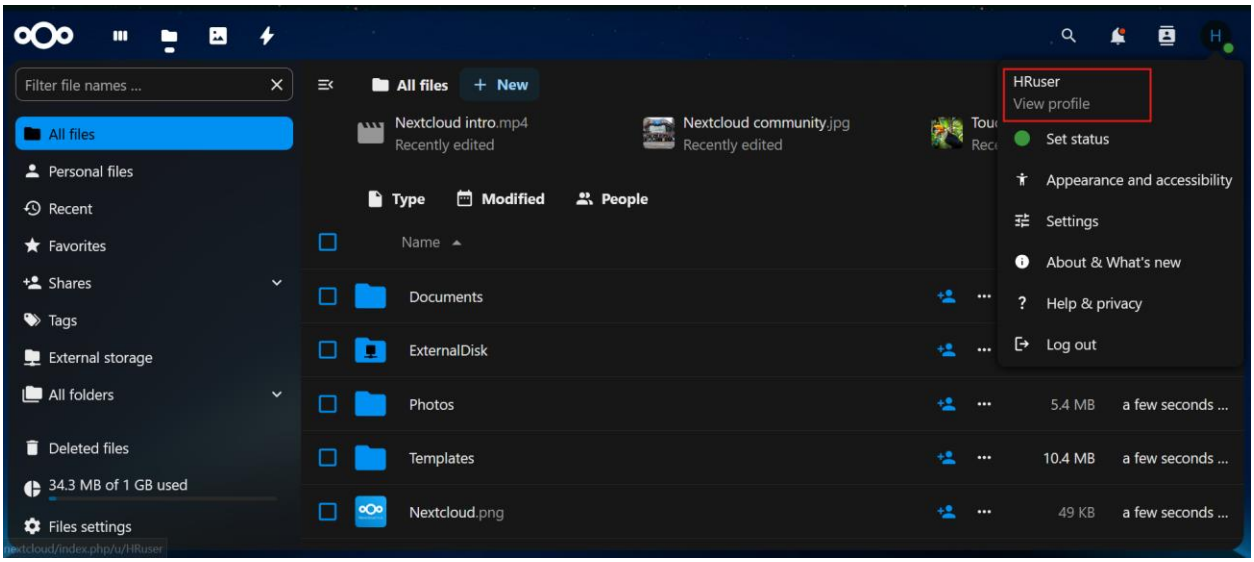


Figure 20: HRuser cannot see the folder

2.3.3.5 Summary: What This Feature Demonstrates

Element	**Description**
User Management	Ability to create and manage multiple users
Group Assignment	Organize users by departments (IT, HR, etc.)
Permission Control	Fine-grained control of who can see, edit, or share folders
Access Testing	Proved isolation and access per group, like in enterprise environments

2.3.4 Set Up Scheduled Backups for Nextcloud

Ensure that your Nextcloud data and database are backed up **automatically** and **securely** using **cron jobs**. This simulates real-world IT operations where daily backups are critical.

❖ 📁 What to Back Up?

You need to back up **two components**:

1. **Nextcloud data folder**
    - Usually located at /var/www/html/nextcloud/data/
    - Contains all user-uploaded files
2. **Nextcloud database** (MariaDB/MySQL)
    - Contains all configurations, user info, shares, etc.

❖ 🧰 Tools Used

- cron: To schedule automatic jobs
- tar: To compress folders into archive files
- mysqldump: To export the database
- Optional: rsync or external disk for off-server storage

2.3.4.1 Create a Backup Script

Create a script that backs up both the data and database.

sudo nano /opt/nextcloud-backup.sh

Write the following content:

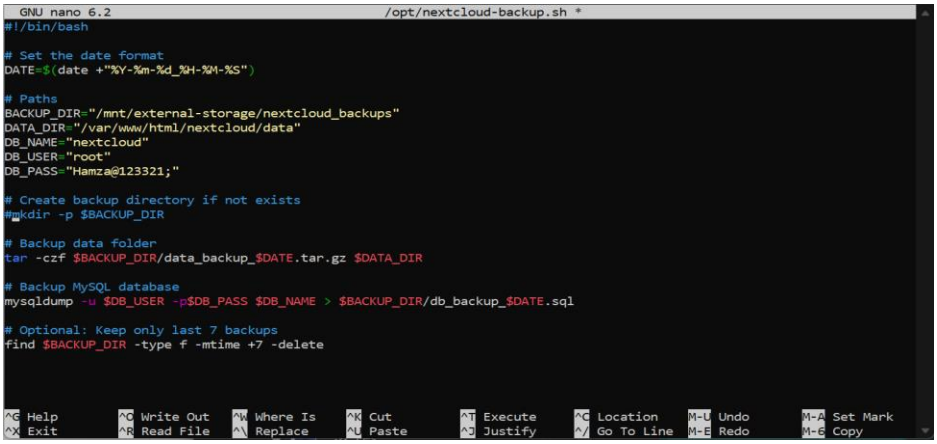


Figure 21:the script file in Nano editor and the backup folder structure

Then make it executable:

sudo chmod +x /opt/nextcloud-backup.sh

2.3.4.2 Test the Script Manually

Run the backup script:

sudo /opt/nextcloud-backup.sh

Check your /mnt/external-storage/nextcloud_backups/ folder for .tar.gz and .sql files.

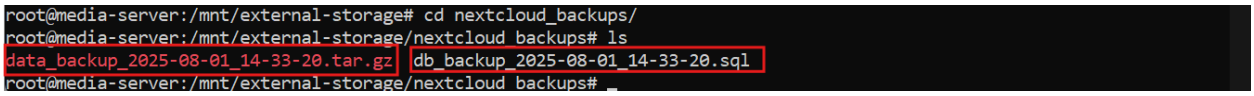


Figure 22: list of generated backup files with timestamps

2.3.4.3 Schedule the Backup with Cron

To automate the backup process, I used a **cron job** to schedule the script to run daily or weekly.

🔧 **Test Schedule:**

First, I scheduled the script to run at 4:00 PM to verify it worked:

sudo crontab -e

Added:

0 16 * * * /opt/nextcloud-backup.sh

✅ This means: run the script every day at 4:00 PM.

After confirming success, I updated the schedule to run **every Monday at 8:00 AM**, which is a more realistic production setting:

0 8 * * 1 /opt/nextcloud-backup.sh

📌 This simulates weekly scheduled backups as done in real companies.

2.3.4.4 Add Email Notifications via Gmail SMTP

To demonstrate real enterprise monitoring practices, I configured the server to send **email alerts** after each backup:

🔐 *Why Use Gmail SMTP?*

Since my server is connected to the internet via a **bridged network adapter**, I used Gmail's SMTP service to reliably send outgoing emails, avoiding ISP blocks on port 25.

🛠️ *Setup Summary:*

- **Installed SMTP client:**

  sudo apt install msmtp msmtp-mta -y

- **Created Gmail App Password** (for enhanced security)
- **Configured msmtp** via /etc/msmtprc:

```
 GNU nano 6.2                                    /etc/msmtprc *
defaults
auth           on
tls            on
tls_trust_file /etc/ssl/certs/ca-certificates.crt
#logfile /home/hamza/msmtp.log

account        gmail
host           smtp.gmail.com
port           587
from           hamzahssaini0@gmail.com
user           hamzahssaini0@gmail.com
password       fmai hmtp gwso npan

account default : gmail
```

- **Modified the backup script**

  to send email on success or failure:

```
&& echo "☑ Backup successful at $DATE" |sudo msmtp $EMAIL \
|| echo "❌ Backup FAILED at $DATE" |sudo msmtp $EMAIL
```

📩 This allowed me to **receive real-time backup alerts**, just like a production monitoring system.

- ☑ **Result:**
  - The backup runs every Monday at 8:00 AM.
  - Both the data folder and database are backed up.
  - Emails are sent automatically to notify about success or failure.
  - I also used an external mount point (/mnt/external-storage/) to store the backups, simulating real infrastructure.

