St. Francis Institute of Technology, Mumbai-400 103

Department of Information Technology

A.Y. 2024-2025

Class: TE-ITA/B, Semester: V

Subject: **Advanced DevOps Lab**

Experiment – 2: To understand the benefits of Cloud Infrastructure and create AWS Cloud9 EC2 development environment and run python code in the environment.

1. **Aim:** To understand the benefits of Cloud Infrastructure and create AWS Cloud9 EC2 development environment and run python code in the environment.
2. **Objectives:** After study of this experiment, the student will be able to
   - Understand basic cloud9 IDE
   - Perform Collaboration for Projects.
3. **Outcomes:** After study of this experiment, the student will be able to
   - Understand cloud computing service Cloud9 IDE and collaboration facility provided by cloud9
4. **Prerequisite:** Fundamentals of cloud computing
5. **Requirements:** PC and Internet
6. **Pre-Experiment Exercise:**

Brief Theory:

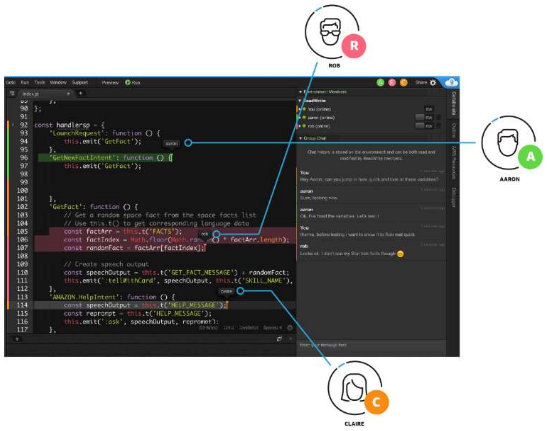
AWS Cloud9 is a cloud-based integrated development environment (IDE) that lets you write, run, and debug your code with just a browser. It includes a code editor, debugger, and terminal. Cloud9 comes prepackaged with essential tools for popular programming languages, including JavaScript, Python, PHP, and more, so you don't need to install files or configure your development machine to start new projects. Since your Cloud9 IDE is cloud-based, you can work on your projects from your office, home, or anywhere using an internet-connected machine. Cloud9 also provides a seamless experience for developing serverless applications enabling you to easily define resources, debug, and switch between local and remote execution of serverless applications. With Cloud9, you can quickly share your development environment with your team, enabling you to pair program and track each other's inputs in real time.

CODE WITH JUST A BROWSER

AWS Cloud9 gives you the flexibility to run your development environment on a managed Amazon EC2 instance or any existing Linux server that supports SSH. This means that you can write, run, and debug applications with just a browser, without needing to install or maintain a local IDE. The Cloud9 code editor and integrated debugger include helpful, time-saving features such as code hinting code completion, and step-through debugging. The Cloud9 terminal provides a browser- based shell experience enabling you to install additional software, do a git push, or enter commands.

CODE TOGETHER IN REAL TIME

AWS Cloud9 makes collaborating on code easy. You can share your development environment with your team in just a few clicks and pair program together. While collaborating, your team members can see each other type in real time, and instantly chat with one another from within the IDE.



```
    },
};

const handlersp = {
    'LaunchRequest': function () {
        this.emit('GetFact');
    },
    'GetNewFactIntent': function () {
        this.emit('GetFact');



    },
    'GetFact': function () {
        // Get a random space fact from the space facts list
        // Use this.t() to get corresponding language data
        const factArr = this.t('FACTS');
        const factIndex = Math.floor(Math.random() * factArr.length);
        const randomFact = factArr[factIndex];

        // Create speech output
        const speechOutput = this.t('GET_FACT_MESSAGE') + randomFact;
        this.emit(':tellWithCard', speechOutput, this.t('SKILL_NAME'),
    },
    'AMAZON.HelpIntent': function () {
        const speechOutput = this.t('HELP_MESSAGE');
        const reprompt = this.t('HELP_MESSAGE');
        this.emit(':ask', speechOutput, reprompt);
    },
```

Chat history is stored on the environment and can be both read and modified by ReadWrite members.

You
Hey Aaron, can you jump in here quick and look at these variables?

aaron
Sure, looking now.

aaron
Ok, I've fixed the variables. Let's test it

You
thanks, before testing I want to show it to Rob real quick

rob
Looks ok. I don't see my Star Trek facts though 😊

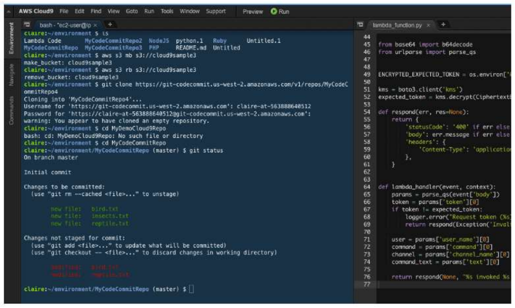
BUILD SERVERLESS APPLICATIONS WITH EASE

AWS Cloud9 makes it easy to write, run, and debug serverless applications. It preconfigures the development environment with all the SDKs, libraries, and plug-ins needed for serverless development. Cloud9 also provides an environment for locally testing and debugging AWS Lambda functions. This allows you to iterate on your code directly, saving you time and improving the quality of your code.

DIRECT TERMINAL ACCESS TO AWS

AWS Cloud9 comes with a terminal that includes sudo privileges to the managed Amazon EC2 instance that is hosting your development environment and a pre-authenticated AWS Command

Line Interface. This makes it easy for you to quickly run commands and directly access AWS services

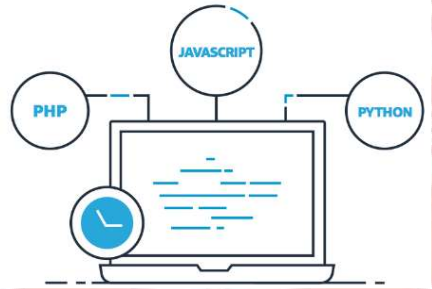

AWS Cloud9 File Edit Find View Goto Run Tools Window Support Preview Run
bash - "ec2-user@ip
lambda_function.py
Environment
Navigate
Commands

```
claire:~/environment $ ls
Lambda Code       MyCodeCommitRepo2  NodeJS  python.1   Ruby      Untitled.1
MyCodeCommitRepo  MyCodeCommitRepo3  PHP     README.md  Untitled
claire:~/environment $ aws s3 mb s3://cloud9sample3
make_bucket: cloud9sample3
claire:~/environment $ aws s3 rb s3://cloud9sample3
remove_bucket: cloud9sample3
claire:~/environment $ git clone https://git-codecommit.us-west-2.amazonaws.com/v1/repos/MyCodeC
ommitRepo4
Cloning into 'MyCodeCommitRepo4'...
Username for 'https://git-codecommit.us-west-2.amazonaws.com': claire-at-563888640512
Password for 'https://claire-at-563888640512@git-codecommit.us-west-2.amazonaws.com':
warning: You appear to have cloned an empty repository.
claire:~/environment $ cd MyDemoCloud9Repo
bash: cd: MyDemoCloud9Repo: No such file or directory
claire:~/environment $ cd MyCodeCommitRepo
claire:~/environment/MyCodeCommitRepo (master) $ git status
On branch master

Initial commit

Changes to be committed:
  (use "git rm --cached <file>..." to unstage)

        new file:   bird.txt
        new file:   insects.txt
        new file:   reptile.txt

Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git checkout -- <file>..." to discard changes in working directory)

        modified:   bird.txt
        modified:   reptile.txt

claire:~/environment/MyCodeCommitRepo (master) $ 
```

```

from base64 import b64decode
from urlparse import parse_qs


ENCRYPTED_EXPECTED_TOKEN = os.environ['

kms = boto3.client('kms')
expected_token = kms.decrypt(Ciphertext

def respond(err, res=None):
    return {
        'statusCode': '400' if err else
        'body': err.message if err else
        'headers': {
            'Content-Type': 'applicatio
        },
    }


def lambda_handler(event, context):
    params = parse_qs(event['body'])
    token = params['token'][0]
    if token != expected_token:
        logger.error("Request token (%s
        return respond(Exception('Inval

    user = params['user_name'][0]
    command = params['command'][0]
    channel = params['channel_name'][0]
    command_text = params['text'][0]

    return respond(None, "%s invoked %s
```

