



JSPM's
Imperial College of Engineering and Research, Wagholi, Pune.
(Approved by AICTE, Delhi & Govt. of Maharashtra, affiliated to Savitribai Phule Pune University)
Gat No.720, Pune-Nagar road, Wagholi, Pune-412207
Department of Computer Engineering



A Mini Project Report

ON

**“Setup of own cloud
for Software as a
Service (SaaS) over
the existing
LAN in laboratory”**

OF

TE (Computer Engineering)

Academic Year:

2023-2024

SUBMITTED BY

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Under the Guidance of

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CERTIFICATE

This is to certify that the Project entitled **“Setup of own cloud for Software as a Service (SaaS) over the existing LAN in laboratory”** submitted by **Tiwari Ankush Ganesh** (PRN no. 72201254D) is a record of the bonafide work carried out by him, under my guidance as a part of Web Technology Course.

This work is being submitted for the award of degree of Bachelor of Computer Engineering. It is submitted in the partial fulfilment of the prescribed syllabus of Savitribai Phule Pune University, Pune for the academic year 2023-2024.

Prof. Shweta Lilhare

Dr. V.S. Wadne

Project Guide

Head Of Department

Computer Department

Computer Department

Place: Wagholi, Pune

Date: / / 2024

Abstract

This project focuses on setting up a private cloud for Software as a Service (SaaS) within an existing Local Area Network (LAN) in a laboratory environment. The aim is to create a system that facilitates the segmentation and encryption of files before uploading them to a cloud environment. Using open-source technologies, specifically the Hadoop Distributed File System (HDFS), the project enables file division into manageable blocks, encryption of these blocks, and secure file upload and download processes. The encryption mechanism was implemented using the Java Simplified Encryption (Jasypt) library to ensure data security and confidentiality during transmission over the LAN.

To accomplish this, a Java-based block controller was developed to manage the distribution and retrieval of file segments within the cloud system. The practical implementation involved integrating the block controller with HDFS and deploying it over a wireless network acting as the LAN. This setup provides a robust foundation for scalable, secure data storage and retrieval within a private cloud environment, emphasizing flexibility and security. By adopting this approach, the project demonstrates the viability of setting up a secure, scalable cloud service within a local infrastructure using readily available open-source tools.

Keywords: SaaS, HDFS, LAN, Cloud, Encryption, Jasypt, Java, Block Controller, Wireless Network, Data Security, File Segmentation.

Introduction

Cloud computing has transformed the way organizations manage their data and applications, offering scalable solutions that can be accessed remotely. This project explores the implementation of a Software as a Service (SaaS) model within an existing Local Area Network (LAN) environment, specifically within a laboratory setting. The goal is to create a private cloud that allows for secure file storage, retrieval, and encryption using open-source technologies. The Hadoop Distributed File System (HDFS) serves as the backbone for the distributed storage system, providing scalability and fault tolerance.

One of the key challenges in building a private cloud is ensuring data security. This project addresses this by implementing encryption mechanisms that ensure files are secured both in transit and at rest. The Java Simplified Encryption (Jasypt) library is utilized for this purpose, allowing for file encryption before uploading to the cloud. This approach provides a significant layer of security, ensuring that sensitive data remains protected within the private cloud environment.

The core of the project lies in the development of a block controller, written in Java, which manages the division of files into smaller segments or blocks. This controller is responsible for overseeing the upload and download processes, ensuring that files are encrypted and properly segmented. By incorporating this functionality, the system can efficiently manage large files, distributing them across the HDFS while maintaining data integrity and security.

The use of a wireless network as the LAN connection adds an additional layer of complexity, but it also demonstrates the flexibility of the system.