2.3.4.5 Verification Email backup success From my Phone:

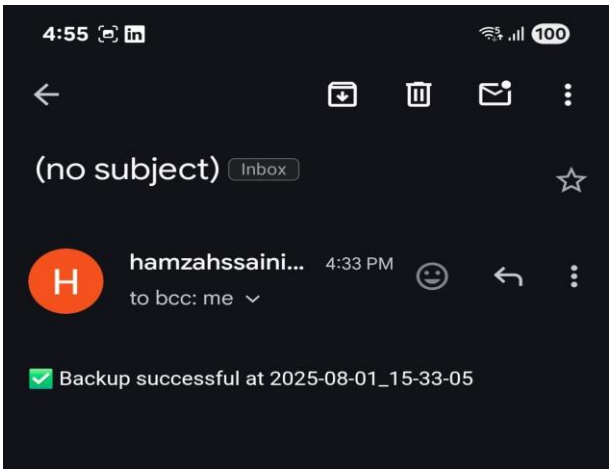


Figure 23: Verification Email backup success From my Phone

2.3.4.6 Report About Protocol SMTP :

To notify me of backup success or failure, I configured email alerts using Gmail SMTP over a secure connection (smtp.gmail.com, port 587 with STARTTLS).

I used Gmail **App Passwords** for authentication and ensured the messages contained **no sensitive content**, only success/failure status.

All communication between my server and Gmail was **encrypted with TLS**, making it safe even over public internet.

In production, more advanced options like **SMTP with GPG-encrypted payloads** or **centralized monitoring/alerting platforms** (e.g., Prometheus + Alertmanager) could be considered.

2.3.5 Enable Monitoring & Logging for Nextcloud

To simulate enterprise-level system monitoring, I integrated various tools to monitor the health, usage, and performance of the Nextcloud environment.

2.3.5.1 System Monitoring with Netdata

I installed Netdata, with these commands if you want to learn more visit this link:

https://learn.netdata.cloud/docs/netdata-agent/installation/linux

wget -O /tmp/netdata-kickstart.sh https://get.netdata.cloud/

kickstart.sh && sh /tmp/netdata-kickstart.sh

A real-time system monitoring tool that provides a full web dashboard for:

- **CPU, memory, disk usage**
- **Apache activity**
- **Network traffic**
- **Database queries**
- **Live performance alerts**

I accessed Netdata at http://192.168.11.182:19999 and confirmed it collected over **3,800 live metrics** from my local server.

