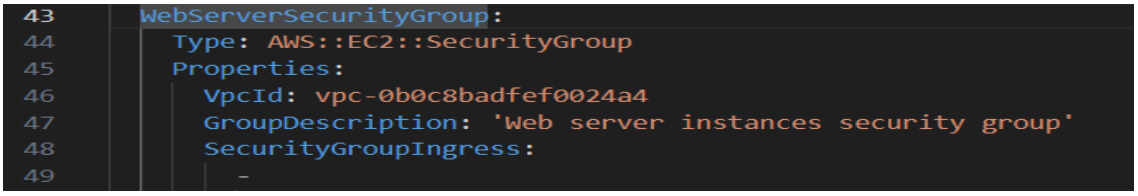
Number List Parameters

In this series of exercises, we explore advanced features of AWS CloudFormation to create reusable, dynamic, and reliable infrastructure templates. These exercises cover key concepts such as list parameters, AWS-specific parameter types, pseudo parameters, and intrinsic functions like Fn::Select and Fn::Sub. The focus is on enhancing template flexibility by allowing customizable inputs, validating those inputs against AWS resources, and dynamically generating resource properties based on user-defined or pseudo parameters.

By mastering these techniques, we can efficiently manage infrastructure as code, simplify stack creation processes, and ensure accuracy and consistency across deployments, while also adhering to AWS best practices.

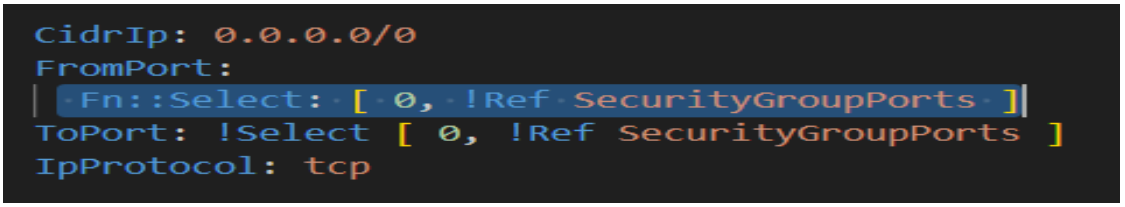
Activity

1. Find the template files in our GitHub repository under the same name as the heading for easy access and edits. Find and Save the attached template locally, open it in VS Code for edits.Copy and rename the Database Security Group resource as WebServerSecurityGroup in the template. Update the description of the WebServerSecurityGroup to reflect its purpose.

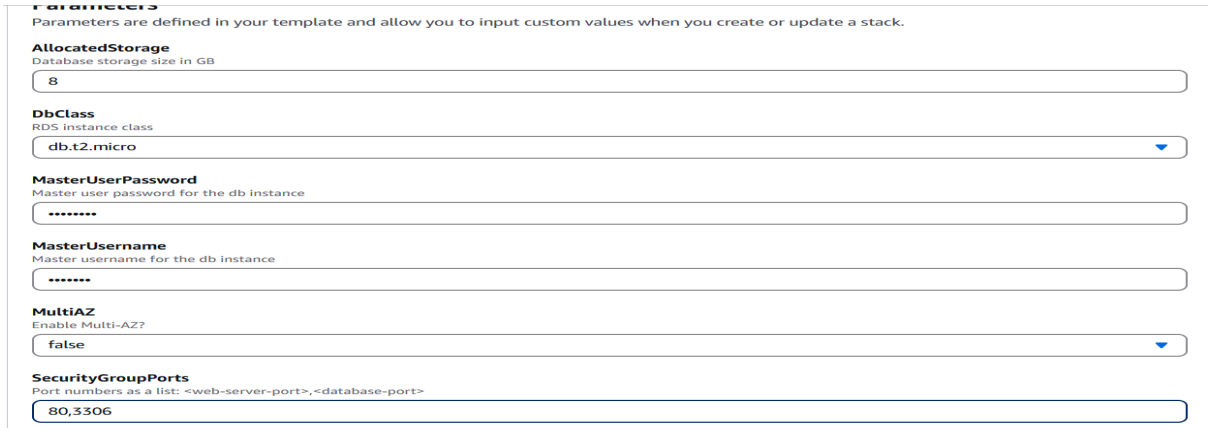


2. Define a new parameter of type List, specifying it will take port numbers as a comma-separated list. Add a description to the parameter explaining the order of ports (e.g., web server port first, database port second).