START NEW PROJECTS QUICKLY

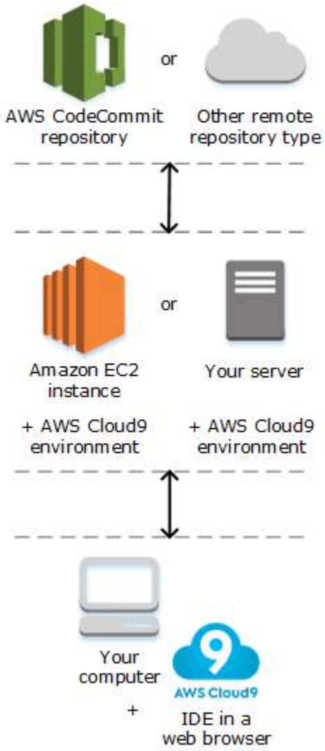
AWS Cloud9 makes it easy for you to start new projects. Cloud9's development environment comes prepackaged with tooling for over 40 programming languages, including Node.js, JavaScript, Python, PHP, Ruby, Go, and C++. This enables you to start writing code for popular application stacks within minutes by eliminating the need to install or configure files, SDKs, and plug-ins for your development machine. Because Cloud9 is cloud-based, you can easily maintain multiple development environments to isolate your project's resources.



How does AWS Cloud9 work?

The following diagram shows a high-level overview of how AWS Cloud9 works.

From the diagram (starting at the bottom), you use the AWS Cloud9 IDE, running in a web browser on your local computer, to interact with your AWS Cloud9 environment. A computing resource (for example, an Amazon EC2 instance or your own server) connects to that environment. Finally, your work is stored in an AWS CodeCommit repository or other type of remote repository.



7. Laboratory Exercise

8. Post-Experiments Exercise

A. Extended Theory:

Use of AWS cloud9 with other AWS services.

B. Questions:

1. Which programming languages are supported by cloud9?
2. What are the types of AWS Cloud9 development environments?

C. Conclusion:

Write the significance of the topic studied in the experiment.

D. References:

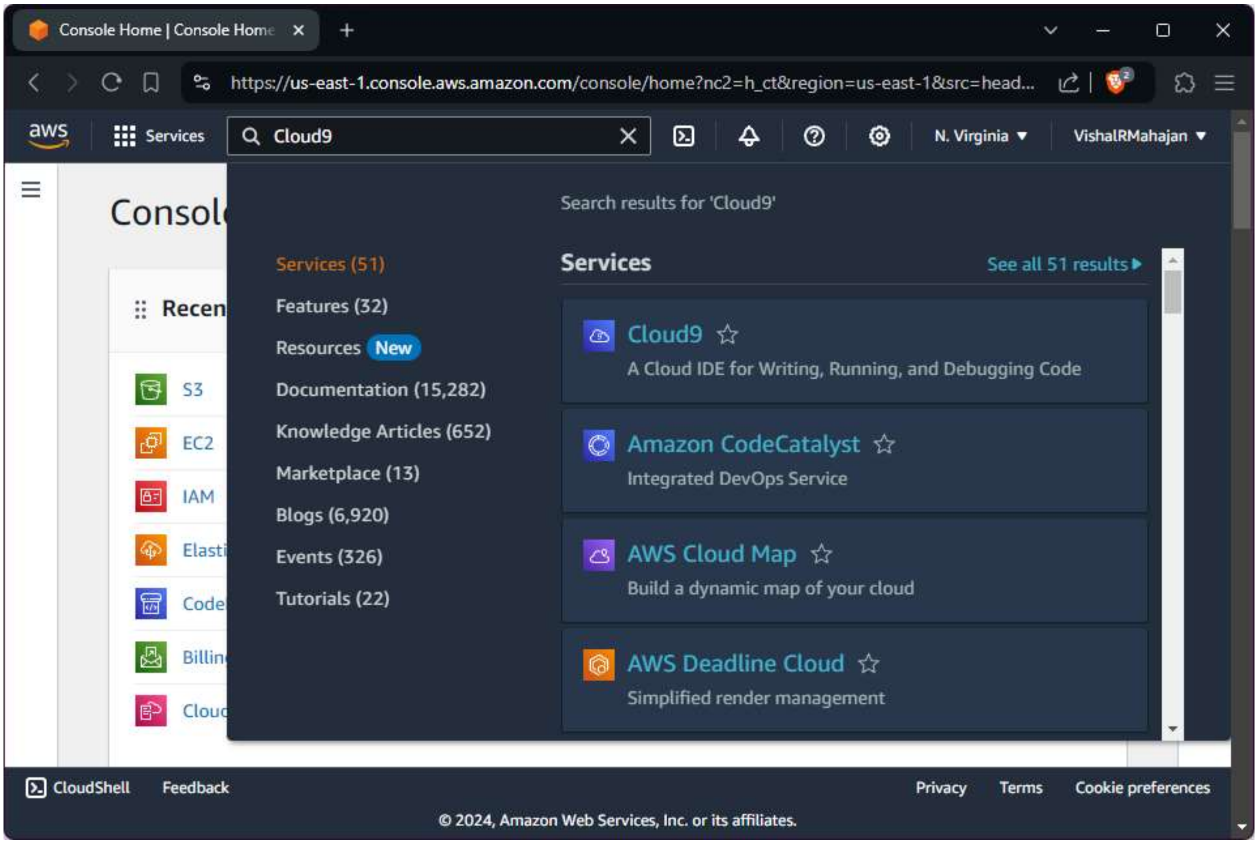
https://docs.aws.amazon.com/cloud9/latest/user-guide/aws-cloud9-ug.pdf

https://aws.amazon.com/cloud9/faqs/

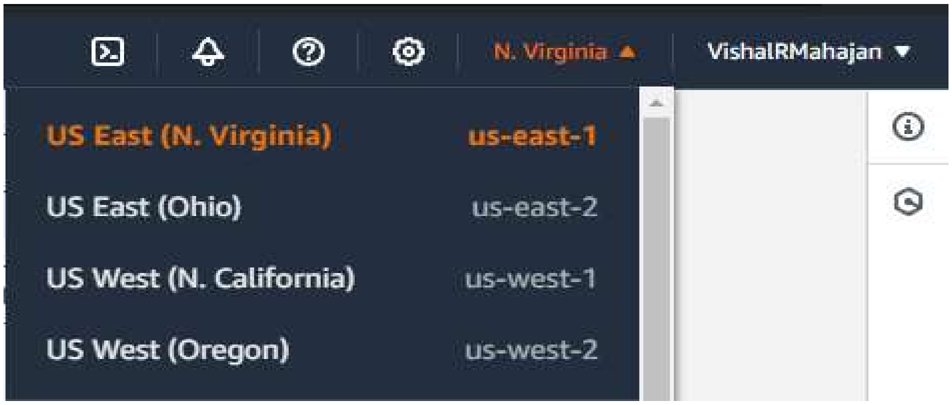
Name: Vishal Rajesh Mahajan ADL EXP 02
Class: TE IT A Roll No: 62

