Amazon Web Services
Data Engineering Immersion Day

Lab 1 - Prelab. Real-Time Clickstream Anomaly Detection
August 2020

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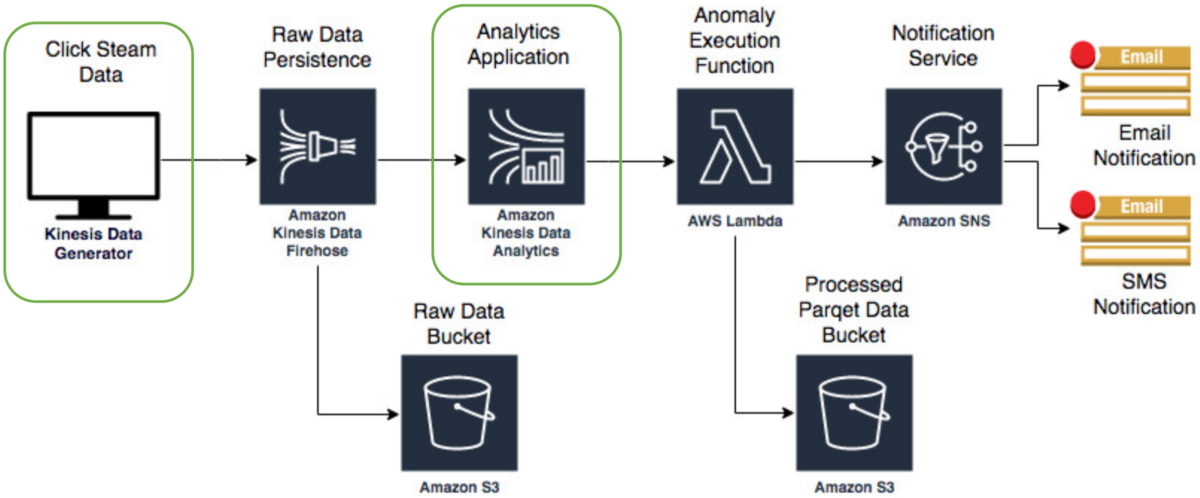
Introduction

This guide will help you set up the pre-lab environment for the Real-Time Clickstream Anomaly Detection Amazon Kinesis Data Analytics lab.



After you deploy the CloudFormation template, sign into your account to view the following resources:

- Two Amazon Simple Storage Service (Amazon S3) buckets: You will use these buckets to persist raw and processed data.
- One AWS Lambda function: This Lambda function will be triggered once an anomaly has been detected.
- Amazon Simple Notification Service (Amazon SNS) topic with an email and phone number subscribed to it: The Lambda function will publish to this topic once an anomaly has been detected.
- Amazon Cognito User credentials: You will use these user credentials to log into the Kinesis Data Generator to send records to our Amazon Kinesis Data Firehose.

Today, you are attending a formal AWS event and we've uploaded the CloudFormation template and the Kinesis Data Generator to an s3 bucket for you. If in the future you might want to perform these labs in your own AWS environment by yourself, you can follow instructions here - https://aws-dataengineering-day.workshop.aws/en/300.html

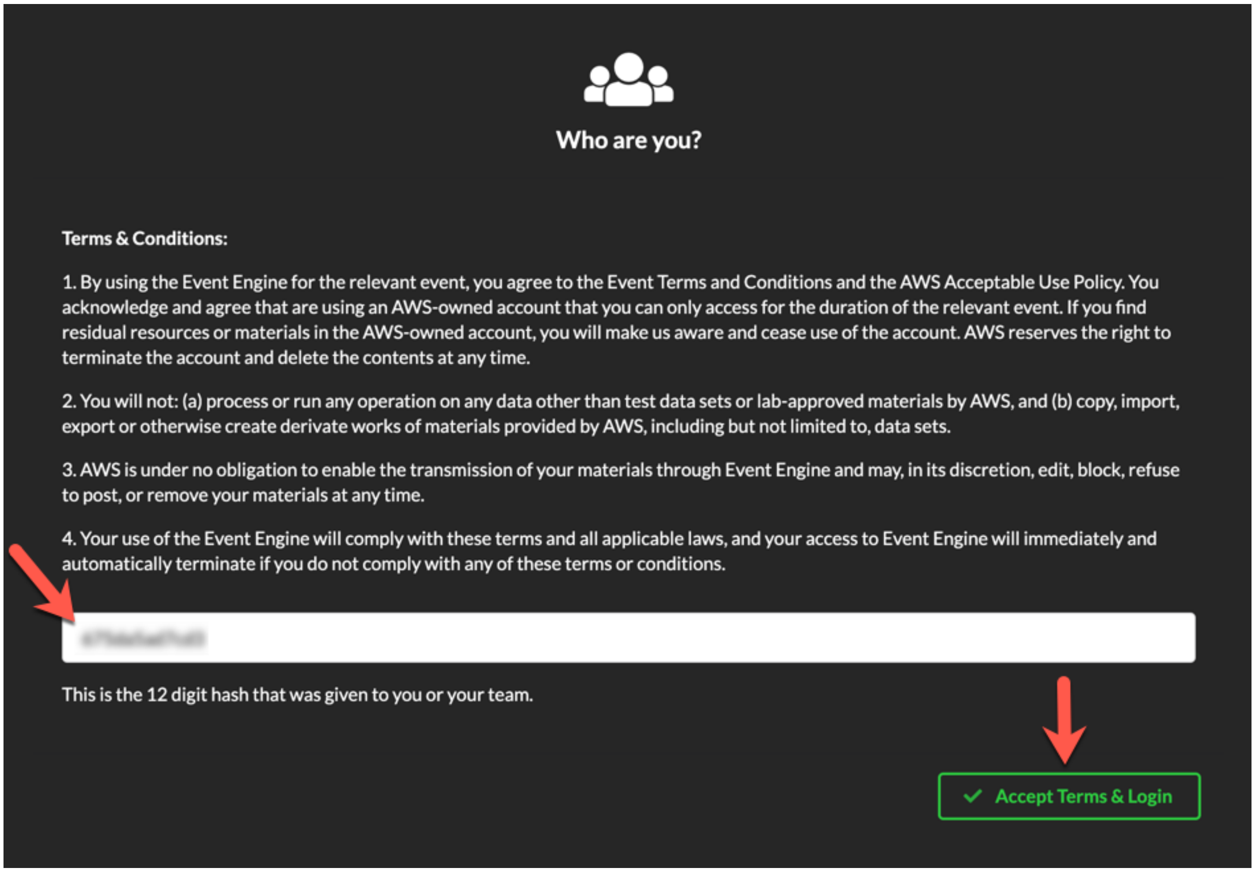
Get Started Using the Lab Environment

Please skip this section if you are running the lab on your own AWS account.

