Auditing over secured cloud data with data dynamics and data sharing Configuration Manual

MSc Research Project
Cloud Computing

Pruthviraj Bhamare
Student ID: 20190182

School of Computing
National College of Ireland

Supervisor: Sean Heeney

National College of Ireland
Project Submission Sheet
School of Computing

Student Name:	Pruthviraj Bhamare
Student ID:	20190182
Programme:	Cloud Computing
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Module:	MSc Research Project
Supervisor:	Sean Heeney
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Auditing over secured cloud data with data dynamics and data sharing Configuration Manual

Pruthviraj Bhamare
20190182

1 Overview:

This document helps to configure and execute “Msc Research Project” named as “Data Auditing over secured cloud data with data dynamics and data sharing”. The project has a client-server architecture. It requires 4 different entities: Cloud, Data Owner, Data User, and Key Server. The project is implemented in java. The server and client configuration details, required software installation details, project deployment, and execution details are enlisted in this document.

2 Configuration Details:

One server is used to configure cloud storage and key server. Amazon t2.2xlarge instance is used as a server. Where XAMP server is installed. Windows Server 2012 R2 operating system is installed on the server.

The user end system where desktop application is installed has Windows 11 operating system and intel i7 processor, 16 Gb ram.

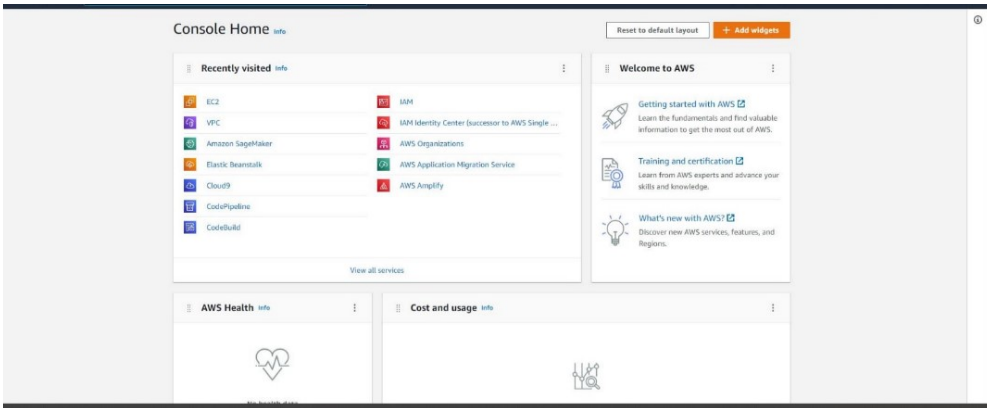
This application can be installed on the system with these minimum specifications.

Components	Requirement
OS	Windows 10/11
CPU	8
RAM	8GB
Storage	100 GB

3 Installations

3.1 Server-end environment setup:

1. Setup for launch EC2 instance in AWS.
2. First open EC2 instance. Figure 1
3. Click on Launch Instance. Figure 2

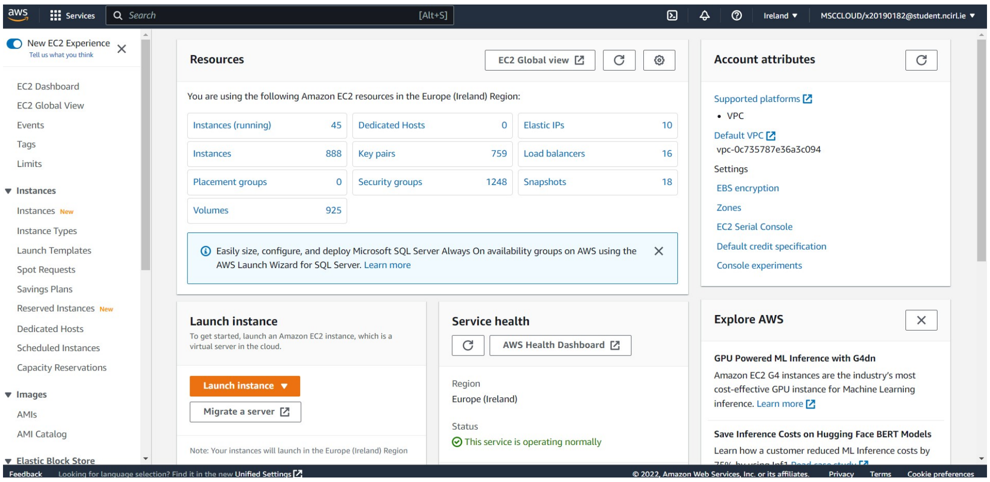


Learn the fundamentals and find valuable information to get the most out of AWS.

Learn from AWS experts and advance your skills and knowledge.

Discover new AWS services, features, and Regions.

Figure 1: EC2 instance



You are using the following Amazon EC2 resources in the Europe (Ireland) Region:

Instances (running)	45	Dedicated Hosts	0	Elastic IPs	10
Instances	888	Key pairs	759	Load balancers	16
Placement groups	0	Security groups	1248	Snapshots	18
Volumes	925				

Easily size, configure, and deploy Microsoft SQL Server Always On availability groups on AWS using the AWS Launch Wizard for SQL Server. Learn more

- VPC

vpc-0c735787e36a3c094

Launch instance

To get started, launch an Amazon EC2 instance, which is a virtual server in the cloud.

Note: Your instances will launch in the Europe (Ireland) Region

Region
Europe (Ireland)

Status
This service is operating normally

GPU Powered ML Inference with G4dn

Amazon EC2 G4 instances are the industry's most cost-effective GPU instance for Machine Learning inference. Learn more

Save Inference Costs on Hugging Face BERT Models

Learn how a customer reduced ML Inference costs by

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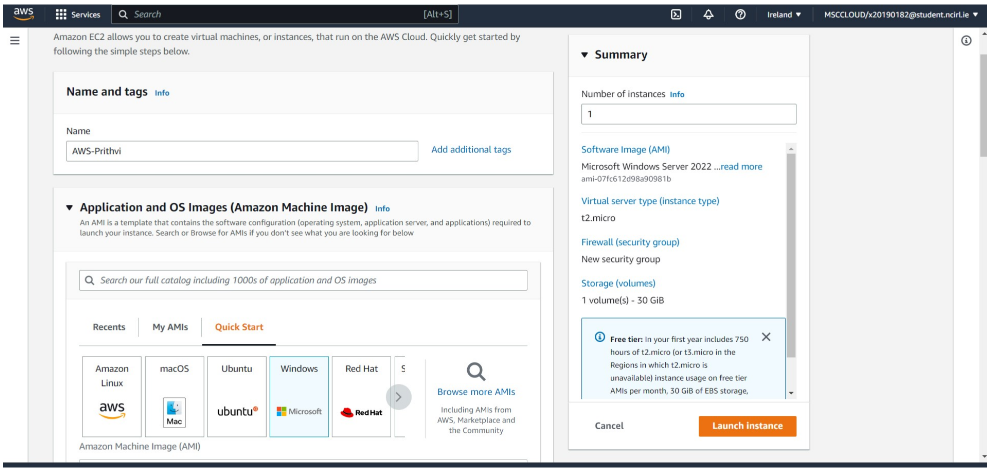
Figure 2: Launch instance

4. Then give name to your instance and select Windows Server 2012 as an OS. Refer Figure 3

5. Select instance type, for this project I chose t2.2xlarge instance type. Refer figure 4



Amazon EC2 allows you to create virtual machines, or instances, that run on the AWS Cloud. Quickly get started by following the simple steps below.

Name and tags Info

Name: AWS-Prithvi — Add additional tags

▼ Application and OS Images (Amazon Machine Image) Info

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. Search or Browse for AMIs if you don't see what you are looking for below

Search our full catalog including 1000s of application and OS images

Recents
My AMIs
Quick Start
Amazon Linux
macOS
Ubuntu
Windows
Red Hat
Browse more AMIs
Including AMIs from AWS, Marketplace and the Community
Amazon Machine Image (AMI)

▼ Summary

Number of instances Info: 1

Software Image (AMI): Microsoft Windows Server 2022 ...read more
ami-07fc612d98a90981b

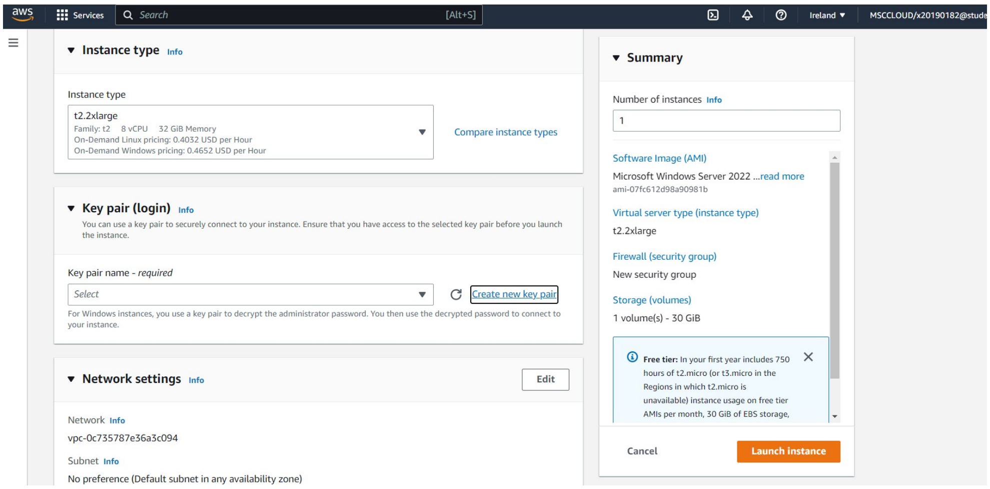
Virtual server type (instance type): t2.micro

Firewall (security group): New security group

Storage (volumes): 1 volume(s) - 30 GiB

Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in the Regions in which t2.micro is unavailable) instance usage on free tier AMIs per month, 30 GiB of EBS storage,

Figure 3: Name and OS selection



▼ Instance type Info

Instance type: t2.2xlarge
Family: t2 8 vCPU 32 GiB Memory
On-Demand Linux pricing: 0.4032 USD per Hour
On-Demand Windows pricing: 0.4652 USD per Hour

Compare instance types

▼ Key pair (login) Info

You can use a key pair to securely connect to your instance. Ensure that you have access to the selected key pair before you launch the instance.

Key pair name - *required*: Select — Create new key pair

For Windows instances, you use a key pair to decrypt the administrator password. You then use the decrypted password to connect to your instance.

▼ Network settings Info — Edit

Network Info: vpc-0c735787e36a3c094

Subnet Info: No preference (Default subnet in any availability zone)

▼ Summary

Number of instances Info: 1

Software Image (AMI): Microsoft Windows Server 2022 ...read more
ami-07fc612d98a90981b

Virtual server type (instance type): t2.2xlarge

Firewall (security group): New security group

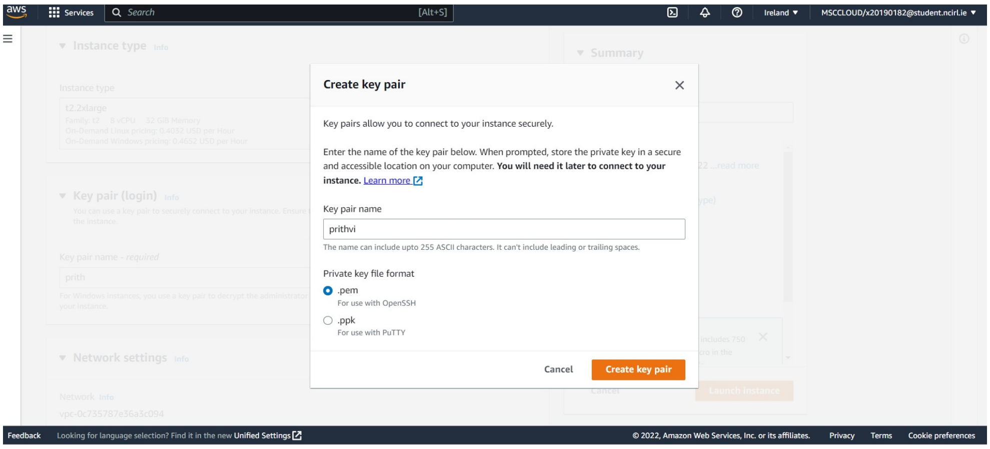
Storage (volumes): 1 volume(s) - 30 GiB

Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in the Regions in which t2.micro is unavailable) instance usage on free tier AMIs per month, 30 GiB of EBS storage,

Figure 4: Select Instance Type

6. After that create a new key pair, give a name and select .pem and create a new key. The .pem file will be downloaded in your system. Refer Figure 5

7. After that in network settings, Edit inbound rules. Click on Add Security Groups and Security group rule. Set port range 8080, select source as 0.0.0.0/0. Refer Figure 6


aws
Services
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Create key pair

Key pairs allow you to connect to your instance securely.