In-Lab Exercise:

1. Login with your AWS account.
2. Navigate to Cloud 9 service from Developer tools section as below:

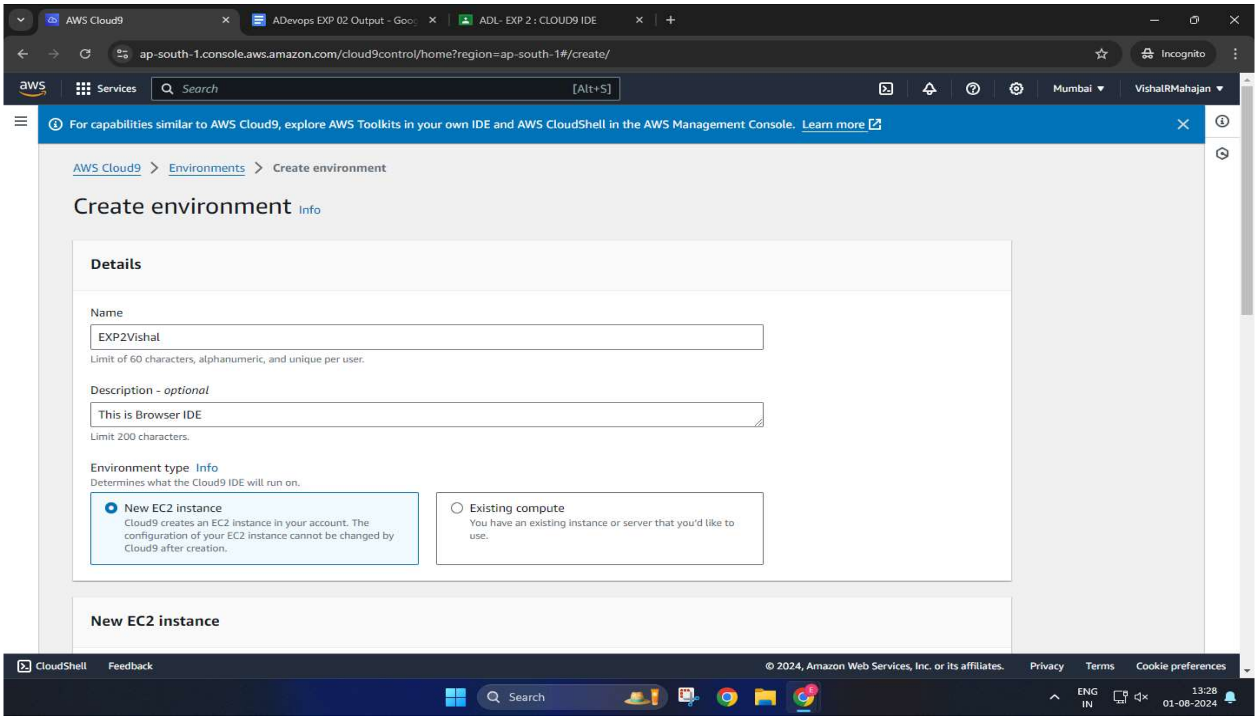


3. Choose an AWS Region to create the environment in US East (N. Virginia) Region


N. Virginia ▲
VishalRMahajan ▼
US East (N. Virginia) us-east-1
US East (Ohio) us-east-2
US West (N. California) us-west-1
US West (Oregon) us-west-2

4. Open Cloud9 and Click on Create Environment

5. Provide name for the Environment (EXP2Vishal) and Select New EC2 instance, T2 micro (It is Free Tier),Platform Default and Timeout to 30 min and Click on Create.


AWS Cloud9
ADevops EXP 02 Output - Goo
ADL- EXP 2 : CLOUD9 IDE
ap-south-1.console.aws.amazon.com/cloud9control/home?region=ap-south-1#/create/
Incognito
Services
Search
[Alt+S]
Mumbai
VishalRMahajan
For capabilities similar to AWS Cloud9, explore AWS Toolkits in your own IDE and AWS CloudShell in the AWS Management Console. Learn more
AWS Cloud9 > Environments > Create environment
CloudShell
Feedback
© 2024, Amazon Web Services, Inc. or its affiliates.
Privacy
Terms
Cookie preferences
Search
ENG IN
13:28
01-08-2024

Create environment Info

Details

Name
EXP2Vishal
Limit of 60 characters, alphanumeric, and unique per user.

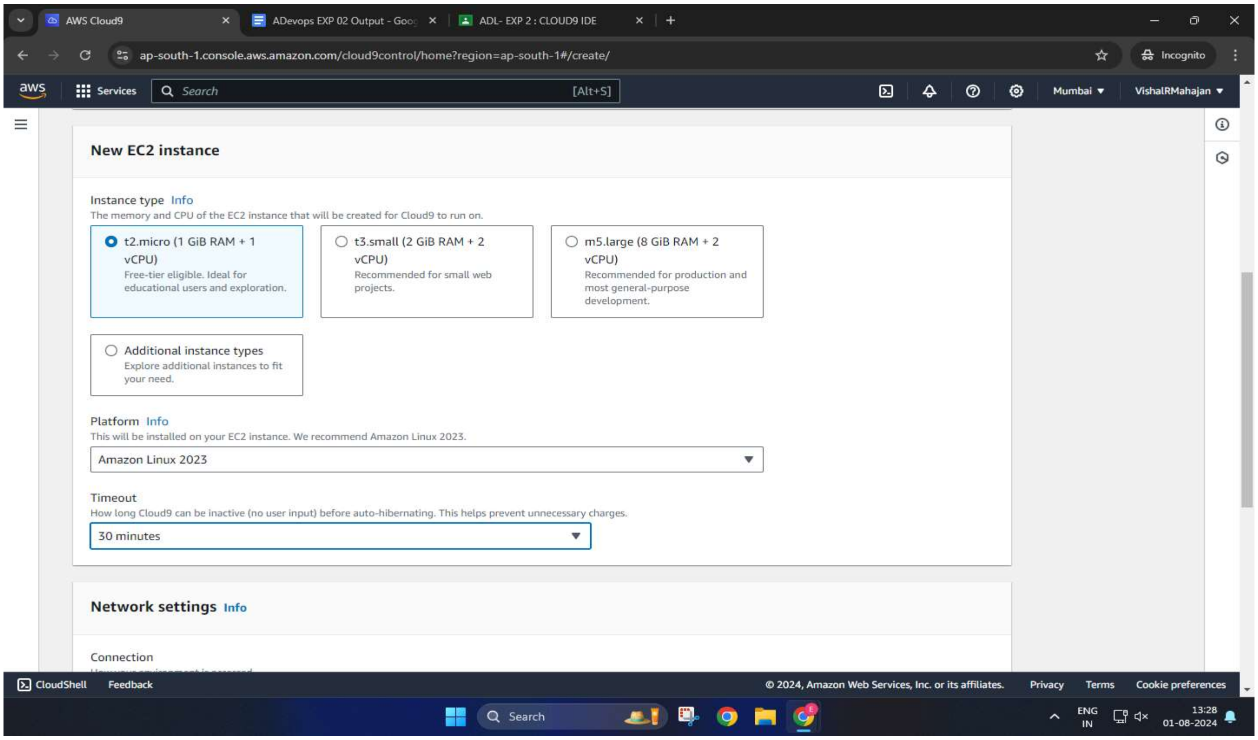
Description - *optional*
This is Browser IDE
Limit 200 characters.