Today, you are attending a formal event and you will have been sent your access details beforehand. If in the future you might want to perform these labs in your own AWS environment by yourself, you can follow instructions on GitHub - https://github.com/aws-samples/data-engineering-for-aws-immersion-day.

A 12-character access code (or 'hash') is the access code that grants you permission to use a dedicated AWS account for the purposes of this workshop.

1. Go to https://dashboard.eventengine.run/, enter the access code and click Proceed:



Who are you?

Terms & Conditions:

1. By using the Event Engine for the relevant event, you agree to the Event Terms and Conditions and the AWS Acceptable Use Policy. You acknowledge and agree that are using an AWS-owned account that you can only access for the duration of the relevant event. If you find residual resources or materials in the AWS-owned account, you will make us aware and cease use of the account. AWS reserves the right to terminate the account and delete the contents at any time.

2. You will not: (a) process or run any operation on any data other than test data sets or lab-approved materials by AWS, and (b) copy, import, export or otherwise create derivate works of materials provided by AWS, including but not limited to, data sets.

3. AWS is under no obligation to enable the transmission of your materials through Event Engine and may, in its discretion, edit, block, refuse to post, or remove your materials at any time.

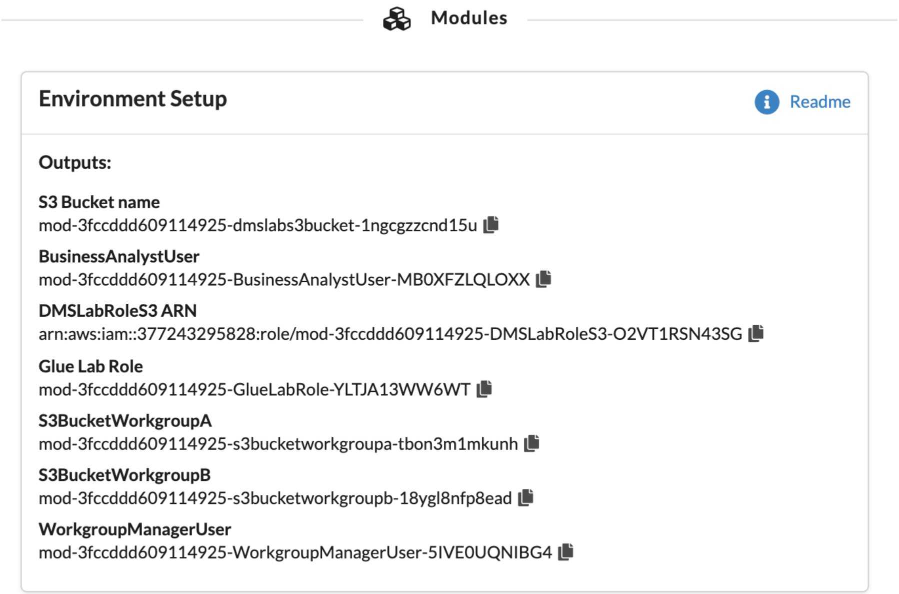
4. Your use of the Event Engine will comply with these terms and all applicable laws, and your access to Event Engine will immediately and automatically terminate if you do not comply with any of these terms or conditions.

[redacted]

This is the 12 digit hash that was given to you or your team.

2. On the Team Dashboard web page you will see a set of parameters that you will need during the labs. Best to save them to a text file locally, alternatively you can always go to this page to review them. Replace the parameters with the corresponding values from here where indicated in subsequent labs:

Because you’re at a formal event, some AWS resources have been pre-deployed for your convenience, for example you can see a list of parameters on your event dashboard:



Outputs:

S3 Bucket name
mod-3fccddd609114925-dmslabs3bucket-1ngcgzzcnd15u

BusinessAnalystUser
mod-3fccddd609114925-BusinessAnalystUser-MB0XFZLQLOXX

DMSLabRoleS3 ARN
arn:aws:iam::377243295828:role/mod-3fccddd609114925-DMSLabRoleS3-O2VT1RSN43SG

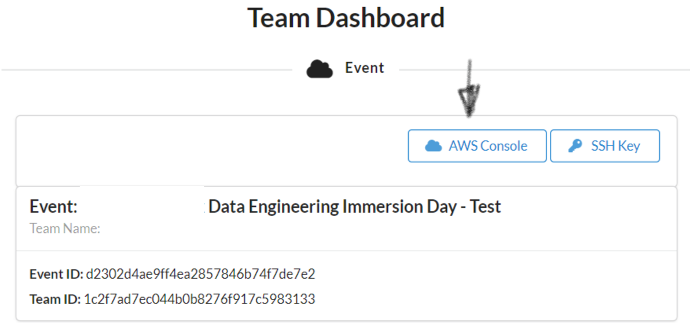
Glue Lab Role
mod-3fccddd609114925-GlueLabRole-YLTJA13WW6WT

