

# *Getting started with AWS CloudFormation*

AWS CloudFormation is a service that helps you model and set up your AWS resources so that you can spend less time managing those resources and more time focusing on your applications that run in AWS. You create a template that describes all the AWS resources that you want (like Amazon EC2 instances or Amazon RDS DB instances), and CloudFormation takes care of provisioning and configuring those resources for you. You don't need to individually create and configure AWS resources and figure out what's dependent on what; CloudFormation handles that.

In this tutorial, you will be making use of the provided YAML template to create a CloudFormation stack consisting of an Amazon EC2 instance with simple properties. Thereafter, you will be updating the stack by adding Input Parameters and additional resources including Elastic IP and Security Groups.

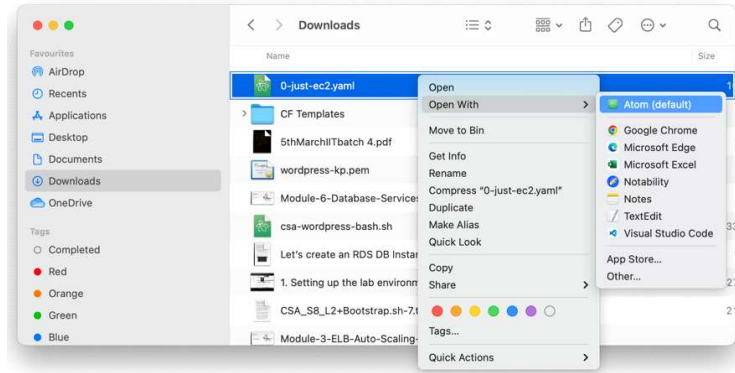
Following are the steps to be performed:

- Step 1: Pick a template
- Step 2: Create the initial stack
- Step 3: Monitor the progress of stack creation
- Step 4: Update the stack
- Step 5: Monitor the progress of stack updating
- Step 6: Clean up

## **Step 1: Pick a template**

A CloudFormation template is a JSON or YAML formatted text file. You can save these files with any extension, such as .json, .yaml, .template, or .txt. CloudFormation uses these templates as blueprints for building your AWS resources.

- Download the sample YAML template by clicking [here](#), and use notepad or any text editor to open the downloaded template.



- Upon opening, you can easily view and go through the contents of this template.

```

1  |---
2  | Resources:
3  |   MyInstance:
4  |     Type: AWS::EC2::Instance
5  |     Properties:
6  |       AvailabilityZone: us-east-1a
7  |       ImageId: ami-a4c7edb2
8  |       InstanceType: t2.micro
9  |

```

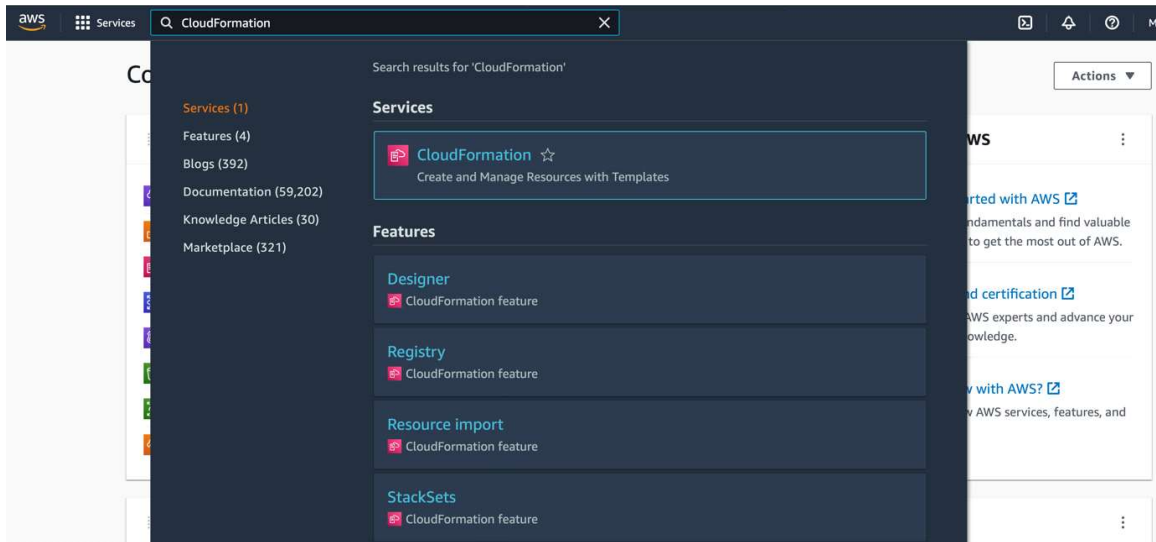
- If you use this template to create a stack, AWS CloudFormation will launch an Amazon EC2 instance.
- Resources declarations use *Properties* attribute to specify the information used to create a resource.
- Depending on the resource type, some properties are required such as *AvailabilityZone*, *ImageID* and *InstanceType* for an *AWS::EC2::Instance* resource, and others are optional.