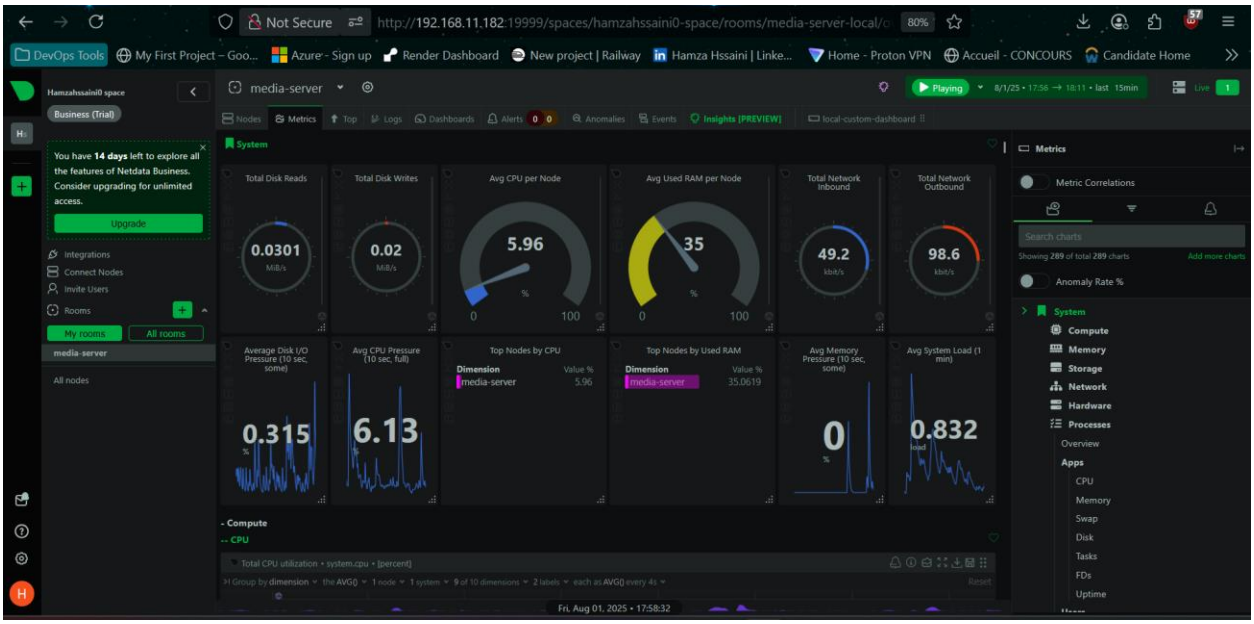


Figure 24 : Netdata Dashboard

2.3.5.1 Log Monitoring

In addition to Netdata, I configured and monitored:

- **Apache Logs** for HTTP and SSL issues

  sudo tail -f /var/log/apache2/error.log

  sudo tail -f /var/log/apache2/nextcloud_error.log

- **Nextcloud Logs** for login failures, file sync errors, etc.

  sudo tail -f /var/www/html/nextcloud/data/nextcloud.log

- System Monitoring with htop

  sudo apt install htop -y

  htop

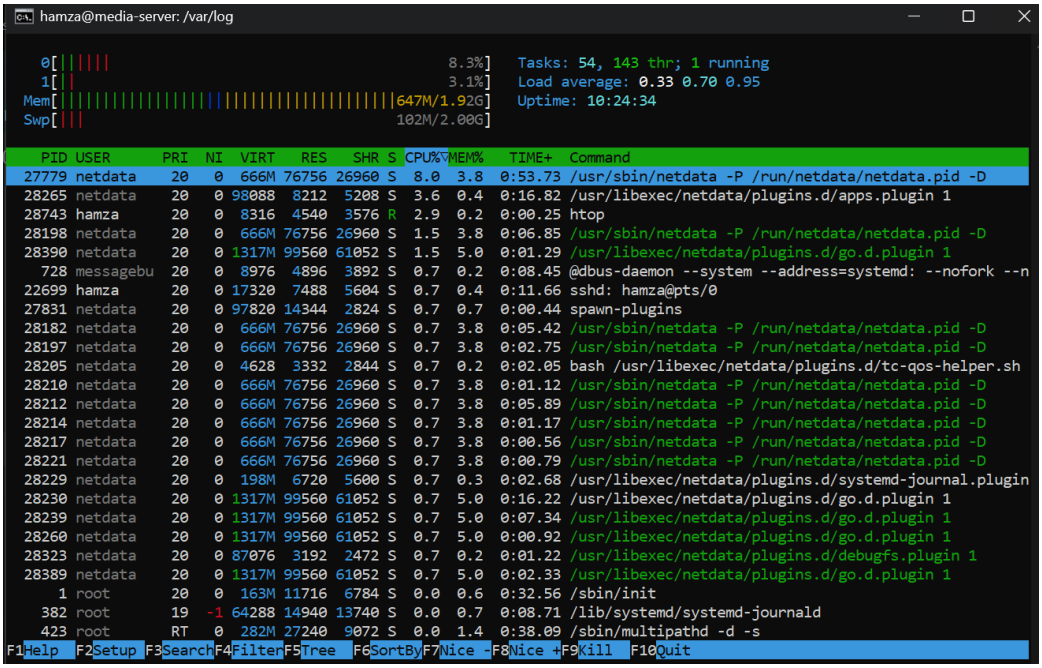


Figure 25: htop dashboard

These tools combined gave me **both system-level** and **application-level** insights into my Nextcloud server.

2.3.6 Real-Time Document Editing with OnlyOffice or Collabora

To enable real-time editing and collaboration of office documents (Word, Excel, PowerPoint) directly inside the Nextcloud interface using **OnlyOffice** or **Collabora Online**.