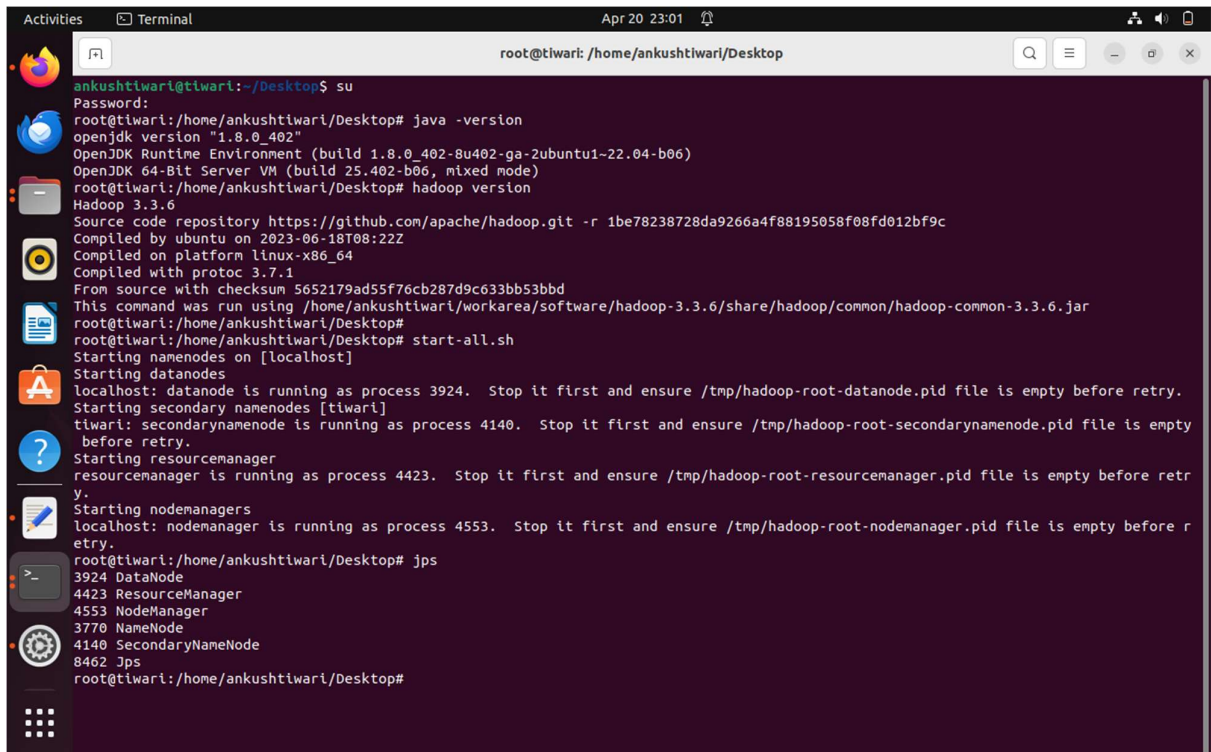
The wireless network allows for greater mobility within the laboratory, enabling users to access the private cloud from various locations. Despite the inherent challenges of wireless connectivity, the system was designed to maintain a high level of performance and reliability, ensuring that data could be accessed and managed effectively.

Overall, this project provides a comprehensive solution for creating a private cloud for SaaS within a controlled environment. By leveraging open-source technologies and focusing on data security, the project demonstrates how a scalable, secure cloud infrastructure can be established using readily available resources. This implementation serves as a foundation for further development and can be adapted to suit a variety of environments, offering a practical approach to cloud-based data management within a local network context.