## Step 2: Create the initial stack

Now, you will be using the above template to create your initial stack.

### To create a stack on the CloudFormation console:

- Login to AWS Management Console and search for CloudFormation via the search bar provided at the top, and click the search result to get to the CloudFormation dashboard.



- Once you land to CloudFormation console, click **Create Stack**.



After starting the Create Stack wizard, you specify the template that you want AWS CloudFormation to use to create your stack.

CloudFormation templates are JSON- or YAML-formatted files that specify the AWS resources that make up your stack.

## To choose a stack template

- For **Prepare template**, make sure **Template is ready** remains selected.

**Create stack**

**Prerequisite - Prepare template**

**Prepare template**  
Every stack is based on a template. A template is a JSON or YAML file that contains configuration information about the AWS resources you want to include in the stack.

☒ Template is ready
 ☐ Use a sample template
 ☐ Create template in Designer

**Specify template**  
A template is a JSON or YAML file that describes your stack's resources and properties.

- In the **Specify template** section, select **Upload a template** file to select a CloudFormation template on your local computer.

**Specify template**  
A template is a JSON or YAML file that describes your stack's resources and properties.

**Template source**  
Selecting a template generates an Amazon S3 URL where it will be stored.

☐ Amazon S3 URL
 ☒ Upload a template file

**Upload a template file**

*No file chosen*

JSON or YAML formatted file

S3 URL: *Will be generated when template file is uploaded*

- Click **Choose File** to select the downloaded template file. Once you have chosen your template, CloudFormation uploads the file and displays the S3 URL.

**Specify template**  
A template is a JSON or YAML file that describes your stack's resources and properties.

**Template source**  
Selecting a template generates an Amazon S3 URL where it will be stored.

☐ Amazon S3 URL
 ☒ Upload a template file

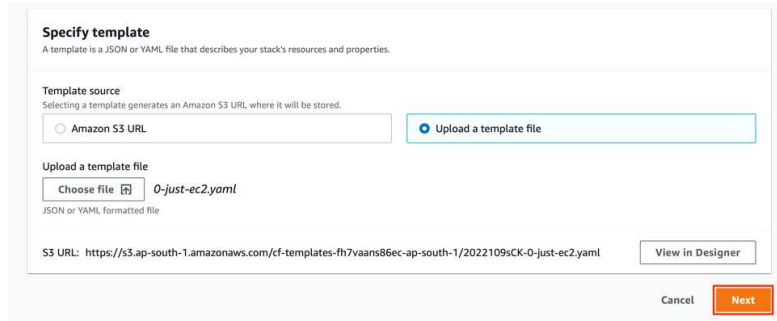
**Upload a template file**

*0-just-ec2.yaml*

JSON or YAML formatted file

S3 URL: `https://s3-ap-south-1.amazonaws.com/cf-templates-fh7vaans86ec-ap-south-1/2022109sCK-0-just-ec2.yaml`


- To accept your settings, choose **Next**, and proceed with [specifying the stack name and parameters](#).



**Specify template**  
A template is a JSON or YAML file that describes your stack's resources and properties.

**Template source**  
Selecting a template generates an Amazon S3 URL, where it will be stored.

☐ Amazon S3 URL
 ☒ Upload a template file

**Upload a template file**  
 Choose file  0-just-ec2.yaml  
JSON or YAML formatted file

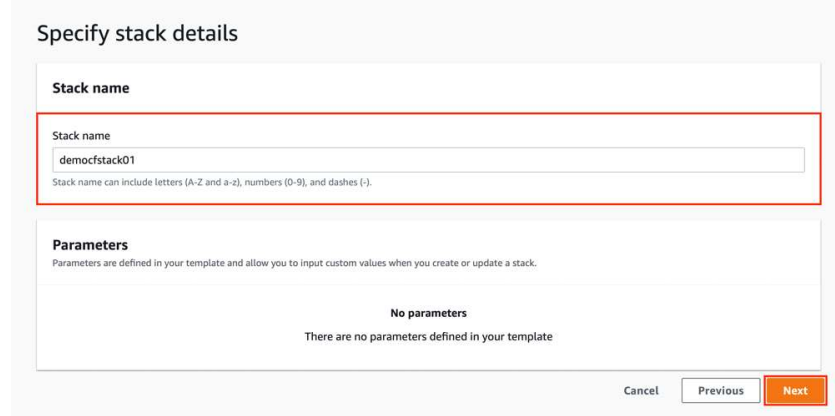
S3 URL: <https://s3.ap-south-1.amazonaws.com/cf-templates-fh7vaans86ec-ap-south-1/2022109sCK-0-just-ec2.yaml> [View in Designer](#)

Cancel [Next](#)

After selecting a stack template, specify the stack name and values for the parameters that were defined in the template.

