AWS re:Start

CHALLENGE LAB

CloudFormation Exercise

WEEK 11

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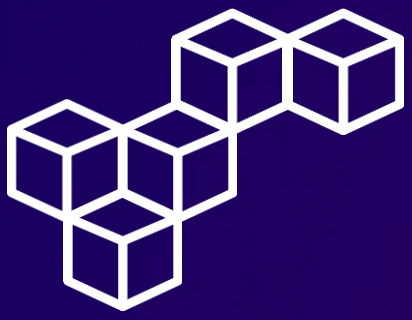

Overview

Your Challenge

This lab is an environment for creating an Amazon VPC and Amazon EC2 instance (and other supporting elements) using an AWS CloudFormation template.

The goal of this lab is to create a CloudFormation template with the following components:

- An Amazon Virtual Private Cloud
- An internet gateway attached to the VPC
- Security groups for accessing the VPC configured to allow SSH from anywhere
- A private subnet within the VPC
- An Amazon EC2 instance (a T3.micro) within the private subnet (Note: It is not necessary to access the EC2 via SSH or Remote Desktop for a successful solution)

Build and test the lab iterating the solution until all components build. The terminal in the browser provides access to a Linux shell on a server that exists outside of the AWS account that you use when your lab is running.

After you start the lab, the terminal will be pre-configured with the credentials necessary to using the AWS Command Line Interface (AWS CLI). The terminal also has Python 3 installed with the boto 3 library available. You can use it to run AWS Python SDK code.

Task 1

Building the CloudFormation template

Build the CloudFormation template

Build and review the **template.yaml** CloudFormation template.

```yaml
AWSTemplateFormatVersion: 2010-09-09
Description: Lab template

# Lab VPC with private subnet and Internet Gateway

Parameters:

  LabVpcCidr:
    Type: String
    Default: 10.0.0.0/20

  PrivateSubnetCidr:
    Type: String
    Default: 10.0.0.0/24

  AmazonLinuxAMIID:
    Type: AWS::SSM::Parameter::Value<AWS::EC2::Image::Id>
    Default: /aws/service/ami-amazon-linux-latest/amzn2-ami-hvm-x86_64-gp2

Resources:

###########
# VPC with Internet Gateway
###########

  LabVPC:
    Type: AWS::EC2::VPC
    Properties:
      CidrBlock: !Ref LabVpcCidr
      EnableDnsSupport: true
      EnableDnsHostnames: true
      Tags:
        - Key: Name
          Value: Lab VPC

  LabIGW:
    Type: AWS::EC2::InternetGateway
    Properties:
      Tags:
        - Key: Name
          Value: Lab IGW

  VPCtoIGWConnection:
    Type: AWS::EC2::VPCGatewayAttachment
    DependsOn:
      - LabIGW
      - LabVPC
    Properties:
      InternetGatewayId: !Ref LabIGW
      VpcId: !Ref LabVPC

###########
# Private Subnet
###########

  LabPrivateSubnet:
    Type: AWS::EC2::Subnet
    DependsOn: LabVPC
    Properties:
      VpcId: !Ref LabVPC
      CidrBlock: !Ref PrivateSubnetCidr
      AvailabilityZone: !Select
        - 0
        - !GetAZs
          Ref: AWS::Region
      Tags:
        - Key: Name
          Value: Lab Private Subnet
```

```yaml
###########
# Security Group
###########

  LabSecurityGroup:
    Type: AWS::EC2::SecurityGroup
    DependsOn: LabVPC
    Properties:
      GroupName: Lab Security Group
      GroupDescription: 'Enable SSH access'
      VpcId: !Ref LabVPC
      SecurityGroupIngress:
        - IpProtocol: tcp
          FromPort: '22'
          ToPort: '22'
          CidrIp: 0.0.0.0/0
      Tags:
        - Key: Name
          Value: Lab Security Group

###########
# EC2 Instance
###########

  LabInstance:
    Type: AWS::EC2::Instance
    Properties:
      ImageId: !Ref AmazonLinuxAMIID
      InstanceType: t3.micro
      SubnetId: !Ref LabPrivateSubnet
      Tags:
        - Key: Name
          Value: Lab Instance

###########
# Outputs
###########

Outputs:

  VPCId:
    Value: !Ref LabVPC

  InternetGatewayId:
    Value: !Ref LabIGW

  SubnetId:
    Value: !Ref LabPrivateSubnet

  SecurityGroupId:
    Value: !Ref LabSecurityGroup

  InstanceId:
    Value: !Ref LabInstance
```