Environment type Info
Determines what the Cloud9 IDE will run on.

● New EC2 instance
Cloud9 creates an EC2 instance in your account. The configuration of your EC2 instance cannot be changed by Cloud9 after creation.

○ Existing compute
You have an existing instance or server that you'd like to use.

New EC2 instance


AWS Cloud9
ADevops EXP 02 Output - Goo
ADL- EXP 2 : CLOUD9 IDE
ap-south-1.console.aws.amazon.com/cloud9control/home?region=ap-south-1#/create/
Incognito
Services
Search
[Alt+S]
Mumbai
VishalRMahajan
CloudShell
Feedback
© 2024, Amazon Web Services, Inc. or its affiliates.
Privacy
Terms
Cookie preferences
Search
ENG IN
13:28
01-08-2024

New EC2 instance

Instance type Info
The memory and CPU of the EC2 instance that will be created for Cloud9 to run on.

● t2.micro (1 GiB RAM + 1 vCPU)
Free-tier eligible. Ideal for educational users and exploration.

○ t3.small (2 GiB RAM + 2 vCPU)
Recommended for small web projects.

○ m5.large (8 GiB RAM + 2 vCPU)
Recommended for production and most general-purpose development.

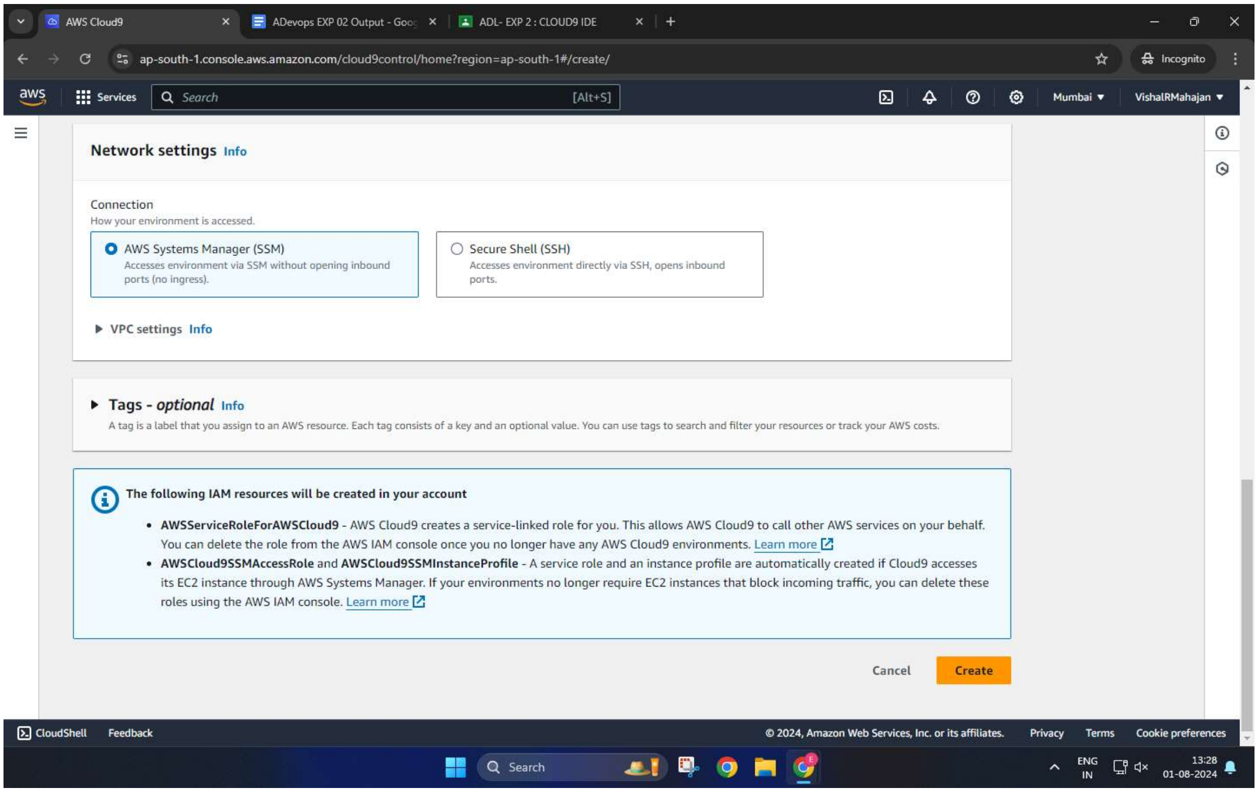
○ Additional instance types
Explore additional instances to fit your need.

Platform Info
This will be installed on your EC2 instance. We recommend Amazon Linux 2023.
Amazon Linux 2023

Timeout
How long Cloud9 can be inactive (no user input) before auto-hibernating. This helps prevent unnecessary charges.
30 minutes

Network settings Info

Connection



AWS Cloud9
ADevops EXP 02 Output - Goog
ADL- EXP 2 : CLOUD9 IDE
ap-south-1.console.aws.amazon.com/cloud9control/home?region=ap-south-1#/create/
Incognito
Services
Search
[Alt+S]
Mumbai
VishalRMahajan

Network settings Info

Connection
How your environment is accessed.

● AWS Systems Manager (SSM)
Accesses environment via SSM without opening inbound ports (no ingress).

○ Secure Shell (SSH)
Accesses environment directly via SSH, opens inbound ports.