### To specify the stack name and parameter values

- On the **Specify stack details** page, type a stack name in the **Stack name** box, leave the **Parameters** section blank (as there are no parameters defined in your template), and choose **Next** to proceed with settings options for your stack.



**Specify stack details**

**Stack name**

Stack name  
democfstack01  
Stack name can include letters (A-Z and a-z), numbers (0-9), and dashes (-).

**Parameters**  
Parameters are defined in your template and allow you to input custom values when you create or update a stack.

**No parameters**  
There are no parameters defined in your template

Cancel [Previous](#) [Next](#)

- For this hands-on, there is no need to configure stack options. Hence, accept default values for options listed on this page.

- Scroll down to the bottom of this page and click **Next** to proceed with reviewing your stack.

The final step before your stack is launched is to review the values entered while creating the stack. You can also estimate the cost of your stack.

- On the **Review** page, review the details of your stack.

If you need to change any of the values before launching the stack, choose **Edit** on the appropriate section to go back to the page that has the setting that you want to change.

- Since no values need to be changed for this hands-on, scroll down to the bottom of this page and click **Create stack** to launch your stack.

### Step 3: Monitor the progress of stack creation

- CloudFormation displays the **Events** pane of the **Stack details** page for your new stack.

From here, you can [view your stack's events, data, or resources](#). CloudFormation automatically refreshes the stack events every minute. Additionally, CloudFormation displays the **New events available** badge when new stack events occur; choose the refresh icon to load these events into the list. By viewing stack creation events, you can understand the sequence of events that lead to your stack's creation (or failure, if you are debugging your stack).

While your stack is being created, it's listed on the **Stacks** page with a status of **CREATE\_IN\_PROGRESS**.

- After your stack has been successfully created, its status changes to **CREATE\_COMPLETE**. You can then choose the **Resources** tab to view the list of resources deployed in this stack.

CloudFormation > Stacks > democfstack01

Stacks (1)

Filter by stack name

Active View nested

democfstack01  
2022-04-20 11:05:00 UTC+0530  
CREATE\_COMPLETE

democfstack01

Delete Update Stack actions Create stack

Stack info Events Resources Outputs Parameters Template Change sets

Resources (1)

Search resources

Logical ID	Physical ID	Type	Status	Status reason	Model
MyInstance	<a href="#">i-0ac6544417539385f</a>	AWS::EC2::Instance	CREATE_COMPLETE	-	-

## Step 4: Update the stack

When you want to quickly deploy updates to your stack, perform a direct update. With a direct update, you submit a template or input parameters that specify updates to the resources in the stack, and AWS CloudFormation immediately deploys them. If you want to use a template to make your updates, you can modify the current template and store it locally or in an Amazon S3 bucket.

- For this update, [click here](#) to download the modified template with resources added such as two separate security groups and an elastic IP, and a parameter to provide description for one of the security groups.

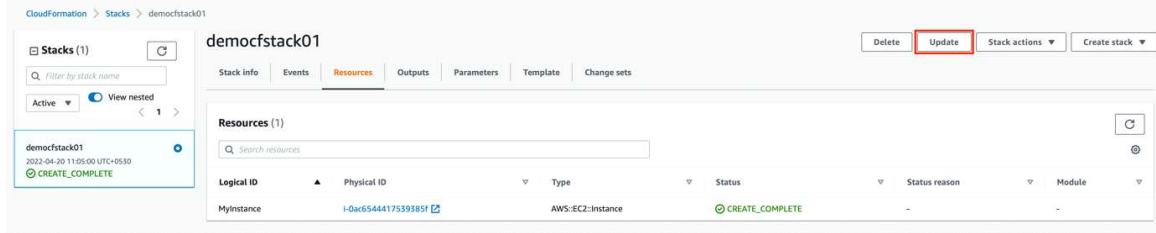


```

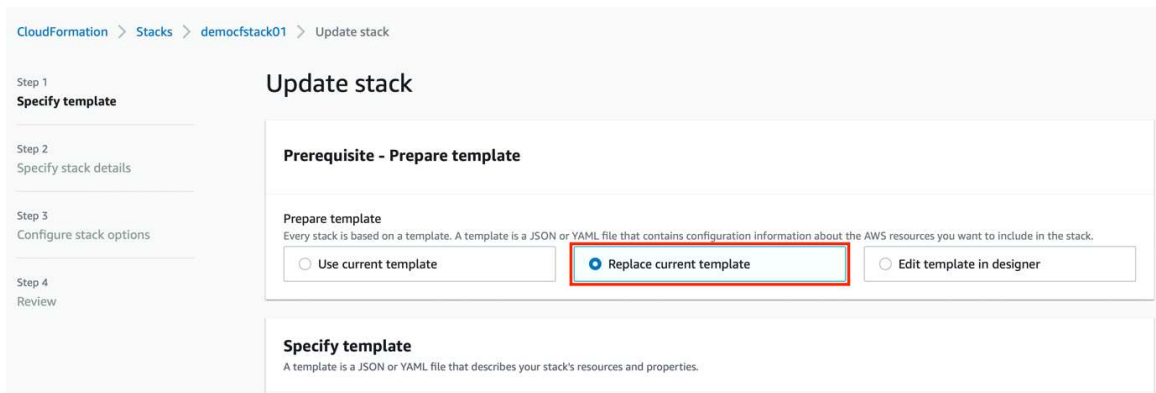
1 ---
2 Parameters:
3   SecurityGroupDescription:
4     Description: Security Group Description
5     Type: String
6
7 Resources:
8   MyInstance:
9     Type: AWS::EC2::Instance
10    Properties:
11      AvailabilityZone: us-east-1a
12      ImageId: ami-a4c7edb2
13      InstanceType: t2.micro
14      SecurityGroups:
15        - !Ref SSHSecurityGroup
16        - !Ref ServerSecurityGroup
17
18    # an elastic IP for our instance
19    MyEIP:
20      Type: AWS::EC2::EIP
21      Properties:
22        InstanceId: !Ref MyInstance
23
24    # our EC2 security group
25    SSHSecurityGroup:
26      Type: AWS::EC2::SecurityGroup
27      Properties:
28        GroupDescription: Enable SSH access via port 22
29        SecurityGroupIngress:
30          - CidrIp: 0.0.0.0/0
31            FromPort: 22
32            IpProtocol: tcp
33            ToPort: 22
34
35    # our second EC2 security group
36    ServerSecurityGroup:
37      Type: AWS::EC2::SecurityGroup
38      Properties:
39        GroupDescription: !Ref SecurityGroupDescription
40        SecurityGroupIngress:
41          - IpProtocol: tcp
42            FromPort: 80
43            ToPort: 80
44            CidrIp: 0.0.0.0/0
45          - IpProtocol: tcp
46            FromPort: 22
47            ToPort: 22
48            CidrIp: 192.168.1.1/32