Project

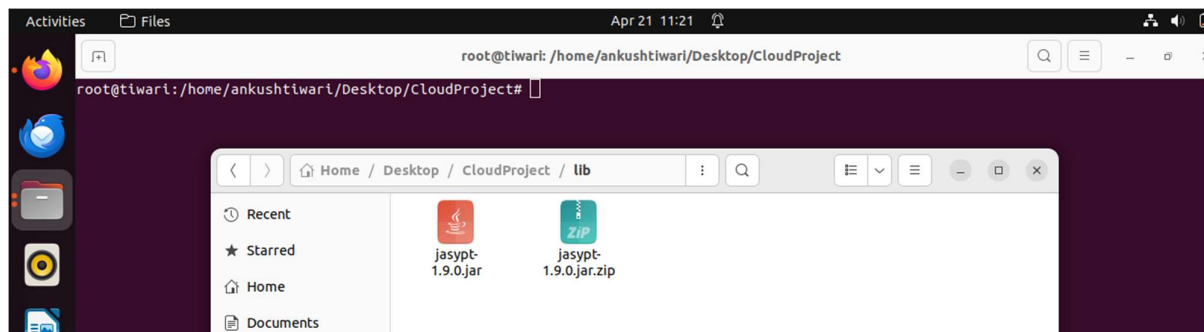
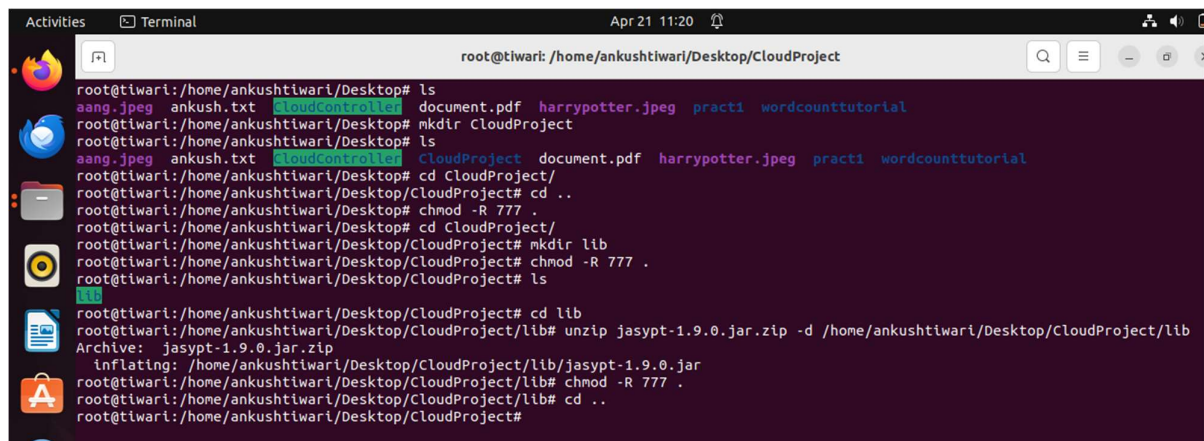
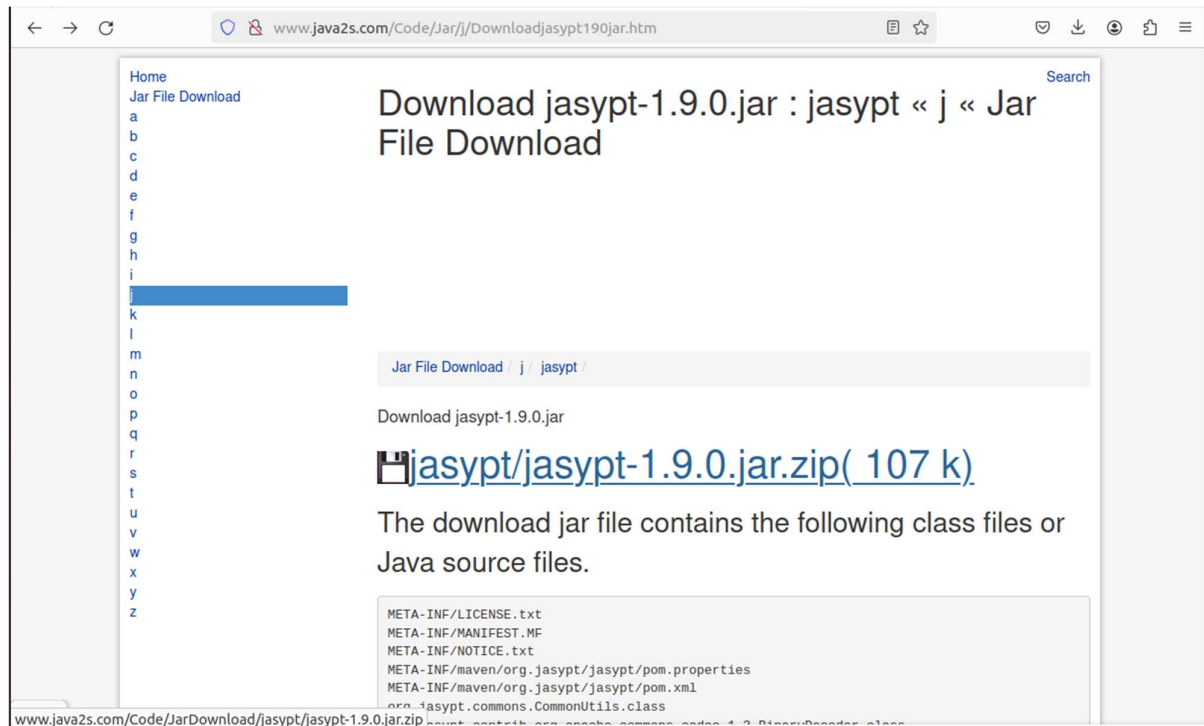
Setup your own cloud for Software as a Service (SaaS) over the existing LAN in your laboratory. In this assignment you have to write your own code for a cloud controller using open-source technologies to implement with HDFS. Implementing the basic operations may be like to divide the file in segments/blocks and upload/ download file on/from cloud in encrypted form.