S3BucketWorkgroupA
mod-3fccddd609114925-s3bucketworkgroupa-tbon3m1mkunh

S3BucketWorkgroupB
mod-3fccddd609114925-s3bucketworkgroupb-18ygl8nfp8ead

WorkgroupManagerUser
mod-3fccddd609114925-WorkgroupManagerUser-5IVE0UQNIBG4

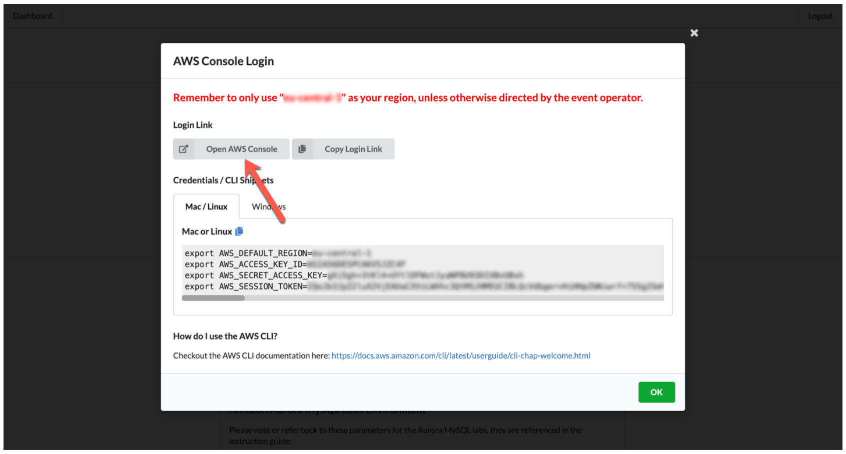
3. On the Team Dashboard, please click AWS Console to log into the AWS Management Console:



Event: Data Engineering Immersion Day - Test
Team Name:

Event ID: d2302d4ae9ff4ea2857846b74f7de7e2
Team ID: 1c2f7ad7ec044b0b8276f917c5983133

4. Click Open Console. For the purposes of this workshop, you will not need to use command line and API access credentials



Remember to only use "[redacted]" as your region, unless otherwise directed by the event operator.

```
export AWS_DEFAULT_REGION=[redacted]
export AWS_ACCESS_KEY_ID=[redacted]
export AWS_SECRET_ACCESS_KEY=[redacted]
export AWS_SESSION_TOKEN=[redacted]
```

How do I use the AWS CLI?

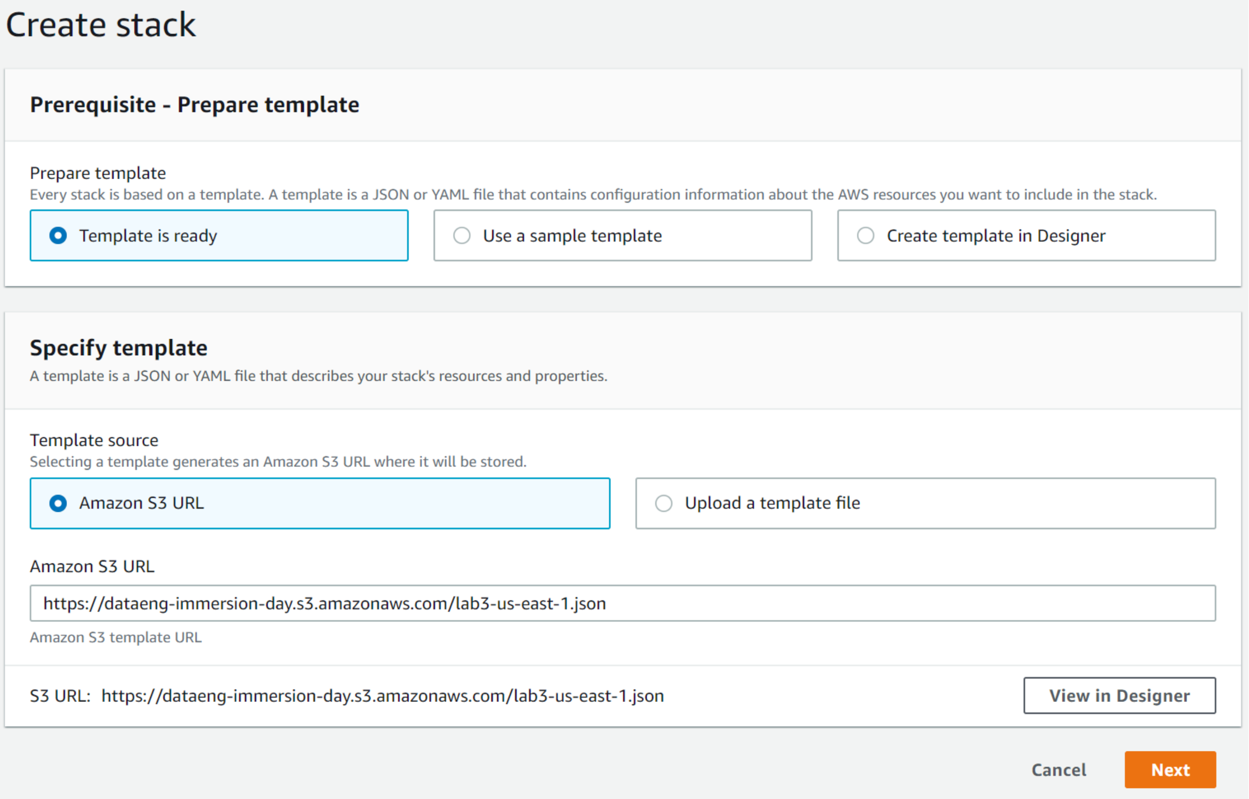
Checkout the AWS CLI documentation here: https://docs.aws.amazon.com/cli/latest/userguide/cli-chap-welcome.html

Please note or refer back to these parameters for the Aurora MySQL labs, they are referenced in the instruction guide:

Once you have completed these steps, you can continue with the rest of this lab

CloudFormation Stack Deployment

1. Use this link to create a new CloudFormation Stack: https://console.aws.amazon.com/cloudformation/home?region=us-east-1#/stacks/new?stackName=kinesis-pre-lab&templateURL=https://aws-dataengineering-day.workshop.aws.s3.amazonaws.com/Kinesis_Pre_Lab_us-east-1.json



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.