Enter the name of the key pair below. When prompted, store the private key in a secure and accessible location on your computer. **You will need it later to connect to your instance.** Learn more

Key pair name: prithvi

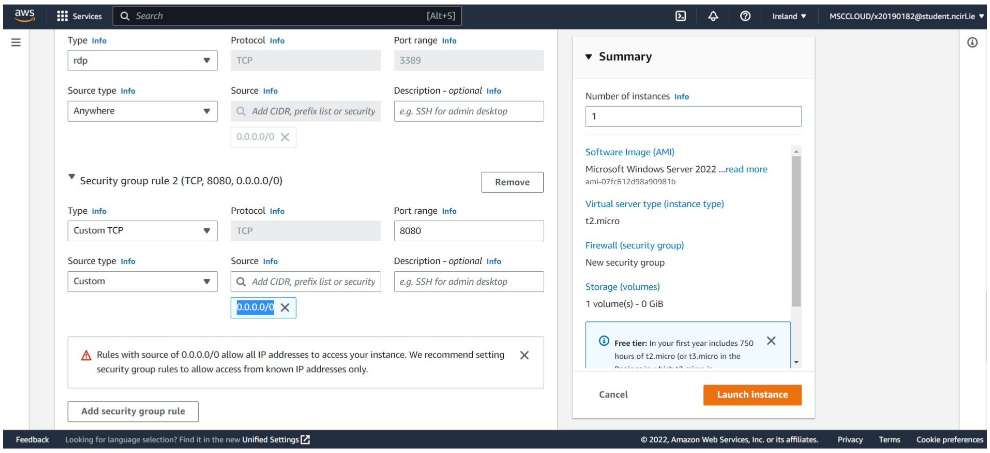
The name can include upto 255 ASCII characters. It can't include leading or trailing spaces.

Private key file format

● .pem For use with OpenSSH

○ .ppk For use with PuTTY

Figure 5: Creation of Key


aws
Services
Search
[Alt+S]
Ireland ▼
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Type: rdp | Protocol: TCP | Port range: 3389

Source type: Anywhere | Source: 0.0.0.0/0 | Description - optional: e.g. SSH for admin desktop

Security group rule 2 (TCP, 8080, 0.0.0.0/0)

Type: Custom TCP | Protocol: TCP | Port range: 8080

Source type: Custom | Source: 0.0.0.0/0 | Description - optional: e.g. SSH for admin desktop

Rules with source of 0.0.0.0/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only.

Summary

Number of instances: 1

Software Image (AMI): Microsoft Windows Server 2022 ...read more ami-07fc612d98a90981b

Virtual server type (instance type): t2.micro

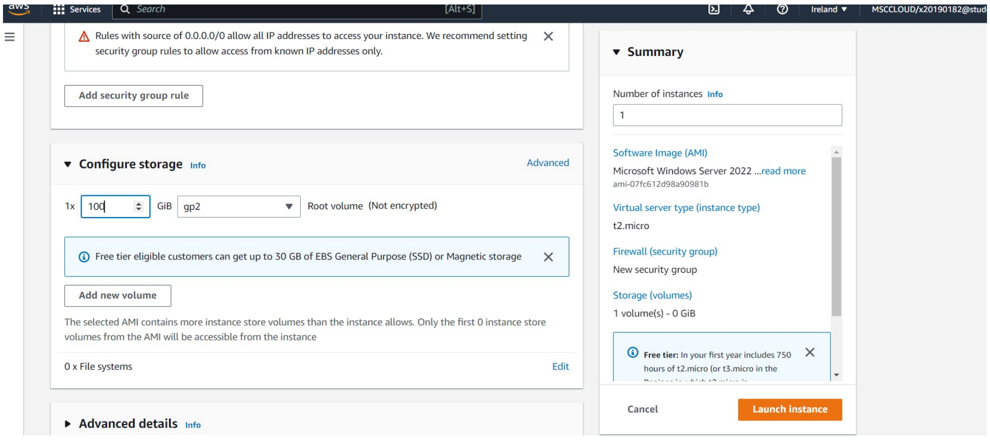
Firewall (security group): New security group

Storage (volumes): 1 volume(s) - 0 GiB

Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in the

Figure 6: Set inbound rule

8. After this you have to select the storage. I have selected 100 Gb, refer figure 7
9. Then click on Launch instance
10. You will see a Success Window. Refer Figure 8



Rules with source of 0.0.0.0/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only.

Add security group rule

Configure storage Info — Advanced

1x 100 GiB gp2 Root volume (Not encrypted)

Free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic storage

Add new volume

The selected AMI contains more instance store volumes than the instance allows. Only the first 0 instance store volumes from the AMI will be accessible from the instance

0 x File systems — Edit

Advanced details Info

Summary

Number of instances Info: 1

Software Image (AMI)
Microsoft Windows Server 2022 ...read more
ami-07fc612d98a90981b

Virtual server type (instance type)
t2.micro

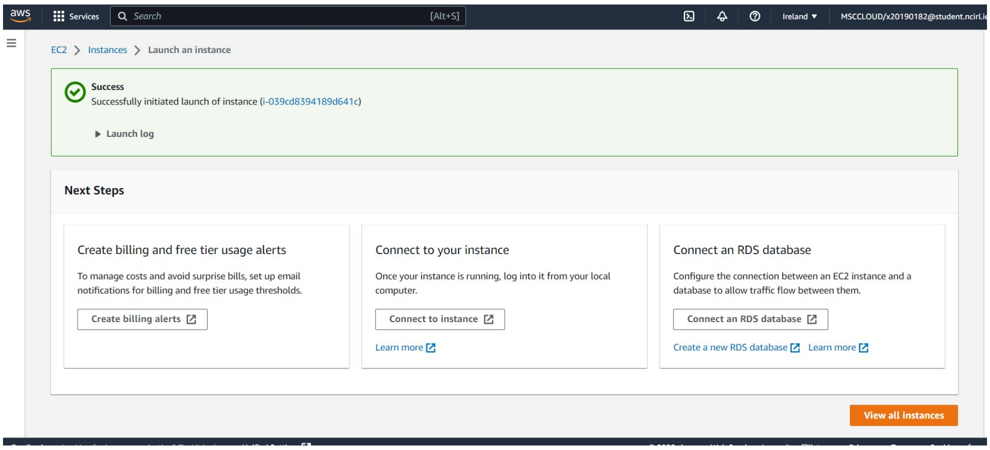
Firewall (security group)
New security group

Storage (volumes)
1 volume(s) - 0 GiB

Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in the

Cancel — Launch instance

Figure 7: Storage selection



EC2 > Instances > Launch an instance

Success
Successfully initiated launch of instance (i-039cd8394189d641c)

Launch log

Next Steps

Create billing and free tier usage alerts
To manage costs and avoid surprise bills, set up email notifications for billing and free tier usage thresholds.
Create billing alerts

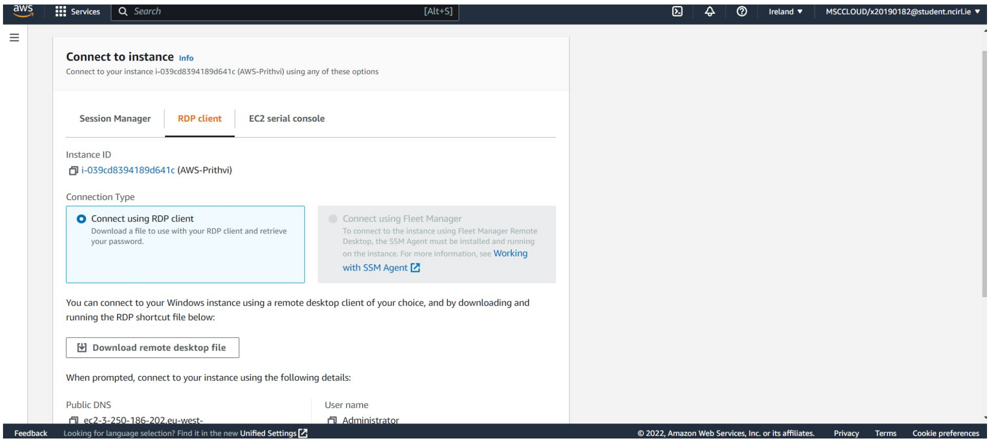
Connect to your instance
Once your instance is running, log into it from your local computer.
Connect to instance
Learn more

Connect an RDS database
Configure the connection between an EC2 instance and a database to allow traffic flow between them.
Connect an RDS database
Create a new RDS database — Learn more

View all instances

Figure 8: Instance created successfully

11. Then click on connect to instance. Refer Figure 9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Info
Session Manager
RDP client
EC2 serial console
Download remote desktop file
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Connect to instance

Connect to your instance i-039cd8394189d641c (AWS-Prithvi) using any of these options

Instance ID

i-039cd8394189d641c (AWS-Prithvi)

Connection Type

● Connect using RDP client
Download a file to use with your RDP client and retrieve your password.

○ Connect using Fleet Manager
To connect to the instance using Fleet Manager Remote Desktop, the SSM Agent must be installed and running on the instance. For more information, see Working with SSM Agent

You can connect to your Windows instance using a remote desktop client of your choice, and by downloading and running the RDP shortcut file below:

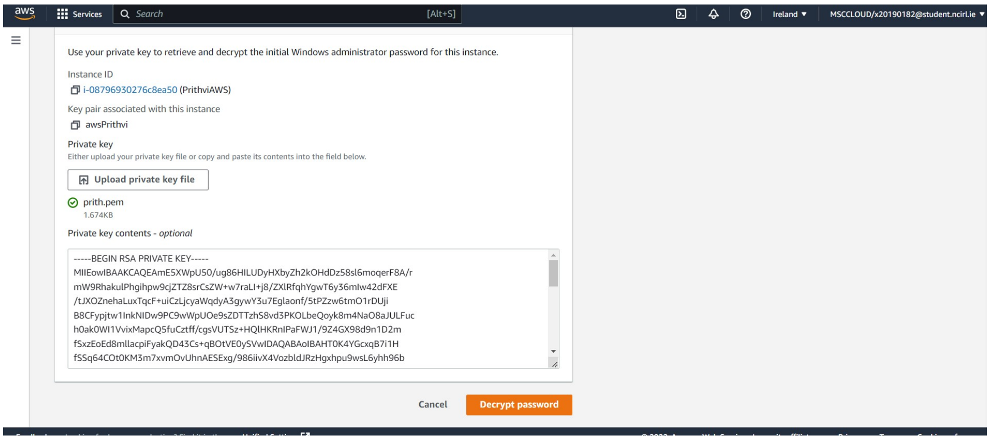
When prompted, connect to your instance using the following details:

Public DNS: ec2-3-250-186-202.eu-west-

User name: Administrator

Figure 9: Connect to instance

12. Then you will see the connect to instance pane, you will have to click on decrypt the password using downloaded .pem key. refer Figure 10



Use your private key to retrieve and decrypt the initial Windows administrator password for this instance.