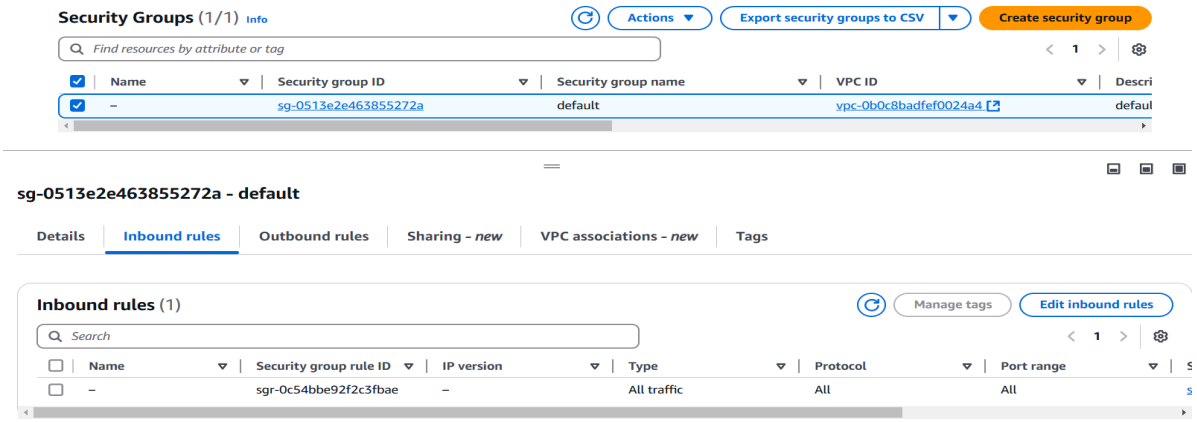
3. Use Fn::Select to reference the first member of the list for the FromPort attribute of the WebServerSecurityGroup, with an index of 0. Repeat using Fn::Select for the ToPort attribute with a shorthand syntax. Update the Database Security Group to use the second member of the list for both FromPort and ToPort, with an index of 1.



4. Save the updated template and upload it in the AWS Management Console to create a new stack.
5. Provide a comma-separated list of numbers (e.g., 80,3306) for the SecurityGroupPorts parameter during stack creation and skip to the review page and submit.



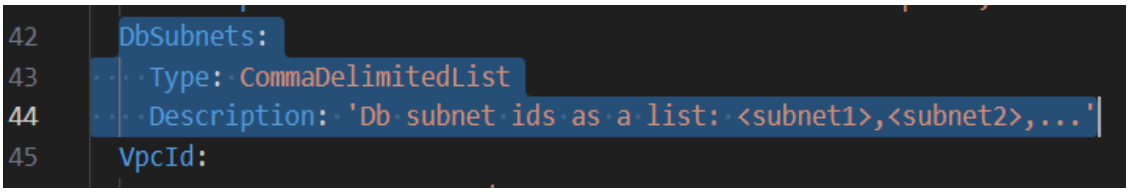
6. Verify the configuration in the VPC Console by checking the inbound rules of both security groups to ensure the ports were set correctly.



7. Delete the stack to clean up the resources once verified.

String List Parameetrs

1. Find the template files in our GitHub repository under the same name as the heading for easy access and edits. Find and Save the attached template locally, open it in VS Code for edits.Add a new DbSubnets parameter with the type CommaDelimitedList to accept subnet IDs as a comma-separated list of strings. Provide a description for the DbSubnets parameter to clarify its purpose.