Template source

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

● Amazon S3 URL ○ Upload a template file

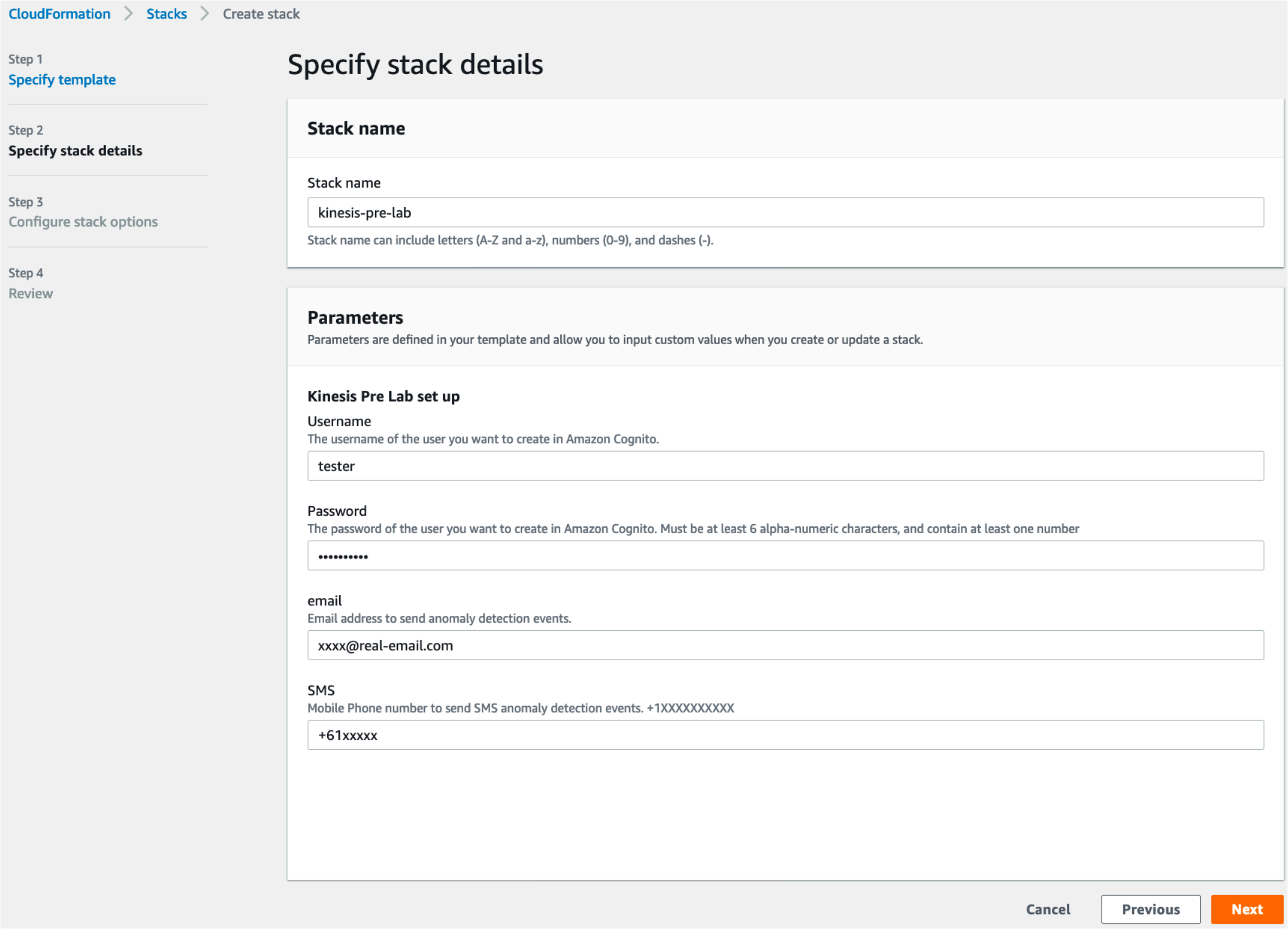
Amazon S3 URL

https://dataeng-immersion-day.s3.amazonaws.com/lab3-us-east-1.json

Amazon S3 template URL

S3 URL: https://dataeng-immersion-day.s3.amazonaws.com/lab3-us-east-1.json

2. Click **Next** at the bottom of the page in as shown in above screenshot**.**
3. **In the Parameters** section, fill the following fields as shown in screenshot:
    - **Username:** This is your username to login to the Kinesis Data Generator
    - **Password:** This is your password for the Kinesis Data Generator. The password must be at least 6 alpha-numeric characters and contain at least one number and a capital letter.
    - **Email:** Type an email address that you can access. The SNS topic sends a confirmation to this address.
    - **SMS:** Type a phone number (+1XXXXXXXXX) where you can receive texts from the SNS topic.



CloudFormation > Stacks > Create stack

Step 1
Specify template

Step 2
Specify stack details

Step 3
Configure stack options

Step 4
Review

Specify stack details

Stack name

Stack name

kinesis-pre-lab

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.

Kinesis Pre Lab set up

Username
The username of the user you want to create in Amazon Cognito.

tester

Password
The password of the user you want to create in Amazon Cognito. Must be at least 6 alpha-numeric characters, and contain at least one number

••••••••••

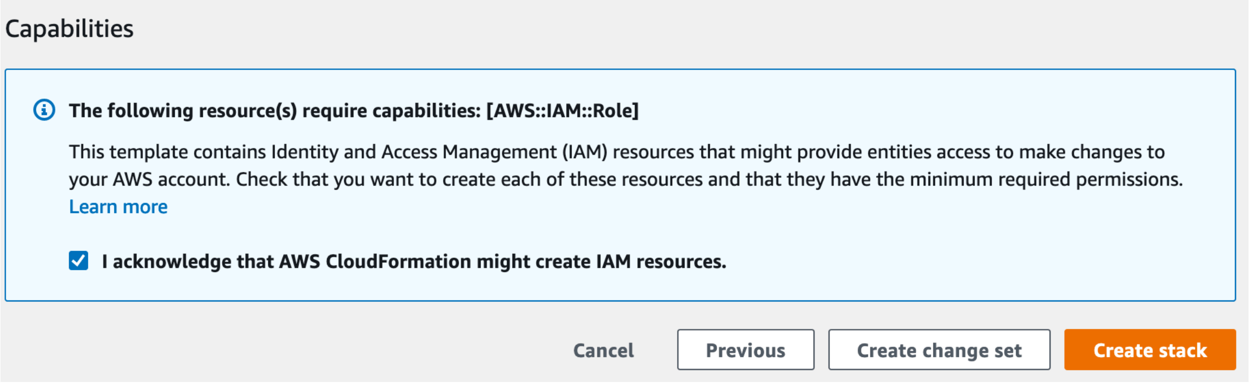
email
Email address to send anomaly detection events.

xxxx@real-email.com

SMS
Mobile Phone number to send SMS anomaly detection events. +1XXXXXXXXXX

+61xxxxx

4. In the **Options**, section, keep the default values.
5. In the **Review** section, select the check box marked **I acknowledge that AWS CloudFormation might create IAM resources**.