Instance ID

i-08796930276c8ea50 (PrithviAWS)

Key pair associated with this instance

awsPrithvi

Private key

Either upload your private key file or copy and paste its contents into the field below.

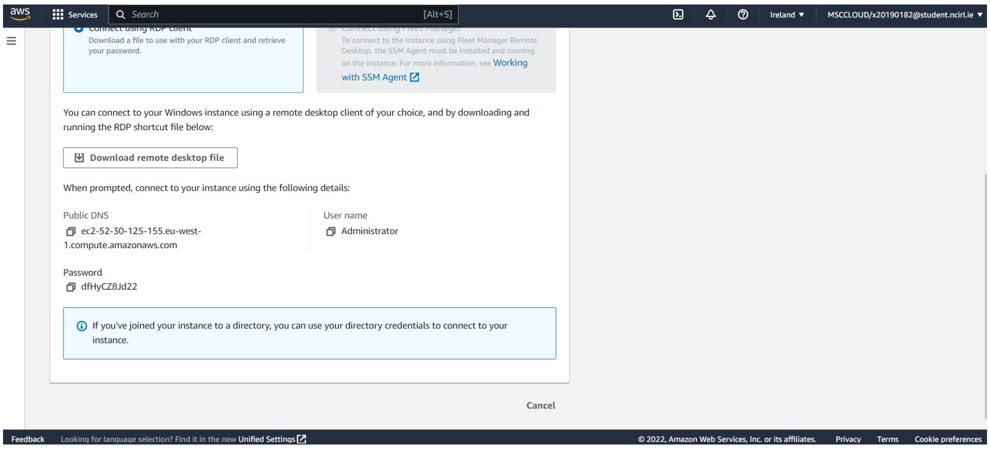
prith.pem
1.674KB

Private key contents - *optional*

```
-----BEGIN RSA PRIVATE KEY-----
MIIEowIBAAKCAQEAmE5XWpU50/ug86HILUDyHXbyZh2kOHdDz58sl6moqerF8A/r
mW9RhakulPhgihpw9cjZTZ8srCsZW+w7raLI+j8/ZXlRfqhYgwT6y36mlw42dFXE
/tJXOZnehaLuxTqcF+uiCzLjcyaWqdyA3gywY3u7Eglaonf/5tPZzw6tmO1rDUji
B8CFypjtw1lnkNIDw9PC9wWpUOe9sZDTTzhS8vd3PKOLbeQoyk8m4NaO8aJULFuc
h0akOWI1VvixMapcQ5fuCztff/cgsVUTSz+HQlHKRnIPaFWJ1/9Z4GX98d9n1D2m
fSxzEoEd8mllacpiFyakQD43Cs+qBOtVE0ySVwIDAQABAoIBAHT0K4YGcxqB7i1H
fSSq64COt0KM3m7xvmOvUhnAESExg/986iivX4VozbldJRzHgxhpu9wsL6yhh96b
```

Figure 10: decrypt password

13. Then download remote desktop file and open it. Refer Figure 11



Connect using RDP client
Download a file to use with your RDP client and retrieve your password.

Connect using Fleet Manager
To connect to the instance using Fleet Manager Remote Desktop, the SSM Agent must be installed and running on the instance. For more information, see Working with SSM Agent

You can connect to your Windows instance using a remote desktop client of your choice, and by downloading and running the RDP shortcut file below:

When prompted, connect to your instance using the following details:

Public DNS
ec2-52-30-125-155.eu-west-1.compute.amazonaws.com

User name
Administrator

Password
dfHyCZ8Jd22

If you've joined your instance to a directory, you can use your directory credentials to connect to your instance.

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Feedback
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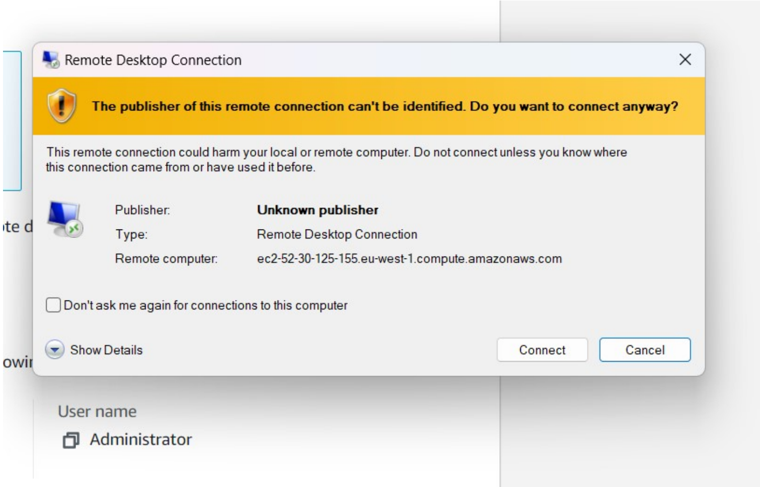
Figure 11: Download remote desktop file

14. Then click on connect and you will be connect to the AWS EC2 instance which has the OS Windows Server 2012. Refer Figure 12



The publisher of this remote connection can't be identified. Do you want to connect anyway?

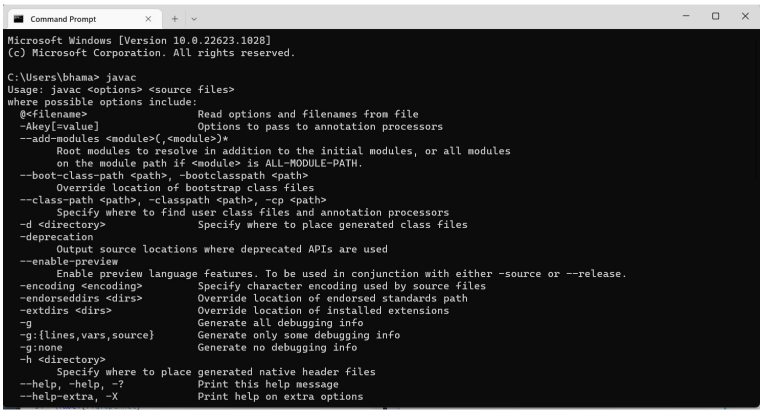
This remote connection could harm your local or remote computer. Do not connect unless you know where this connection came from or have used it before.

Publisher: **Unknown publisher**
Type: Remote Desktop Connection
Remote computer: ec2-52-30-125-155.eu-west-1.compute.amazonaws.com

□ Don't ask me again for connections to this computer

Figure 12: Connect to EC2

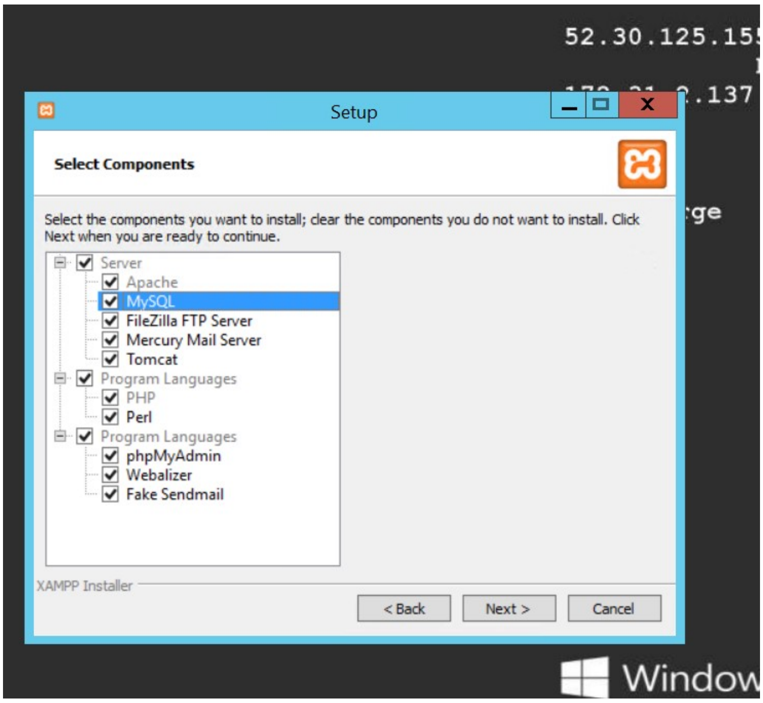
15. Now you need to install jdk 11 in EC2 instance as well so Refer Figure 13 Link to download - `https://www.oracle.com/ie/java/technologies/javase/jdk11-archive-downlo` `html`



```
Microsoft Windows [Version 10.0.22623.1028]
(c) Microsoft Corporation. All rights reserved.

C:\Users\bhama> javac
Usage: javac <options> <source files>
where possible options include:
  @<filename>                  Read options and filenames from file
  -Akey[=value]                Options to pass to annotation processors
  --add-modules <module>(,<module>)*
        Root modules to resolve in addition to the initial modules, or all modules
        on the module path if <module> is ALL-MODULE-PATH.
  --boot-class-path <path>, -bootclasspath <path>
        Override location of bootstrap class files
  --class-path <path>, -classpath <path>, -cp <path>
        Specify where to find user class files and annotation processors
  -d <directory>               Specify where to place generated class files
  -deprecation
        Output source locations where deprecated APIs are used
  --enable-preview
        Enable preview language features. To be used in conjunction with either -source or --release.
  -encoding <encoding>         Specify character encoding used by source files
  -endorseddirs <dirs>         Override location of endorsed standards path
  -extdirs <dirs>              Override location of installed extensions
  -g                           Generate all debugging info
  -g:{lines,vars,source}       Generate only some debugging info
  -g:none                      Generate no debugging info
  -h <directory>
        Specify where to place generated native header files
  --help, -help, -?            Print this help message
  --help-extra, -X             Print help on extra options
```

Figure 13: JDK installation

16. Download and Install XAMPP. Refer Figure 14 Link to Download - `https://www.apachefriends.org/download.html`



Setup

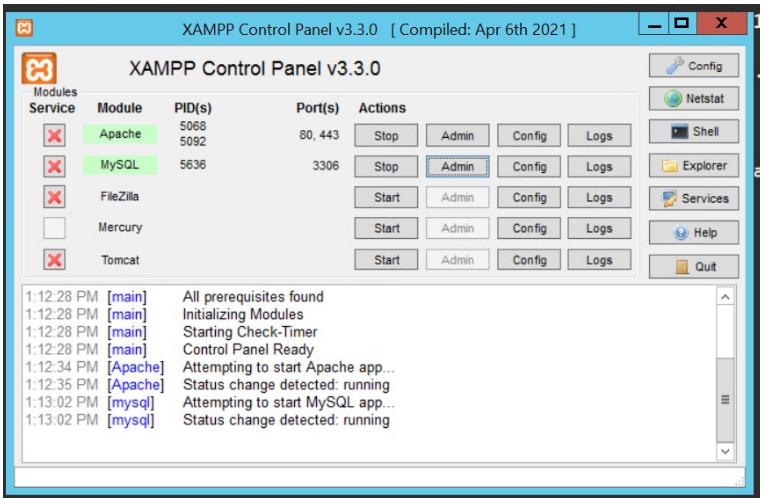
Select Components

Select the components you want to install; clear the components you do not want to install. Click Next when you are ready to continue.