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Task 2

Creating the CloudFormation stack

Step 1: Create stack

Run the following aws cloudformation create-stack command to start the creation of the CloudFormation stack from the **template.yaml** template.

```
eee_W_3083018@runweb126078:~$ aws cloudformation create-stack \
> --stack-name myStack \
> --template-body file://template.yaml
{
    "StackId": "arn:aws:cloudformation:us-west-2:533267382223:stack/myStack/acbb
}
```

Step 2: Review stack resources status

Run the following aws cloudformation describe-stack-resources command to check the status of each resource that is created by the stack, and wait until all resources are created.

```
eee_W_3083018@runweb126078:~$ aws cloudformation describe-stack-resources \
> --stack-name myStack \
> --query 'StackResources[*].[ResourceType,ResourceStatus]' \
> --output table
-------------------------------------------------------------
|                  DescribeStackResources                   |
+---------------------------------+------------------------+
|  AWS::EC2::InternetGateway      |  CREATE_COMPLETE       |
|  AWS::EC2::Instance             |  CREATE_COMPLETE       |
|  AWS::EC2::Subnet               |  CREATE_COMPLETE       |
|  AWS::EC2::SecurityGroup        |  CREATE_COMPLETE       |
|  AWS::EC2::VPC                  |  CREATE_COMPLETE       |
|  AWS::EC2::VPCGatewayAttachment |  CREATE_COMPLETE       |
+---------------------------------+------------------------+
```

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Task 2

Creating the CloudFormation stack

Step 3: Review stack status

Run the following aws cloudformation describe-stacks command to review the stack status. The stack has been created successfully, and it has a StackStatus of CREATE_COMPLETE. Also notice that the Outputs section includes the stack resources IDs which will be used to review all of the created resources in detail.

```
eee_W_3083018@runweb126078:~$ aws cloudformation describe-stacks \
> --stack-name myStack \
> --output table
```

```
-------------------------------------------------------------------------------------------------------------------------------------------------------------
|                                                                DescribeStacks                                                                             |
+-----------------------------------------------------------------------------------------------------------------------------------------------------------+
||                                                                  Stacks                                                                                 ||
|+-----------------------------+---------------------------------------------------------------------------------------------------------------------------+|
||  CreationTime               |  2024-06-05T18:50:57.205000+00:00                                                                                         ||
||  Description                |  Lab template                                                                                                             ||
||  DisableRollback            |  False                                                                                                                    ||
||  EnableTerminationProtection|  False                                                                                                                    ||
||  StackId                    |  arn:aws:cloudformation:us-west-2:533267382223:stack/myStack/acbb17b0-236b-11ef-8b87-0abec8bf5429                         ||
||  StackName                  |  myStack                                                                                                                  ||
||  StackStatus                |  CREATE_COMPLETE                                                                                                          ||
|+-----------------------------+---------------------------------------------------------------------------------------------------------------------------+|
||                                                              DriftInformation                                                                           ||
|+-----------------------------------------------------------------+-------------------------------------------------------------------------------------+|
||  StackDriftStatus                                               |  NOT_CHECKED                                                                        ||
|+-----------------------------------------------------------------+-------------------------------------------------------------------------------------+|
||                                                                  Outputs                                                                                ||
|+-----------------------------------------------------+-------------------------------------------------------------------------------------------+|
||                      OutputKey                      |                                  OutputValue                                              ||
|+-----------------------------------------------------+-------------------------------------------------------------------------------------------+|
||  InternetGatewayId                                  |  igw-04e8485ceec770f0e                                                                    ||
||  VPCId                                              |  vpc-002be21096a3bcb36                                                                    ||
||  InstanceId                                         |  i-091a00b79f89f82ff                                                                      ||
||  SecurityGroupId                                    |  sg-09bd503c4e4b97cc1                                                                     ||
||  SubnetId                                           |  subnet-057e6c8763e7a8e71                                                                 ||
|+-----------------------------------------------------+-------------------------------------------------------------------------------------------+|
```

Task 3

Testing CloudFormation stack creation

Step 1: Review VPC and IGW

Run the following aws ec2 describe-vpcs and aws ec2 describe-internet-gateways commands to review the newly created VPC and IGW.

```
eee_W_3083018@runweb126094:~$ aws ec2 describe-vpcs \
> --vpc-ids vpc-002be21096a3bcb36 \
> --query "Vpcs[*].{CIDR:CidrBlock,State:State,VPC_ID:VpcId,Name:Tags[?Key=='Name']|[0].Value}"
[
    {
        "CIDR": "10.0.0.0/20",
        "State": "available",
        "VPC_ID": "vpc-002be21096a3bcb36",
        "Name": "Lab VPC"
    }
]

eee_W_3083018@runweb126094:~$ aws ec2 describe-internet-gateways \
> --internet-gateway-ids igw-04e8485ceec770f0e \
> --query "InternetGateways[*].{Attachments:Attachments[0].VpcId,IGW_ID:InternetGatewayId,Name:Tags[?Key=='Name']|[0].Value}"
[
    {
        "Attachments": "vpc-002be21096a3bcb36",
        "IGW_ID": "igw-04e8485ceec770f0e",
        "Name": "Lab IGW"
    }
]
```