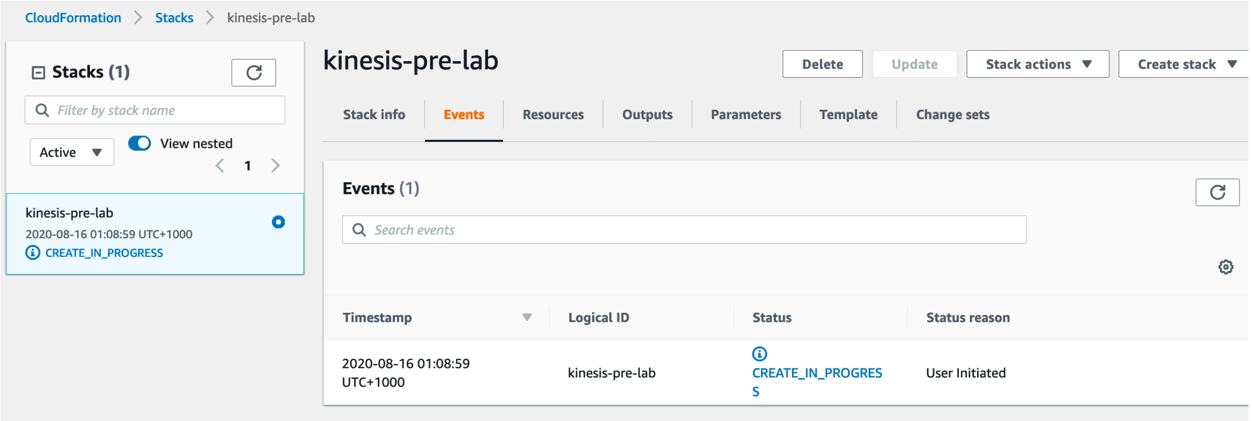
Capabilities

The following resource(s) require capabilities: [AWS::IAM::Role]

This template contains Identity and Access Management (IAM) resources that might provide entities access to make changes to your AWS account. Check that you want to create each of these resources and that they have the minimum required permissions. Learn more

☑ **I acknowledge that AWS CloudFormation might create IAM resources.**

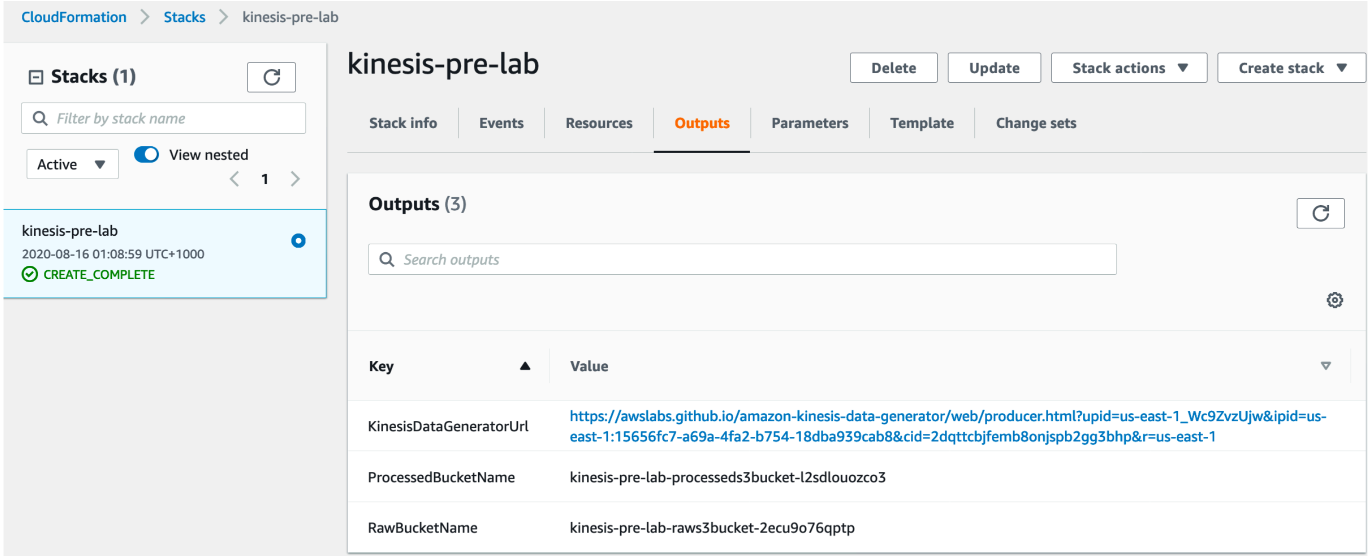
6. Click **Create**. CloudFormation redirects you to your existing stacks.



kinesis-pre-lab
2020-08-16 01:08:59 UTC+1000
CREATE_IN_PROGRESS

Timestamp	Logical ID	Status	Status reason
2020-08-16 01:08:59 UTC+1000	kinesis-pre-lab	CREATE_IN_PROGRESS	User Initiated

7. Once your stack is deployed, click the **Outputs** tab to view more information:
   - **KinesisDataGeneratorUrl:** This value is the Kinesis Data Generator (KDG) URL.
   - **RawBucketName –** Store raw data coming from KDG.
   - **ProcessedBucketName –** Store transformed data



kinesis-pre-lab
2020-08-16 01:08:59 UTC+1000
CREATE_COMPLETE

Key	Value
KinesisDataGeneratorUrl	https://awslabs.github.io/amazon-kinesis-data-generator/web/producer.html?upid=us-east-1_Wc9ZvzUjw&ipid=us-east-1:15656fc7-a69a-4fa2-b754-18dba939cab8&cid=2dqttcbjfemb8onjspb2gg3bhp&r=us-east-1
ProcessedBucketName	kinesis-pre-lab-processeds3bucket-l2sdlouozco3
RawBucketName	kinesis-pre-lab-raws3bucket-2ecu9o76qptp

Congratulations! You are all done with the CloudFormation deployment.

