Cloud Deployment of Java Web App on AWS EC2 using Maven

This document explains the step-by-step setup of a Java-based web application on an AWS EC2 instance using Apache Maven and Amazon Corretto (Java 8). The project demonstrates cloud provisioning, secure SSH access, and remote cloud development using VS Code.

Project Objectives

- Set up a secure cloud-based virtual machine (EC2)
- Configure IAM for secure cloud access
- Install necessary Java development tools (Maven, Corretto)
- Build a Java web app using Maven
- Enable remote development from VS Code

Tools & Technologies

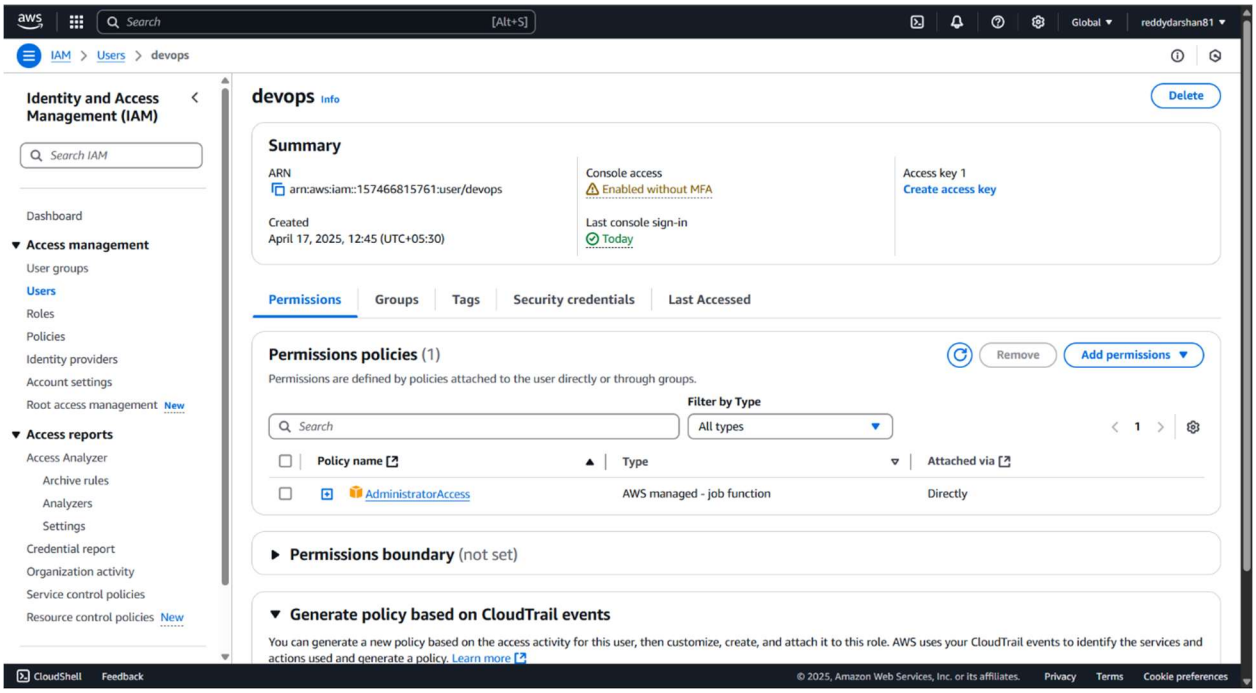
- **AWS IAM**
- **Amazon EC2 (Free Tier)**
- **Apache Maven**
- **Amazon Corretto 8**
- **Visual Studio Code (VS Code)**
- **Remote - SSH Extension**
- **SSH Key Pair**
- **Windows Terminal**

1. IAM User Creation

Created an **IAM user** with administrative privileges.

🔎 What is IAM?

AWS Identity and Access Management (IAM) allows you to securely manage access to AWS services. Creating an IAM user with admin access enables secure operations on AWS resources like EC2.