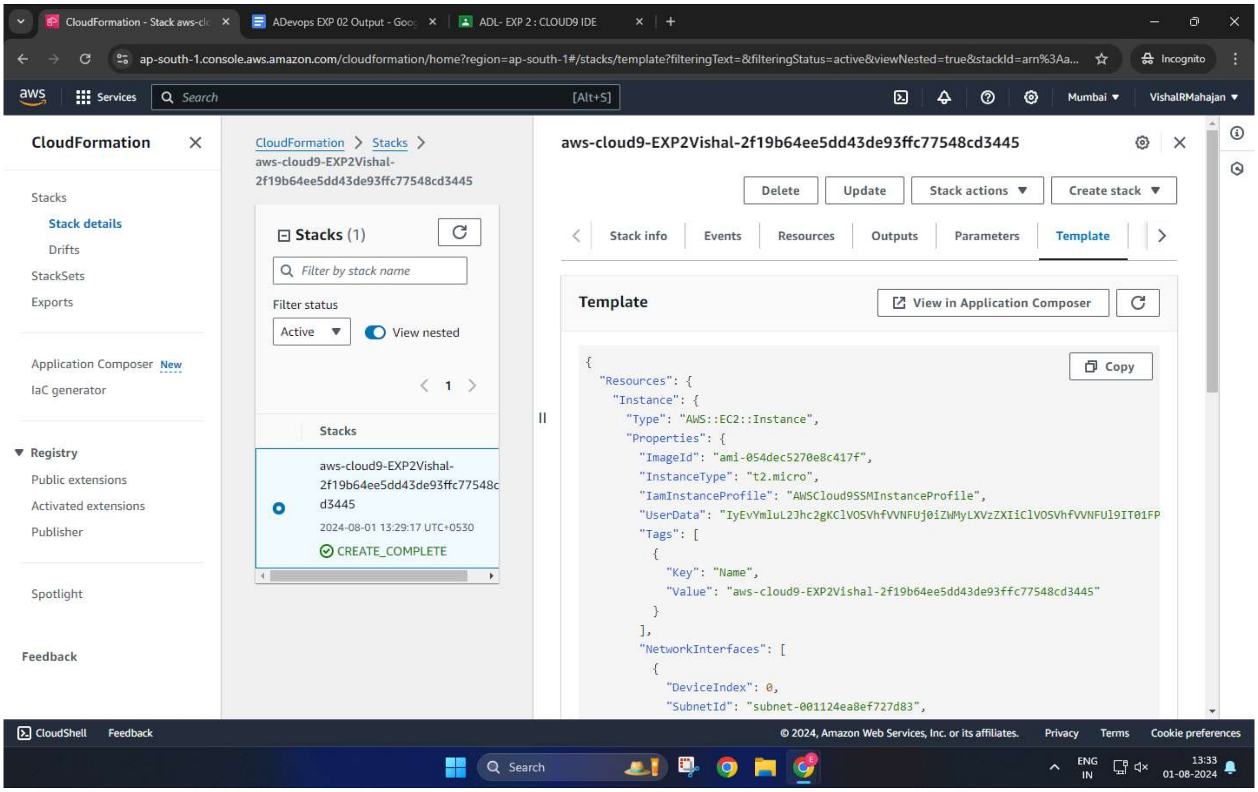
▶ VPC settings Info

▶ **Tags - *optional*** Info
A tag is a label that you assign to an AWS resource. Each tag consists of a key and an optional value. You can use tags to search and filter your resources or track your AWS costs.

The following IAM resources will be created in your account

- **AWSServiceRoleForAWSCloud9** - AWS Cloud9 creates a service-linked role for you. This allows AWS Cloud9 to call other AWS services on your behalf. You can delete the role from the AWS IAM console once you no longer have any AWS Cloud9 environments. Learn more
- **AWSCloud9SSMAccessRole** and **AWSCloud9SSMInstanceProfile** - A service role and an instance profile are automatically created if Cloud9 accesses its EC2 instance through AWS Systems Manager. If your environments no longer require EC2 instances that block incoming traffic, you can delete these roles using the AWS IAM console. Learn more

6. We can see CloudFormation Template of the Cloud9 instance we just created



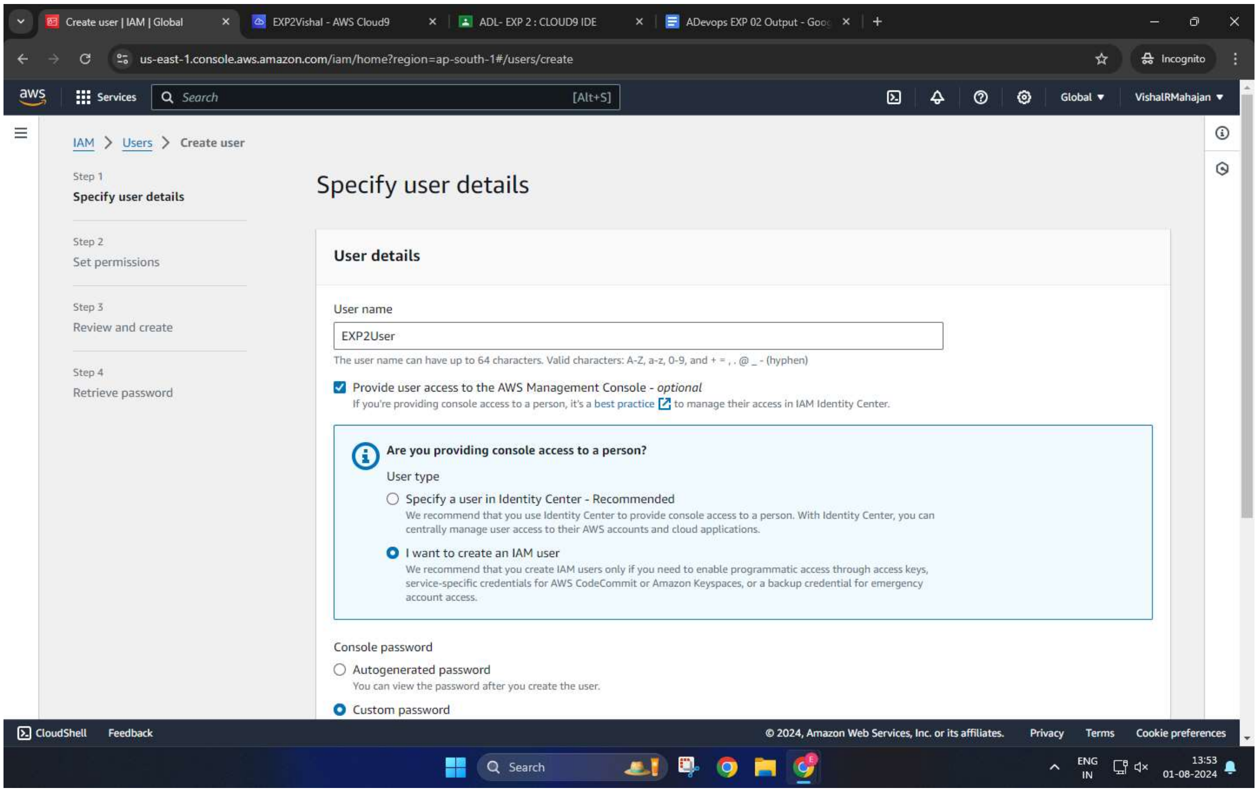
aws-cloud9-EXP2Vishal-2f19b64ee5dd43de93ffc77548cd3445
2024-08-01 13:29:17 UTC+0530
CREATE_COMPLETE

aws-cloud9-EXP2Vishal-2f19b64ee5dd43de93ffc77548cd3445

Template

```
{
  "Resources": {
    "Instance": {
      "Type": "AWS::EC2::Instance",
      "Properties": {
        "ImageId": "ami-054dec5270e8c417f",
        "InstanceType": "t2.micro",
        "IamInstanceProfile": "AWSCloud9SSMInstanceProfile",
        "UserData": "IyEvYmluL2Jhc2gKClVOSVhfVVNFUj0iZWMyLXVzZXIiClVOSVhfVVNFUl9IT01FP
        "Tags": [
          {
            "Key": "Name",
            "Value": "aws-cloud9-EXP2Vishal-2f19b64ee5dd43de93ffc77548cd3445"
          }
        ],
        "NetworkInterfaces": [
          {
            "DeviceIndex": 0,
            "SubnetId": "subnet-001124ea8ef727d83",
```

7. Open IAM (Identity and Access Management) and create a user. Specify details as in images.



Specify user details

User details

User name

EXP2User

The user name can have up to 64 characters. Valid characters: A-Z, a-z, 0-9, and + = , . @ _ - (hyphen)

☑ Provide user access to the AWS Management Console - *optional*

If you're providing console access to a person, it's a best practice to manage their access in IAM Identity Center.

Are you providing console access to a person?