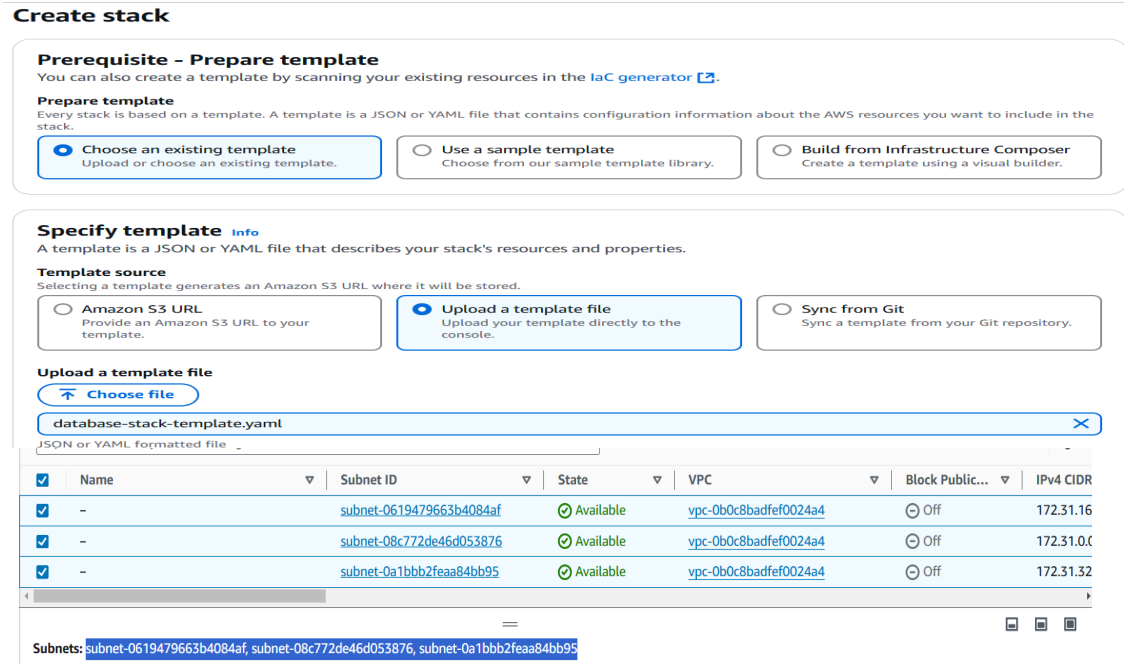
2. Reference the DbSubnets parameter directly in the DBSubnetGroup resource where a list of subnet IDs is required.

```
  # with the IDs of the subnets in your default VPC!
  DbSubnetGroup:
    Type: 'AWS::RDS::DBSubnetGroup'
    Properties:
      DBSubnetGroupDescription: Subnets to launch db instances into
      SubnetIds: !Ref DbSubnets
```

3. Define a default value('80,3306') for the SecurityGroupPorts parameter as a list of numbers separated by commas to simplify future stack creation.

```
    Type: List<Number>
    Description: 'Port numbers as a list: <web-server-port>,<database-port>'
    Default: '80,3306'
  DbSubnets:
    Type: CommaDelimitedList
    Description: 'Db subnet ids as a list: <subnet1>,<subnet2>,...'
  VpcId:
    Type: AWS::EC2::VPC::Id
```

4. Save the template and upload it in the AWS Management Console to create a new stack.
5. Enter a name for the stack and provide subnet IDs in a comma-separated format from the VPC Console for the DbSubnets parameter. Enter other parameters (e.g., master user credentials) and use default values for parameters like SecurityGroupPorts.



6. Review the parameter values and confirm that the DbSubnets parameter removes any extra spaces during stack creation.
7. Verify that the stack and parameters are created correctly and match the provided inputs.

Parameters (8)

Search

Key	Value
AllocatedStorage	8
DbClass	db.t2.micro
DbSubnets	subnet-0619479663b4084af,subnet-08c772de46d053876,subnet-0a1bbb2feaa84bb95
MasterUsername	****
MasterUserPassword	****
MultiAZ	false
SecurityGroupPorts	80,3306
VpcId	vpc-0b0c8badfef0024a4

8. Delete the stack to clean up the resources once verified.

Specific Parameter Types

1. Find the template files in our GitHub repository under the same name as the heading for easy access and edits. Find and Save the attached template locally, open it in VS Code for edits.Change the DbSubnets parameter type to ListAWS::EC2::Subnet::Id to validate subnet IDs and define a new parameter VpcId with type AWS::EC2::VPC::Id for validating VPC IDs. Add a description for VpcId, e.g., "A valid VPC ID in your AWS account."