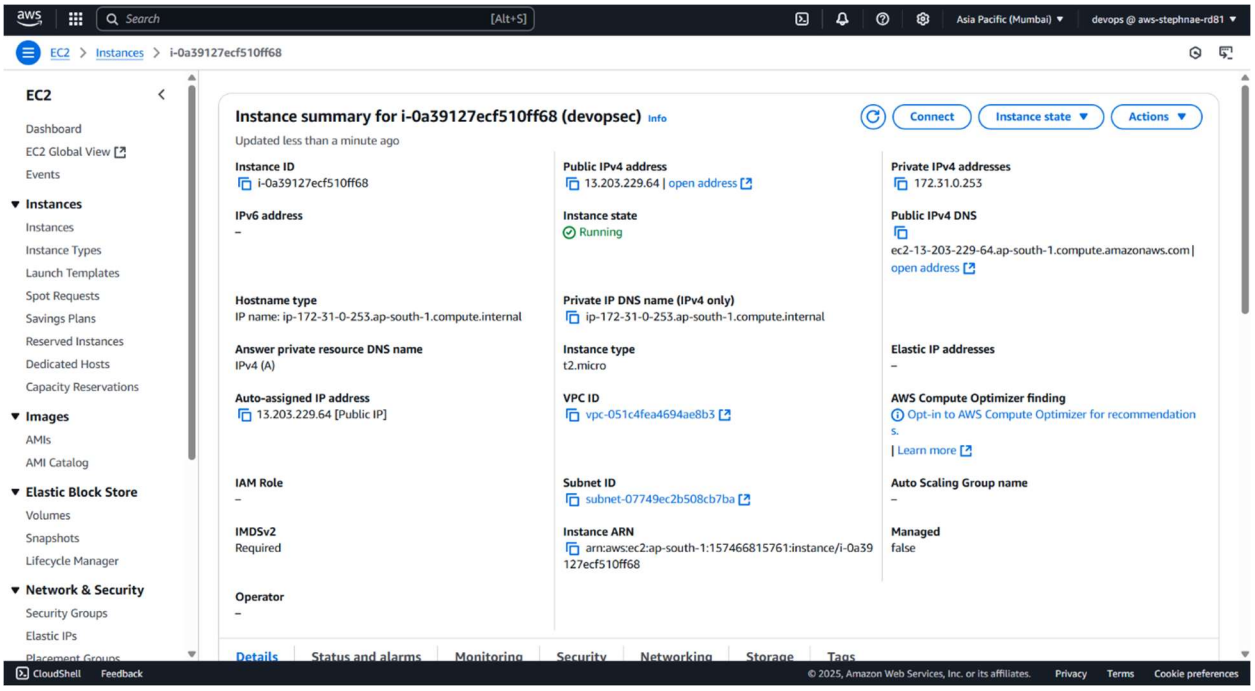


2. Launch EC2 Instance

- Launched a **Free Tier** Amazon Linux 2 EC2 instance.
- Created a **Key Pair** (nextgen-keypair.pem) for SSH access.
- Allowed SSH from my IP address in the **Security Group**.
- Other settings left as default.

Why is EC2 Important?

Amazon EC2 provides scalable virtual servers in the cloud. It enables you to deploy and manage applications easily without needing physical infrastructure.



3. Set Permissions for PEM Key (Windows)

In the VS Code terminal, navigated to the folder containing the PEM file and ran:

bash

CopyEdit

```
icacls "nextgen-keypair.pem" /reset

icacls "nextgen-keypair.pem" /grant:r "darshan\juice:R"

icacls "nextgen-keypair.pem" /inheritance:r
```

This ensures the key has proper permissions required by SSH.

```
PS C:\Users\juice> cd .\Desktop\
PS C:\Users\juice\Desktop> cd .\devops\
PS C:\Users\juice\Desktop\devops> ls


    Directory: C:\Users\juice\Desktop\devops


Mode                 LastWriteTime         Length Name
----                 -------------         ------ ----
-a----        2025-04-17  12:57 PM           1674 nextgen-keypair.pem


PS C:\Users\juice\Desktop\devops>
```

```
PS C:\Users\juice\Desktop\devops> icacls "nextgen-keypair.pem" /reset
>> icacls "nextgen-keypair.pem" /grant:r "darshan\juice:R"
>> icacls "nextgen-keypair.pem" /inheritance:r
>>
processed file: nextgen-keypair.pem
Successfully processed 1 files; Failed processing 0 files
processed file: nextgen-keypair.pem
Successfully processed 1 files; Failed processing 0 files
processed file: nextgen-keypair.pem
Successfully processed 1 files; Failed processing 0 files
PS C:\Users\juice\Desktop\devops>
```