User type

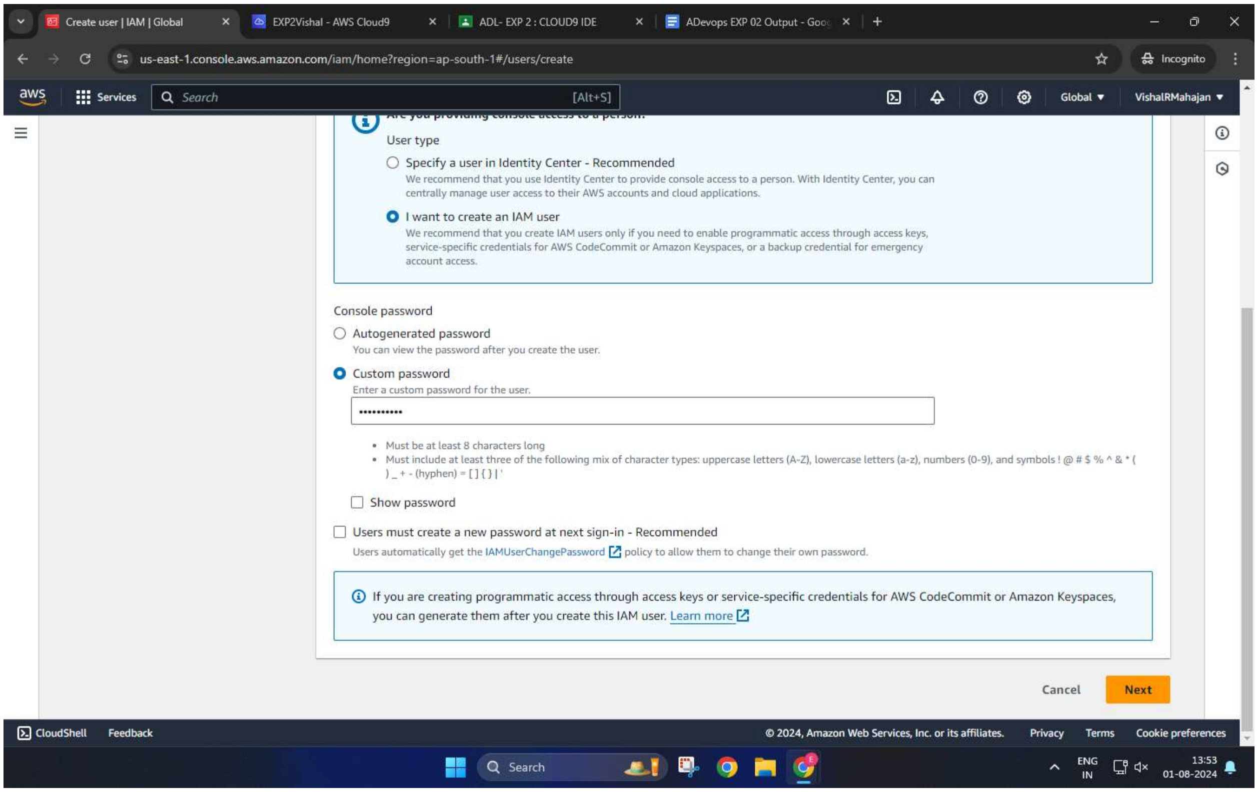
○ Specify a user in Identity Center - Recommended
We recommend that you use Identity Center to provide console access to a person. With Identity Center, you can centrally manage user access to their AWS accounts and cloud applications.

● I want to create an IAM user
We recommend that you create IAM users only if you need to enable programmatic access through access keys, service-specific credentials for AWS CodeCommit or Amazon Keyspaces, or a backup credential for emergency account access.

Console password

○ Autogenerated password
You can view the password after you create the user.

● Custom password



User type

○ Specify a user in Identity Center - Recommended
We recommend that you use Identity Center to provide console access to a person. With Identity Center, you can centrally manage user access to their AWS accounts and cloud applications.

● I want to create an IAM user
We recommend that you create IAM users only if you need to enable programmatic access through access keys, service-specific credentials for AWS CodeCommit or Amazon Keyspaces, or a backup credential for emergency account access.

Console password

○ Autogenerated password
You can view the password after you create the user.

● Custom password
Enter a custom password for the user.

••••••••••

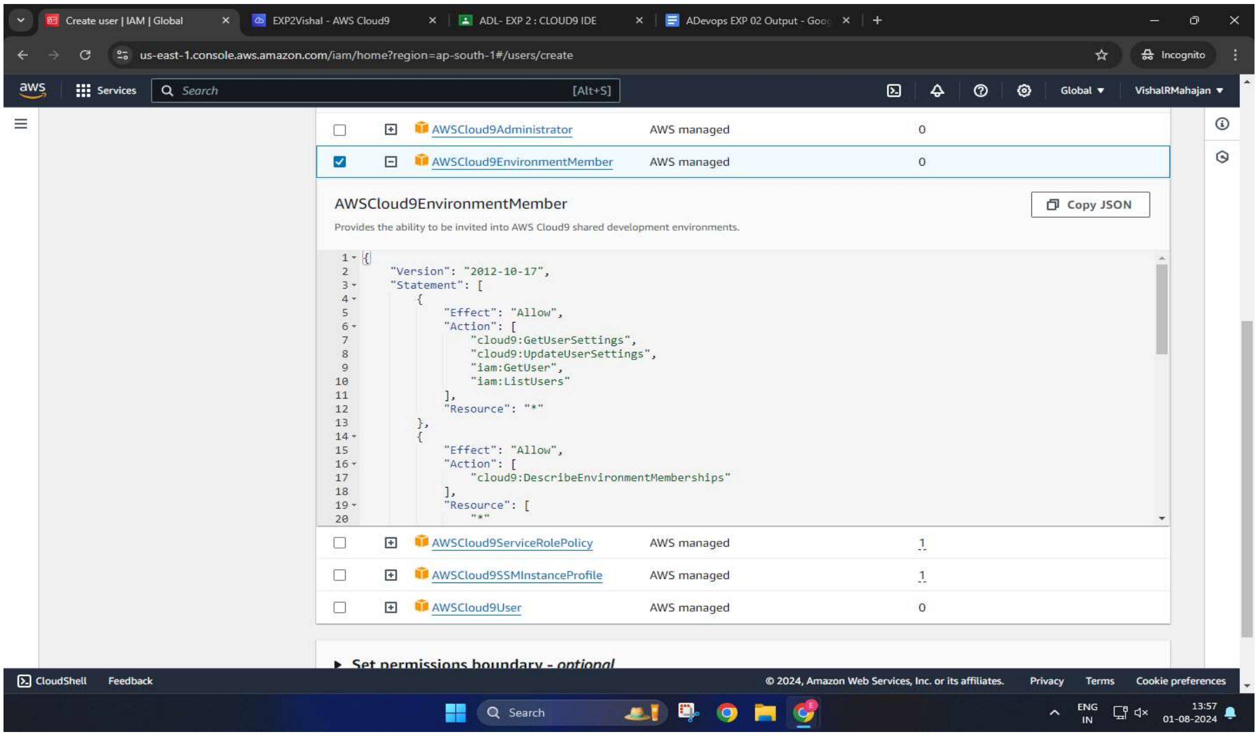
- Must be at least 8 characters long
- Must include at least three of the following mix of character types: uppercase letters (A-Z), lowercase letters (a-z), numbers (0-9), and symbols ! @ # $ % ^ & * ( ) _ + - (hyphen) = [ ] { } | '

□ Show password

□ Users must create a new password at next sign-in - Recommended
Users automatically get the IAMUserChangePassword policy to allow them to change their own password.