- ☑ Server
  - ☑ Apache
  - ☑ MySQL
  - ☑ FileZilla FTP Server
  - ☑ Mercury Mail Server
  - ☑ Tomcat
- ☑ Program Languages
  - ☑ PHP
  - ☑ Perl
- ☑ Program Languages
  - ☑ phpMyAdmin
  - ☑ Webalizer
  - ☑ Fake Sendmail

Figure 14: XAMPP Installation

17. After installation open XAMPP. You will see the XAMPP control Panel. In XAMPP control panel, start services of Apache and MYSQL Refer Figure 15



XAMPP Control Panel v3.3.0 [Compiled: Apr 6th 2021]

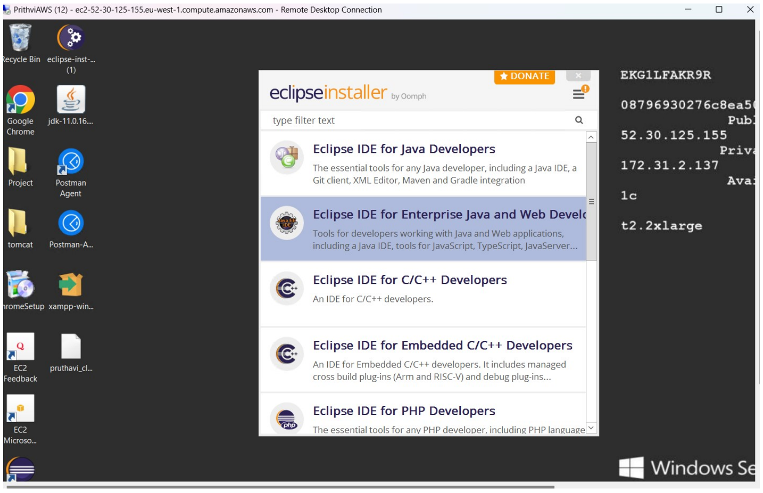
XAMPP Control Panel v3.3.0

Modules Service	Module	PID(s)	Port(s)	Actions			
☒	Apache	5068 5092	80, 443	Stop	Admin	Config	Logs
☒	MySQL	5636	3306	Stop	Admin	Config	Logs
☒	FileZilla			Start	Admin	Config	Logs
□	Mercury			Start	Admin	Config	Logs
☒	Tomcat			Start	Admin	Config	Logs

```
1:12:28 PM  [main]     All prerequisites found
1:12:28 PM  [main]     Initializing Modules
1:12:28 PM  [main]     Starting Check-Timer
1:12:28 PM  [main]     Control Panel Ready
1:12:34 PM  [Apache]   Attempting to start Apache app...
1:12:35 PM  [Apache]   Status change detected: running
1:13:02 PM  [mysql]    Attempting to start MySQL app...
1:13:02 PM  [mysql]    Status change detected: running
```

Figure 15: XAMPP Control Panel

18. Then Download and Install Eclipse IDE Enterprise for Java and Web Developer. Refer Figure 16 Link to download - `https://www.eclipse.org/downloads/packages/release/2020-06/r/eclipse-ide-enterprise-java-developers`



PrithviAWS (12) - ec2-52-30-125-155.eu-west-1.compute.amazonaws.com - Remote Desktop Connection

eclipseinstaller by Oomph

type filter text

Eclipse IDE for Java Developers
The essential tools for any Java developer, including a Java IDE, a Git client, XML Editor, Maven and Gradle integration

Eclipse IDE for Enterprise Java and Web Develo
Tools for developers working with Java and Web applications, including a Java IDE, tools for JavaScript, TypeScript, JavaServer...

Eclipse IDE for C/C++ Developers
An IDE for C/C++ developers.

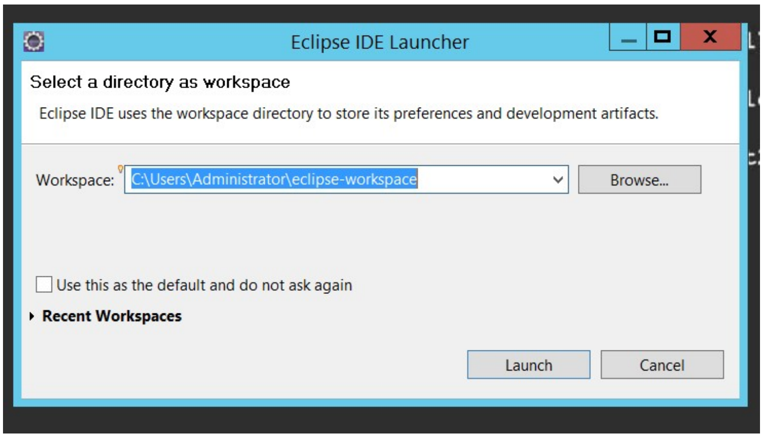
Eclipse IDE for Embedded C/C++ Developers
An IDE for Embedded C/C++ developers. It includes managed cross build plug-ins (Arm and RISC-V) and debug plug-ins...

Eclipse IDE for PHP Developers
The essential tools for any PHP developer, including PHP language

```
EKG1LFAKR9R
08796930276c8ea5
                Publ
52.30.125.155
                Priva
172.31.2.137
                Ava
1c
t2.2xlarge
```

Figure 16: Eclipse Installation

19. After installation select workspace and then click on launch. 17



Eclipse IDE Launcher

Select a directory as workspace

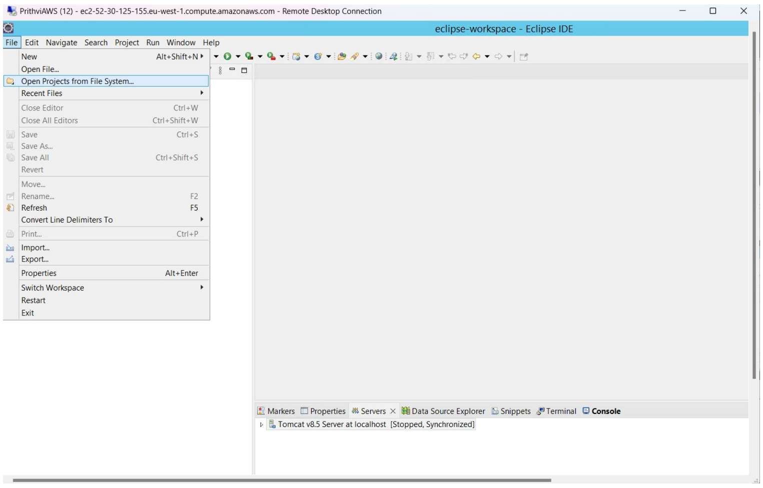
Eclipse IDE uses the workspace directory to store its preferences and development artifacts.

Workspace: C:\Users\Administrator\eclipse-workspace

□ Use this as the default and do not ask again

Figure 17: Choose folder for workspace

20. Now in Eclipse open projects from file system. Now refer to the zip two folders of desktop side application which I provided in the Code Artifact named "Pruthvi-Keyserver" and Pruthvi-Server. Refer Figure 18



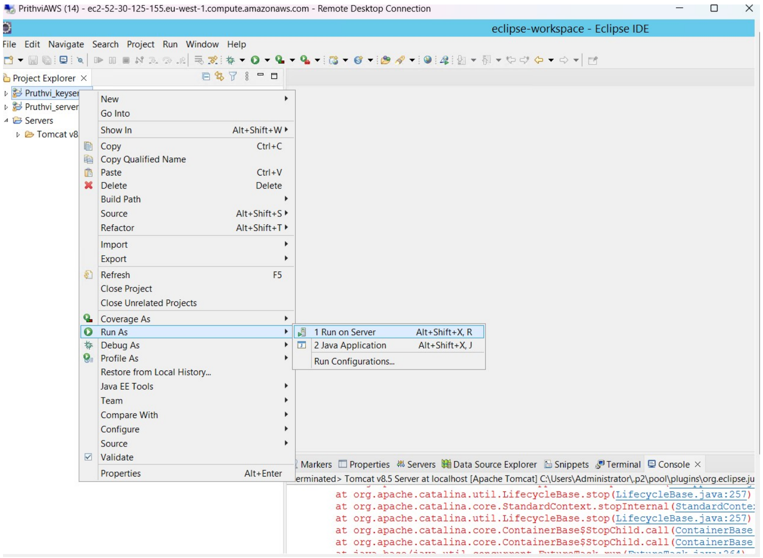
PrithviAWS (12) - ec2-52-30-125-155.eu-west-1.compute.amazonaws.com - Remote Desktop Connection

eclipse-workspace - Eclipse IDE

Tomcat v8.5 Server at localhost [Stopped, Synchronized]

Figure 18: Choose appropriate back-end code for back-end application

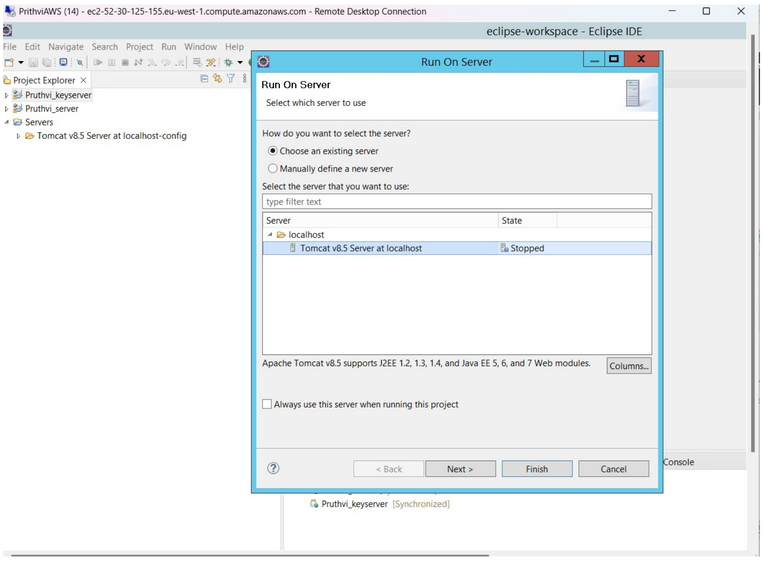
21. Now after opening projects Click right click on the Pruthvi-Keyserver or Pruthvi-server, then click on Run As, then click 1 Run on Server. Refer Figure 19



```
erminated> Tomcat v8.5 Server at localhost [Apache Tomcat] C:\Users\Administrator\.p2\pool\plugins\org.eclipse.ju
        at org.apache.catalina.util.LifecycleBase.stop(LifecycleBase.java:257)
        at org.apache.catalina.core.StandardContext.stopInternal(StandardConte:
        at org.apache.catalina.util.LifecycleBase.stop(LifecycleBase.java:257)
        at org.apache.catalina.core.ContainerBase$StopChild.call(ContainerBase
        at org.apache.catalina.core.ContainerBase$StopChild.call(ContainerBase
```

Figure 19: Run back-end application

22. Now select Apache v8.5 Server at localhost and click on finish. Refer Figure 20


PrithviAWS (14) - ec2-52-30-125-155.eu-west-1.compute.amazonaws.com - Remote Desktop Connection
eclipse-workspace - Eclipse IDE
File Edit Navigate Search Project Run Window Help
Project Explorer
Pruthvi_keyserver
Pruthvi_server
Servers
Tomcat v8.5 Server at localhost-config
Console
Pruthvi_keyserver [Synchronized]

Run On Server

Run On Server

Select which server to use

How do you want to select the server?

● Choose an existing server

○ Manually define a new server

Select the server that you want to use:

type filter text

Server	State
localhost	
Tomcat v8.5 Server at localhost	Stopped

Apache Tomcat v8.5 supports J2EE 1.2, 1.3, 1.4, and Java EE 5, 6, and 7 Web modules.