```

- In the stack details pane, choose **Update**.



- Select **Replace current template** to specify the location of the updated template in the **Specify template** section.




- Since the modified template is stored locally on your computer, select **Upload a template file**. Click **Choose file** to navigate to the file and select it, and then choose **Next**.

**Specify template**  
A template is a JSON or YAML file that describes your stack's resources and properties.

**Template source**  
Selecting a template generates an Amazon S3 URL where it will be stored.

☐ Amazon S3 URL
 ☒ Upload a template file

**Upload a template file**

Choose file  1-ec2-with-sg-eip.yaml

JSON or YAML formatted file

S3 URL: <https://s3-external-1.amazonaws.com/cf-templates-fh7vaans86ec-us-east-1/20221105Ob-1-ec2-with-sg-eip.yaml> View in Designer

Cancel **Next**

- On the **Specify stack details** page enter a description for your second security group, and then choose **Next**.

CloudFormation > Stacks > democfstack01 > Update stack

Step 1  
Specify template

Step 2  
**Specify stack details**

Step 3  
Configure stack options

Step 4  
Review

**Specify stack details**

**Parameters**  
Parameters are defined in your template and allow you to input custom values when you create or update a stack.

SecurityGroupDescription  
Security Group Description

This security group will allow HTTP and SSH access to our instance.

Cancel Previous **Next**

- On the **Configure stack options** page, you can update the tags and permissions applied to the stack, and modify advanced options such as stack policy, rollback configuration, or update the Amazon SNS notification topic.

CloudFormation > Stacks > democfstack01 > Update stack

Step 1  
Specify template

Step 2  
Specify stack details

Step 3  
Configure stack options

Step 4  
Review

### Configure stack options

**Tags**  
You can specify tags (key-value pairs) to apply to resources in your stack. You can add up to 50 unique tags for each stack. [Learn more](#)

Key:  Value:

**Permissions**  
Choose an IAM role to explicitly define how CloudFormation can create, modify, or delete resources in the stack. If you don't choose a role, CloudFormation uses permissions based on your user credentials. [Learn more](#)

**IAM role - optional**  
Choose the IAM role for CloudFormation to use for all operations performed on the stack.

☒ Use existing role ☐ Change IAM role

**Stack failure options**

**Behavior on provisioning failure**  
Specify the roll back behavior for a stack failure. [Learn more](#)

☒ Roll back all stack resources  
Roll back the stack to the last known stable state.

☐ Preserve successfully provisioned resources  
Preserves the state of successfully provisioned resources, while rolling back failed resources to the last known stable state. Resources without a last known stable state will be deleted upon the next stack operation.

- To update your stack, you don't need to add or change any value or any given option on this page. Hence, scroll down to the end of this page and click **Next**.

### Advanced options

You can set additional options for your stack, like notification options and a stack policy. [Learn more](#)

► **Stack policy during update**  
Defines the resources that you want to protect from unintentional updates during a stack update.

