



lab title

# Programming and Deployment using AWS CloudFormation V1.00



Course title

**AWS Certified Developer Associate**



# Table of Contents

## Contents

Table of Contents.....	1
About the Lab .....	1
Develop a CloudFront template.....	1
Launch a CloudFormation Stack .....	1
Creating a CloudFormation Template using CloudFormer.....	1

## About the Lab

These lab notes are to support the instructional videos on Creating a DynamoDB Database using CloudFormation in the BackSpace AWS Certified Developer course.

In this lab we will:

- Develop a CloudFront template to launch a DynamoDB instance.
- Launch a CloudFormation stack from a template.
- Use the CloudFormer tool to create a template.

Please refer to the AWS JavaScript SDK documentation at:

[http://s3.amazonaws.com/awsdocs/CF/latest/cf\\_dg.pdf](http://s3.amazonaws.com/awsdocs/CF/latest/cf_dg.pdf)

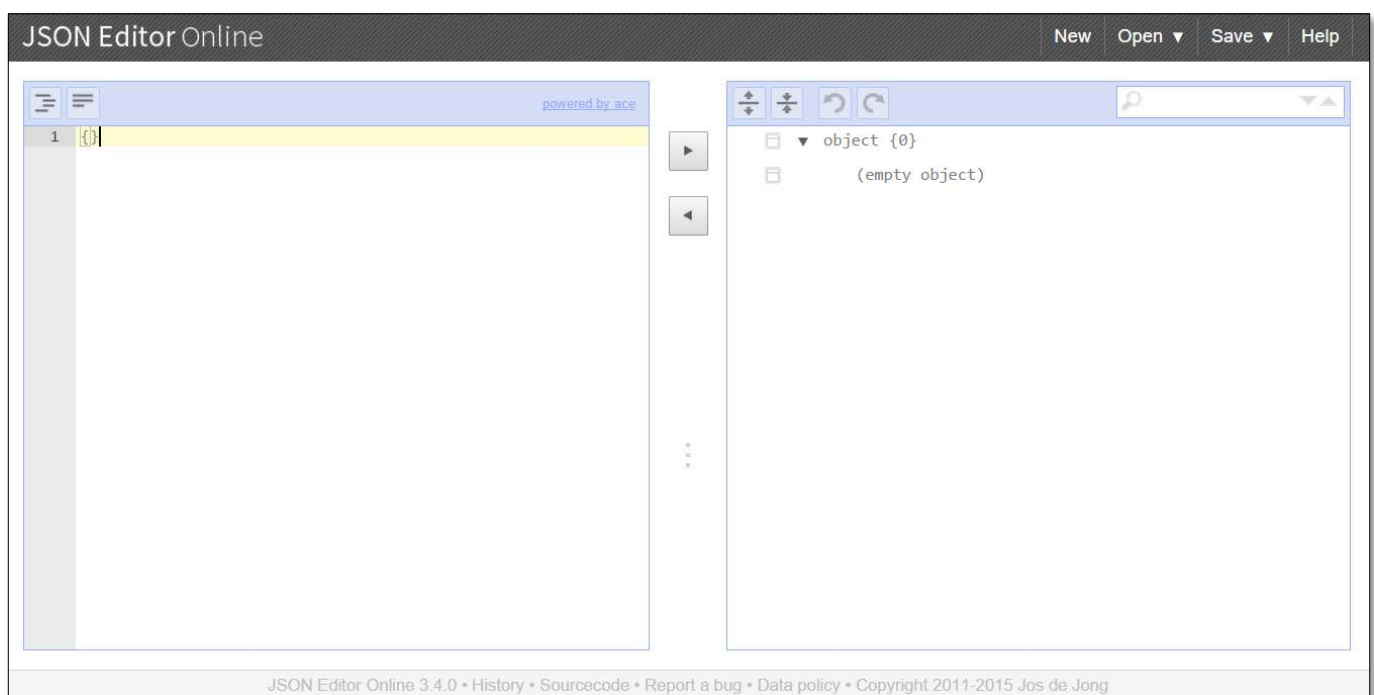
**Please note that AWS services change on a weekly basis and it is extremely important you check the version number on this document to ensure you have the latest version with any updates or corrections.**

# ▶ Develop a CloudFront template

In this section we will develop a CloudFront template using a JSON editor to launch a DynamoDB instance with pre-configured launch settings.