4. Connecting to EC2 Instance via SSH

- **What was done**: Copied the **Public IPv4 DNS** from the EC2 dashboard and connected to the instance:

bash

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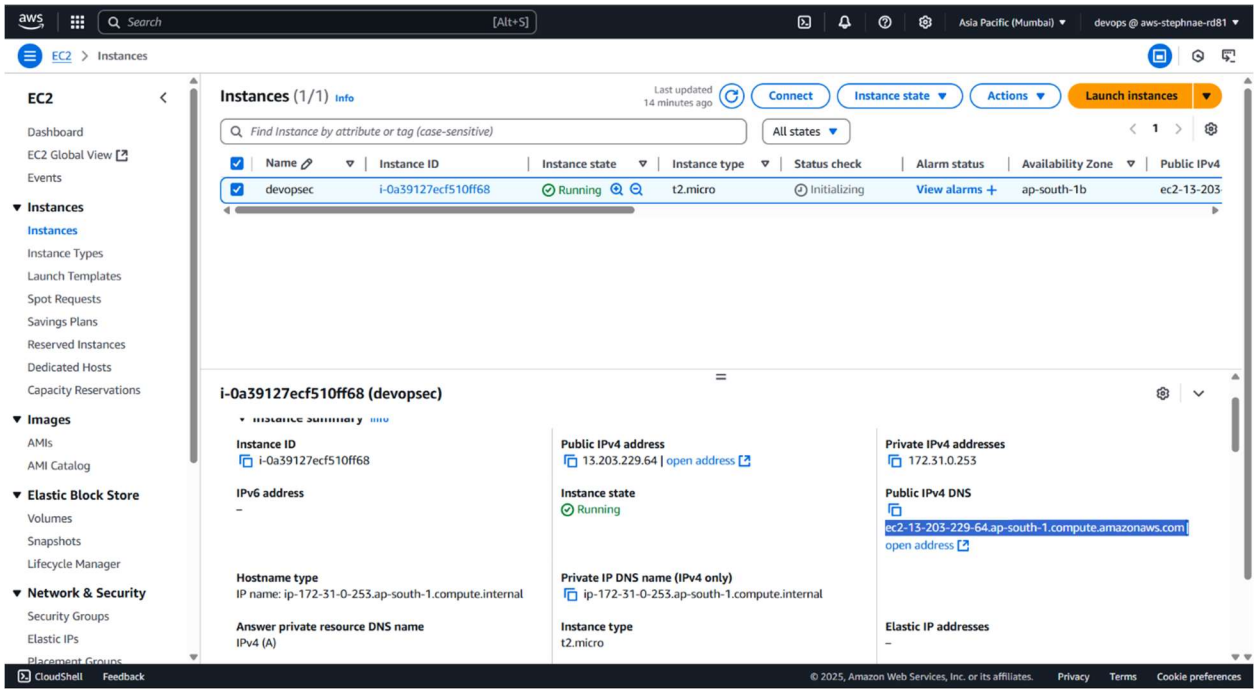
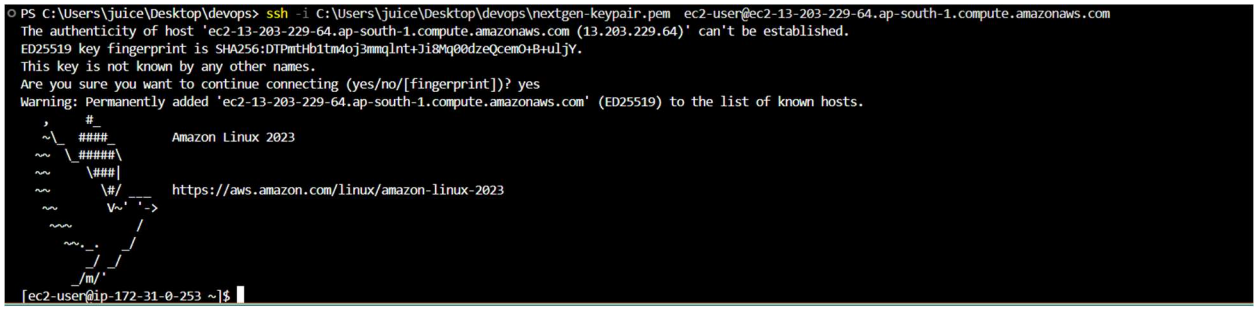
ssh -i C:\Users\juice\Desktop\devops\nextgen-keypair.pem ec2-user@ec2-13-203-229-64.ap-south-1.compute.amazonaws.com

- **Why it's important**: SSH allows secure command-line access to remote servers for administration and deployment tasks.