► **Rollback configuration**  
Specify alarms for CloudFormation to monitor when creating and updating the stack. If the operation breaches an alarm threshold, CloudFormation rolls it back. [Learn more](#)

► **Notification options**

- Review the stack information and the changes that you submitted.

In the **Change set preview** section, check that AWS CloudFormation will make all the changes that you expect. For example, you can check that AWS CloudFormation adds, removes, and modifies the resources that you intended to add, remove, or modify. AWS CloudFormation generates this preview by creating a change set for the stack

Change set preview

Changes (4)				
<input type="text" value="Search changes"/> <span>&lt; 1 &gt;</span>				
Action	Logical ID	Physical ID	Resource type	Replacement
Add	MyEIP	-	AWS::EC2::EIP	-
Modify	MyInstance	<a href="#">i-0ac6544417539385f</a>	AWS::EC2::Instance	True
Add	SSHSecurityGroup	-	AWS::EC2::SecurityGroup	-
Add	ServerSecurityGroup	-	AWS::EC2::SecurityGroup	-

- When you are satisfied with your changes, choose **Update stack**.

Change set preview

Changes (4)				
<input type="text" value="Search changes"/> <span>&lt; 1 &gt;</span>				
Action	Logical ID	Physical ID	Resource type	Replacement
Add	MyEIP	-	AWS::EC2::EIP	-
Modify	MyInstance	<a href="#">i-0ac6544417539385f</a>	AWS::EC2::Instance	True
Add	SSHSecurityGroup	-	AWS::EC2::SecurityGroup	-
Add	ServerSecurityGroup	-	AWS::EC2::SecurityGroup	-

## Step 5: Monitor the progress of stack updating

- CloudFormation displays the stack details page for your stack, with the **Events** pane selected. Your stack now has a status of **UPDATE\_IN\_PROGRESS**.

Following is the expected outcome of this update:

- Two security groups *SSHSecurityGroup* and *ServerSecurityGroup* will be created with ingress rules.
- An elastic IP *MyEIP* will be generated.
- The existing EC2 instance *MyInstance* will be terminated.
- A new EC2 instance *MyInstance* will be launched as a replacement while attaching newly created resources such security groups (*SSHSecurityGroup* and *ServerSecurityGroup*) and elastic IP (*MyEIP*) to it.

CloudFormation > Stacks > democfstack01

Stacks (1)

Filter by stack name

Active View nested

democfstack01  
2022-04-21 10:53:14 UTC+0530  
UPDATE\_COMPLETE\_CLEANUP\_IN\_PROGRESS

Stack info Events Resources Outputs Parameters Template Change sets

Events (20)

Search events

Timestamp	Logical ID	Status	Status reason
2022-04-21 10:56:59 UTC+0530	MyInstance	DELETE_IN_PROGRESS	-
2022-04-21 10:56:57 UTC+0530	democfstack01	UPDATE_COMPLETE_CLEANUP_IN_PROGRESS	-
2022-04-21 10:56:55 UTC+0530	MyEIP	CREATE_COMPLETE	-
2022-04-21 10:56:37 UTC+0530	MyEIP	CREATE_IN_PROGRESS	Resource creation Initiated
2022-04-21 10:56:22 UTC+0530	MyEIP	CREATE_IN_PROGRESS	-
2022-04-21 10:56:20 UTC+0530	MyInstance	UPDATE_COMPLETE	-
2022-04-21 10:55:27 UTC+0530	MyInstance	UPDATE_IN_PROGRESS	Resource creation Initiated
2022-04-21 10:55:25 UTC+0530	MyInstance	UPDATE_IN_PROGRESS	Requested update requires the creation of a new physical resource; hence creating one.
2022-04-21 10:55:19 UTC+0530	ServerSecurityGroup	CREATE_COMPLETE	-
2022-04-21 10:55:19 UTC+0530	SSHSecurityGroup	CREATE_COMPLETE	-
2022-04-21 10:55:18 UTC+0530	ServerSecurityGroup	CREATE_IN_PROGRESS	Resource creation Initiated
2022-04-21 10:55:18 UTC+0530	SSHSecurityGroup	CREATE_IN_PROGRESS	Resource creation Initiated
2022-04-21 10:55:13 UTC+0530	ServerSecurityGroup	CREATE_IN_PROGRESS	-
2022-04-21 10:55:12 UTC+0530	SSHSecurityGroup	CREATE_IN_PROGRESS	-
2022-04-21 10:55:07 UTC+0530	democfstack01	UPDATE_IN_PROGRESS	User Initiated
2022-04-21 10:53:55 UTC+0530	democfstack01	CREATE_COMPLETE	-

- After CloudFormation has successfully finished updating the stack, it sets the stack status to **UPDATE\_COMPLETE**.