□ Always use this server when running this project

Figure 20: start server

23. Now you will see that the servers are started in the down pane of the eclipse. You can see servers are started in figure 21

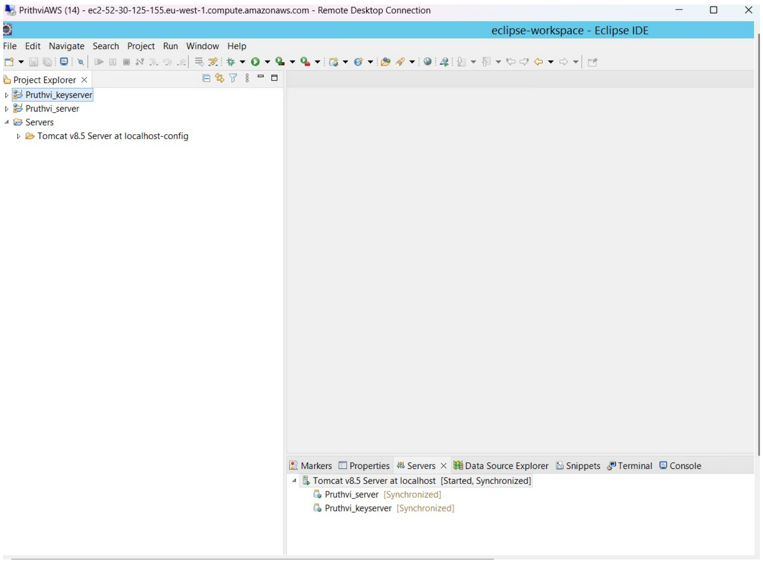
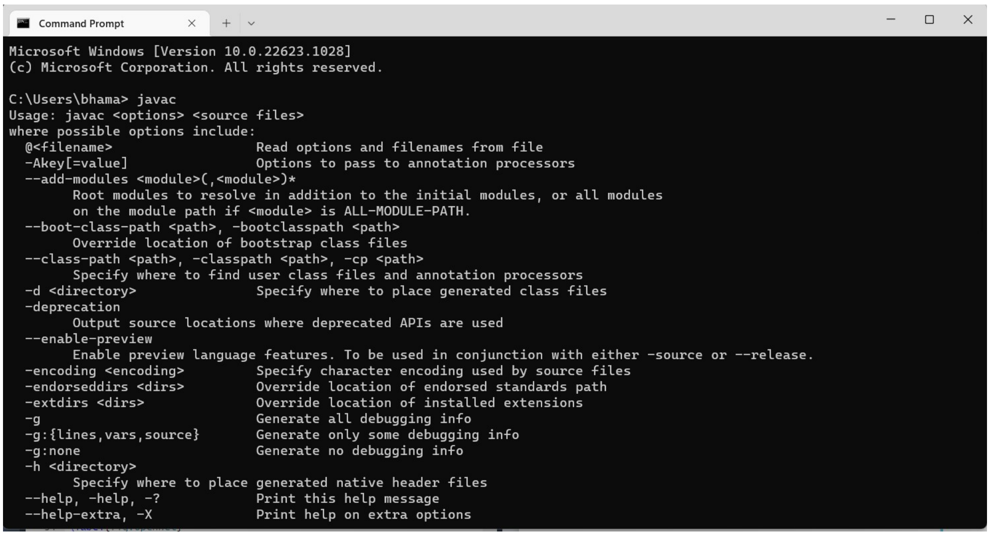

PrithviAWS (14) - ec2-52-30-125-155.eu-west-1.compute.amazonaws.com - Remote Desktop Connection
eclipse-workspace - Eclipse IDE
File Edit Navigate Search Project Run Window Help
Project Explorer
Pruthvi_keyserver
Pruthvi_server
Servers
Tomcat v8.5 Server at localhost-config
Markers Properties Servers Data Source Explorer Snippets Terminal Console
Tomcat v8.5 Server at localhost [Started, Synchronized]
Pruthvi_server [Synchronized]
Pruthvi_keyserver [Synchronized]

Figure 21: Servers running

3.2 Installations at Client-End:

1. Installed JDK 11 and to verify that java is installed or not we can use javac command in command prompt shown in fig 22 Link to download - `https://www.oracle.com/ie/java/technologies/javase/jdk11-archive-downloads.html`

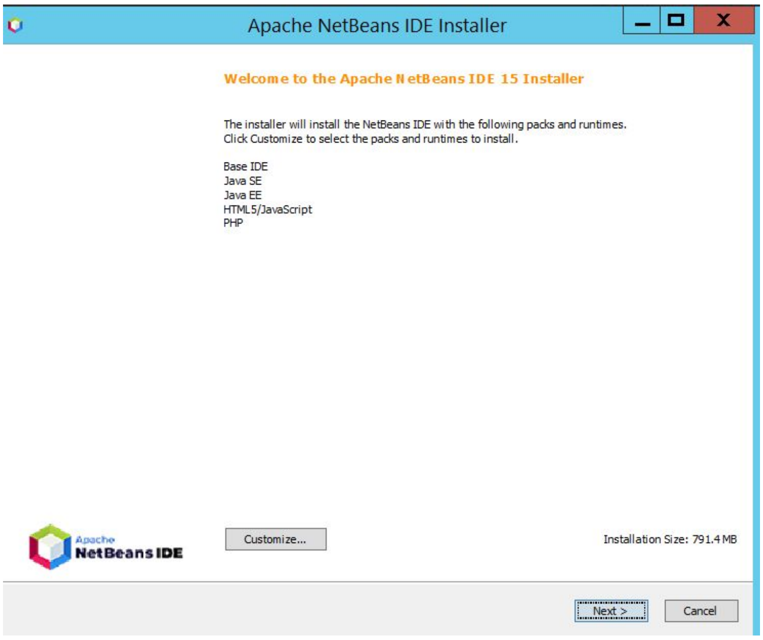


```
Microsoft Windows [Version 10.0.22623.1028]
(c) Microsoft Corporation. All rights reserved.

C:\Users\bhama> javac
Usage: javac <options> <source files>
where possible options include:
  @<filename>                  Read options and filenames from file
  -Akey[=value]                Options to pass to annotation processors
  --add-modules <module>(,<module>)*
        Root modules to resolve in addition to the initial modules, or all modules
        on the module path if <module> is ALL-MODULE-PATH.
  --boot-class-path <path>, -bootclasspath <path>
        Override location of bootstrap class files
  --class-path <path>, -classpath <path>, -cp <path>
        Specify where to find user class files and annotation processors
  -d <directory>               Specify where to place generated class files
  -deprecation
        Output source locations where deprecated APIs are used
  --enable-preview
        Enable preview language features. To be used in conjunction with either -source or --release.
  -encoding <encoding>         Specify character encoding used by source files
  -endorseddirs <dirs>         Override location of endorsed standards path
  -extdirs <dirs>              Override location of installed extensions
  -g                           Generate all debugging info
  -g:{lines,vars,source}       Generate only some debugging info
  -g:none                      Generate no debugging info
  -h <directory>
        Specify where to place generated native header files
  --help, -help, -?            Print this help message
  --help-extra, -X             Print help on extra options
```

Figure 22: Verify Jdk installation

2. For application development Netbeans 8.2 IDE is used. Installed Netbeans 8.2 IDE shown in fig 23. Link to download - `https://netbeans-ide.informer.com/8.2/`

3. After installation open project. Here you have to open the Zip file which I provided for desktop application in code Artifact named "Pruthviraj-desktop". refer figure 24



Apache NetBeans IDE Installer

Welcome to the Apache NetBeans IDE 15 Installer

The installer will install the NetBeans IDE with the following packs and runtimes.
Click Customize to select the packs and runtimes to install.

Base IDE
Java SE
Java EE
HTML5/JavaScript
PHP

Installation Size: 791.4 MB

Figure 23: Netbeans Installation

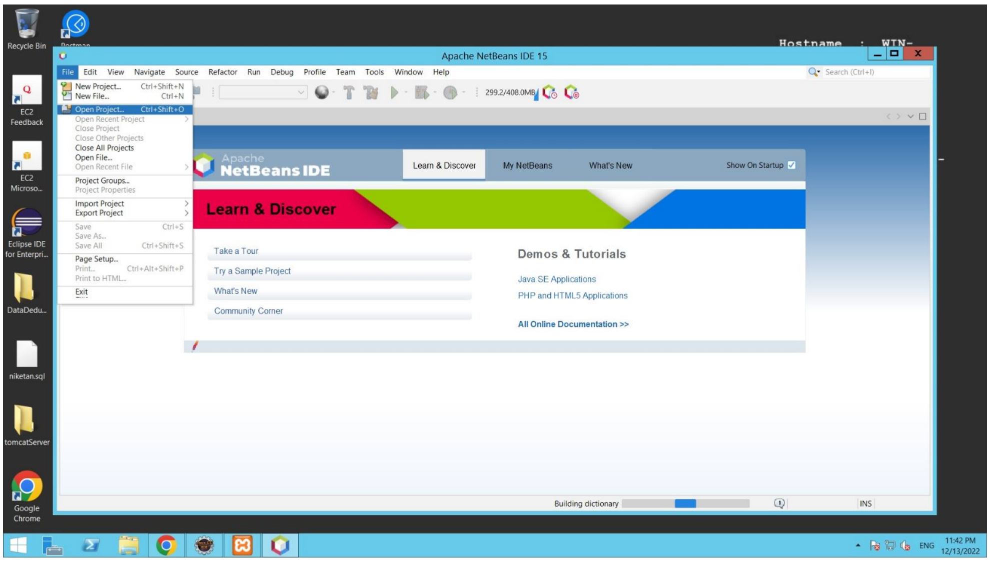
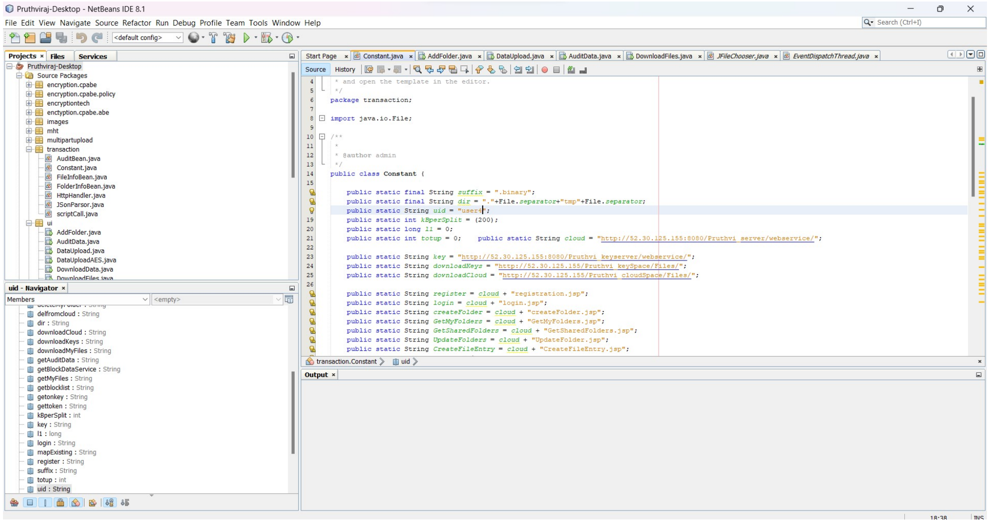


Figure 24: Open new project

4. The desktop application is created for end user using java swing components.

5. Now open the transaction folder in Pruthviraj-Desktop, then open constant.java file. Refer figure 25



```
 * and open the template in the editor.
 */
package transaction;

import java.io.File;

/**
 *
 * @author admin
 */
public class Constant {

    public static final String suffix = ".binary";
    public static final String dir = "."+File.separator+"tmp"+File.separator;
    public static String uid = "user4";
    public static int kBperSplit = (200);
    public static long l1 = 0;
    public static int totup = 0;    public static String cloud = "http://52.30.125.155:8080/Pruthvi_server/webservice/";

    public static String key = "http://52.30.125.155:8080/Pruthvi_keyserver/webservice/";
    public static String downloadKeys = "http://52.30.125.155/Pruthvi_keySpace/Files/";
    public static String downloadCloud = "http://52.30.125.155/Pruthvi_cloudSpace/Files/";

    public static String register = cloud + "registration.jsp";
    public static String login = cloud + "login.jsp";
    public static String createFolder = cloud + "createFolder.jsp";
    public static String GetMyFolders = cloud + "GetMyFolders.jsp";
    public static String GetSharedFolders = cloud + "GetSharedFolders.jsp";
    public static String UpdateFolders = cloud + "UpdateFolder.jsp";
    public static String CreateFileEntry = cloud + "CreateFileEntry.jsp";
```

