aws CERTIFIED Developer Associate

aws CERTIFIED Solutions Architect Associate

aws CERTIFIED SysOps Administrator Associate

lab

lab title

AWS X-Ray
V1.02

Course title

BackSpace Academy
AWS Certification Preparation

BackSpace

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About the Lab

Please note that not all AWS services are supported in all regions. Please use the US-East-1 (North Virginia) region for this lab.

These lab notes are to support the hands on instructional videos of the AWS X-Ray section of the AWS Certified Developer Associate course.

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 lastest version with any updates or corrections.

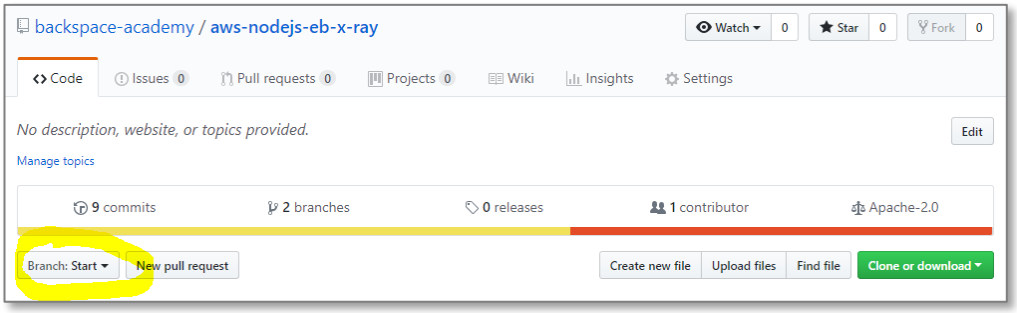
Integrating a NodeJS Application with AWS X-Ray

In this section, we will use the AWS X-Ray SDK for NodeJS to enable a NodeJS application to send segments to the X-Ray daemon.

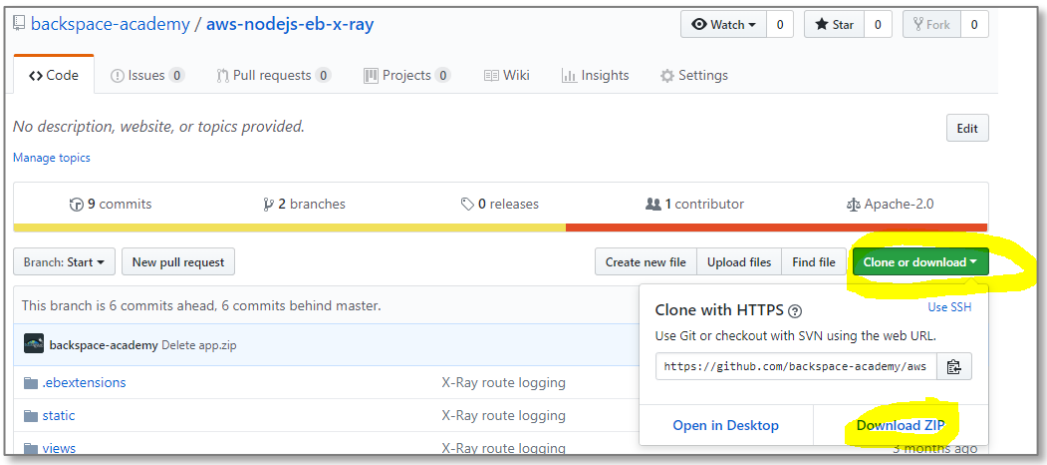
Download the Application

Go to https://github.com/backspace-academy/aws-nodejs-eb-x-ray/tree/Start

Make sure the branch is on *Start*

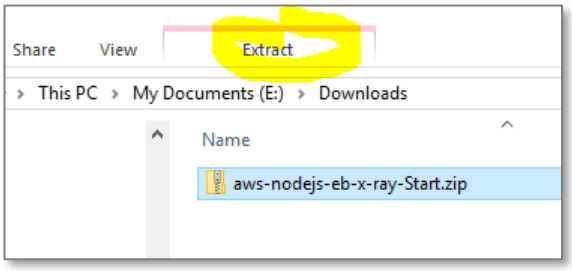


Download the ZIP file containing the application



The code from GitHub will be hidden inside a folder. We need to make sure the code is at the root level of the ZIP file.