Open up the online JSON editor at <http://jsoneditoronline.org/>

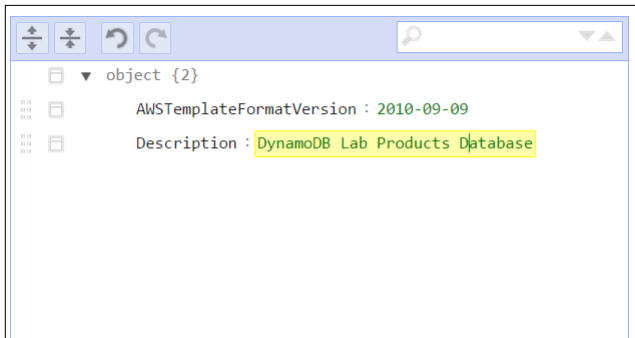
Create an empty object {}



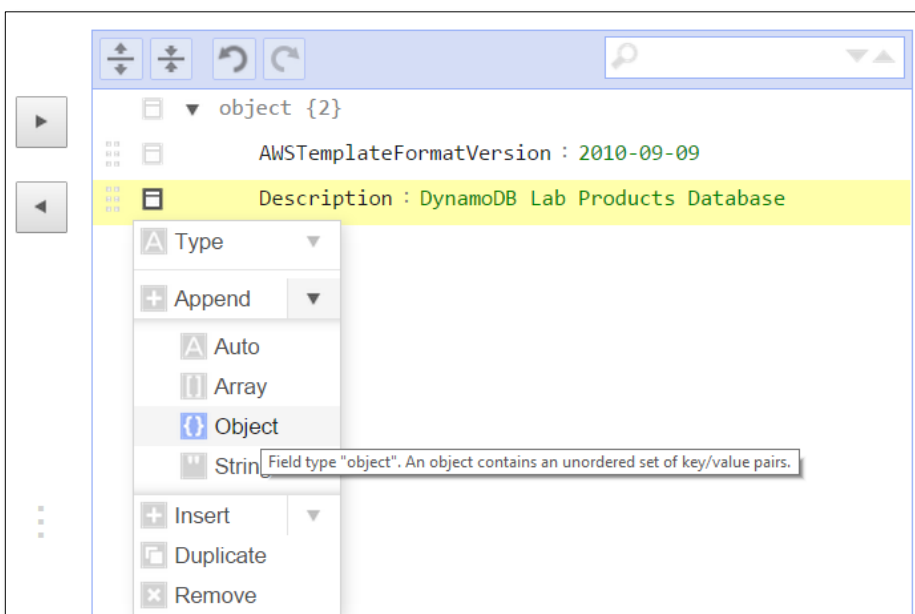
Append the following key pair to the object:

AWSTemplateFormatVersion : 2010-09-09

Description : DynamoDB Lab Products Database

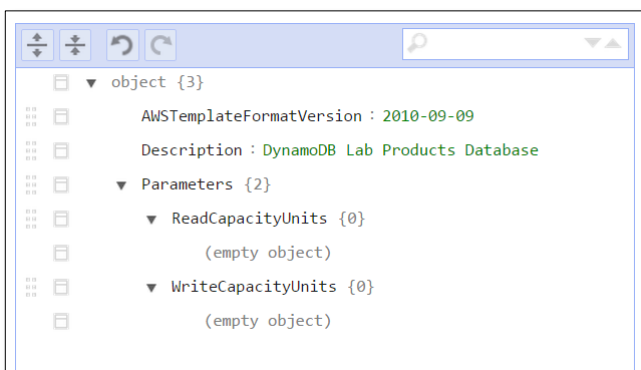


Now append an object called Parameters.



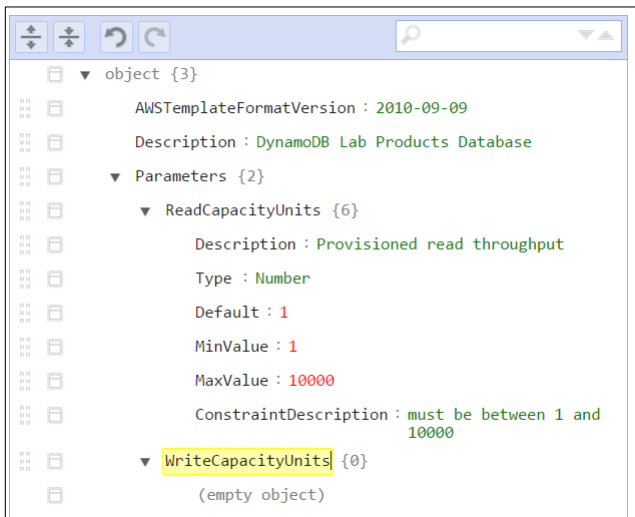
Append two objects to the Parameters object

- ReadCapacityUnits
- WriteCapacityUnits



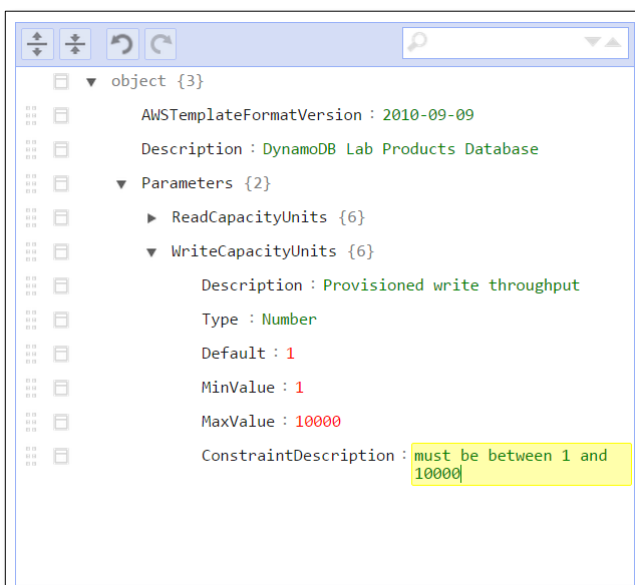
Append the following keys to the ReadCapacityUnits object:

- Description: Provisioned read throughput
- Type: Number
- Default: 1
- MinValue: 1
- MaxValue: 10000
- ConstraintDescription: must be between 1 and 10000