Figure 25: open constant file

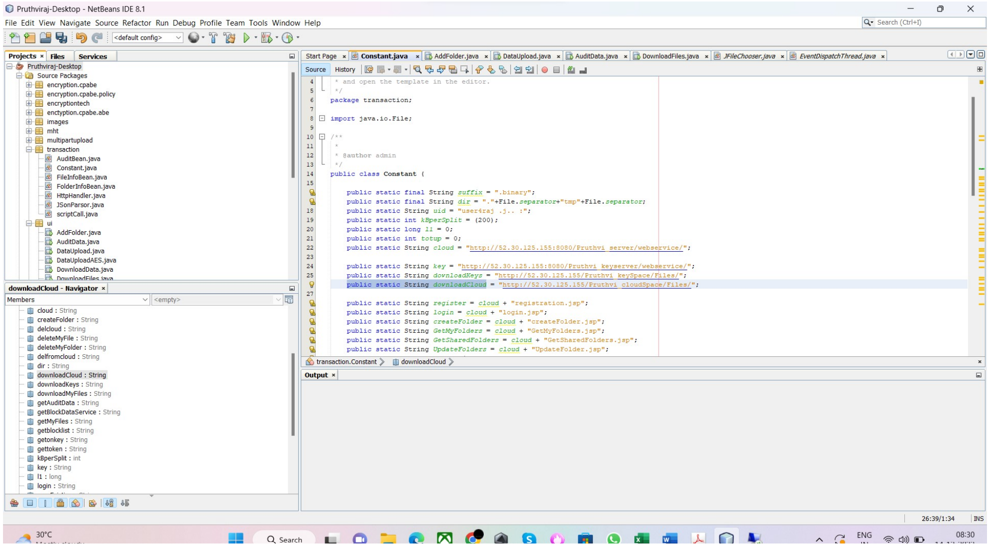
6. Now in constant.java change the localhost to your public IP of EC2 Instance for following: Refer Figure 26

   " public static String cloud"

   "public static String key"

   "public static String downloadKeys"

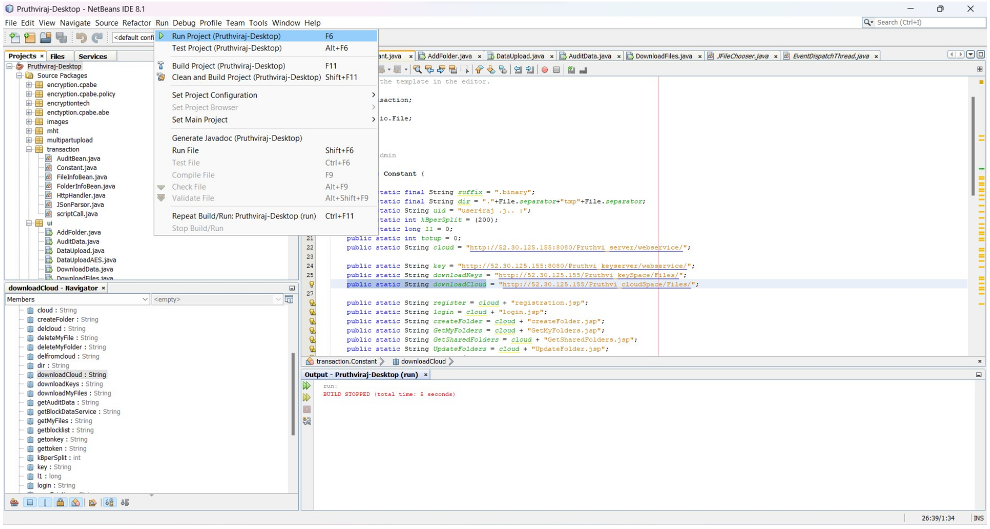
   "public static String downloadCloud"



```
 * and open the template in the editor.
 */
package transaction;

import java.io.File;

/**
 *
 * @author admin
 */
public class Constant {

    public static final String suffix = ".binary";
    public static final String dir = "."+File.separator+"tmp"+File.separator;
    public static String uid = "user4raj .j.. :";
    public static int kBperSplit = (200);
    public static long l1 = 0;
    public static int totup = 0;
    public static String cloud = "http://52.30.125.155:8080/Pruthvi_server/webservice/";

    public static String key = "http://52.30.125.155:8080/Pruthvi_keyserver/webservice/";
    public static String downloadKeys = "http://52.30.125.155/Pruthvi_keySpace/Files/";
    public static String downloadCloud = "http://52.30.125.155/Pruthvi_cloudSpace/Files/";

    public static String register = cloud + "registration.jsp";
    public static String login = cloud + "login.jsp";
    public static String createFolder = cloud + "createFolder.jsp";
    public static String GetMyFolders = cloud + "GetMyFolders.jsp";
    public static String GetSharedFolders = cloud + "GetSharedFolders.jsp";
    public static String UpdateFolders = cloud + "UpdateFolder.jsp";
```

Figure 26: Change of localhost to Public Ip of EC2

7. Now application is all set to run just click on Run and Run Project (Pruthviraj-Desktop) Refer Figure 27



Pruthviraj-Desktop - NetBeans IDE 8.1
File Edit View Navigate Source Refactor Run Debug Profile Team Tools Window Help
Run Project (Pruthviraj-Desktop) F6
Test Project (Pruthviraj-Desktop) Alt+F6
Build Project (Pruthviraj-Desktop) F11
Clean and Build Project (Pruthviraj-Desktop) Shift+F11
Set Project Configuration
Set Project Browser
Set Main Project
Generate Javadoc (Pruthviraj-Desktop)
Run File Shift+F6
Test File Ctrl+F6
Compile File F9
Check File Alt+F9
Validate File Alt+Shift+F9
Repeat Build/Run: Pruthviraj-Desktop (run) Ctrl+F11
Stop Build/Run
Output - Pruthviraj-Desktop (run)

```
run:
BUILD STOPPED (total time: 5 seconds)
```

Figure 27: Run Project

8. Now you will see the Sign in page of the system. Refer Figure 28

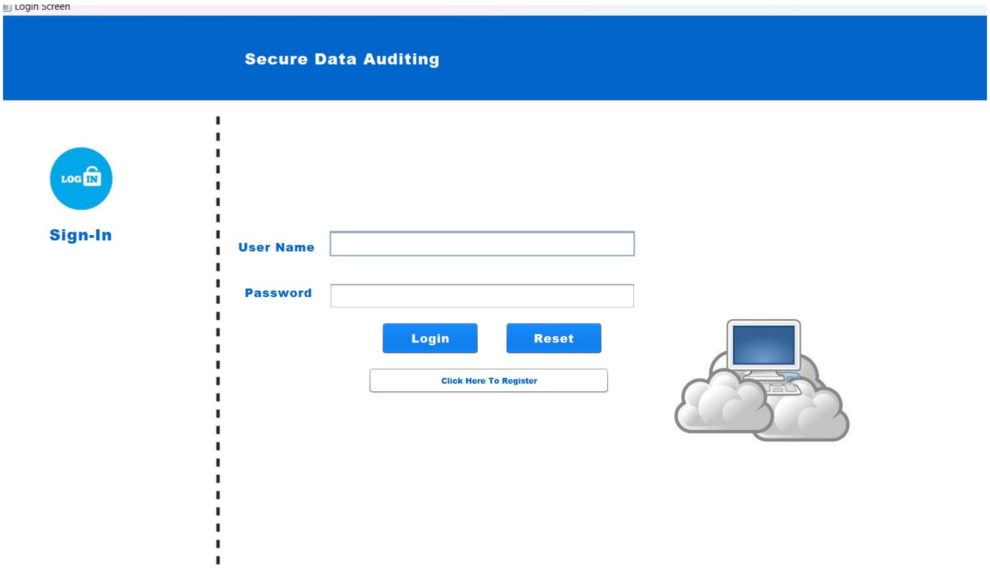
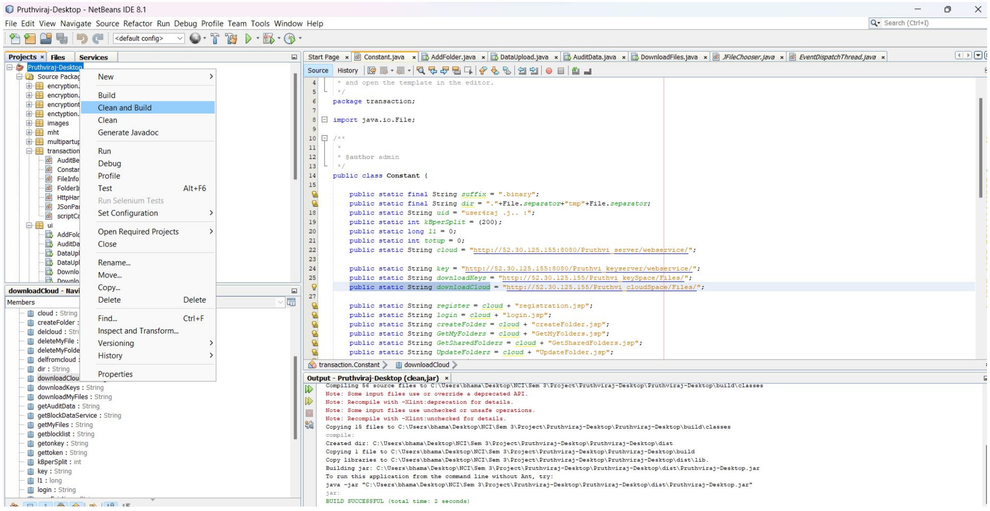


Figure 28: Sign In Page of desktop Application

9. I built executable Jar file of this application. Right Click on Project-Desktop and then click on clean and build. Refer figure 29