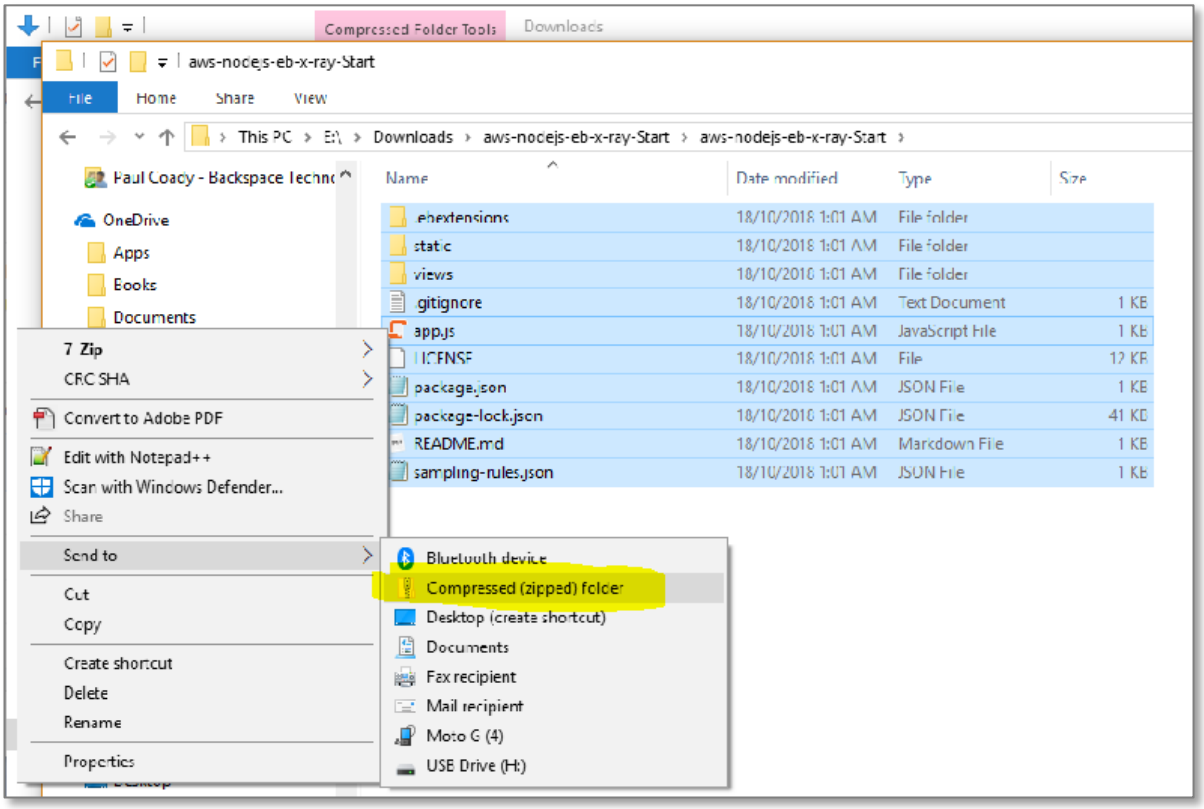
Extract the ZIP file.



Open the folder

Select the code

Create another ZIP file



Integrating with AWS X-Ray

In the *.ebextensions* folder there will be a config file to set up the configuration of Elastic Beanstalk for X-Ray:

- Setting option *XRayEnabled* to true
- Defining the location for X-Ray logs to be stored.

```
option_settings:
  aws:elasticbeanstalk:xray:
    XRayEnabled: true

files:
  "/opt/elasticbeanstalk/tasks/taillogs.d/xray-daemon.conf" :
    mode: "000644"
    owner: root
    group: root
    content: |
      /var/log/xray/xray.log
```

The *sampling-rules.json* file contains the sampling rule (capture everything):

- Target of one sample per second
- 100% of all samples over the target

```
{
  "version": 1,
  "default": {
    "fixed_target": 1,
    "rate": 1.0
  }
}
```

The application code in *app.js* to integrate with X-Ray has the following:

- to load the AWS X-Ray SDK
  - require('aws-xray-sdk');
- to load the AWS SDK and capture calls to it
  - XRay.captureAWS(require('aws-sdk'));
- to load the http client and capture http traffic
  - XRay.captureHTTPs(require('http'));
- to set the default sampling rules
  - XRay.middleware.setSamplingRules('sampling-rules.json');
- to start a segment called myfrontend
  - app.use(XRay.express.openSegment('myfrontend'));
- to start a subsegment called ‘Page Render’
  - XRay.captureAsyncFunc('Page Render', function(seg) {
- To close subsegment called ‘Page Render’
  - seg.close();
- To close segment called myfrontend
  - app.use(XRay.express.closeSegment());

```
// Include the AWS X-Ray SDK
var XRay = require('aws-xray-sdk');
// Capture calls to the AWS SDK
var AWS = XRay.captureAWS(require('aws-sdk'));
// Capture http traffic
var http = XRay.captureHTTPs(require('http'));

var express = require('express');
var bodyParser = require('body-parser');

// Set region for AWS SDKs
AWS.config.region = process.env.REGION

// Configure sampling rules
XRay.middleware.setSamplingRules('sampling-rules.json');

var app = express();

app.set('view engine', 'pug');
app.set('views', __dirname + '/views');
app.use(bodyParser.urlencoded({ extended: false }));

//Start X-ray segment myfrontend
app.use(XRay.express.openSegment('myfrontend'));

app.get('/', function (req, res) {
    // Start X-ray subsegment 'Page Render'
    XRay.captureAsyncFunc('Page Render', function (seg) {
        res.render('index', {
            title: 'BackSpace Academy and AWS X-Ray'
        });
        seg.close(); // Close X-ray subsegment 'Page Render'
    });
    res.status(200).end();
});

//Close X-ray segment myfrontend
app.use(XRay.express.closeSegment());

var port = process.env.PORT || 3000;

var server = app.listen(port, function () {
    console.log('Server running at http://127.0.0.1:' + port + '/');
});
```

Creating an Elastic Beanstalk X-Ray Application

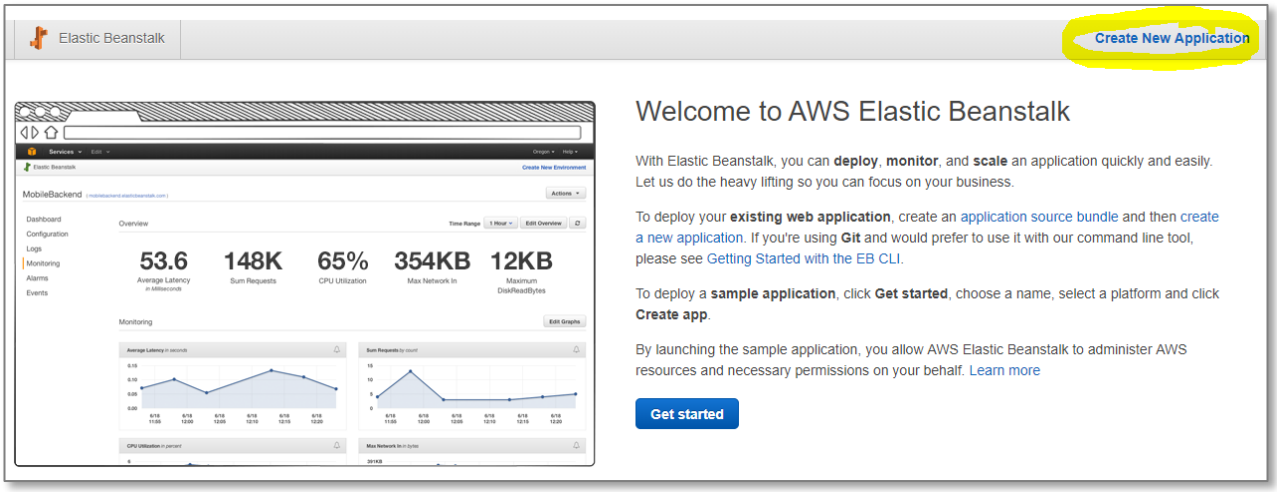
In this section, we will use the Elastic Beanstalk console to launch an Elastic Beanstalk environment that will run both our application and the X-ray daemon.