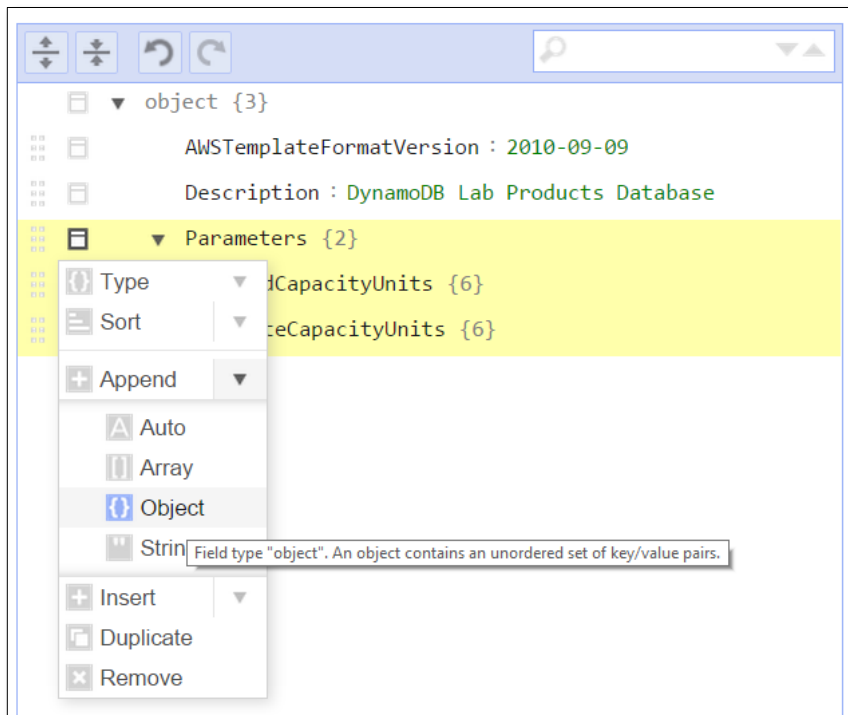


Append the following keys to the WriteCapacityUnits object:

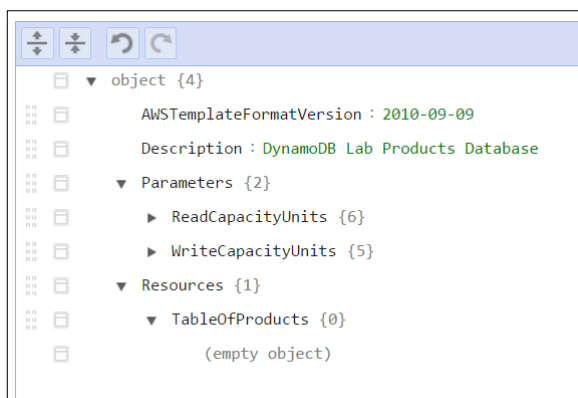
- Description: Provisioned write throughput
- Type: Number
- Default: 1
- MinValue: 1
- MaxValue: 10000
- ConstraintDescription: must be between 1 and 10000



Append an object called Resources to the Parameters object.



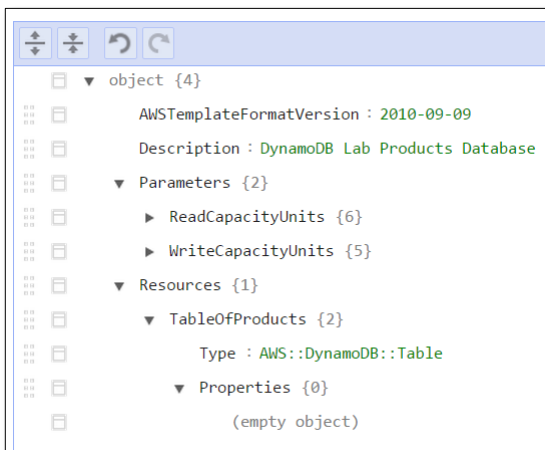
Append a TableOfProducts object to the Resources object:



Append TableOfProducts with keys:

Type: AWS::DynamoDB::Table

Append TableOfProducts with object Properties.

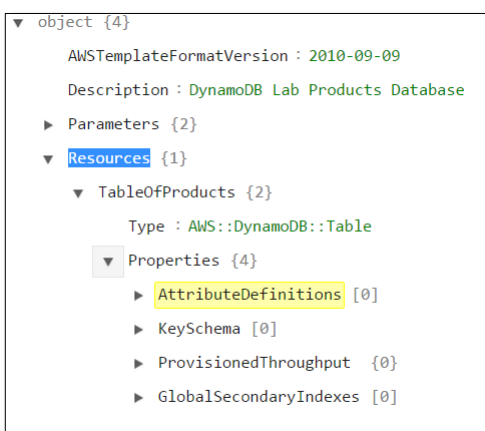


Append the following Arrays (not objects) to the Properties object:

- AttributeDefinitions
- KeySchema
- GlobalSecondaryIndexes

Append the following Object (not array) to the Properties object:

- ProvisionedThroughput



Append an Object to the AttributeDefinitions array.

Append the empty object with keys:

- AttributeName: Id
- AttributeType: N

Duplicate the object two times.