Set up the Amazon Kinesis Data Generator

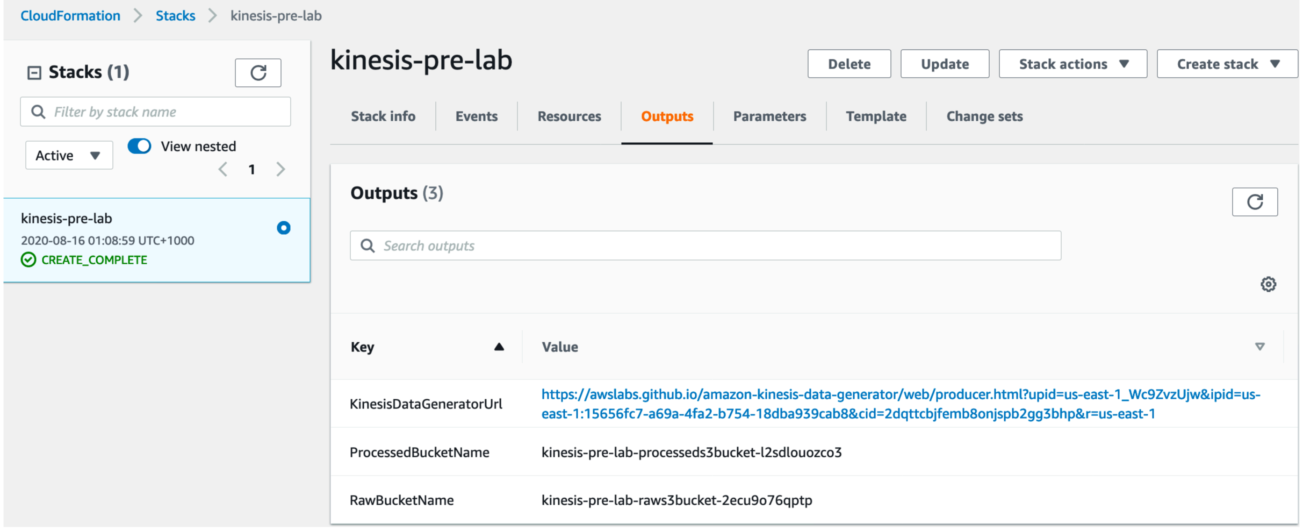
On the **Outputs** tab, notice the **Kinesis Data Generator URL**. Navigate to this URL to login into the Amazon Kinesis Data Generator (Amazon KDG).

The KDG simplifies the task of generating data and sending it to Amazon Kinesis. The tool provides a user-friendly UI that runs directly in your browser. With the KDG, you can do the following tasks:

- Create templates that represent records for your specific use cases
- Populate the templates with fixed data or random data
- Save the templates for future use
- Continuously send thousands of records per second to your Amazon Kinesis stream or Firehose delivery stream

Let's test your Cognito user in the Kinesis Data Generator.

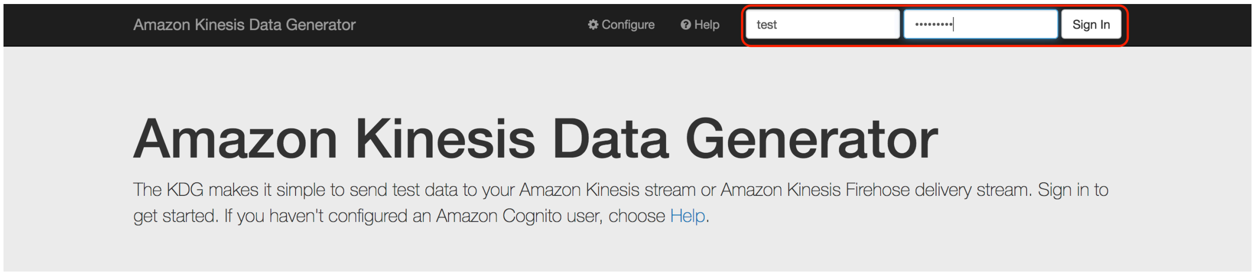
1. On the **Outputs** tab, click the **KinesisDataGeneratorUrl**.



kinesis-pre-lab
2020-08-16 01:08:59 UTC+1000
CREATE_COMPLETE

Key	Value
KinesisDataGeneratorUrl	https://awslabs.github.io/amazon-kinesis-data-generator/web/producer.html?upid=us-east-1_Wc9ZvzUjw&ipid=us-east-1:15656fc7-a69a-4fa2-b754-18dba939cab8&cid=2dqttcbjfemb8onjspb2gg3bhp&r=us-east-1
ProcessedBucketName	kinesis-pre-lab-processeds3bucket-l2sdlouozco3
RawBucketName	kinesis-pre-lab-raws3bucket-2ecu9o76qptp

2. Sign in using the **username** and **password** you entered in the CloudFormation console.



test
•••••••••

Amazon Kinesis Data Generator

The KDG makes it simple to send test data to your Amazon Kinesis stream or Amazon Kinesis Firehose delivery stream. Sign in to get started. If you haven't configured an Amazon Cognito user, choose Help.