Create the Elastic Beanstalk Environment

From the AWS console click *Services*

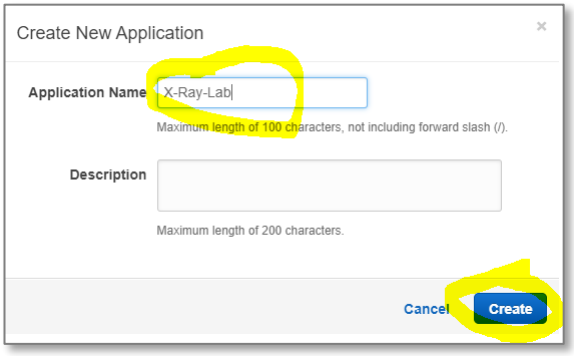
Select *Elastic Beanstalk*

Click *Create New Application*



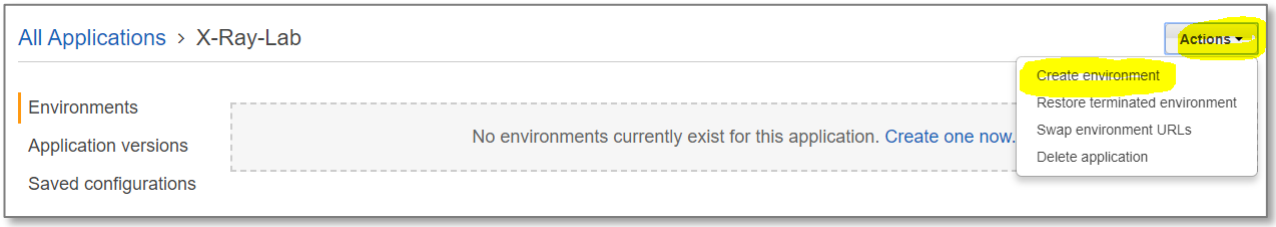
Give your application a name

Click *Create*



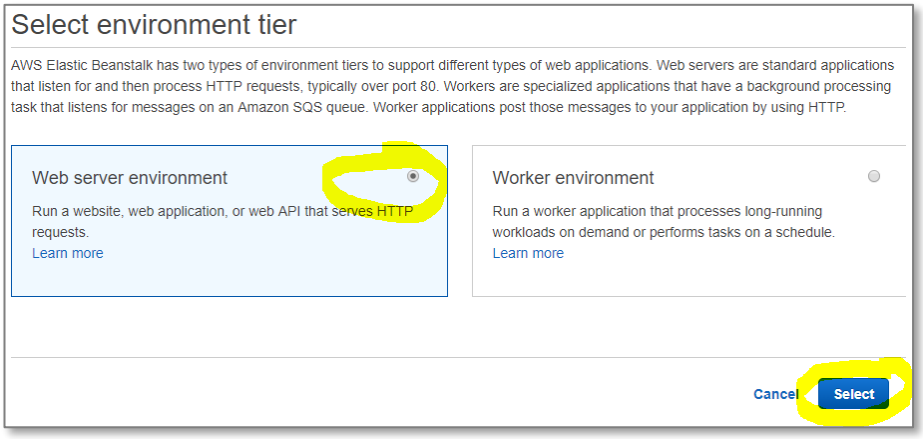
Select *Actions*

Click *Create environment*



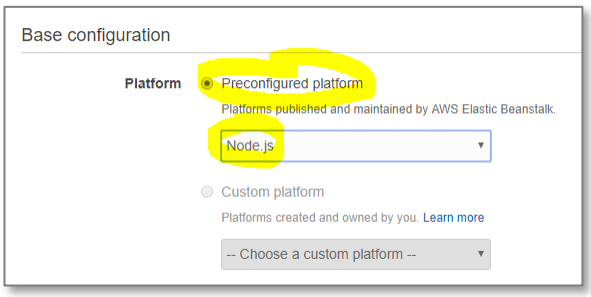
Select *Web server environment*

Click *Select*



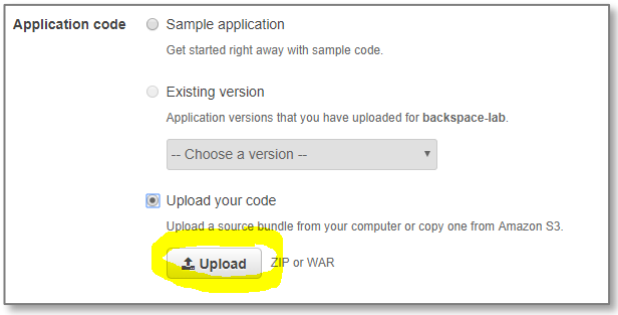
Select *Preconfigured platform*

Select *Node.js*

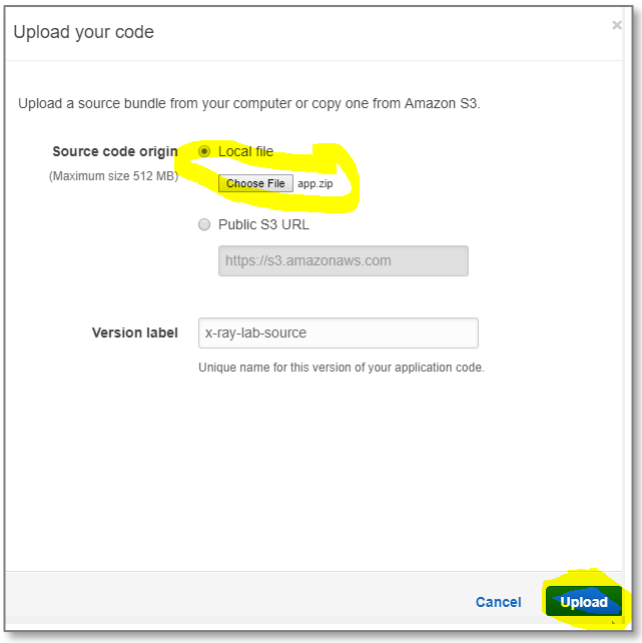


Select *Upload your code*

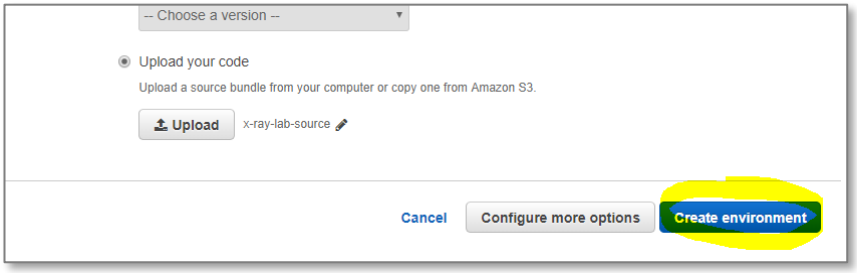
Click *Upload*



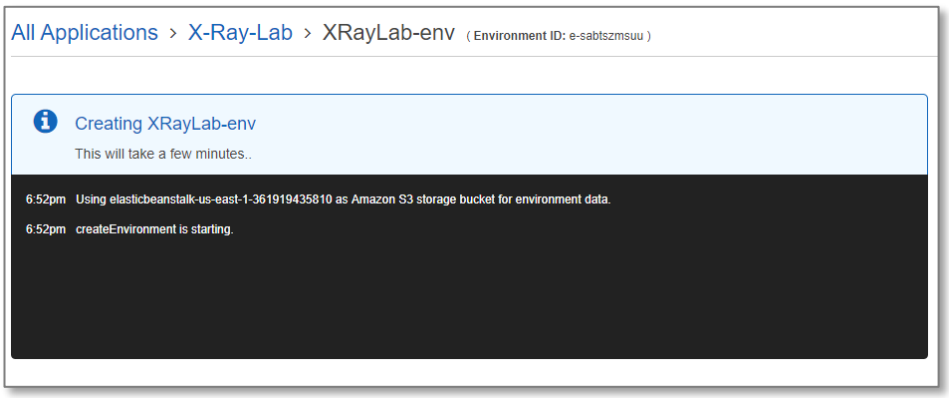