If you are creating programmatic access through access keys or service-specific credentials for AWS CodeCommit or Amazon Keyspaces, you can generate them after you create this IAM user. Learn more

8. After Specifying Details, Set the Permission for User to so that User can access Cloud9. Select AWSCloud9EnviornmentMember.


Create user | IAM | Global
EXP2Vishal - AWS Cloud9
ADL- EXP 2 : CLOUD9 IDE
ADevops EXP 02 Output - Goo
us-east-1.console.aws.amazon.com/iam/home?region=ap-south-1#/users/create
Incognito
aws
Services
Search
[Alt+S]
Global
VishalRMahajan

□	⊞	AWSCloud9Administrator	AWS managed	0
☑	⊟	AWSCloud9EnvironmentMember	AWS managed	0

AWSCloud9EnvironmentMember

Copy JSON

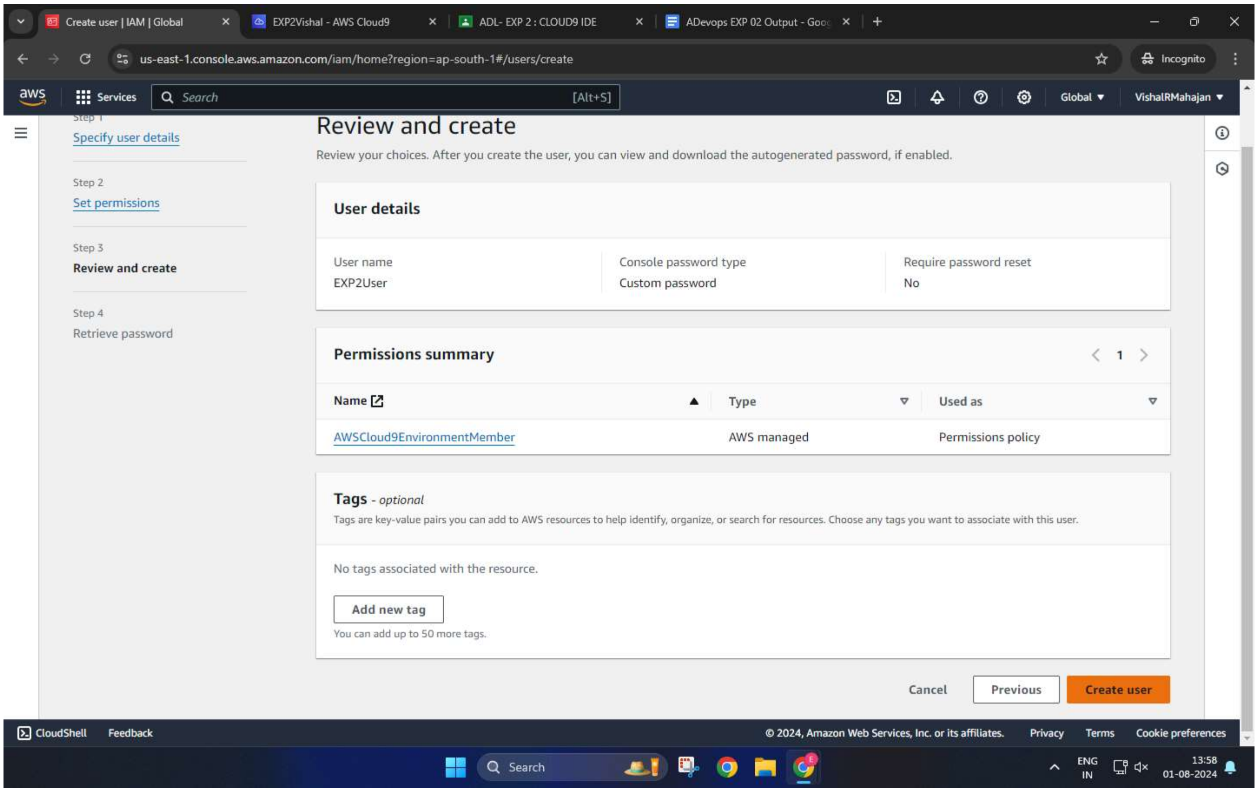
Provides the ability to be invited into AWS Cloud9 shared development environments.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "cloud9:GetUserSettings",
                "cloud9:UpdateUserSettings",
                "iam:GetUser",
                "iam:ListUsers"
            ],
            "Resource": "*"
        },
        {
            "Effect": "Allow",
            "Action": [
                "cloud9:DescribeEnvironmentMemberships"
            ],
            "Resource": [
                "*"
```

□	⊞	AWSCloud9ServiceRolePolicy	AWS managed	1
□	⊞	AWSCloud9SSMInstanceProfile	AWS managed	1
□	⊞	AWSCloud9User	AWS managed	0

▸ Set permissions boundary - *optional*

9. Review and Create the User.



Review and create

Review your choices. After you create the user, you can view and download the autogenerated password, if enabled.

User details

User name	Console password type	Require password reset
EXP2User	Custom password	No

Permissions summary

Name	Type	Used as
AWSCloud9EnvironmentMember	AWS managed	Permissions policy

Tags - *optional*

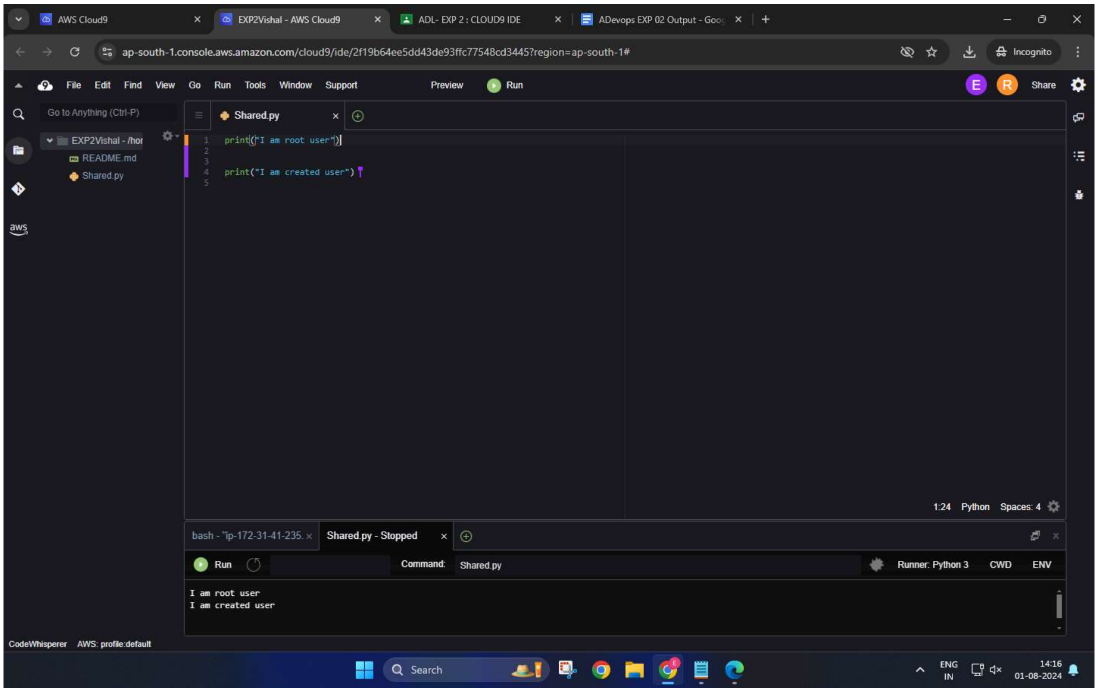
Tags are key-value pairs you can add to AWS resources to help identify, organize, or search for resources. Choose any tags you want to associate with this user.

No tags associated with the resource.

Add new tag

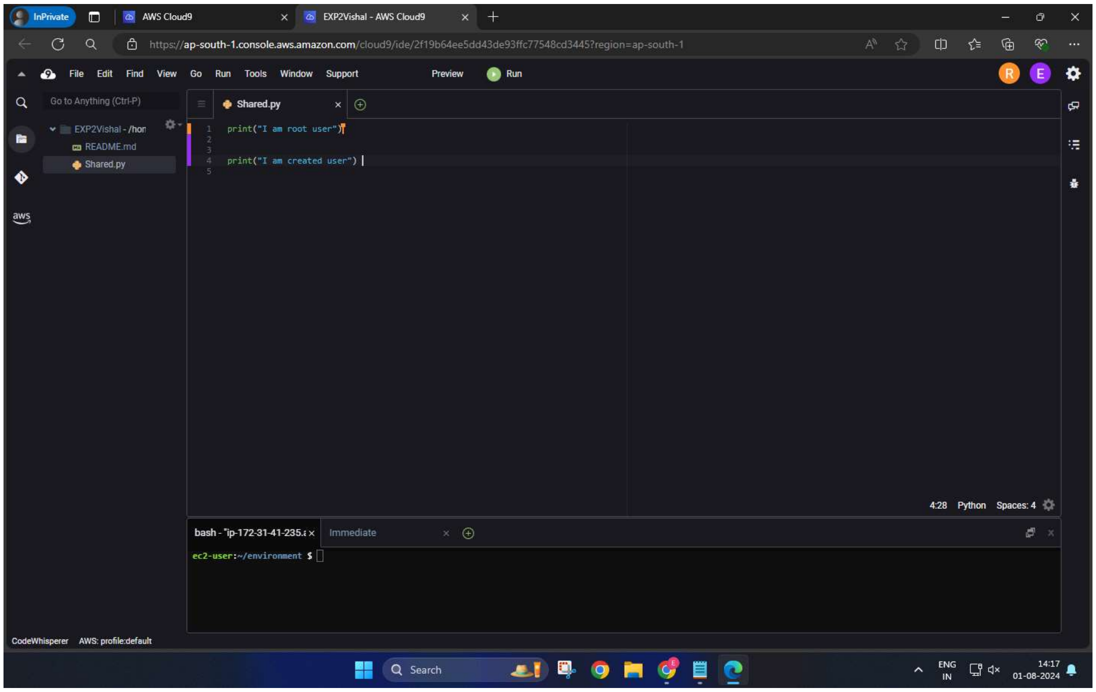
You can add up to 50 more tags.

10. We can see both Root as well as EXP2User can now access the Cloud9 at the same time. First print statement is written by Root and next print statement by created user (EXP2User) at a same time