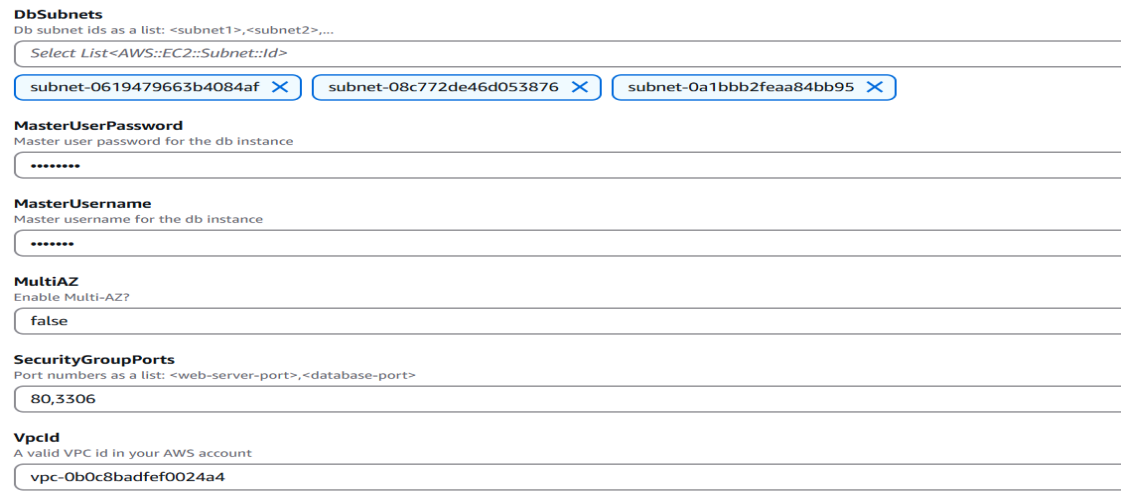
```
43      DbSubnets:
44        Type: List<AWS::EC2::Subnet::Id>
45        Description: 'Db subnet ids as a list: <subnet1>,<subnet2>,...'
46      VpcId:
47        Type: AWS::EC2::VPC::Id
48        Description: A valid VPC id in your AWS account
```

2. Reference VpcId in the VpcId attributes of the WebServerSecurityGroup and DatabaseSecurityGroup resources.

```
51        Type: AWS::EC2::SecurityGroup
52        Properties:
53          VpcId: !Ref VpcId
54          GroupDescription: 'Web server instances security group'
55          SecurityGroupIngress:
56            -
```

```
66        Type: AWS::EC2::SecurityGroup
67        Properties:
68          VpcId: !Ref VpcId
69          GroupDescription: 'Database instances security group'
70          SecurityGroupIngress:
71            -
```

3. Save the updated template and upload it to AWS CloudFormation via "Create stack."
4. Provide valid subnet IDs for DbSubnets using the dropdown list generated by CloudFormation. Select the appropriate VPC ID for the VpcId parameter from the dropdown list. Complete other required parameters (e.g., MasterUserPassword, MasterUsername) and leave defaults where applicable.



5. Skip to the review page and click ‘Create stack’. then , wait for the process to complete and check the parameters.

Parameters (8)

Search

Key	Value	Resolve
AllocatedStorage	8	-
DbClass	db.t2.micro	-
DbSubnets	subnet-0619479663b4084af,subnet-08c772de46d053876,subnet-0a1bbb2feaa84bb95	-
MasterUsername	****	-
MasterUserPassword	****	-
MultiAZ	false	-
SecurityGroupPorts	80,3306	-
VpcId	vpc-0b0c8badfef0024a4	-