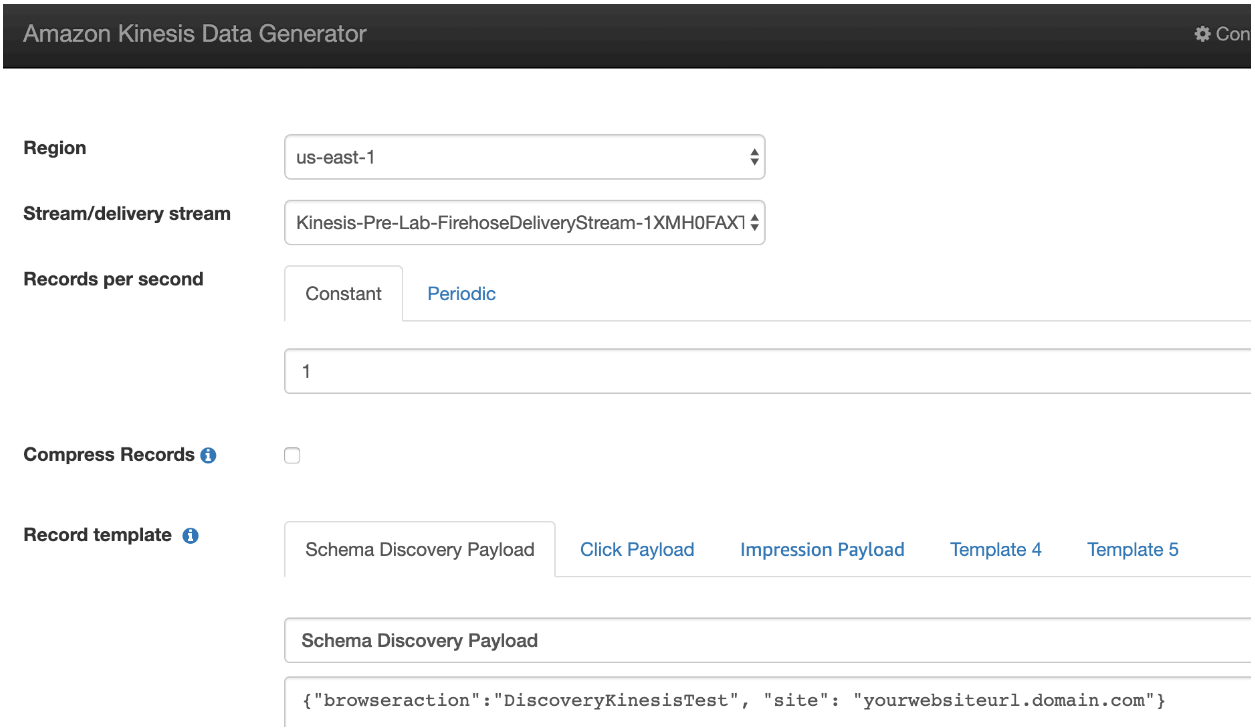
3. After you sign in, you should see the KDG console. You need to set up some templates to mimic the clickstream web payload.

- Create the following three templates. Copy the tab name highlight in bold letter and value as json string, refer screenshot:

Schema Discovery Payload
{"browseraction":"DiscoveryKinesisTest", "site": "yourwebsiteurl.domain.com"}
Click Payload
{"browseraction":"Click", "site": "yourwebsiteurl.domain.com"}
Impression Payload
{"browseraction":"Impression", "site": "yourwebsiteurl.domain.com"}

- Change Region to **US-EAST-1** and select a created Firehose Delivery Stream from the dropdown.
- Set **Records per second** to **1**

Your Amazon Kinesis Data Generator console should look similar to this example.



Region: us-east-1

Stream/delivery stream: Kinesis-Pre-Lab-FirehoseDeliveryStream-1XMH0FAX1

Records per second: Constant | Periodic

1

Compress Records ℹ ☐

Record template ℹ: Schema Discovery Payload | Click Payload | Impression Payload | Template 4 | Template 5

Schema Discovery Payload

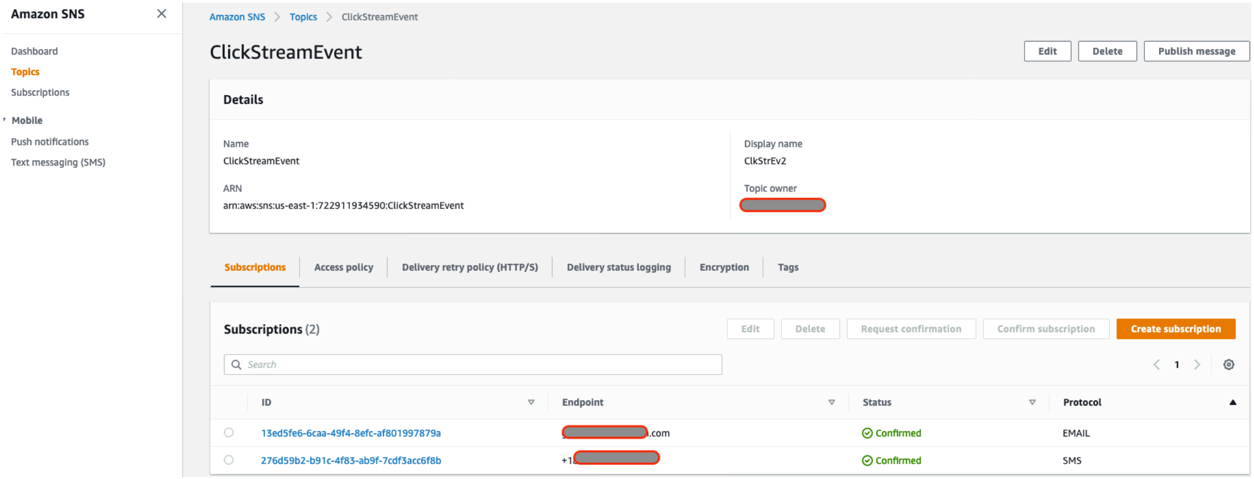
```
{"browseraction":"DiscoveryKinesisTest", "site": "yourwebsiteurl.domain.com"}
```

Don’t click on Send Data yet, leave this browser tab open, we will do that during the main lab.

Set up Email and SMS Subscription

1. Navigate to Amazon SNS Topics by following this link: https://console.aws.amazon.com/sns/v3/home?region=us-east-1#/topics