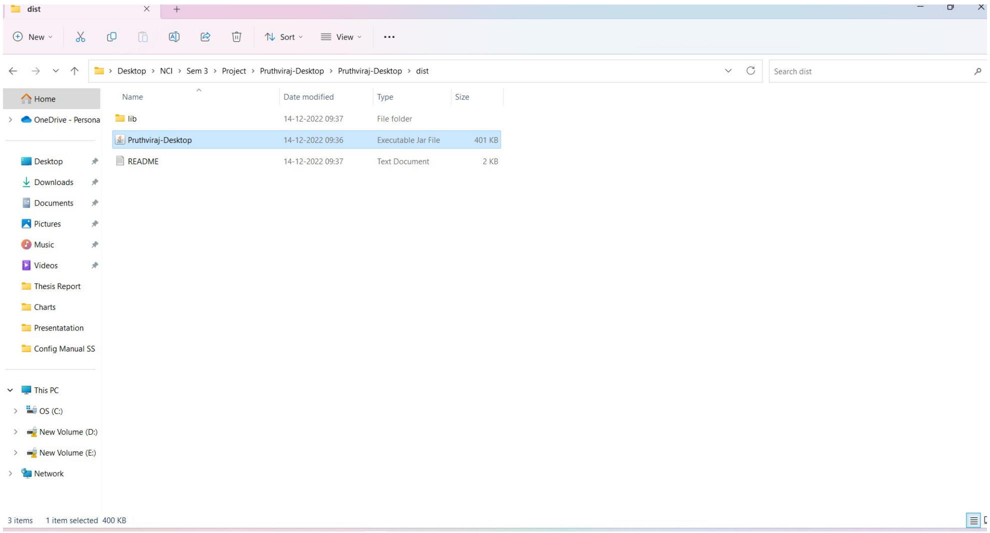
```
 * and open the template in the editor.
 */
package transaction;

import java.io.File;

/**
 *
 * @author admin
 */
public class Constant {

    public static final String suffix = ".binary";
    public static final String dir = "."+File.separator+"tmp"+File.separator;
    public static String uid = "user4raj .j.. :";
    public static int kBperSplit = (200);
    public static long l1 = 0;
    public static int totup = 0;
    public static String cloud = "http://52.30.125.155:8080/Pruthvi_server/webservice/";

    public static String key = "http://52.30.125.155:8080/Pruthvi_keyserver/webservice/";
    public static String downloadKeys = "http://52.30.125.155/Pruthvi_keySpace/Files/";
    public static String downloadCloud = "http://52.30.125.155/Pruthvi_cloudSpace/Files/";

    public static String register = cloud + "registration.jsp";
    public static String login = cloud + "login.jsp";
    public static String createFolder = cloud + "createFolder.jsp";
    public static String GetMyFolders = cloud + "GetMyFolders.jsp";
    public static String GetSharedFolders = cloud + "GetSharedFolders.jsp";
    public static String UpdateFolders = cloud + "UpdateFolder.jsp";
```

```
Compiling 56 source files to C:\Users\bhama\Desktop\NCI\Sem 3\Project\Pruthviraj-Desktop\Pruthviraj-Desktop\build\classes
Note: Some input files use or override a deprecated API.
Note: Recompile with -Xlint:deprecation for details.
Note: Some input files use unchecked or unsafe operations.
Note: Recompile with -Xlint:unchecked for details.
Copying 15 files to C:\Users\bhama\Desktop\NCI\Sem 3\Project\Pruthviraj-Desktop\Pruthviraj-Desktop\build\classes
compile:
Created dir: C:\Users\bhama\Desktop\NCI\Sem 3\Project\Pruthviraj-Desktop\Pruthviraj-Desktop\dist
Copying 1 file to C:\Users\bhama\Desktop\NCI\Sem 3\Project\Pruthviraj-Desktop\Pruthviraj-Desktop\build
Copy libraries to C:\Users\bhama\Desktop\NCI\Sem 3\Project\Pruthviraj-Desktop\Pruthviraj-Desktop\dist\lib.
Building jar: C:\Users\bhama\Desktop\NCI\Sem 3\Project\Pruthviraj-Desktop\Pruthviraj-Desktop\dist\Pruthviraj-Desktop.jar
To run this application from the command line without Ant, try:
java -jar "C:\Users\bhama\Desktop\NCI\Sem 3\Project\Pruthviraj-Desktop\Pruthviraj-Desktop\dist\Pruthviraj-Desktop.jar"
jar:
BUILD SUCCESSFUL (total time: 2 seconds)
```

Figure 29: Building of executable jar file

10. The built file is created in the ”dist” folder of your project directory. Refer Figure 30

11. Now desktop application is ready to use.



Desktop › NCI › Sem 3 › Project › Pruthviraj-Desktop › Pruthviraj-Desktop › dist

Search dist

Name	Date modified	Type	Size
lib	14-12-2022 09:37	File folder	
Pruthviraj-Desktop	14-12-2022 09:36	Executable Jar File	401 KB
README	14-12-2022 09:37	Text Document	2 KB

3 items 1 item selected 400 KB

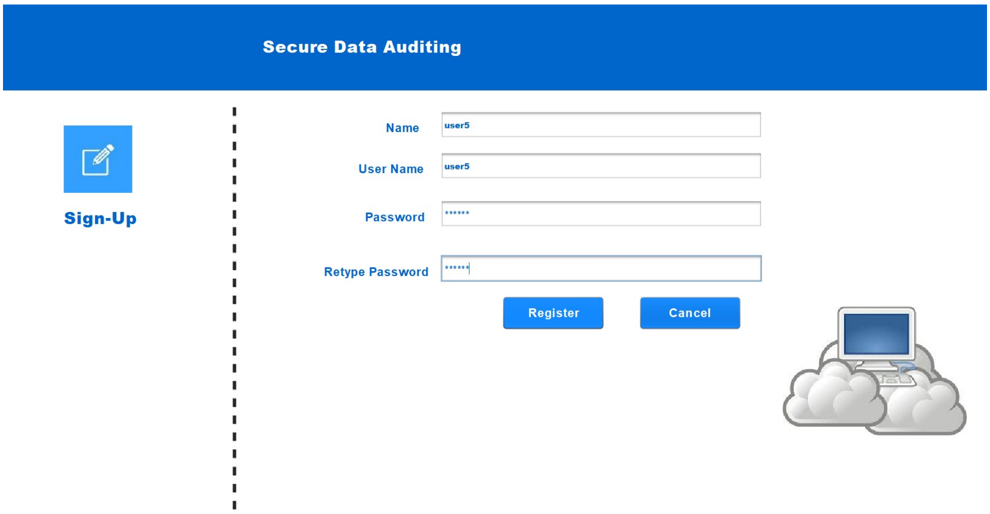
Figure 30: Executable file location

4 Execution environment of the desktop application:

To run executable jar file, user must have jdk 1.8 minimum and above in the pc/laptop.

4.1 Application:

The end-user may interact with the system using a graphical user interface program. All server apps are linked to this application. Following the command's first execution, the system establishes connections with all of the servers before launching the program. The system can be accessed via the screens below.



Name	user5
User Name	user5
Password	******
Retype Password	******

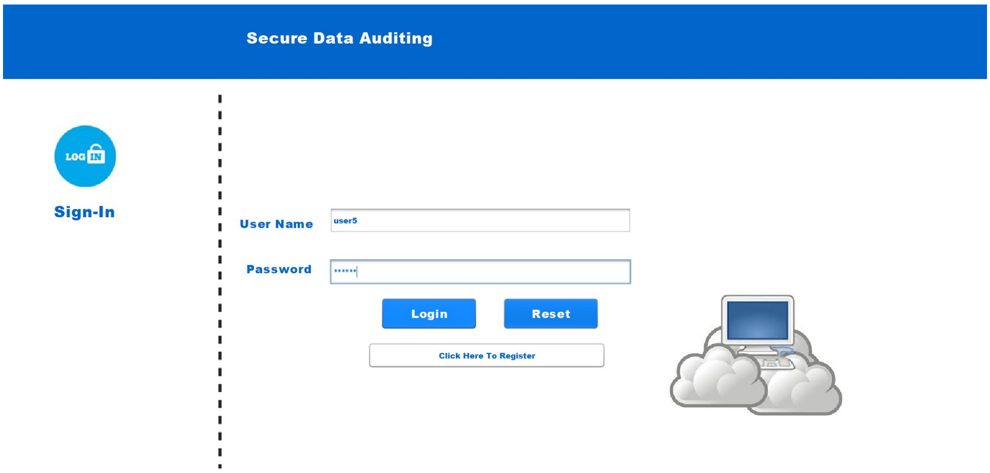
Figure 31: Registration of user

4.1.1 Registration:

The user can set up an account on the system using this screen. Account creation requires name, username and minimum 6 digit/words password. Figure 31

4.1.2 Login:

The system allows the registered user to log in. Username and password are needed for login. The user will have access to several system functionalities after a successful login. Figure 32



User Name user5

Password ••••••

Figure 32: Login

4.1.3 Control Panel of Secured Data Auditing:

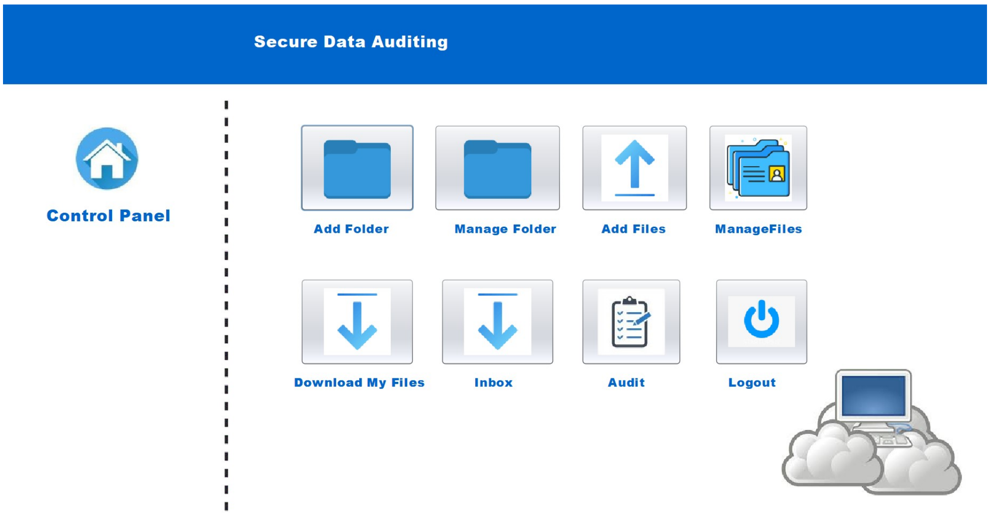
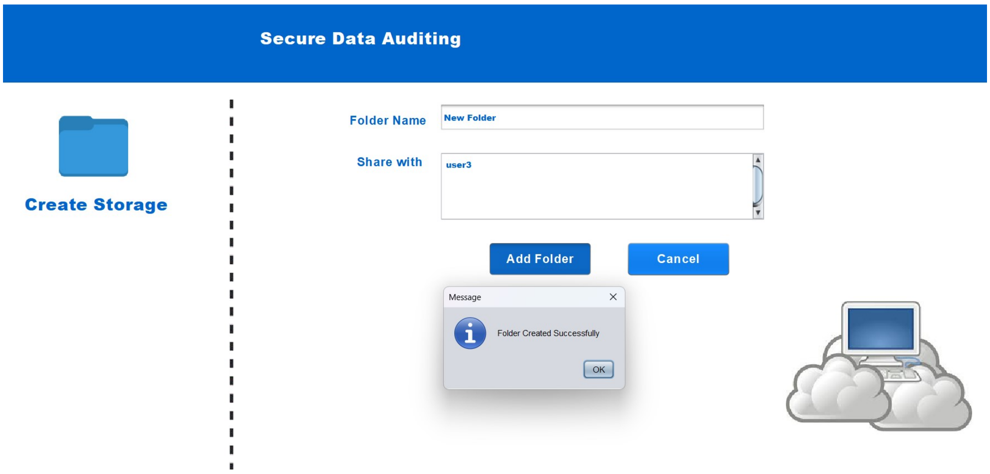


Figure 33: Control Panel

After a successful login, the end user sees this as their home screen. Several capabilities, including add folder, manage folder, add files, manage file, download files, inbox and data auditing, are accessible from this panel. Refer Figure 15