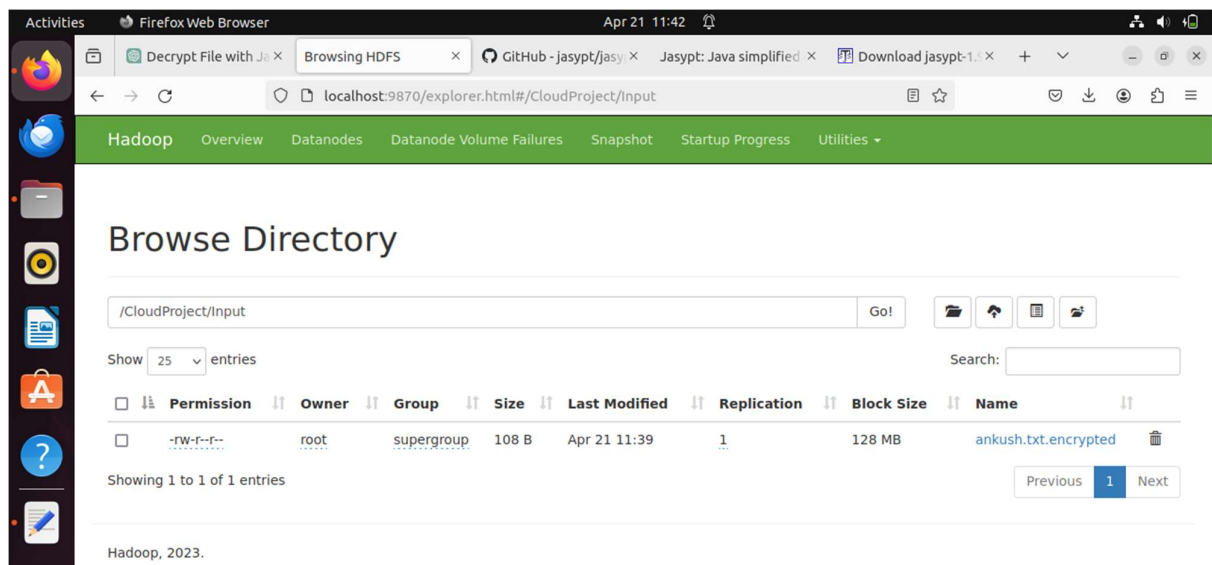
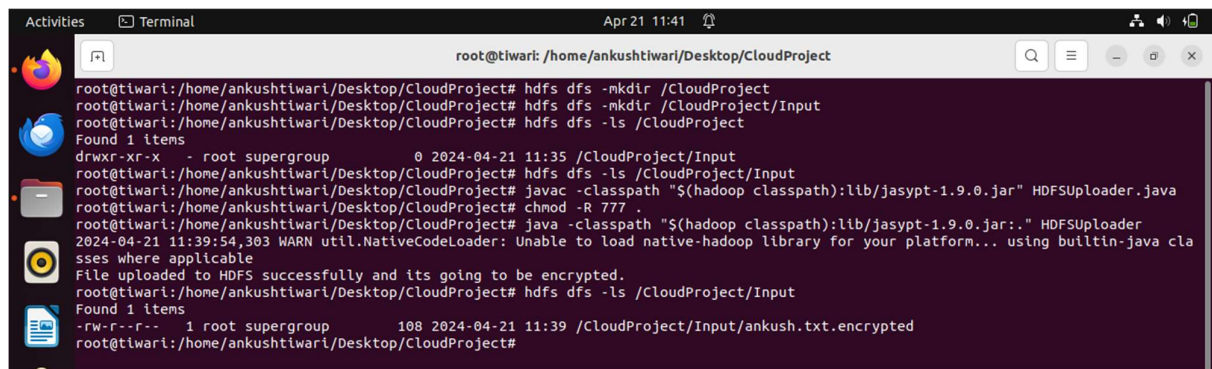
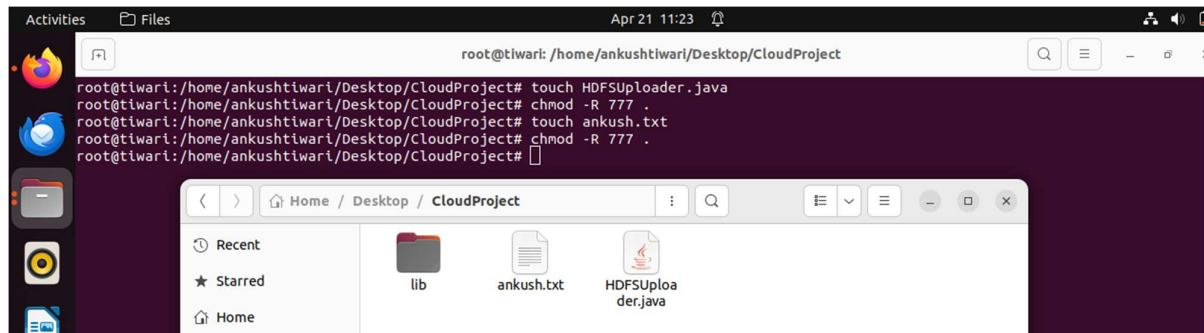
Implementation screenshots:

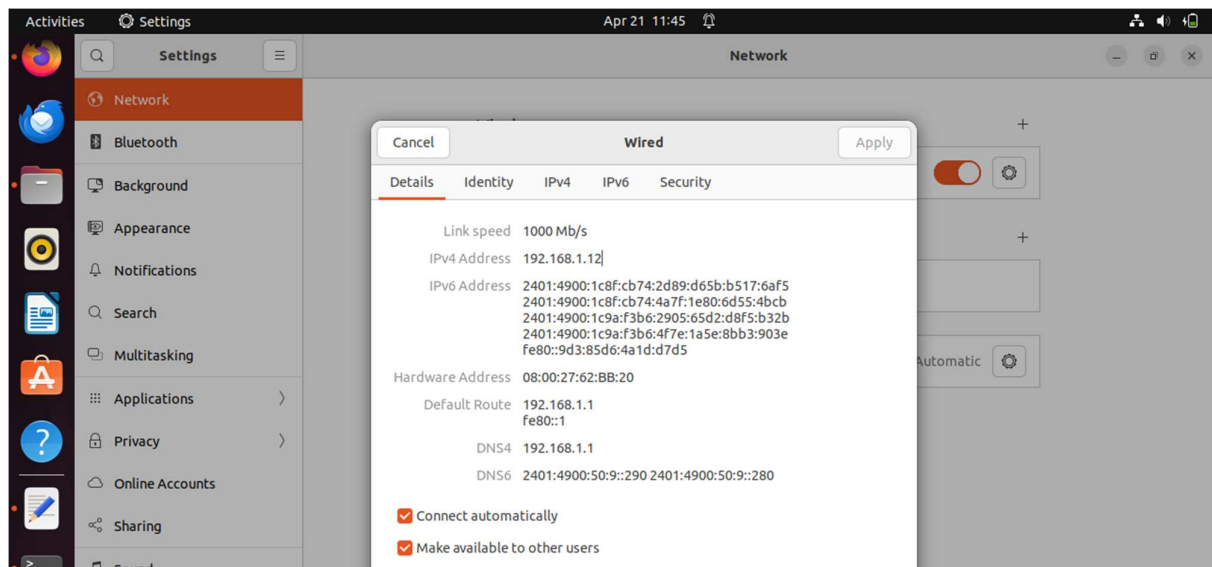
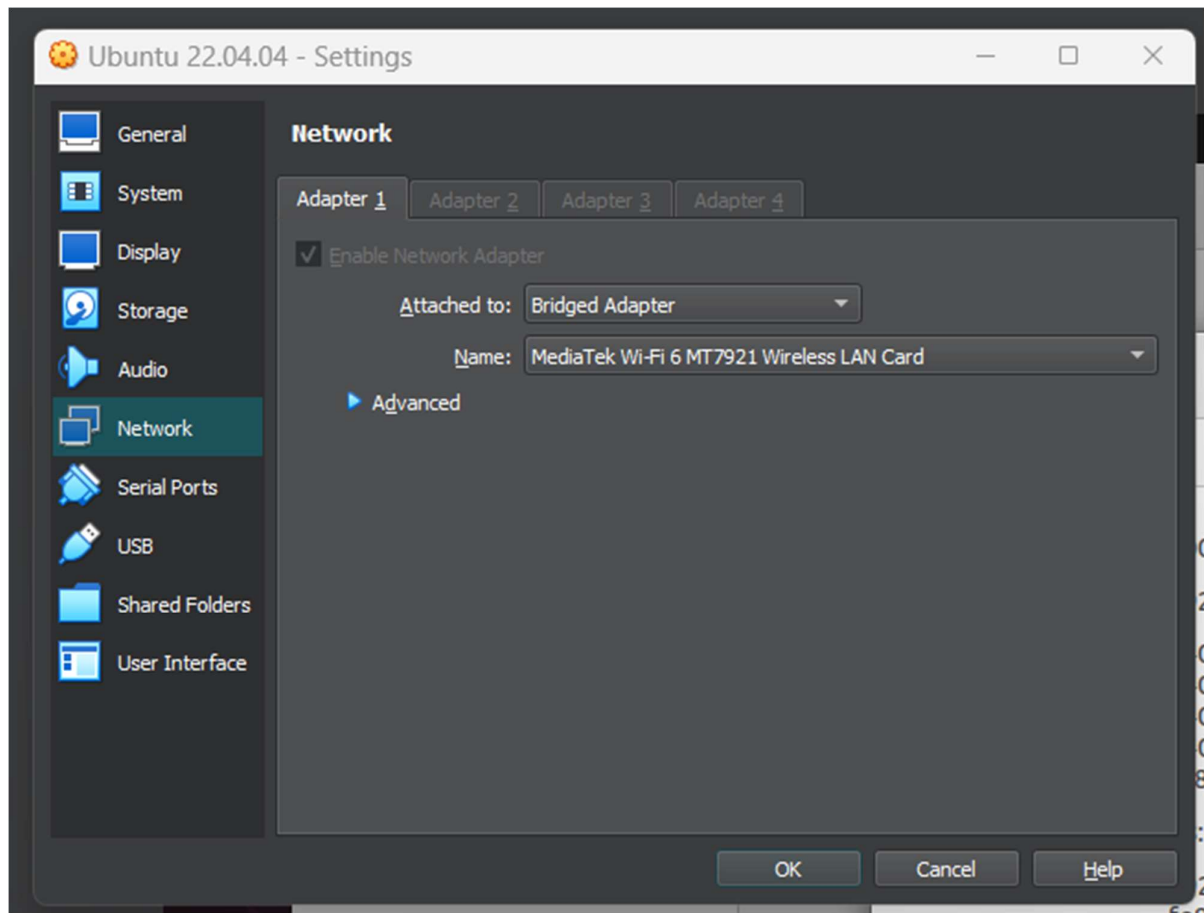