This feature simulates how modern companies work with online documents—collaborating instantly, without using Google Drive or Microsoft 365, while keeping all files securely stored in their private cloud.

- **What Is OnlyOffice / Collabora?**

  OnlyOffice and **Collabora** are powerful, open-source document editing suites that integrate directly with Nextcloud. They allow multiple users to:

  - 📝 Create and edit .docx, .xlsx, and .pptx files in the browser
  - 👥 Collaborate in **real-time** with other team members
  - 🔐 Keep sensitive files stored **locally**, not on external cloud services

- **Why Is This Important?**

  In professional environments, companies need:

  - Full **control** over document storage and access
  - The ability for teams to **work together on documents** live
  - A secure alternative to Google Docs or Office 365 that supports **enterprise compliance (like GDPR)**

  Integrating OnlyOffice or Collabora into Nextcloud turns your cloud into a **complete private collaboration platform** — perfect for enterprise and education use.

- **What I Will Implement?**

  For this project, I will:

  - Deploy **OnlyOffice Document Server** using Docker
  - Integrate it with my existing Nextcloud instance
  - Test editing .docx and .xlsx files in real time from multiple user accounts
  - Capture screenshots and logs to demonstrate the setup and usage

Result

After completing this feature, users of my Nextcloud project will be able to:

- Open Word or Excel files from Nextcloud
- Edit them live in their browser
- Collaborate with other users instantly
- Do all this without sending the files to Google, Microsoft, or any external service

2.3.6.1 Install and Run ONLYOFFICE Document Server

1. Pull the ONLYOFFICE Docker image:

   ```
   docker pull onlyoffice/documentserver
   ```

2. Create directory for SSL certificates:

   ```
   sudo mkdir -p /etc/onlyoffice /certs
   ```

3. Generate self-signed SSL certificates:

   ```
   openssl req -x509 -nodes -days 365 -newkey rsa:2048 \
    -keyout /etc/onlyoffice/certs/tls.key \
    -out /etc/onlyoffice/certs/tls.crt \
    -subj "/C=MA/ST=FES/L=FES/O=Student/CN=192.168.11.182"
   ```

4. Run ONLYOFFICE Document Server container with certificates:

   ```
   docker run -d -p 8082:80 -p 8443:443 \
    --name onlyoffice-document-server \
    -e JWT_ENABLED=true \
    -e JWT_SECRET=secret \
    -e SSL_ENABLED=true \
    -v /etc/onlyoffice/certs:/var/www/onlyoffice/Data/certs:ro \
    onlyoffice/documentserver
   ```

Replace the CN value with your server IP or domain name.

```
root@media-server:/etc/onlyoffice/certs# docker run -d -p 8082:80 -p 8443:443 \
  --name onlyoffice-document-server \
  -e JWT_ENABLED=true \
  -e JWT_SECRET=secret \
  -e SSL_ENABLED=true \
  -v /etc/onlyoffice/certs:/var/www/onlyoffice/Data/certs:ro \
  onlyoffice/documentserver
07485b6442bc018c9de2e1a7a4a0a7ee3a05932a7417aad564583ad9d0df8c37
```

Figure 26: docker run command and running container

2.3.6.2 Verify ONLYOFFICE Document Server Is Running

- ✓ Check exposed ports:

docker port onlyoffice-document-server

```
root@media-server:/etc/onlyoffice/certs# docker port onlyoffice-document-server
80/tcp -> 0.0.0.0:8082
80/tcp -> [::]:8082
443/tcp -> 0.0.0.0:8443
443/tcp -> [::]:8443
```

- ✓ Run health check inside the container:

docker exec -it onlyoffice-document-server curl -k https://localhost:8443/healthcheck

Expected output:

{"status":"ok"} OR nothing (This mean no errors)

```
root@media-server:/etc/onlyoffice/certs# docker exec -it onlyoffice-document-server curl -k https://192.168.11.182:8443/healthcheck
trueroot@media-server:/etc/onlyoffice/certs#
```

2.3.6.3 Configure Nextcloud to Use ONLYOFFICE

- Install and enable ONLYOFFICE app in Nextcloud if not done
- Open Nextcloud Admin Settings → ONLYOFFICE
- Fill in the following settings:

Setting	Value
Document Editing Service address	https://192.168.11.182:8443
ONLYOFFICE Docs internal requests	https://192.168.11.182:8443
Server address for internal requests	http://192.168.11.182
JWT Secret	Secret

Replace IP with your actual server IP.