5. Installing Apache Maven

- **What was done**:

bash

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wget https://archive.apache.org/dist/maven/maven-3/3.5.2/binaries/apache-maven-3.5.2-bin.tar.gz

sudo tar -xzf apache-maven-3.5.2-bin.tar.gz -C /opt

echo "export PATH=/opt/apache-maven-3.5.2/bin:$PATH" >> ~/.bashrc

source ~/.bashrc

- **Why it's important**: Maven is a project management and build automation tool used for Java projects.

```
[ec2-user@ip-172-31-0-253 ~]$ wget https://archive.apache.org/dist/maven/maven-3/3.5.2/binaries/apache-maven-3.5.2-bin.tar.gz
 sudo tar -xzf apache-maven-3.5.2-bin.tar.gz -C /opt

echo "export PATH=/opt/apache-maven-3.5.2/bin:$PATH" >> ~/.bashrc

source ~/.bashrc
--2025-04-17 08:19:45--  https://archive.apache.org/dist/maven/maven-3/3.5.2/binaries/apache-maven-3.5.2-bin.tar.gz
Resolving archive.apache.org (archive.apache.org)... 65.108.204.189, 2a01:4f9:1a:a084::2
Connecting to archive.apache.org (archive.apache.org)|65.108.204.189|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 8738691 (8.3M) [application/x-gzip]
Saving to: ‘apache-maven-3.5.2-bin.tar.gz’

apache-maven-3.5.2-bin. 100%[===========================>]   8.33M  4.50MB/s    in 1.9s

2025-04-17 08:19:47 (4.50 MB/s) - ‘apache-maven-3.5.2-bin.tar.gz’ saved [8738691/8738691]

[ec2-user@ip-172-31-0-253 ~]$
```

6. Installing Amazon Corretto 8 (Java 1.8)

- **What was done**:

  bash

  CopyEdit

  sudo dnf install -y java-1.8.0-amazon-corretto-devel

  export JAVA_HOME=/usr/lib/jvm/java-1.8.0-amazon-corretto.x86_64

  export PATH=/usr/lib/jvm/java-1.8.0-amazon-corretto.x86_64/jre/bin/:$PATH

- **Why it's important**: Java is required for building and running Java-based applications. Corretto is AWS’s distribution of OpenJDK.

```
PROBLEMS   OUTPUT   DEBUG CONSOLE   TERMINAL   PORTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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libXdamage-1.1.6-3.amzn2023.0.1.x86_64             libXext-1.3.6-1.amzn2023.0.1.x86_64                libXfixes-6.0.1-3.amzn2023.0.1.x86_64
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libjpeg-turbo-2.1.4-2.amzn2023.0.5.x86_64          libjxl-1:0.10.3-54.amzn2023.x86_64                 libnotify-0.8.3-4.amzn2023.0.1.x86_64
libogg-2:1.3.4-4.amzn2023.0.2.x86_64               libosinfo-1.12.0-1.amzn2023.0.1.x86_64             libpciaccess-0.16-4.amzn2023.0.2.x86_64
libpng-2:1.6.37-10.amzn2023.0.6.x86_64             libproxy-0.5.7-3.amzn2023.0.1.x86_64               librsvg2-2.59.2-317.amzn2023.x86_64
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liburwind-1.4.0-5.amzn2023.0.2.x86_64              libusbx-1.0.24-2.amzn2023.0.2.x86_64               libvorbis-1:1.3.7-3.amzn2023.0.2.x86_64
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libxkbcommon-1.6.0-2.amzn2023.0.1.x86_64           libxshmfence-1.3.2-3.amzn2023.0.1.x86_64           libxslt-1.1.43-1.amzn2023.0.1.x86_64
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sound-theme-freedesktop-0.8-22.amzn2023.noarch     tracker-3.7.3-3.amzn2023.0.1.x86_64                tracker-miners-3.7.4-2.amzn2023.0.1.x86_64
upower-1.90.6-139.amzn2023.x86_64                  upower-libs-1.90.6-139.amzn2023.x86_64             webrtc-audio-processing-0.3.1-6.amzn2023.0.2.x86_64
wireplumber-0.5.7-1.amzn2023.0.1.x86_64            wireplumber-libs-0.5.7-1.amzn2023.0.1.x86_64       xdg-desktop-portal-1.18.4-105.amzn2023.x86_64
xdg-desktop-portal-gtk-1.15.1-61.amzn2023.x86_64   xkeyboard-config-2.41-1.amzn2023.0.1.noarch        xml-common-0.6.3-56.amzn2023.0.2.noarch
xprop-1.2.7-1.amzn2023.x86_64

Complete!
[ec2-user@ip-172-31-0-253 ~]$
```