2. Click the topic name. The Topic details screen appears listing the e-mail/SMS subscription as pending or confirmed.



ClickStreamEvent

Details

Name
ClickStreamEvent

Display name
ClkStrEv2

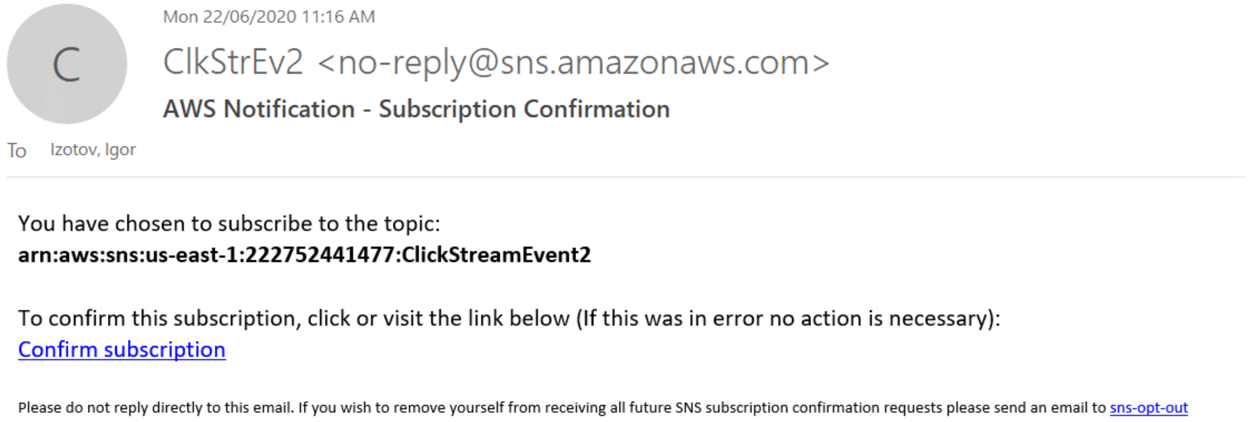
ARN
arn:aws:sns:us-east-1:722911934590:ClickStreamEvent

Topic owner
[redacted]

Subscriptions (2)

	ID	Endpoint	Status	Protocol
○	13ed5fe6-6caa-49f4-8efc-af801997879a	[redacted].com	✓ Confirmed	EMAIL
○	276d59b2-b91c-4f83-ab9f-7cdf3acc6f8b	+1[redacted]	✓ Confirmed	SMS

3. Check your inbox for a subscription confirmation email from no-reply@sns.amazonaws.com, click **Confirm subscription** to confirm



Mon 22/06/2020 11:16 AM

ClkStrEv2 <no-reply@sns.amazonaws.com>

AWS Notification - Subscription Confirmation

To Izotov, Igor

You have chosen to subscribe to the topic:
arn:aws:sns:us-east-1:222752441477:ClickStreamEvent2

To confirm this subscription, click or visit the link below (If this was in error no action is necessary):
Confirm subscription

Please do not reply directly to this email. If you wish to remove yourself from receiving all future SNS subscription confirmation requests please send an email to sns-opt-out

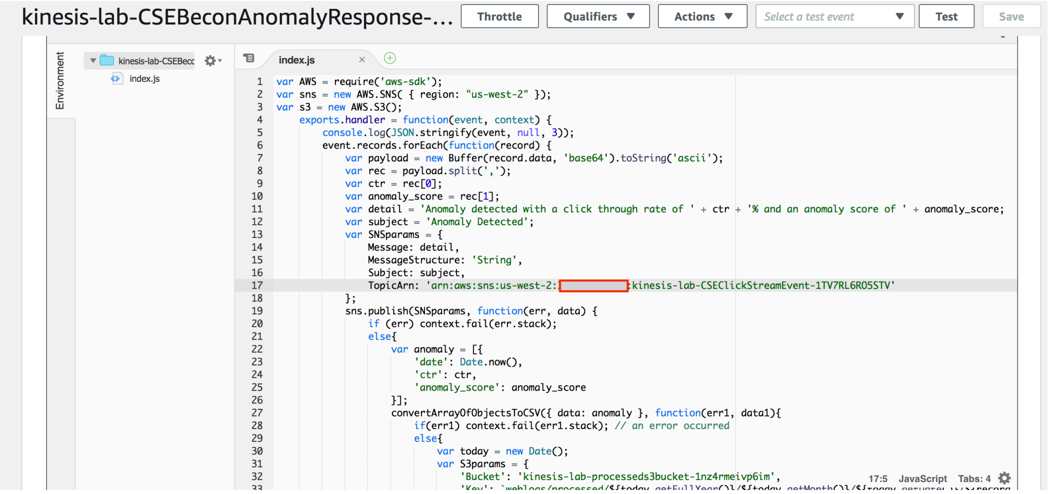
Note: If you can't locate the request confirmation email, make sure to check your email junk folder.

Review AWS Lambda Anomaly function:

CloudFormation template already deployed this Lambda function. You
Just need to spend few minutes to observe code and understand the action behind the lambda trigger:

1. In the console, navigate to **CSEBeconAnomalyResponse** AWS Lambda function by following the link: https://console.aws.amazon.com/lambda/home?region=us-east-1&#/functions/CSEBeconAnomalyResponse?tab=configuration

2. Scroll down to code section.



```
var AWS = require('aws-sdk');
var sns = new AWS.SNS( { region: "us-west-2" });
var s3 = new AWS.S3();
    exports.handler = function(event, context) {
        console.log(JSON.stringify(event, null, 3));
        event.records.forEach(function(record) {
            var payload = new Buffer(record.data, 'base64').toString('ascii');
            var rec = payload.split(',');
            var ctr = rec[0];
            var anomaly_score = rec[1];
            var detail = 'Anomaly detected with a click through rate of ' + ctr + '% and an anomaly score of ' + anomaly_score;
            var subject = 'Anomaly Detected';
            var SNSparams = {
                Message: detail,
                MessageStructure: 'String',
                Subject: subject,
                TopicArn: 'arn:aws:sns:us-west-2:[redacted]:kinesis-lab-CSEClickStreamEvent-1TV7RL6RO5STV'
            };
            sns.publish(SNSparams, function(err, data) {
                if (err) context.fail(err.stack);
                else{
                    var anomaly = [{
                        'date': Date.now(),
                        'ctr': ctr,
                        'anomaly_score': anomaly_score
                    }];
                    convertArrayOfObjectsToCSV({ data: anomaly }, function(err1, data1){
                        if(err1) context.fail(err1.stack); // an error occurred
                        else{
                            var today = new Date();
                            var S3params = {
                                'Bucket': 'kinesis-lab-processeds3bucket-1nz4rmeivp6im',
                                'Key': `weblogs/processed/${today.getFullYear()}/${today.getMonth()}/${today.getDate
```

3. Review the code in the Lambda code editor. Notice the TopicArn value matches the SNS topic ARN from the previous step.

You've completed the pre-lab instructions. Please proceed to lab 3.