Step 2: Review private subnet

Run the following aws ec2 describe-subnets command to review the newly created subnet.

```
eee_W_3083018@runweb126094:~$ aws ec2 describe-subnets \
> --subnet-ids subnet-057e6c8763e7a8e71 \
> --query "Subnets[*].{AZ:AvailabilityZone,CIDR:CidrBlock,State:State,Subnet_ID:SubnetId,VPC_ID:VpcId,Name:Tags[?Key=='Name']|[0].Value}"
[
    {
        "AZ": "us-west-2a",
        "CIDR": "10.0.0.0/24",
        "State": "available",
        "Subnet_ID": "subnet-057e6c8763e7a8e71",
        "VPC_ID": "vpc-002be21096a3bcb36",
        "Name": "Lab Private Subnet"
    }
]
```

Task 3

Testing CloudFormation stack creation

Step 3: Review security group

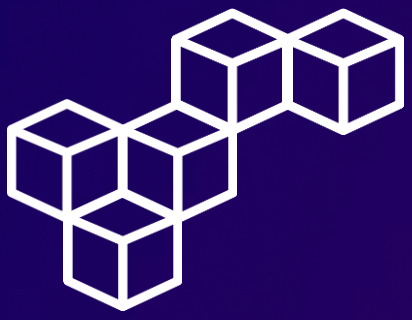
Run the following aws ec2 describe-security-groups command to review the newly created security group.

```
eee_W_3083018@runweb126094:~$ aws ec2 describe-security-groups \
> --group-ids sg-09bd503c4e4b97cc1 \
> --query "SecurityGroups[*].{Name:GroupName,Description:Description,Inbound_Rule:IpPermissions[0].{Protocol:IpProtocol,Port:FromPort,Source:IpRanges[0].CidrIp
},VPC_ID:VpcId}"
[
    {
        "Name": "Lab Security Group",
        "Description": "Enable SSH access",
        "Inbound_Rule": {
            "Protocol": "tcp",
            "Port": 22,
            "Source": "0.0.0.0/0"
        },
        "VPC_ID": "vpc-002be21096a3bcb36"
    }
]
```

Step 4: Review private instance

Run the following aws ec2 describe-instances command to review the newly created instance.

```
eee_W_3083018@runweb126094:~$ aws ec2 describe-instances \
> --instance-ids i-091a00b79f89f82ff \
> --query "Reservations[*].Instances[*].{AMI_ID:ImageId,Instance_ID:InstanceId,Instance_Type:InstanceType,AZ:Placement.AvailabilityZone,Private_IP:PrivateIpAdd
ress,State:State.Name,Subnet_ID:SubnetId,VPC_ID:VpcId,Name:Tags[?Key=='Name']|[0].Value}"
[
    [
        {
            "AMI_ID": "ami-0676a735c5f8e67c4",
            "Instance_ID": "i-091a00b79f89f82ff",
            "Instance_Type": "t3.micro",
            "AZ": "us-west-2a",
            "Private_IP": "10.0.0.71",
            "State": "running",
            "Subnet_ID": "subnet-057e6c8763e7a8e71",
            "VPC_ID": "vpc-002be21096a3bcb36",
            "Name": "Lab Instance"
        }
    ]
]
```



Conclusions

CloudFormation Stacks
CloudFormation Stacks enable the deployment and management of AWS resources as a single unit, ensuring consistency and efficiency across your infrastructure.

CloudFormation Templates
CloudFormation Templates define the structure and configuration of AWS resources, providing a blueprint for automated and repeatable deployments.

aws cloudformation create-stack
The cloudformation create-stack command enables automated provisioning of AWS resources based on defined CloudFormation templates, ensuring consistent infrastructure deployment.

aws cloudformation describe-stack-resources
The cloudformation describe-stack-resources command provides detailed information about the resources within a specified CloudFormation stack.

aws cloudformation describe-stacks
The cloudformation describe-stacks command provides detailed information about the status and configuration of CloudFormation stacks, aiding in monitoring and management.

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