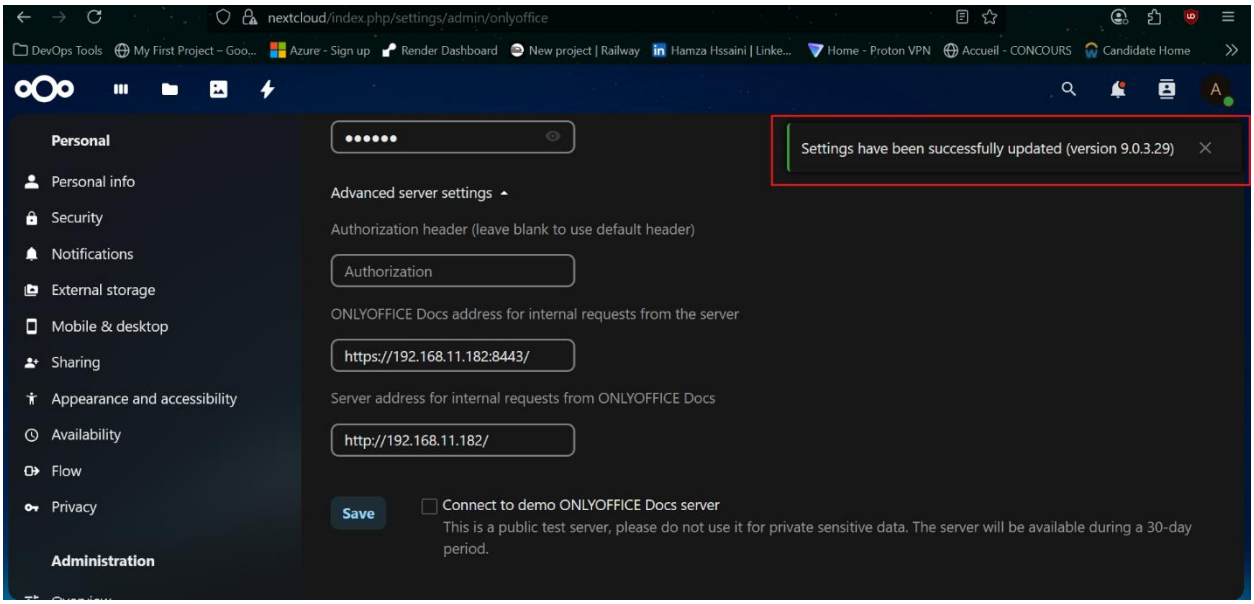


Figure 27: Nextcloud ONLYOFFICE app settings filled Success

- Add trusted domain in Nextcloud CLI (run on Nextcloud server):

  sudo -u www-data php /var/www/html/nextcloud/occ config:system:set trusted_domains 3 --value=192.168.11.182

```
root@media-server:/etc/onlyoffice/certs# sudo -u www-data php /var/www/html/nextcloud/occ config:system:set trusted_domains 3 --value=192.168.11.182
System config value trusted_domains => 3 set to string 192.168.11.182
```

2.3.6.4 Test Document Editing

- Upload a Word or Excel document to Nextcloud
- Open the file — it should load in ONLYOFFICE editor in the browser
- Test editing with multiple logged-in users simultaneously for live collaboration