CloudFormation > Stacks > democfstack01

Stacks (1)

Filter by stack name

Active View nested

democfstack01  
2022-04-21 10:53:14 UTC+0530  
UPDATE\_COMPLETE

Stack info Events Resources Outputs Parameters Template Change sets

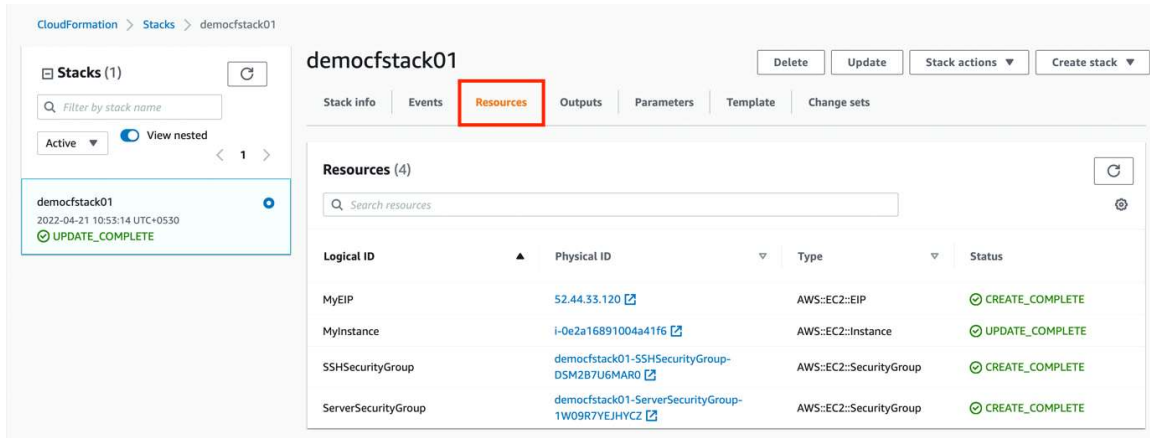
Events (22)

Search events

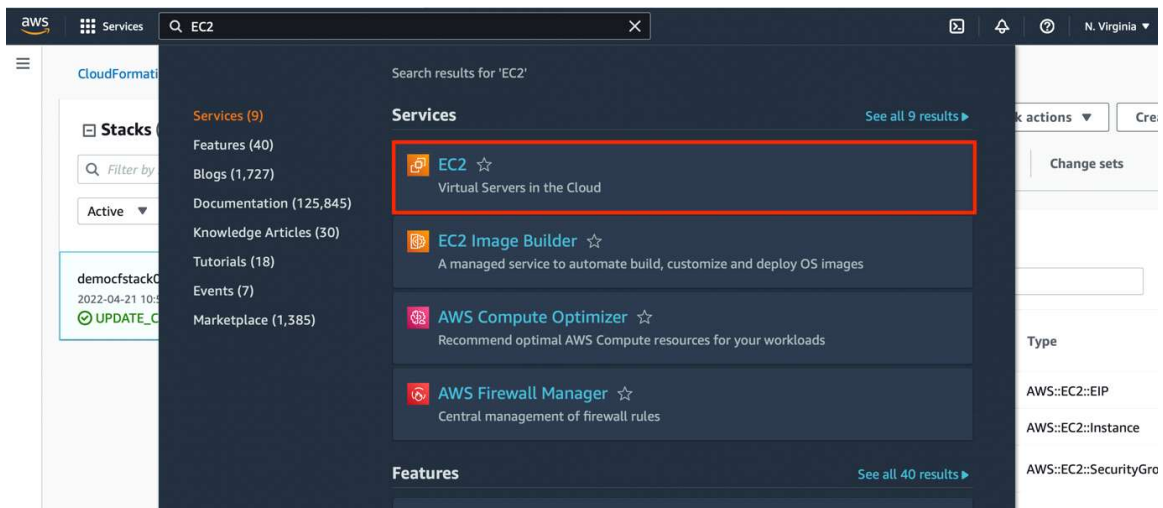
Timestamp	Logical ID	Status	Status reason
2022-04-21 10:57:30 UTC+0530	democfstack01	UPDATE_COMPLETE	-
2022-04-21 10:57:29 UTC+0530	MyInstance	DELETE_COMPLETE	-
2022-04-21 10:56:59 UTC+0530	MyInstance	DELETE_IN_PROGRESS	-
2022-04-21 10:56:57 UTC+0530	democfstack01	UPDATE_COMPLETE_CLEANUP_IN_PROGRESS	-
2022-04-21 10:56:55 UTC+0530	MyEIP	CREATE_COMPLETE	-
2022-04-21 10:56:37 UTC+0530	MyEIP	CREATE_IN_PROGRESS	Resource creation Initiated
2022-04-21 10:56:22 UTC+0530	MyEIP	CREATE_IN_PROGRESS	-
2022-04-21 10:56:20 UTC+0530	MyInstance	UPDATE_COMPLETE	-
2022-04-21 10:55:27 UTC+0530	MyInstance	UPDATE_IN_PROGRESS	Resource creation Initiated
2022-04-21 10:55:25 UTC+0530	MyInstance	UPDATE_IN_PROGRESS	Requested update requires the creation of a new physical resource; hence creating one.
2022-04-21 10:55:19 UTC+0530	ServerSecurityGroup	CREATE_COMPLETE	-
2022-04-21 10:55:19 UTC+0530	SSHSecurityGroup	CREATE_COMPLETE	-
2022-04-21 10:55:18 UTC+0530	ServerSecurityGroup	CREATE_IN_PROGRESS	Resource creation Initiated
2022-04-21 10:55:18 UTC+0530	SSHSecurityGroup	CREATE_IN_PROGRESS	Resource creation Initiated
2022-04-21 10:55:13 UTC+0530	ServerSecurityGroup	CREATE_IN_PROGRESS	-
2022-04-21 10:55:12 UTC+0530	SSHSecurityGroup	CREATE_IN_PROGRESS	-