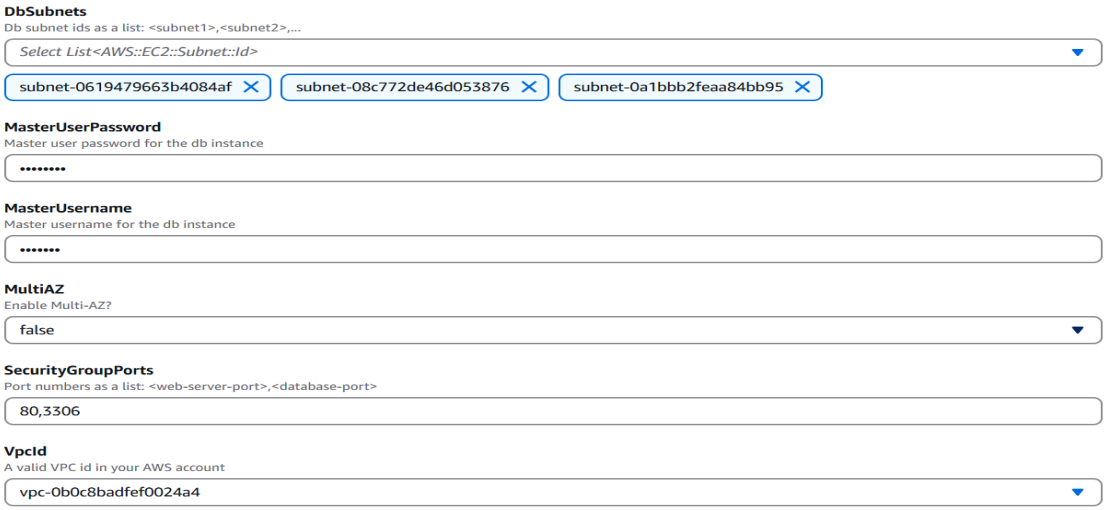
6. Delete the stack to clean up resources after validation.

Pseudo Parameters and Sub Functions

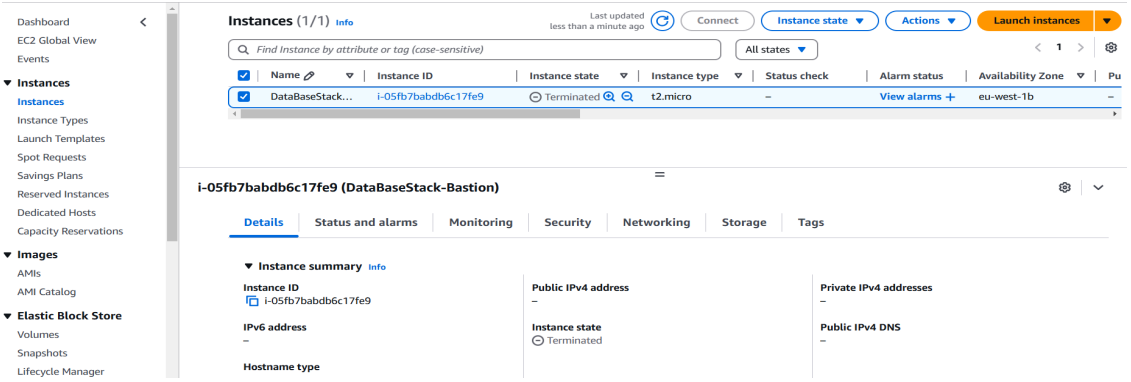
1. Find the template files in our GitHub repository under the same name as the heading for easy access and edits. Find and Save the attached template locally, open it in VS Code for edits.Understand that pseudo parameters are predefined by AWS CloudFormation and can be referenced like parameters without defining them in the template.
2. Learn to reference pseudo parameters such as AWS::AccountId, AWS::Region, and AWS::StackName using Ref or Fn::Sub.
3. Use the Fn::Sub function to substitute pseudo parameters and variables in strings, either in long or short format.
4. Add a new EC2 instance resource, Bastion, to the existing template. Set properties for the instance: ImageId from the EC2 console, InstanceType as 't2.micro,' and SubnetId using Fn::Select for the first subnet from DbSubnets. Add a Name tag to the instance with the value constructed using AWS::StackName and the literal "-Bastion" with Fn::Sub.

```
49  Resources:
50    Bastion:
51      Type: AWS::EC2::Instance
52      Properties:
53        ImageId: ami-04bd4a6a67aa8e86e
54        InstanceType: t2.micro
55        SubnetId: !Select [ 0, !Ref DbSubnets ]
56        Tags:
57          -
58            Key: Name
59            Value: !Sub '${AWS::StackName}-Bastion'
```

5. Save the template and upload it to the AWS CloudFormation Console via "Create stack."
6. Provide stack parameters, including DB subnets, valid MasterUsername and MasterUserPassword, and VPC ID.



7. Launch the stack and verify the EC2 instance in the EC2 Console, checking its name as "StackName-Bastion."
8. Test the template with different stack names to observe distinct EC2 instance names.



9. Delete the stack after validation to clean up resources.