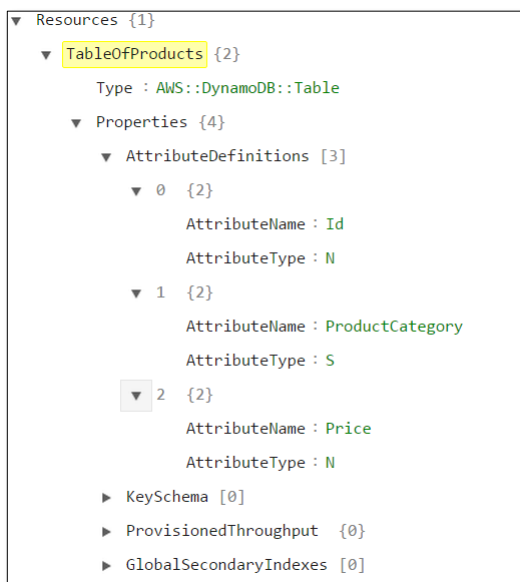
Edit the vales with the following keys:



- AttributeName: ProductCategory
- AttributeType: S

And

- AttributeName: Price
- AttributeType: N

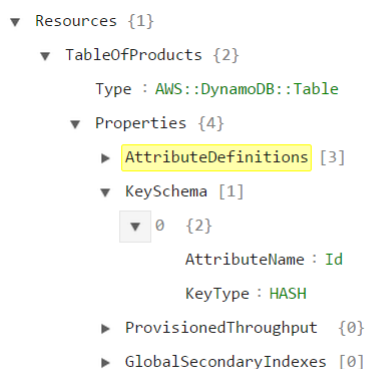


Append an Object to the KeySchema array.

Append the empty object with keys:

AttributeName: Id

KeyType: HASH



Append an Object to the ProvisionedThroughput object.

Append the empty object with keys with no values:

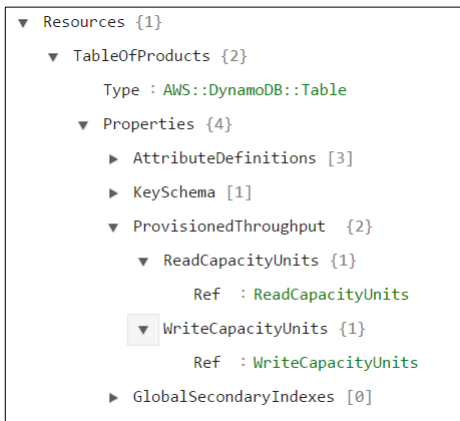
- ReadCapacityUnits

- WriteCapacityUnits

Select each key and change Type to object.

Now add keys that reference our Parameters object.

- Ref: ReadCapacityUnits
- Ref: WriteCapacityUnits



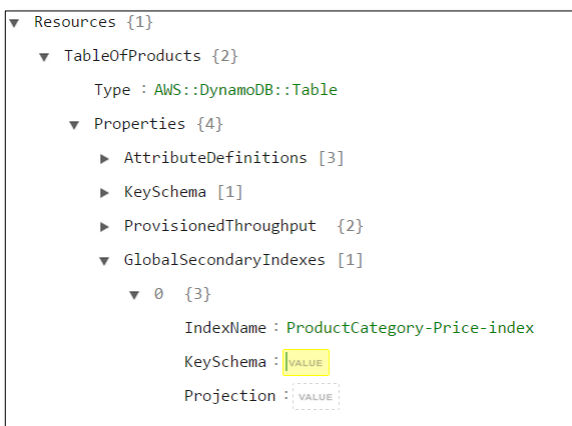
Append an Object to the GlobalSecondaryIndexes array.

Append key to object:

IndexName: ProductCategory-Price-index

Append the object with keys with no values:

- KeySchema
- Projection



Change KeySchema type to Array

Append an object to the array

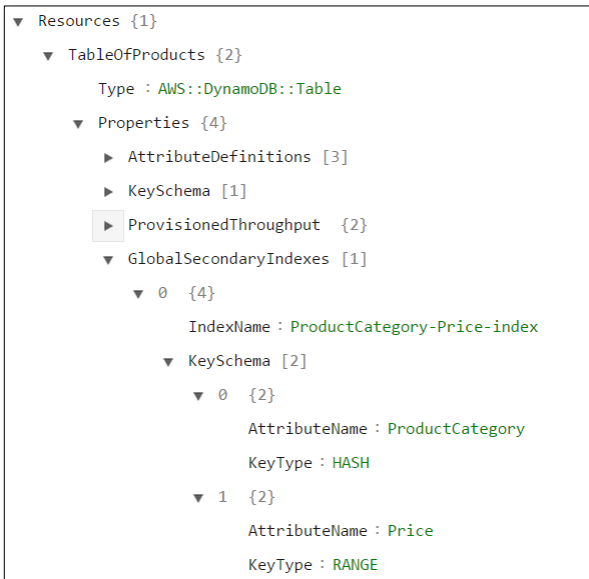
Append keys to the object

- AttributeName: ProductCategory
- KeyType: HASH

Duplicate the object

Change the keys

- AttributeName: Price
- KeyType: RANGE



Change Projection type to object

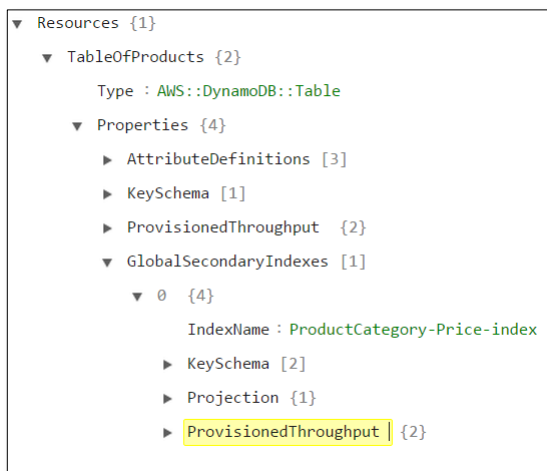
Append the key

ProjectionType: ALL

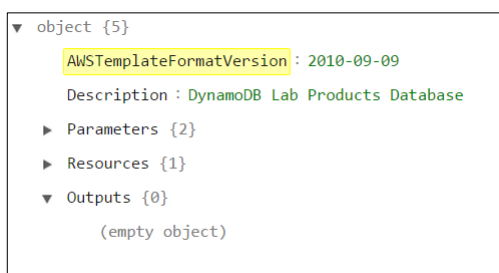


Duplicate the ProvisionedThroughput object created previously

Drag the object into the GlobalSecondaryIndexes array



Append an object Outputs after the Resources object



Add an object TableName

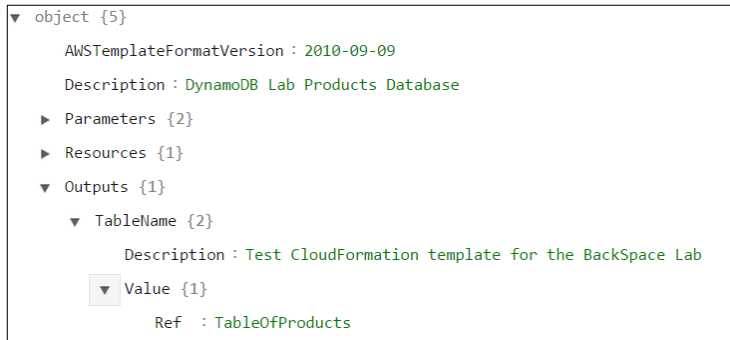
Add key to object

Description: Test CloudFormation template for the BackSpace Lab

Add object called Value

Add key to object Value

Ref: TableOfProducts



Save your code to disk.

Your final JSON file should look like this:

<https://gist.github.com/pcoady/efa71c94cfbba3c0469b>

# Launch a CloudFormation Stack

In this section we will launch a CloudFormation stack from our CloudFormation template.

Go to the CloudFormation console

### Create a Stack

AWS CloudFormation allows you to quickly and easily deploy your infrastructure resources and applications on AWS. You can use one of the templates we provide to get started quickly with applications like WordPress or Drupal, one of the many sample templates or create your own template.

You do not currently have any stacks. Click the "Create New Stack" button below to create a new AWS CloudFormation Stack.

Create New Stack

### Create a Template from your Existing Resources

If you already have AWS resources running, the CloudFormer tool can create a template from your existing resources. This means you can capture and redeploy applications you already have running.

To do this, click Launch CloudFormer and create an AWS CloudFormation stack that runs the CloudFormer tool. After the stack creation is complete, navigate to the CloudFormer URL available on the Outputs tab.

Launch CloudFormer

Select Create new stack

Give your stack a name

Upload your JSON file

Click Next

Click Next

Click Create

Create StackUpdate StackDelete Stack

Filter: ActiveBy Name:

	Stack Name	Created Time	Status	Description
<input checked="" type="checkbox"/>	BackSpace-Lab	2015-08-29 07:27:50 UTC+1000	CREATE_IN_PROGRESS	DynamoDB Lab Products Database

You have just created a DynamoDB database with pre-configured launch settings from the CloudFormation template.

When the create has completed

Overview	Outputs	Resources	Events	Template	Parameters	Tags	Stack Policy
2015-08-29		Status	Type	Logical ID		Status Reason	
▶ 07:28:44 UTC+1000		CREATE_COMPLETE	AWS::CloudFormation::Stack	BackSpace-Lab			
▶ 07:28:42 UTC+1000		CREATE_COMPLETE	AWS::DynamoDB::Table	TableOfProducts			
▶ 07:28:11 UTC+1000		CREATE_IN_PROGRESS	AWS::DynamoDB::Table	TableOfProducts		Resource creation Initiated	
▶ 07:28:10 UTC+1000		CREATE_IN_PROGRESS	AWS::DynamoDB::Table	TableOfProducts			
▶ 07:27:50 UTC+1000		CREATE_IN_PROGRESS	AWS::CloudFormation::Stack	BackSpace-Lab		User Initiated	

Go to the DynamoDB console to see the database

Amazon DynamoDB Tables		
Filter:	Explore Table	Create Table
	Create Index	Modify Throughput
	Delete Table	
Name	Status	Hash Key
BackSpace-Lab-TableOfProducts-MPV4GCVQW1XO	ACTIVE	Id

Click on the details tab to see the details set in the CloudFormation template

BackSpace-Lab-TableOfProducts-MPV4GCVQW1XO	
Details	Indexes
Monitoring	Alarm Setup
Streams	
Table Name:	BackSpace-Lab-TableOfProducts-MPV4GCVQW1XO
Primary Hash Key:	Id (Number)
Table Status:	Active
Creation Date:	Sat Aug 29 07:28:11 GMT+1000 2015
Provisioned Read Capacity Units:	1
Provisioned Write Capacity Units:	1
Region:	US East (N. Virginia)
Amazon Resource Name (ARN):	arn:aws:dynamodb:us-east-1:802694931986:table/BackSpace-Lab-TableOfProducts-MPV4GCVQW1XO
Last Decrease Time:	
Last Increase Time:	
Storage Size (in bytes)*:	0 bytes
Item Count*:	0

Click on Indexes tab to see the Global secondary index created from the CloudFormation template.

