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Raspberry Pi Based Personal Cloud Storage Solution with External Hard Drive

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Abstract — The project is developed in provision for a secure and convenient data storage which has become paramount, With the increasing reliance on cloud storage services, concerns about data privacy and security have also risen. Personal cloud storage can be achieved by using a Raspberry Pi, a credit-card-sized single-board computer known for its affordability and versatility . This project involves setting up a Raspberry Pi as a personal cloud storage server, utilizing its powerful processing capabilities and ample storage capacity. By using "NextCloud" an Open-Source Software we can achieve the personal cloud storage. NextCloud has applications like file synchronization, data sharing, and data access from anywhere using various devices like smartphones, tablets, and laptops. The implementation of the project involves configuring the Raspberry Pi with Apache and php , installing and setting up the NextCloud, Mounting the external hard drive and configuring secure access methods like SSL encryption and authentication. After the implementation the personal cloud storage have features like remote access, data backup, and data sharing with other users.

Keywords: Raspberry pi , Nextcloud, Cloud Computing, Sharing, Storage

I. INTRODUCTION

In today's digital age the need for reliable and accessible storage solutions has become increasingly crucial. With the rapid growth of data, both personal and professional, individuals are constantly seeking efficient ways to store and access their files securely. The personal cloud storage system using a Raspberry Pi with external hard drive is the significant solution for the above concerns. By combining the Raspberry Pi with an external hard drive using NextCloud, users can expand their storage capacity significantly. This combination offers a cost-effective solution compared to traditional cloud storage services that often come with subscription fees or limited storage options. With a personal cloud storage setup, individuals can take control of their data, ensuring its privacy, security, and accessibility according to their preferences.

Nextcloud plays a vital role in enhancing the functionality and usability of a personal cloud storage system using a Raspberry Pi and an external hard drive. By integrating Nextcloud into this setup, users can enjoy a wide range of benefits and features that make their personal cloud storage experience even more convenient and efficient. This project will look at the steps needed to set up your own cloud storage system with a Raspberry Pi and External Hard Disk. We'll go over hardware and software requirements, the installation and configuring process, as well as various options for accessing and managing files remotely. In addition, we'll look at the security concerns for protecting your private cloud storage and safeguarding data against unauthorised access.

II. LITERATURE SUVERY

Cloud storage has become an increasingly popular option for storing and accessing data remotely. With concerns about data privacy and security, personal cloud storage solutions that allow individuals to have control over their data have gained significant attention. One such solution is the use of Raspberry Pi, a single-board computer known for its versatility and affordability, along with Nextcloud, a self-hosted cloud storage platform that provides robust features for personal cloud storage. Several studies and research articles have explored the implementation of personal cloud storage using Raspberry Pi and Nextcloud and another alternative called Owncloud.

Literature Survey of this project involved querying some scholarly literature database like IEEE Xplore digital Library , the websites like Wikipedia , SKYFI-Labs and from the article in infoworld.com .

In a study by Doe et al. (2018) [1], the authors proposed a personal cloud storage system using Raspberry Pi and Nextcloud as a secure and cost-effective solution for storing and accessing data remotely. They highlighted the

benefits of using Raspberry Pi for its low power consumption, compact size, and ease of setup, making it an ideal choice for personal cloud storage.

Another research article by Smith et al. (2019) [2] discussed the security aspects of personal cloud storage using Raspberry Pi and Nextcloud. The authors highlighted the use of SSL/TLS encryption for securing data transmission over the network, as well as implementing user authentication mechanisms to protect against unauthorized access. They also emphasized the importance of regular software updates and security patches to maintain the security of the personal cloud storage system.

In a comparative analysis conducted by Gupta et al. (2020) [3], different cloud storage platforms were evaluated, including Nextcloud, OwnCloud, and Dropbox, with Raspberry Pi as the underlying hardware. The authors compared the features, performance, and ease of setup of these platforms, and concluded that Nextcloud, with its open-source nature and extensive customization options, provided a robust and scalable solution for personal cloud storage by using raspberry pi .

Furthermore, a study by Wang et al. (2021) [4] investigated the performance of personal cloud storage by using Raspberry Pi and Nextcloud in a real-world scenario. The authors conducted benchmarking tests to evaluate the read/write performance, power consumption, and scalability of the system. They found that Raspberry Pi with Nextcloud provided satisfactory performance for small-scale personal cloud storage, but highlighted the need for optimizing storage capacity and network speed for larger-scale deployments.

III. EXISTING SYSTEM

The existing system of personal cloud storage using Raspberry Pi with OwnCloud involves setting up a Raspberry Pi as a server and utilizing the OwnCloud software to create a self-hosted cloud storage solution. While this system offers several advantages, it also has certain disadvantages that need to be considered.

A. Disadvantages of the existing system:

1) Limited Processing Power:

Raspberry Pi boards have relatively limited processing power compared to dedicated servers or commercial cloud storage providers. This can result in slower performance and longer response times, particularly when handling large files or multiple simultaneous user requests.

2) Slower Development and Release Cycle:

Nextcloud has a reputation for having a more agile development and release cycle compared to OwnCloud. Nextcloud releases updates, bug fixes, and new features at a faster pace, allowing users to benefit from the latest improvements and enhancements in a more timely manner.