If the stack update fails, CloudFormation; automatically rolls back changes, and sets the stack status to **UPDATE\_ROLLBACK\_COMPLETE**.

- Choose the **Resources** tab to view the list of resources deployed in this stack



- To verify these resources on EC2 dashboard, type **EC2** on the search bar, and click on the search result.



- You can now see the list of two EC2 instances: the terminated one and the one launched afresh as a replacement.

**Instances (2) Info**

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone
-	i-0974740788a8a2633	Terminated	t2.micro	-	No alarms	us-east-1a
-	i-0e2a16891004a41f6	Running	t2.micro	2/2 checks passed	No alarms	us-east-1a

Select an instance

- Select the running EC2 instance while the **Details** tab gets selected automatically.

Here you can view the *Instance summary* to check and confirm that an Elastic IP is being associated with this virtual machine.

**Instances (1/2) Info**

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone
-	i-0974740788a8a2633	Terminated	t2.micro	-	No alarms	us-east-1a
-	i-0e2a16891004a41f6	Running	t2.micro	2/2 checks passed	No alarms	us-east-1a

**Instance: i-0e2a16891004a41f6**

Select an instance above

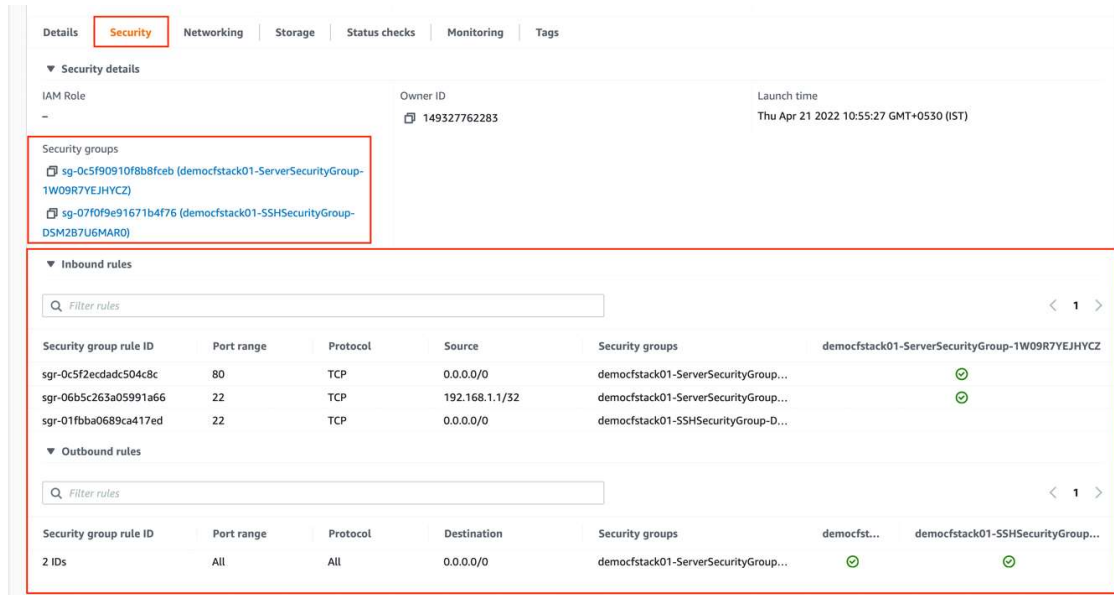
**Details** | Security | Networking | Storage | Status checks | Monitoring | Tags

**Instance summary Info**

Instance ID i-0e2a16891004a41f6	Public IPv4 address 52.44.33.120   <a href="#">open address</a>	Private IPv4 addresses 172.31.42.122
IPv6 address -	Instance state Running	Public IPv4 DNS ec2-52-44-33-120.compute-1.amazonaws.com   <a href="#">open address</a>
Hostname type IP name: ip-172-31-42-122.ec2.internal	Private IP DNS name (IPv4 only) ip-172-31-42-122.ec2.internal	Answer private resource DNS name -
Instance type t2.micro	Elastic IP addresses 52.44.33.120 [Public IP]	Auto-assigned IP address -

- Go to the **Security** tab to access and retrieve the list of two security groups (along with their ingress and egress rules) attached to this very EC2 instance.