7. Verifying Installations

- **What was done**:

  bash

  CopyEdit

  mvn -v # Verify Maven

  java -version # Verify Java

- **Why it's important**: Validating tool installations ensures the environment is set up correctly before moving to development.

---

8. Generating a Java Web App using Maven

- **What was done**:

  bash

  CopyEdit

  mvn archetype:generate \

  -DgroupId=com.nextwork.app \

  -DartifactId=nextwork-web-project \

-DarchetypeArtifactId=maven-archetype-webapp \

-DinteractiveMode=false

- **Why it's important**: This command scaffolds a basic Java web application, setting up the required project structure to build on.

```
[ec2-user@ip-172-31-0-253 ~]$ mvn -v
Apache Maven 3.5.2 (138edd61fd100ec658bfa2d307c43b76940a5d7d; 2017-10-18T07:58:13Z)
Maven home: /opt/apache-maven-3.5.2
Java version: 1.8.0_442, vendor: Amazon.com Inc.
Java home: /usr/lib/jvm/java-1.8.0-amazon-corretto.x86_64/jre
Default locale: en, platform encoding: UTF-8
OS name: "linux", version: "6.1.131-143.221.amzn2023.x86_64", arch: "amd64", family: "unix"
```

```
[ec2-user@ip-172-31-0-253 ~]$ java -version
openjdk version "1.8.0_442"
OpenJDK Runtime Environment Corretto-8.442.06.1 (build 1.8.0_442-b06)
OpenJDK 64-Bit Server VM Corretto-8.442.06.1 (build 25.442-b06, mixed mode)
```

9. Enabling Remote Development in VS Code

- **What was done**:
  - Installed the **Remote - SSH** extension in VS Code.
  - Connected to the EC2 instance remotely via the VS Code terminal using:

bash

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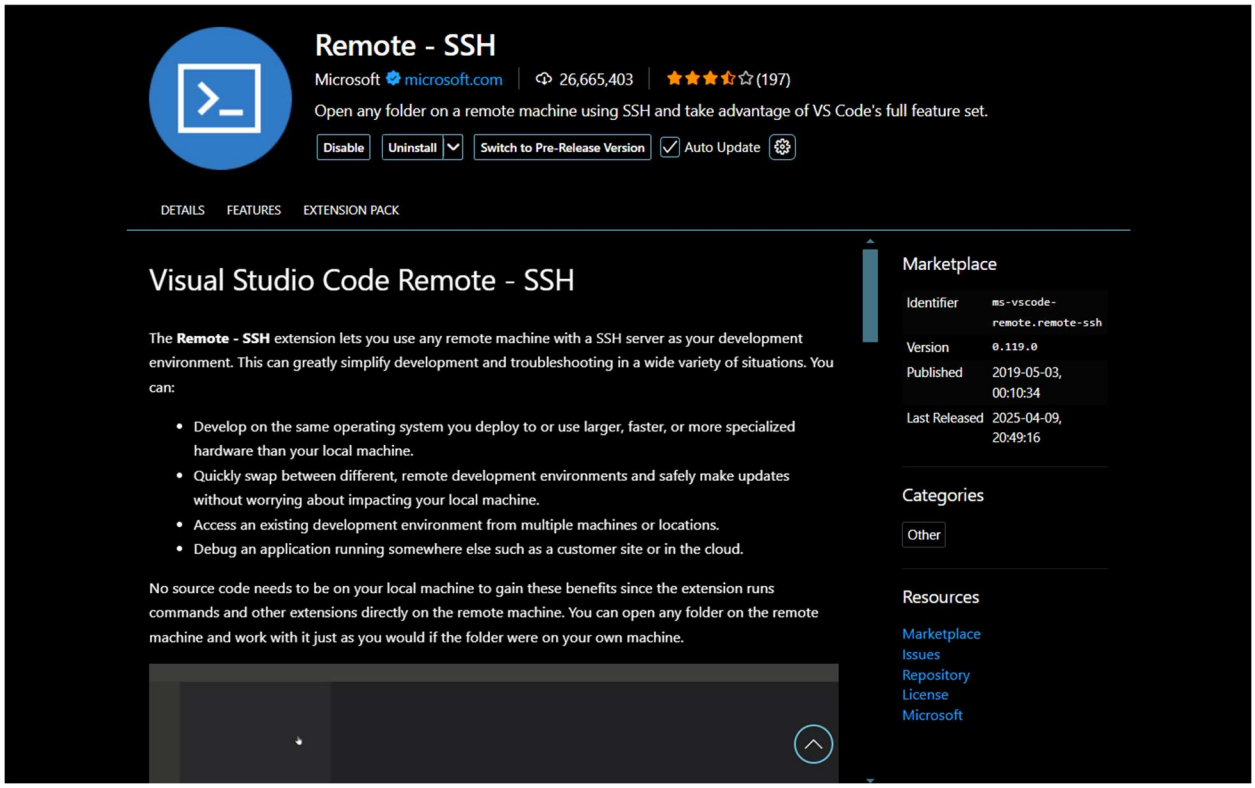
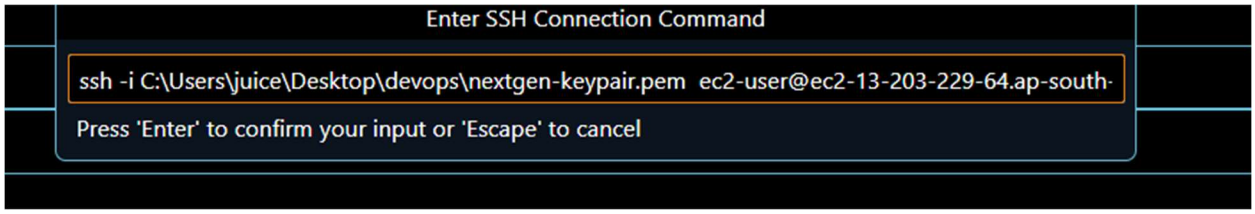
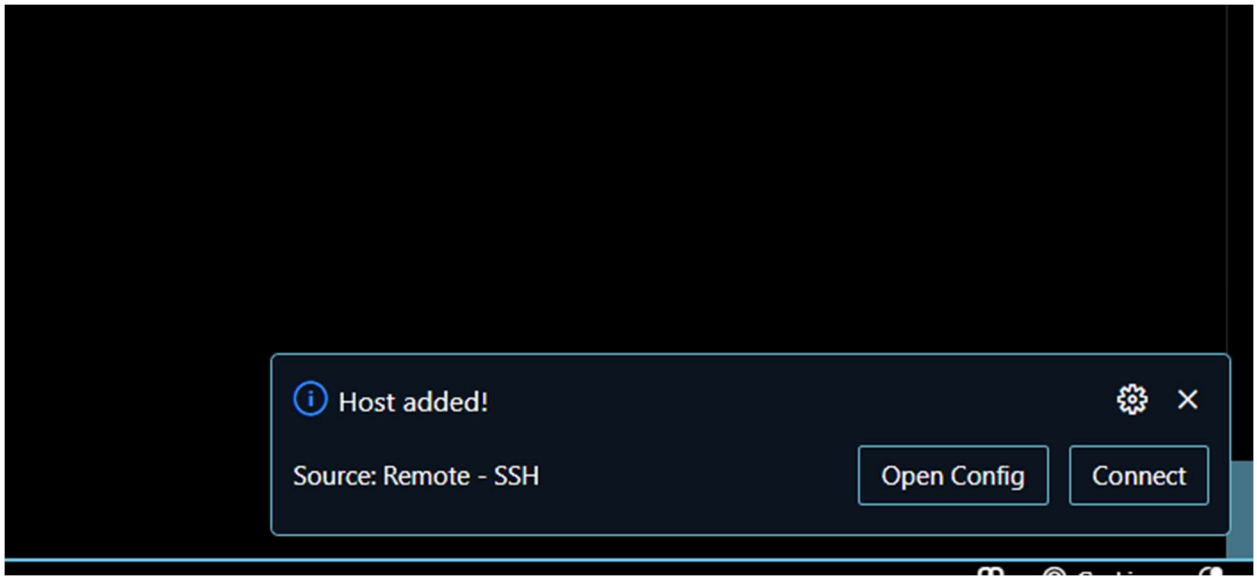
ssh -i C:\Users\juice\Desktop\devops\nextgen-keypair.pem ec2-user@ec2-13-203-229-64.ap-south-1.compute.amazonaws.com