BackSpace-Lab-TableOfProducts-MPV4GCVQW1XO	
Details	Indexes
Monitoring	Alarm Setup
Streams	
Local Secondary Indexes	
Index Name	Hash Key
Range Key	Projected Attributes
Index Size (Bytes)*	Item Count*
This table has no local secondary indexes.	
Global Secondary Indexes	
Index Name	Hash Key
Range Key	Projected Attributes
Status	Read Capacity Units
Write Capacity Units	Index Size (Bytes)*
Item Count*	Delete Index
ProductCategory-Price-index	ProductCategory (String)
Price (Number)	All
Active	1
1	0 bytes
0	Delete

\* Storage size and Item count are not updated in real-time. Instead, they are updated periodically, roughly every six hours.

# ▶ Creating a CloudFormation Template using CloudFormer

In this section we will launch CloudFormer to create a CloudFormation template from our existing resources

Go to the CloudFormation console and Create Stack

Call it CloudFormer

Select CloudFormer from the sample templates

The screenshot shows the 'Select Template' form in the AWS CloudFormation console. It includes a title bar 'Select Template', a description 'Specify a stack name and then select the template that describes the stack that you want to create.', and two main sections: 'Stack' and 'Template'. The 'Stack' section has a 'Name' field with the value 'CloudFormer'. The 'Template' section has a 'Source' section with three radio buttons: 'Select a sample template' (selected), 'Upload a template to Amazon S3', and 'Specify an Amazon S3 template URL'. The 'Select a sample template' option has a dropdown menu showing 'CloudFormer'. The 'Upload a template to Amazon S3' option has a 'Choose File' button and the text 'No file chosen'. The 'Specify an Amazon S3 template URL' option has a text field with the URL 'https://s3-external-1.amazonaws.com/cloudformation-templates-us-east-1/CloudFormer.tem'.

Select Template

Specify a stack name and then select the template that describes the stack that you want to create.

**Stack**

An AWS CloudFormation stack is a collection of related resources that you provision and update as a single unit.

**Name** CloudFormer

**Template**

A template is a JSON-formatted text file that describes your stack's resources and their properties. AWS CloudFormation stores the template in Amazon S3.

**Source**

☒ Select a sample template

CloudFormer

☐ Upload a template to Amazon S3

Choose File No file chosen

☐ Specify an Amazon S3 template URL

https://s3-external-1.amazonaws.com/cloudformation-templates-us-east-1/CloudFormer.tem

Enter a password and username

The screenshot shows the 'Specify Parameters' form in the AWS CloudFormation console. It includes a title bar 'Specify Parameters', a description 'Specify values or use the default values for the parameters that are associated with your AWS CloudFormation template. Learn more.', and a 'Parameters' section. The 'Parameters' section has two fields: 'Password' and 'Username'. The 'Password' field has a masked input (dots) and a label 'Password to log in to CloudFormer'. The 'Username' field has the value 'backspace' and a label 'Username to log in to CloudFormer'.

Specify Parameters

Specify values or use the default values for the parameters that are associated with your AWS CloudFormation template. [Learn more.](#)

**Parameters**

**Password** Password to log in to CloudFormer

**Username** Username to log in to CloudFormer



Review template.

Select the checkbox to acknowledge automatic creation of IAM resources.

**Template**

**Name** CloudFormer

**Template URL** <https://s3-external-1.amazonaws.com/cloudformation-templates-us-east-1/CloudFormer.template>

**Description** AWS CloudFormer Beta - template creation prototype application. This tool allows you to create an AWS CloudFormation template from the AWS resources in your AWS account. **\*\*Warning\*\*** This template creates a single EC2 instance in your account to run the application - you will be billed for the instance at normal AWS EC2 rates.

**Estimate cost** [Cost](#)

**Parameters**

**Password** .....

**Username** backspace

**Create IAM resources** ☒ True

**Options**

**Tags**

No tags provided

**Advanced**

**Notification Timeout** none

**Rollback on failure** Yes

**Capabilities**

**i** The following resource(s) require capabilities: [AWS::IAM::Policy, AWS::IAM::InstanceProfile, AWS::IAM::Role]

This template might include Identity and Access Management (IAM) resources, which can include groups, IAM users, and IAM roles with certain permissions. Ensure that the template you are using is from a trusted source. [Learn more](#).

☒ I acknowledge that this template might cause AWS CloudFormation to create IAM resources.

Click Create

After the Create has completed, select the Outputs tab to see the CloudFormer URL.