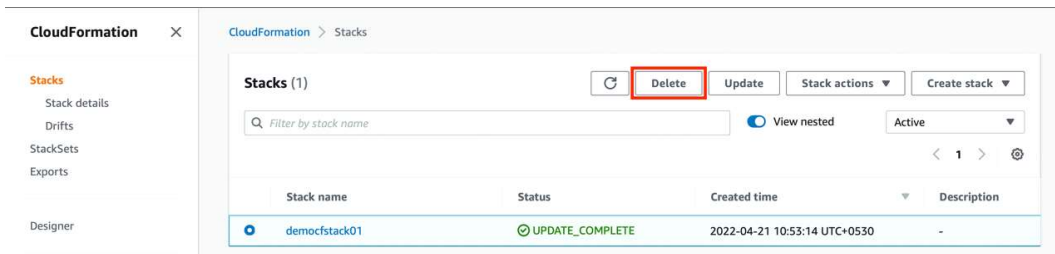


## Step 6: Clean up

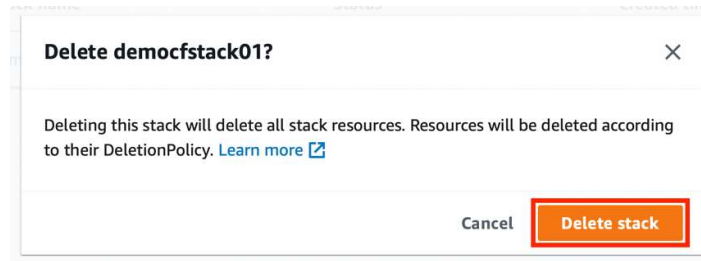
You have completed the hands-on. To make sure you aren't charged for any unwanted services, you can clean up by deleting the stack and its resources.

### To delete the stack and its resources

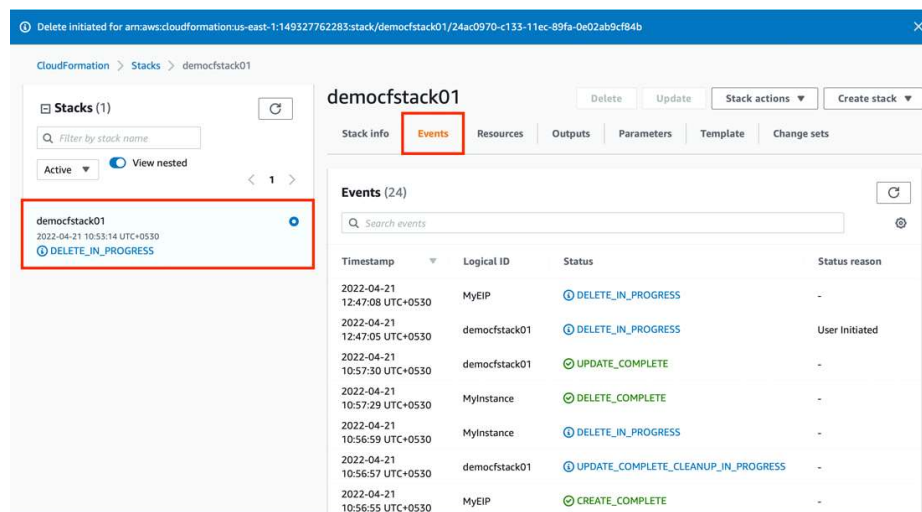
- From the CloudFormation console, select the stack and choose **Delete**.



- In the confirmation message that appears, choose **Delete stack**.



- The status for your stack changes to **DELETE\_IN\_PROGRESS**. In the same way you monitored the creation of the stack, you can monitor its deletion by using the **Events** tab.



- When CloudFormation completes the deletion of the stack, it removes the stack from the list.

CloudFormation > Stacks > democfstack01

Stacks (0)

Active

No stacks  
No stacks to display

democfstack01

Stack info

Events

Resources

Outputs

Parameters

Template

Change sets

Overview

Stack ID  
arn:aws:cloudformation:us-east-1:149327762283:stack/democfstack01/24ac0970-c133-11ec-89fa-0e02ab9cf84b

Description  
-

Status  
DELETE\_COMPLETE

Status reason  
-

Root stack  
-

Parent stack  
-

Created time  
2022-04-21 10:53:14 UTC+0530

Deleted time  
2022-04-21 12:47:05 UTC+0530

Updated time  
2022-04-21 10:55:07 UTC+0530

Drift status  
NOT\_CHECKED

Last drift check time  
-

Termination protection  
-

IAM role  
-

19