4.1.4 Add Folder:


Secure Data Auditing

Folder Name: New Folder

Share with: user3

Message

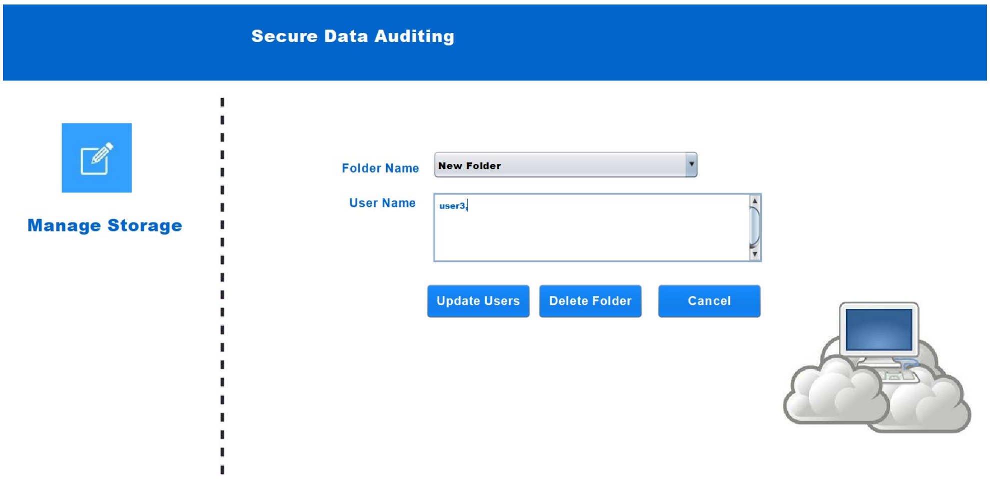
Folder Created Successfully

Figure 34: Add folder

In this data owner or user can create a single repository folder and can share it with other users of desktop application. After creation it shows the dialog box of time took for creating the folder. Refer figure 34

4.1.5 Manage Folder:

From this function user can manage the folder where he/she can revoke access of other users from that particular folder or they can give access to other users. Owner can delete the folder from manage folder. Refer Figure 35


Secure Data Auditing

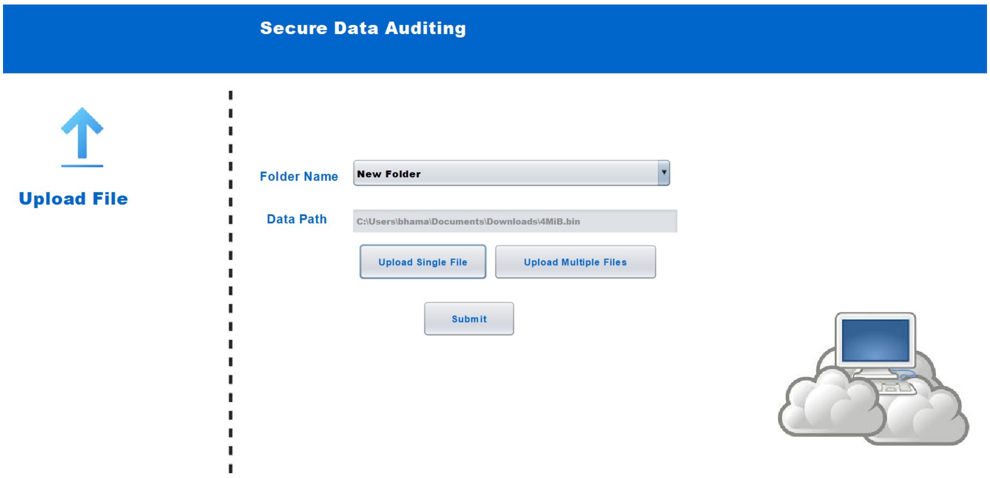
Folder Name: New Folder

User Name: user3,

Figure 35: Manage storage

4.1.6 Add Files:

In this feature user can add single or multiple files in to the folder which is on cloud storage. Refer Fig 36



Secure Data Auditing

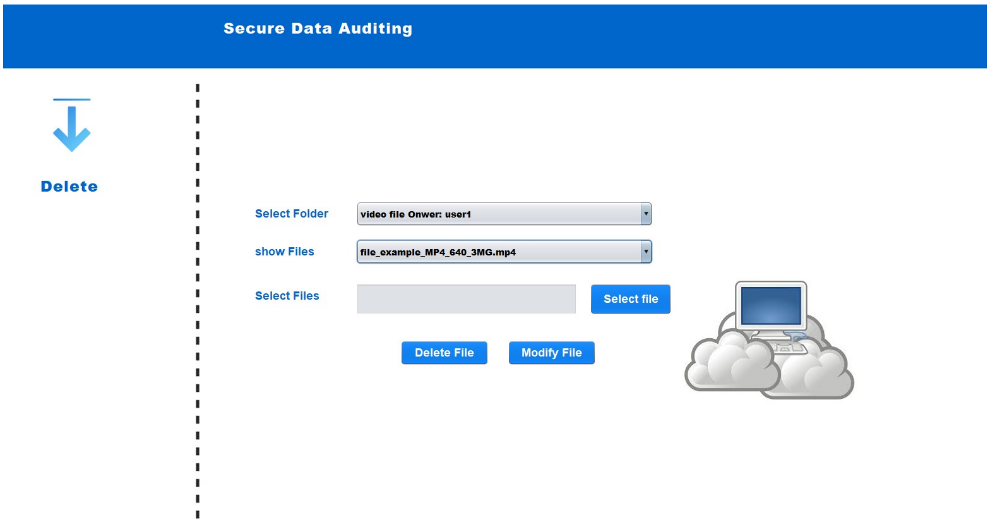
Folder Name: New Folder

Data Path: C:\Users\bhama\Documents\Downloads\4MiB.bin

Figure 36: Upload Files

4.1.7 Manage Files:

In this feature, user can delete files or update the existing files. First user has to select the folder then has to select particular file to delete. Refer Figure 37



Secure Data Auditing

Select Folder: video file Onwer: user1

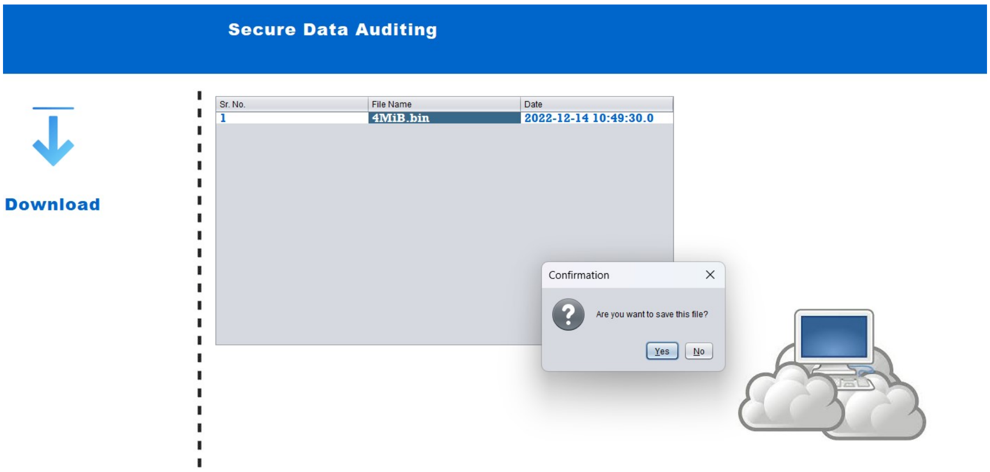
show Files: file_example_MP4_640_3MG.mp4

Select Files:

Figure 37: Manage Files

4.1.8 Download Files:

In this feature user can download his/her own files from the cloud, if he lost files from its own system. First user has to select the folder from which heRefer Figure 38



Sr. No.	File Name	Date
1	4MiB.bin	2022-12-14 10:49:30.0

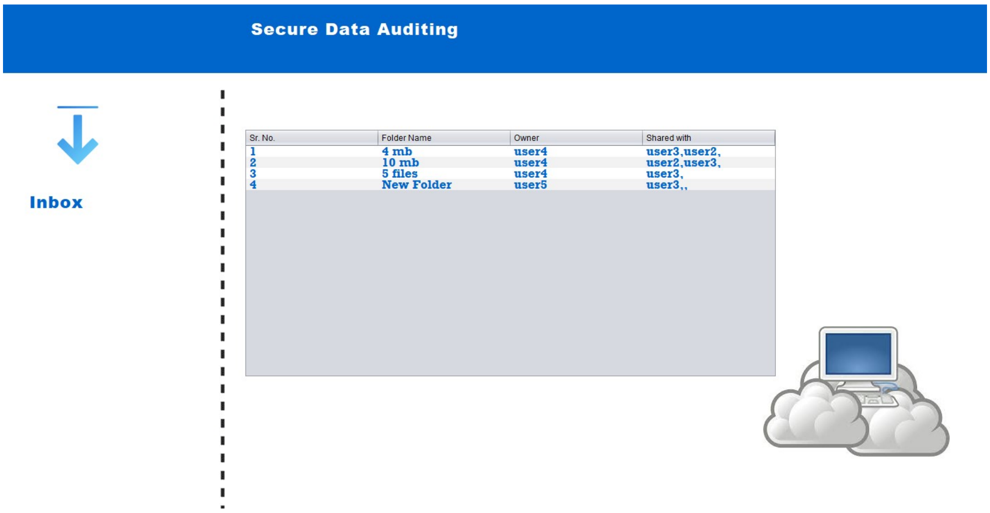
Confirmation

Are you want to save this file?

Figure 38: Download Files

4.1.9 Inbox:

In this feature user will receive the folder directory from other users and can download the necessary file with the download feature in it. Refer Figure 39

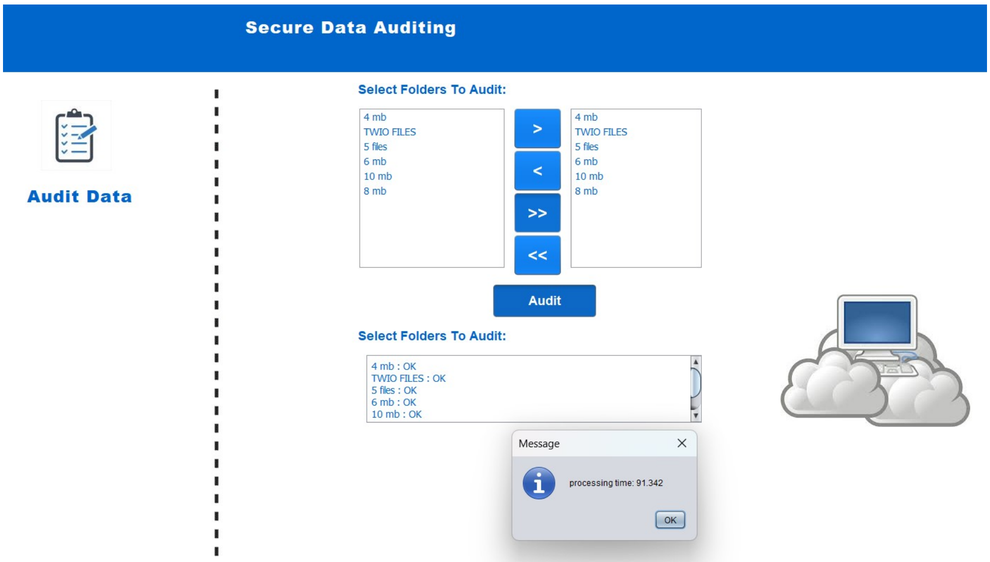


Sr. No.	Folder Name	Owner	Shared with
1	4 mb	user4	user3,user2,
2	10 mb	user4	user2,user3,
3	5 files	user4	user3,
4	New Folder	user5	user3,,

Figure 39: Inbox

4.1.10 Data Auditing:

Last but the most important feature of the system is data auditing. User/owner can check data integrity on this desktop application. If someone tampers any data then it would show the data integrity issue. If it is not tampered then it would show OK in the desktop application. The user can audit one or more folders using this page. A list box on the left side of the screen lists every folder that is part of the owner. From the list, the user can choose one or more folders. The audit outcome is shown on the screen after the audit. Refer Figure 40



4 mb
TWIO FILES
5 files
6 mb
10 mb
8 mb

4 mb
TWIO FILES
5 files
6 mb
10 mb
8 mb

4 mb : OK
TWIO FILES : OK
5 files : OK
6 mb : OK
10 mb : OK

processing time: 91.342

Figure 40: Data Auditing

5 References

https://www.java.com/en/download/help/windows$_{m}anual_{d}ownload.htmlhttps : //www.oracle.com/ie$
$archive - downloads.htmlhttps : //www.apachefriends.org/download.html$