Overview <b>Outputs</b> Resources   Events   Template   Parameters   Tags   Stack Policy		
Key	Value	Description
WebsiteURL	<a href="https://ec2-52-6-219-137.compute-1.amazonaws.com">https://ec2-52-6-219-137.compute-1.amazonaws.com</a>	URL for CloudFormer

Go to the CloudFormer URL

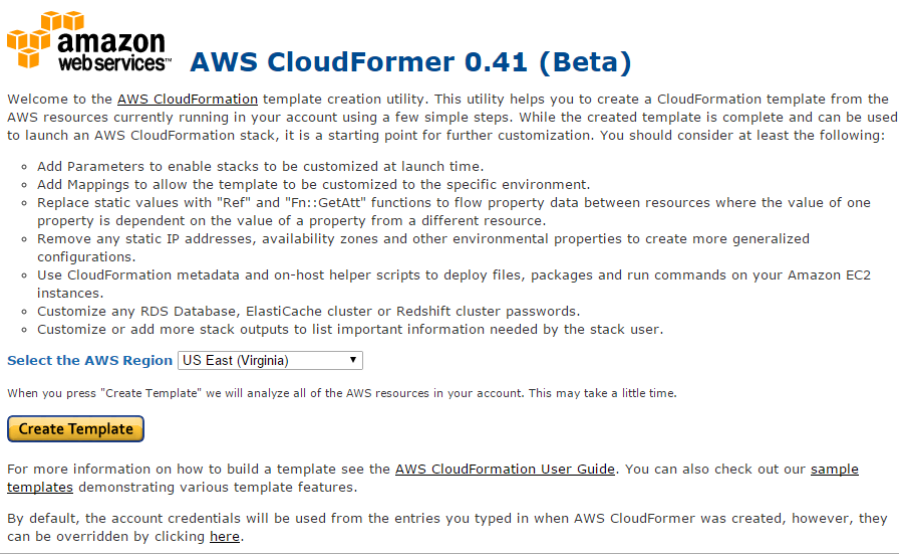
Enter you password and username you set.

Authentication Required

The server <https://ec2-52-6-219-137.compute-1.amazonaws.com:443> requires a username and password. The server says: Application.

User Name:

Password:



**amazon web services™ AWS CloudFormer 0.41 (Beta)**

Welcome to the [AWS CloudFormation](#) template creation utility. This utility helps you to create a CloudFormation template from the AWS resources currently running in your account using a few simple steps. While the created template is complete and can be used to launch an AWS CloudFormation stack, it is a starting point for further customization. You should consider at least the following:

- Add Parameters to enable stacks to be customized at launch time.
- Add Mappings to allow the template to be customized to the specific environment.
- Replace static values with "Ref" and "Fn::GetAtt" functions to flow property data between resources where the value of one property is dependent on the value of a property from a different resource.
- Remove any static IP addresses, availability zones and other environmental properties to create more generalized configurations.
- Use CloudFormation metadata and on-host helper scripts to deploy files, packages and run commands on your Amazon EC2 instances.
- Customize any RDS Database, ElastiCache cluster or Redshift cluster passwords.
- Customize or add more stack outputs to list important information needed by the stack user.

Select the AWS Region US East (Virginia)

When you press "Create Template" we will analyze all of the AWS resources in your account. This may take a little time.

**Create Template**

For more information on how to build a template see the [AWS CloudFormation User Guide](#). You can also check out our [sample templates](#) demonstrating various template features.

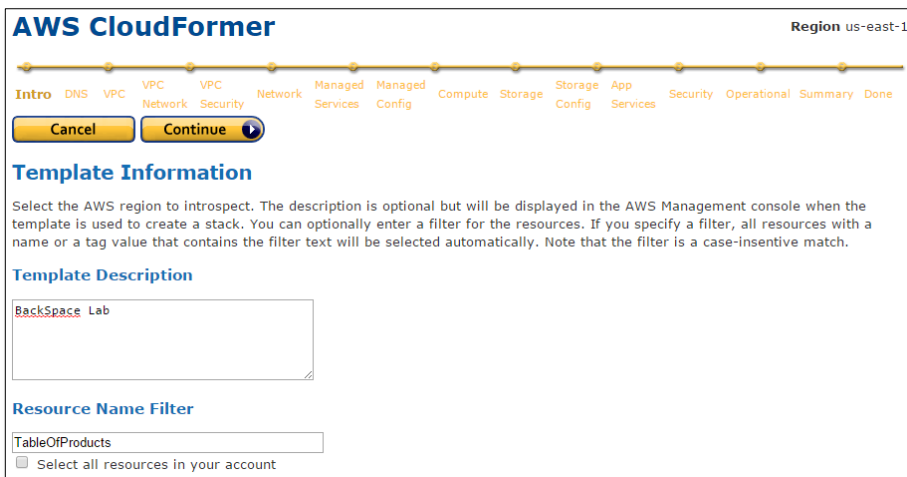
By default, the account credentials will be used from the entries you typed in when AWS CloudFormer was created, however, they can be overridden by clicking [here](#).

Click Create Template

Give the template a name

Filter resource names by TableOfProducts

Click Continue



**AWS CloudFormer** Region us-east-1

Intro DNS VPC VPC Network Security Network Managed Services Managed Config Compute Storage Storage Config App Services Security Operational Summary Done

**Cancel** **Continue**

**Template Information**

Select the AWS region to introspect. The description is optional but will be displayed in the AWS Management console when the template is used to create a stack. You can optionally enter a filter for the resources. If you specify a filter, all resources with a name or a tag value that contains the filter text will be selected automatically. Note that the filter is a case-insensitive match.