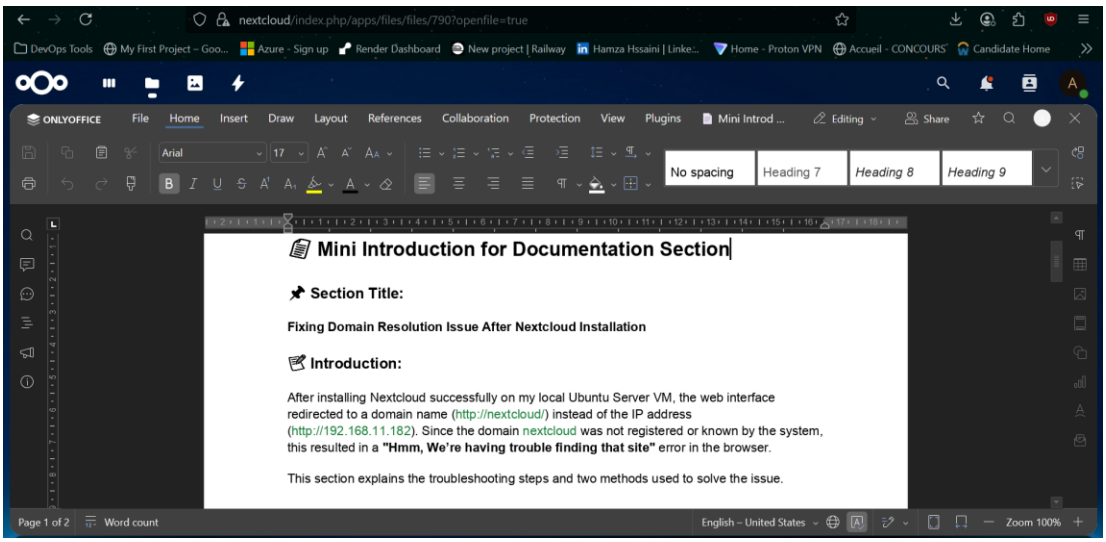


Figure 28: NLYOFFICE document editor with active collaborative editing

Chapter 3: Troubleshooting Notes

Note1: Solving Post-Installation Access Issues in Nextcloud

After successfully installing Nextcloud on my local Ubuntu Server virtual machine, I encountered several **common but critical access-related issues** that are often faced by system administrators in real-world deployments. These problems prevented proper access to the web interface and needed to be resolved for a stable, user-friendly environment.

This section documents the **three main problems** encountered, explains their root causes, and shows how each was resolved. This serves as a guide for other users who install Nextcloud in similar local environments and want to avoid or fix these issues efficiently.

1.1 Overview of the 3 Problems and Their Fixes

1.1.1 Incorrect Domain Redirection

- **Problem:**
  After installation, the browser redirected to http://nextcloud/ which failed to load because nextcloud wasn't a recognized hostname.
- **Fix:**
  - Changed Apache's ServerName to the VM's IP in /etc/apache2/sites-available/nextcloud.conf
  - Added a custom entry in the Windows hosts file to resolve nextcloud to the VM's IP

  - Restarted Apache systemctl status apache2

1.1.2 Apache Showing Default Page Instead of Nextcloud

- **Problem:**
  When visiting http://nextcloud/, the browser showed Apache's default Ubuntu welcome page instead of the Nextcloud dashboard.
- **Fix:**
  - Disabled Apache's default site using a2dissite 000-default.conf

- Ensured nextcloud.conf was enabled with a2ensite nextcloud.conf
- Reloaded Apache to apply the changes systemctl status apache2

1.1.3 Access Through Untrusted Domain

↳ **Problem:**

Nextcloud displayed the error: “Access through untrusted domain” when accessed via http://nextcloud/.