- **Why it's important**: Remote development allows direct code editing on the server, which is efficient for cloud-based application deployment.

```
[INFO] ----------------------------------------------------------------------------
[INFO] Using following parameters for creating project from Old (1.x) Archetype: maven-archetype-webapp:1.0
[INFO] ----------------------------------------------------------------------------
[INFO] Parameter: basedir, Value: /home/ec2-user
[INFO] Parameter: package, Value: com.nextwork.app
[INFO] Parameter: groupId, Value: com.nextwork.app
[INFO] Parameter: artifactId, Value: nextwork-web-project
[INFO] Parameter: packageName, Value: com.nextwork.app
[INFO] Parameter: version, Value: 1.0-SNAPSHOT
[INFO] project created from Old (1.x) Archetype in dir: /home/ec2-user/nextwork-web-project
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 11.045 s
[INFO] Finished at: 2025-04-17T08:25:30Z
[INFO] Final Memory: 19M/86M
[INFO] ------------------------------------------------------------------------
```







C: > Users > juice > .ssh > config

```
Host ec2-13-203-229-64.ap-south-1.compute.amazonaws.com
  HostName ec2-13-203-229-64.ap-south-1.compute.amazonaws.com
  IdentityFile C:\Users\juice\Desktop\devops\nextgen-keypair.pem
  User ec2-user

Host ec2-13-203-229-64.ap-south-1.compute.amazonaws.com
  HostName ec2-13-203-229-64.ap-south-1.compute.amazonaws.com
  IdentityFile C:UsersjuiceDesktopdevopsnextgen-keypair.pem
  User ec2-user

Host ec2-13-203-229-64.ap-south-1.compute.amazonaws.com
  HostName ec2-13-203-229-64.ap-south-1.compute.amazonaws.com
  IdentityFile C:UsersjuiceDesktopdevopsnextgen-keypair.pem
  User ec2-user

Host ec2-13-203-229-64.ap-south-1.compute.amazonaws.com
  HostName ec2-13-203-229-64.ap-south-1.compute.amazonaws.com
  IdentityFile C:UsersjuiceDesktopdevopsnextgen-keypair.pem
  User ec2-user
```

10. SSH Configuration File for Streamlined Access

What was done:

To simplify the SSH connection process in VS Code, I configured the config file located in the .ssh directory. The configuration allowed seamless connection to the EC2 instance without retyping long SSH commands each time.

Here is the content of my SSH config file:

ssh

CopyEdit

```
Host ec2-13-203-229-64.ap-south-1.compute.amazonaws.com
  HostName ec2-13-203-229-64.ap-south-1.compute.amazonaws.com
  IdentityFile C:\Users\juice\Desktop\devops\nextgen-keypair.pem
  User ec2-user
```

⚠️ *Note*: I had multiple entries in the config file initially, with some incorrect formatting (missing backslashes). After correcting the file path and ensuring there was only one clean, correctly-formatted block, the connection worked smoothly.

Why it's important:

- It **simplifies repeated SSH access** by allowing me to just type ssh ec2-13-203-229-64.ap-south-1.compute.amazonaws.com instead of the full ssh -i command.
- It enables **VS Code's Remote - SSH extension** to detect the remote host automatically, allowing me to:
    - Browse EC2 files directly from the Explorer pane in VS Code.
    - Edit, save, and manage files on the cloud server as if they were local.
    - Run terminals and commands from within the VS Code interface.

Result:

I was able to **access and manage my EC2 instance directly from within VS Code**, significantly improving my workflow and making cloud-based Java development easier and more efficient.

Key Learnings

- IAM user roles are crucial for controlled and secure access to AWS resources.
- EC2 instances can be provisioned, secured, and accessed with SSH keys.
- Maven and Java setup on a Linux server enables cloud-hosted Java application development.
- Remote development using VS Code and SSH configuration streamlines productivity and simplifies cloud-based workflows.