**Template Description**

BackSpace Lab

**Resource Name Filter**

TableOfProducts

☐ Select all resources in your account

Deselect everything for DNS and Click Continue

Deselect everything for VPC and Click Continue

Deselect everything for VPC Network and Click Continue

Deselect everything for VPC Security and Click Continue

Deselect everything for Network and Click Continue

Deselect everything for Managed Services and Click Continue

Deselect everything for Managed Service Configuration and Click Continue

Deselect everything for Compute Resources and Click Continue

Deselect everything for Storage and Click Continue

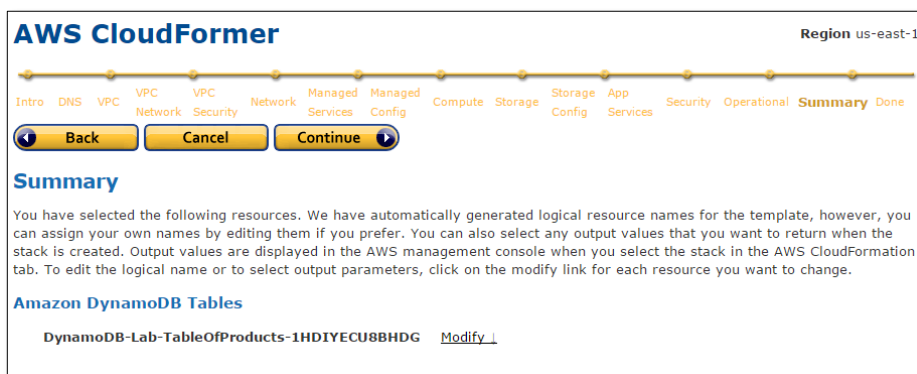
Deselect everything for Storage Configuration and Click Continue

Deselect everything for Application Services and Click Continue

Deselect everything for Security Groups and Click Continue

Deselect everything for Operational Resources and Click Continue

You will now see your DynamoDB TableOfProducts table

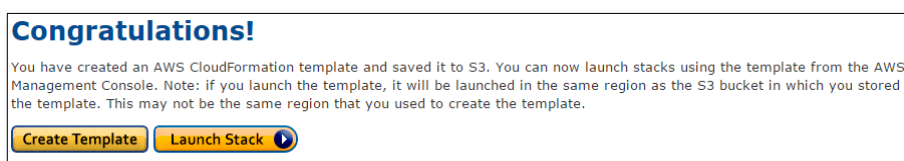


Click Continue

Now you have created a template to create a copy of your DynamoDB table.

Note the template does not have a parameters, outputs or references, it only has the resources section. It just creates an exact copy of resources without allowing for user interaction.

Save the template to S3.



Click Launch Stack

Give the stack a name and click Next

Click Next again.

Click Create

Create Stack

Update Stack

Delete Stack

Filter: Active

By Name:

	Stack Name	Created Time	Status	Description
<input type="checkbox"/>	CloudFormer-DynamoDB	2015-08-30 00:25:20 UTC+1000	CREATE_COMPLETE	BackSpace Lab
<input type="checkbox"/>	DynamoDB-Lab	2015-08-29 23:56:58 UTC+1000	CREATE_COMPLETE	DynamoDB Lab Products Database
<input type="checkbox"/>	CloudFormer	2015-08-29 23:39:09 UTC+1000	CREATE_COMPLETE	AWS CloudFormer Beta - template creation prototype

Now go to the DynamoDB console to see the new table

Amazon DynamoDB Tables		
Filter: <input type="text"/>	Explore Table	Create Table
	Create Index	Modify Throughput
	Delete Ta	
Name	Status	Hash Key
CloudFormer-DynamoDB-tableDynamoDBLabTableOfProducts1HDI	ACTIVE	Id
DynamoDB-Lab-TableOfProducts-1HDIYECU8BHDG	ACTIVE	Id

Select the table created using the CloudFormer template.

Click on the details tab

CloudFormer-DynamoDB-tableDynamoDBLabTableOfProducts1HDIYECU8BHDG-16R5CZT0LLU08	
Details	Indexes
Monitoring	Alarm Setup
Streams	
<b>Table Name:</b>	CloudFormer-DynamoDB-tableDynamoDBLabTableOfProducts1HDIY
<b>Primary Hash Key:</b>	Id (Number)
<b>Table Status:</b>	Active
<b>Creation Date:</b>	Sun Aug 30 00:25:41 GMT+1000 2015
<b>Provisioned Read Capacity Units:</b>	1
<b>Provisioned Write Capacity Units:</b>	1
<b>Region:</b>	US East (N. Virginia)
<b>Amazon Resource Name (ARN):</b>	arn:aws:dynamodb:us-east-1:802694931986:table/CloudFormer-Dyna

Click on the Indexes tab.

CloudFormer-DynamoDB-tableDynamoDBLabTableOfProducts1HDIYECU8BHDG-16R5CZT0LLU08	
Details	Indexes
Monitoring	Alarm Setup
Streams	
<b>Local Secondary Indexes</b>	
Index Name	Hash Key
Range Key	Projected Attributes
Index Size (Bytes)*	Item Count*
This table has no local secondary indexes.	
<b>Global Secondary Indexes</b>	
Index Name	Hash Key
Range Key	Projected Attributes
Status	Read Capacity Units
Write Capacity Units	
ProductCategory-Price-index	ProductCategory (String)
Price (Number)	All
Active	1
1	

If you want to delete the resources after the lab go to the CloudFormation console and delete the stack. This will cleanly delete all the resources.