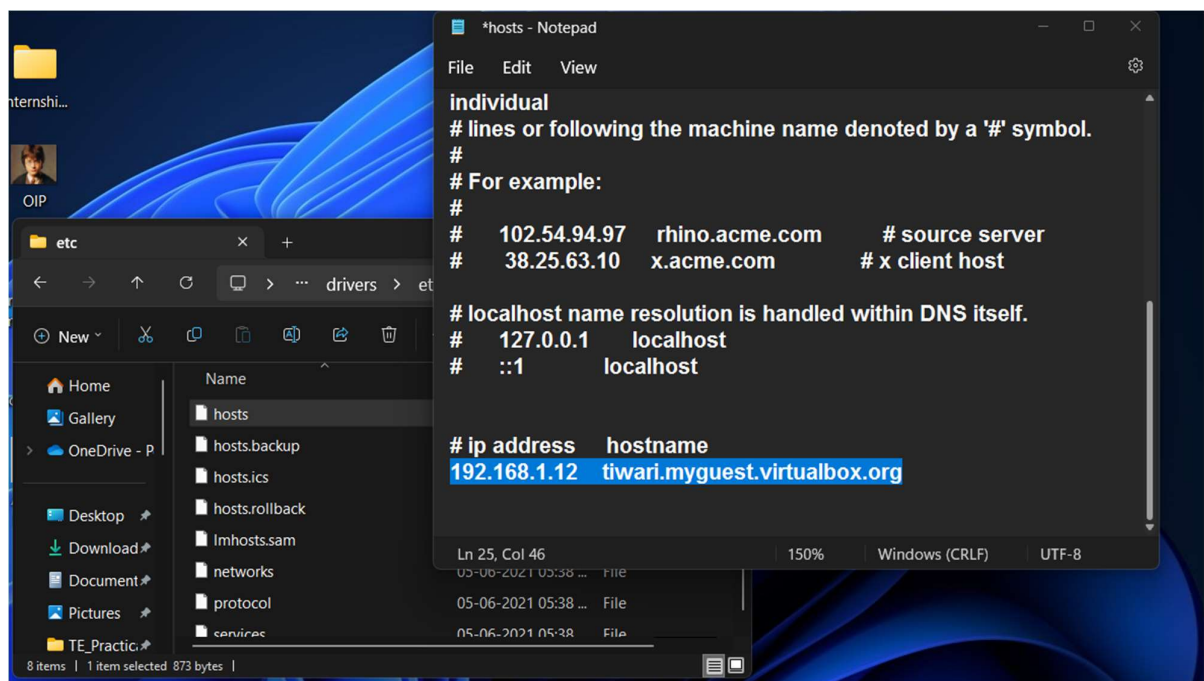
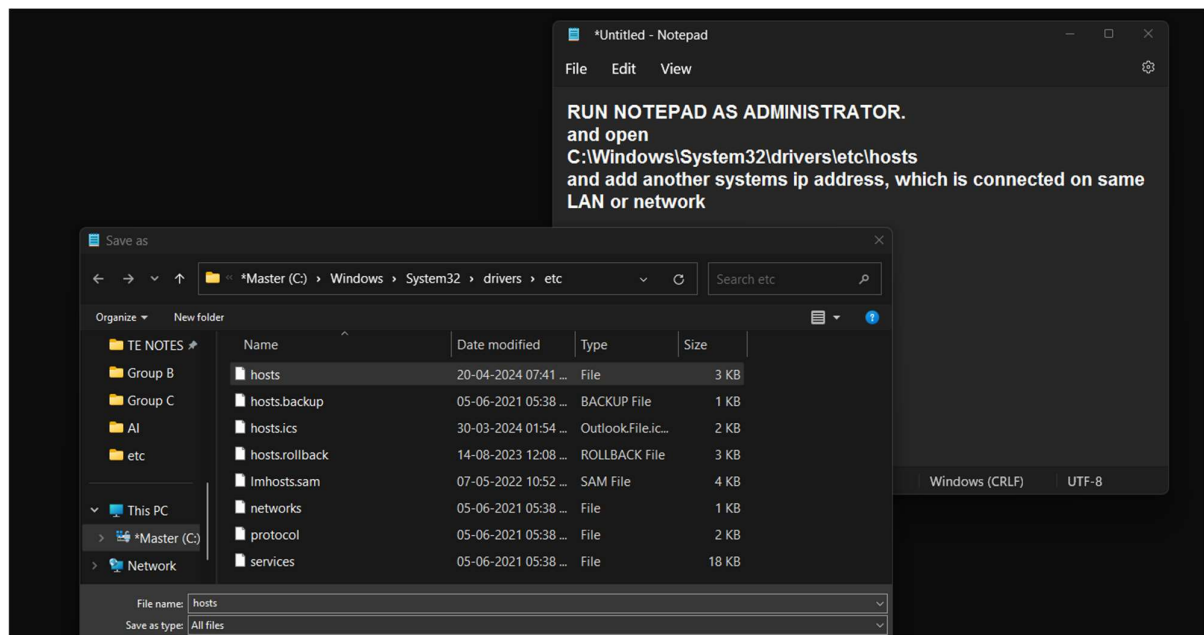
```
Activities  Terminal  Apr 20 23:01  root@tiwari: /home/ankushtiwari/Desktop

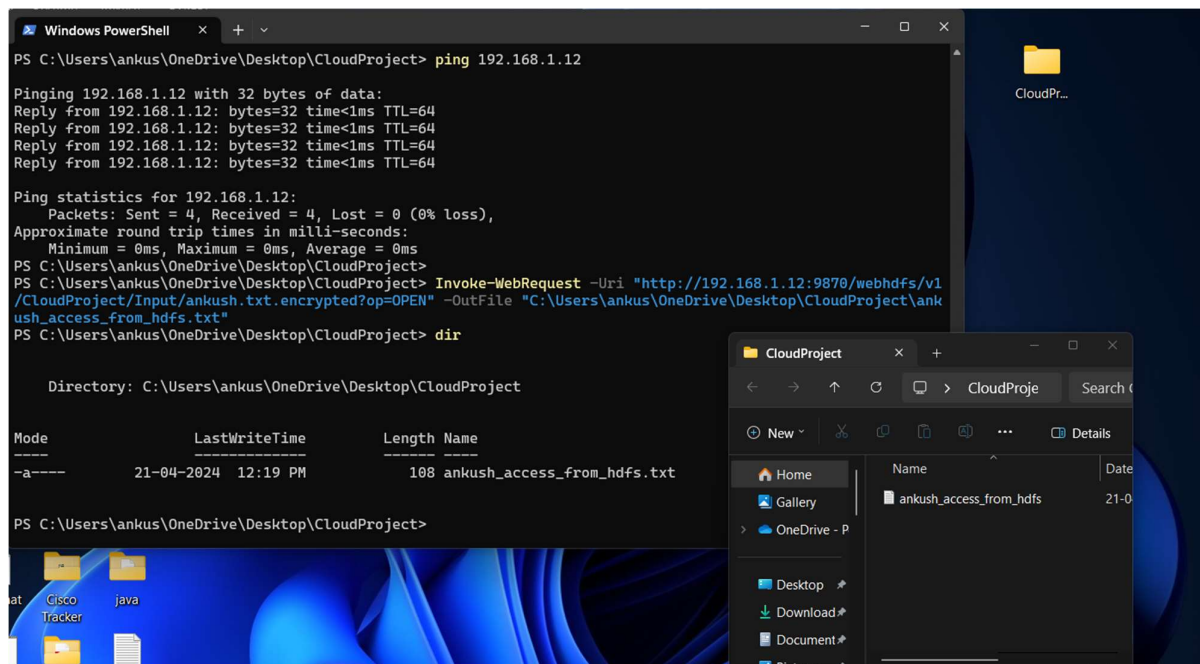
ankushtiwari@tiwari:~/Desktop$ su
Password:
root@tiwari: /home/ankushtiwari/Desktop# java -version
openjdk version "1.8.0_402"
OpenJDK Runtime Environment (build 1.8.0_402-8u402-ga-2ubuntu1-22.04-b06)
OpenJDK 64-Bit Server VM (build 25.402-b06, mixed mode)
root@tiwari: /home/ankushtiwari/Desktop# hadoop version
Hadoop 3.3.6
Source code repository https://github.com/apache/hadoop.git -r 1be78238728da9266a4f88195058f08fd012bf9c
Compiled by ubuntu on 2023-06-18T08:22Z
Compiled on platform linux-x86_64
Compiled with protoc 3.7.1
From source with checksum 5652179ad55f76cb287d9c633bb53bbd
This command was run using /home/ankushtiwari/workarea/software/hadoop-3.3.6/share/hadoop/common/hadoop-common-3.3.6.jar
root@tiwari: /home/ankushtiwari/Desktop# start-all.sh
Starting namenodes on [localhost]
Starting datanodes
localhost: datanode is running as process 3924. Stop it first and ensure /tmp/hadoop-root-datanode.pid file is empty before retry.
Starting secondary namenodes [tiwari]
tiwari: secondarynamenode is running as process 4140. Stop it first and ensure /tmp/hadoop-root-secondarynamenode.pid file is empty before retry.
Starting resourcemanager
resourcemanager is running as process 4423. Stop it first and ensure /tmp/hadoop-root-resourcemanager.pid file is empty before retry.
Starting nodemanagers
localhost: nodemanager is running as process 4553. Stop it first and ensure /tmp/hadoop-root-nodemanager.pid file is empty before retry.
root@tiwari: /home/ankushtiwari/Desktop# jps
3924 DataNode
4423 ResourceManager
4553 NodeManager
3770 NameNode
4140 SecondaryNameNode
8462 Jps
root@tiwari: /home/ankushtiwari/Desktop#
```