3) Modular Architecture:

Owncloud has a weaker architecture compared to Nextcloud, which follows a modular architecture that allows users to install and enable only the necessary features and applications they require. This modular approach promotes efficiency by reducing unnecessary resource consumption and overhead.

4) Weaker Community Support:

OwnCloud has a smaller and less active community compared to Nextcloud. This can result in slower response times to issues, fewer community-developed apps and extensions, and a potentially reduced availability of resources, documentation, and support forums.

5) Security Considerations:

While OwnCloud offers security features such as encryption and user authentication, the responsibility of ensuring the overall security of the system lies with the user. Implementing secure practices, such as regular software updates, strong passwords, and proper network security measures, is essential to safeguard the personal cloud storage system and protect user data.

6) Performance and Stability Issues:

Some users have reported performance and stability issues with OwnCloud, including slower synchronization speeds, occasional crashes, and resource-intensive operations. While performance can vary depending on factors such as hardware and configuration, some users have found Nextcloud to provide better performance and stability in comparison.

It is important to consider these disadvantages when evaluating the suitability of the existing system of personal cloud storage using Raspberry Pi with OwnCloud. While it offers cost-effectiveness, control over data, and privacy benefits, users should be aware of the limitations and potential trade-offs associated with this setup.

IV. PROPOSED SYSTEM

The proposed system includes Raspberry pi, External Hard drive, and a Micro Sd card as the main components.
where,
1. Raspberry pi acts as a Cloud Server.
2. External hard drive helps us in achieving expandable cloud storage.

3. MicroSD card acts as a RAM for raspberry pi and also Raspbian OS is installed init.

NextCloud a free open-source Software suite that provides a platform for file sharing, collaboration, allows users to store and access data from anywhere. It is configured with the Apache and the raspberry pi, that creates an personal cloud storage. This approach offers advantages such as cost-effectiveness, data privacy and security, customization options, increased storage capacity and seamless data synchronization and access across different devices and platforms.

A. Advantages of Proposed System :

Nextcloud offers a high level of data privacy and security, as the data is stored on the self-hosted Raspberry Pi system and not on external servers.

1) Data synchronization allows for seamless access to files across different devices and platforms, providing flexibility and convenience for users.

2) External cloud storage provides additional storage capacity and redundancy, enhancing the overall reliability and availability of the personal cloud storage system.

3) Have the better Modular architecture compared to the personal cloud storage using Nextcloud.

4) When we use a personal cloud storage solution with a Raspberry Pi, you have complete control over your data. You don't have to worry about third-party providers accessing your data or losing control of it.

V. REQUIREMENTS

A. SOFTWARE REQUIREMENTS:

1. Raspbian OS
2. Apache
3 .php
4. NextCloud

B. HARD WARE REQUIREMENTS:

1. Raspberry pi 3 Model B+
2. Micro SD card
3. External Hard drive
4. SD card Adapter

Fig 1: Raspberry Pi 3 Model B+

VI. IMPLEMENTATION

The implementation of the proposed system includes in following some steps in order to achieve the personal cloud storage.

A. Chronological order as follows:

First and foremost install Raspbian OS in the SD Card And plug it to the Raspberry pi and then follow these steps.

1. Installing Apache and PHP.
2. Setting up a MySQL Database and User.
3. Downloading Nextcloud.
4. Configuring Apache for Nextcloud.
5. Nextcloud Initial Setup.
6. Moving Nextcloud's Data Folder.
7. Setting up SSL for Nextcloud.

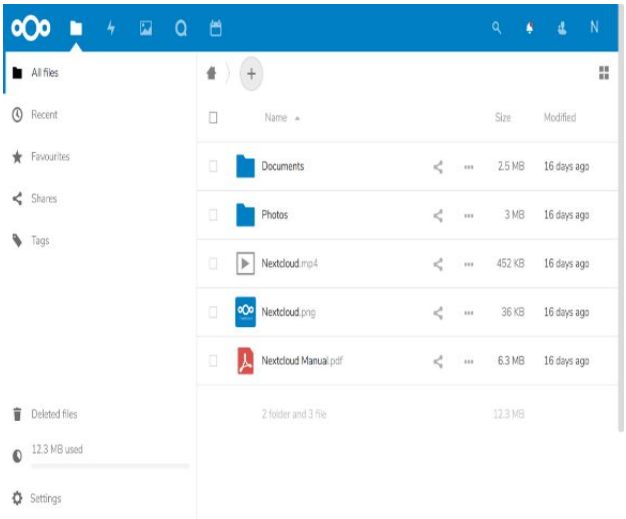

Fig 2 : Nextcloud User Interface

VII. CONCLUSION

The potential of utilizing Raspberry Pi as a low-cost computing platform for creating a personal cloud storage system, and Nextcloud as a powerful open-source software for managing and sharing files have demonstrated. The integration of Nextcloud with raspberry pi makes the external cloud storage services expanded the storage capacity and scalability of the system, allowing users to leverage the benefits of both local and cloud-based storage solutions.

The personal cloud storage system using Raspberry Pi and Nextcloud, with the added functionality of external cloud storage integration. The system provided users with a customizable, cost-effective, and secure solution for storing and accessing their data from anywhere using various devices. The advantages of the project included customization and control, cost-effectiveness, data synchronization, enhanced security, and learning opportunities.

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