↳ **Fix:**

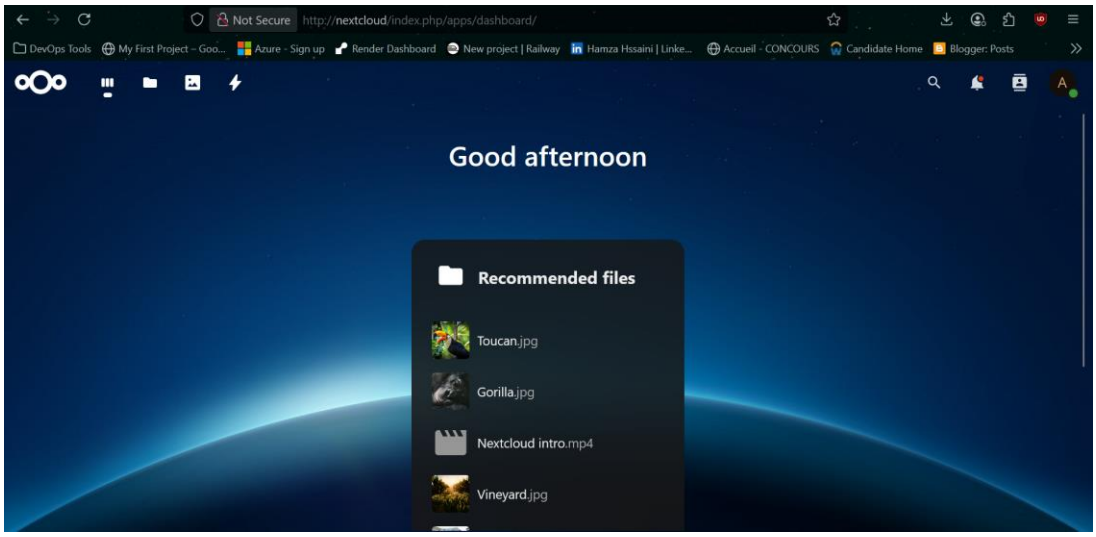
- Edited Nextcloud’s configuration file at /var/www/html/nextcloud/config/config.php
- Added nextcloud to the trusted_domains array

```
array (
  0 => '192.168.11.182',
  1 => 'nextcloud',
),
```

- Restarted Apache systemctl status apache2

↳ ✅ **Result:**

After applying these fixes, Nextcloud became fully accessible via both the IP address and the nextcloud hostname from my host machine. These steps ensured a smoother end-user experience and demonstrate key system administration skills such as virtual host management, domain resolution, and secure web service configuration.



Note2 : msmtp: cannot log to ...: cannot open: Permission denied

Problem:

msmtp: cannot log to ...: cannot open: Permission denied

Solution:

"During testing, I encountered permission issues with msmtp log file access under different runtime environments (cron/root/user). Since email delivery was successful and verified, I disabled logging for simplicity in my student setup. In production, I would either configure AppArmor to allow secure logging or use systemd journal for email tracking."

Note3 : ONLYOFFICE Document Server must be accessible via HTTPS

- ✅ **ONLYOFFICE Document Server must be accessible via HTTPS**, not HTTP, to connect to Nextcloud.

  If not, you'll see the error:
  ```
  Error when trying to connect (Mixed Active Content is not allowed.
  HTTPS address for ONLYOFFICE Docs is required.)
  ```

- 🔐 If you encounter SSL errors, confirm that certificates are correctly mounted in the container and the CN matches your server IP.

- 🌐 Ports **8082 (HTTP)** and **8443 (HTTPS)** must be open and accessible from your Nextcloud server and clients.

- ⚠️ To temporarily disable SSL verification (not recommended for production), run inside ONLYOFFICE container:

  ```
  docker exec onlyoffice-document-server bash -c \

  "echo -e '[ssl]\nverify-peer = false\nverify-host = false' >
  /etc/onlyoffice/documentserver/default.json"

  docker restart onlyoffice-document-server
  ```

Conclusion

This project simulates a full-featured private cloud media server environment using VirtualBox and open-source tools. It demonstrates cloud administration tasks including service deployment, HTTPS security, backup automation, monitoring, and user access control.

The project reflects real-world scenarios and challenges faced by system administrators and DevOps engineers. It strengthened skills in Ubuntu server administration, network configuration, security practices, and automation

Skills Demonstrated

Skill	Technology Used
Virtualization	VirtualBox
Server OS	Ubuntu 22.04
Web Hosting	Apache
DB Management	MariaDB
Cloud Storage	Nextcloud
Monitoring	Netdata, htop
Security	HTTPS, SMTP
Automation	Bash, Cron
Collaboration	OnlyOffice with Docker
Troubleshooting	Apache, DNS, SSL

LinkedIn