```
print("I am root user")


print("I am created user")
```

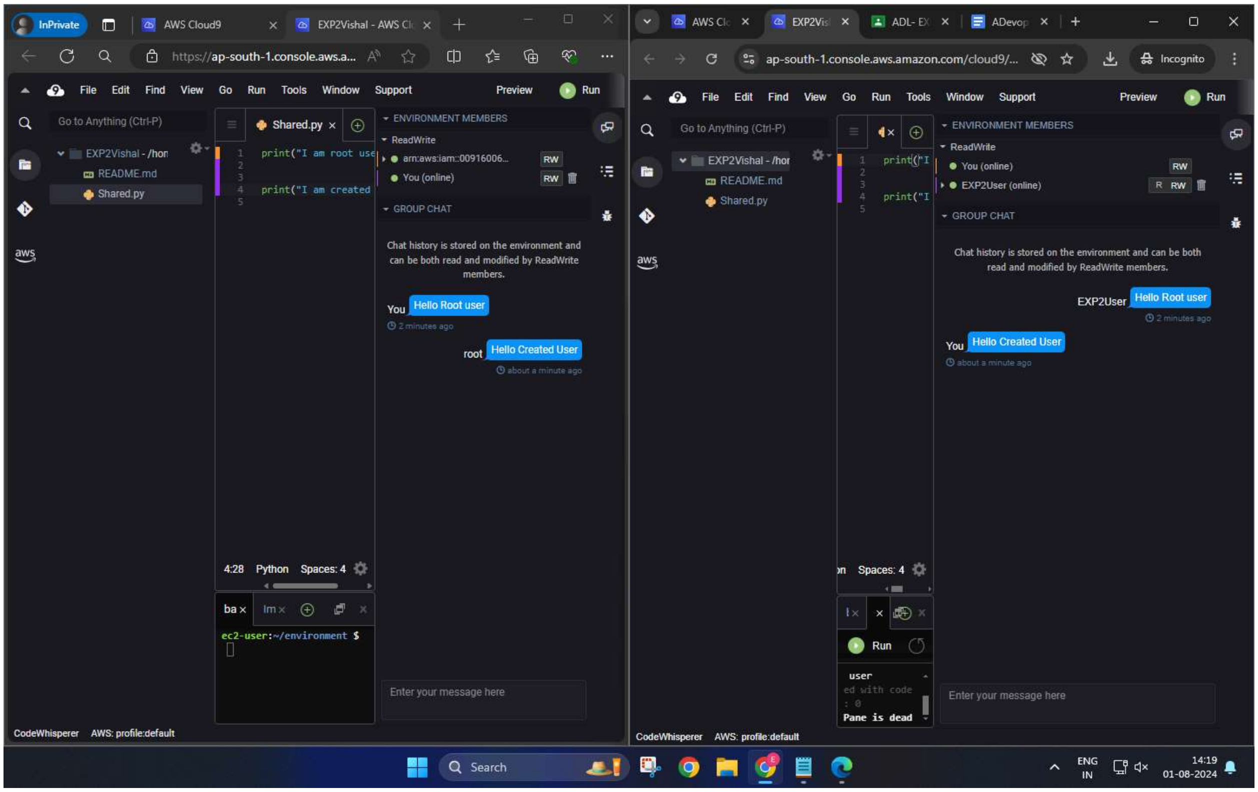
```
I am root user
I am created user
```



```
print("I am root user")


print("I am created user")
```

```
ec2-user:~/environment $
```

11. They can also Chat with each other at the same time.



```
print("I am root use
```

```
print("I am created
```

ENVIRONMENT MEMBERS

ReadWrite

- arn:aws:iam::00916006... RW
- You (online) RW

GROUP CHAT

Chat history is stored on the environment and can be both read and modified by ReadWrite members.

You: Hello Root user (2 minutes ago)

root: Hello Created User (about a minute ago)

```
ec2-user:~/environment $
```

ENVIRONMENT MEMBERS

ReadWrite

- You (online) RW
- EXP2User (online) R RW

GROUP CHAT

Chat history is stored on the environment and can be both read and modified by ReadWrite members.

EXP2User: Hello Root user (2 minutes ago)

You: Hello Created User (about a minute ago)

```
user
ed with code
: 0
Pane is dead
```