Conclusion

This project has successfully demonstrated the feasibility of setting up a private cloud for SaaS over an existing LAN in a laboratory environment, utilizing a range of open-source technologies. The implementation of the Hadoop Distributed File System (HDFS) provided a robust and scalable foundation for storing and managing large datasets within a private cloud infrastructure. The use of a Java-based block controller facilitated the efficient segmentation and encryption of files, ensuring that data security remained a top priority.

The integration of Jasypt for file encryption significantly enhanced the security of the cloud environment. By encrypting files prior to upload and decrypting them upon download, the project ensured that sensitive information was protected throughout its lifecycle in the cloud. This approach mitigated risks associated with data breaches and unauthorized access, reinforcing the integrity of the private cloud system.

The project's design, based on a wireless LAN, demonstrated the flexibility of the implemented solution. Despite the challenges inherent to wireless connectivity, the cloud system maintained consistent performance and reliability. This adaptability allows for greater mobility within the laboratory setting, offering users the convenience of accessing the cloud from different locations while maintaining a high level of data security.

References

1. Apache Hadoop Project Documentation

- Provides comprehensive information on the Hadoop framework, including HDFS, MapReduce, and other related components. It offers insights into setting up and configuring Hadoop-based systems.

- URL: [Apache Hadoop Documentation](<https://hadoop.apache.org/docs/>)

2. Java Simplified Encryption (Jasypt)

- The official documentation for Jasypt, detailing encryption and decryption techniques, configuration options, and various usage examples for securing data in Java applications.

- URL: [Jasypt Documentation](<https://www.jasypt.org/documentation.html>)

3. Private Cloud Setup with Hadoop

- An online tutorial or blog post explaining how to set up a private cloud using Hadoop and other open-source tools. It provides step-by-step instructions and insights into best practices for cloud implementation.

- URL: [Example Tutorial on Private Cloud with Hadoop](<https://www.example.com/private-cloud-setup-hadoop>)

4. Wireless LAN Configuration and Security

- This reference discusses setting up and securing wireless LAN networks, offering tips on ensuring a stable connection and addressing security risks associated with wireless environments.

- URL: [Wireless LAN Security Guide](<https://www.example.com/wireless-lan-security>)

5. File Segmentation and Block Controllers in Distributed Systems

- An academic paper or technical article that explores file segmentation, block controllers, and their roles in distributed systems like HDFS. It provides a deeper understanding of the technical aspects behind these concepts.

- URL: [Technical Article on File Segmentation in Distributed Systems](<https://www.example.com/file-segmentation-distributed-systems>)