Upload the zip file you created previously



Click *Create environment*

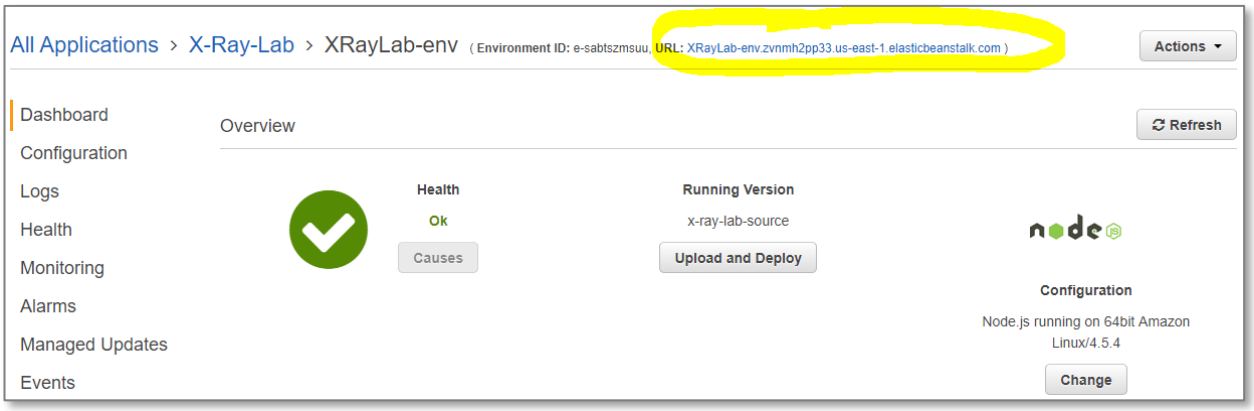


Elastic Beanstalk will now start creating your environment.



After about 15 minutes your environment will be created (if any problems see troubleshooting below)

Click on the endpoint for your application



You should now see the running web application

Troubleshooting

This is most probably caused by Elastic Beanstalk being unable to find your application in the ZIP file.

Make sure the application is not inside a folder before uploading the zip file. If you download the ZIP file directly from GitHub it will put the application inside a folder inside the Zip file and Elastic Beanstalk won't be able to find it.

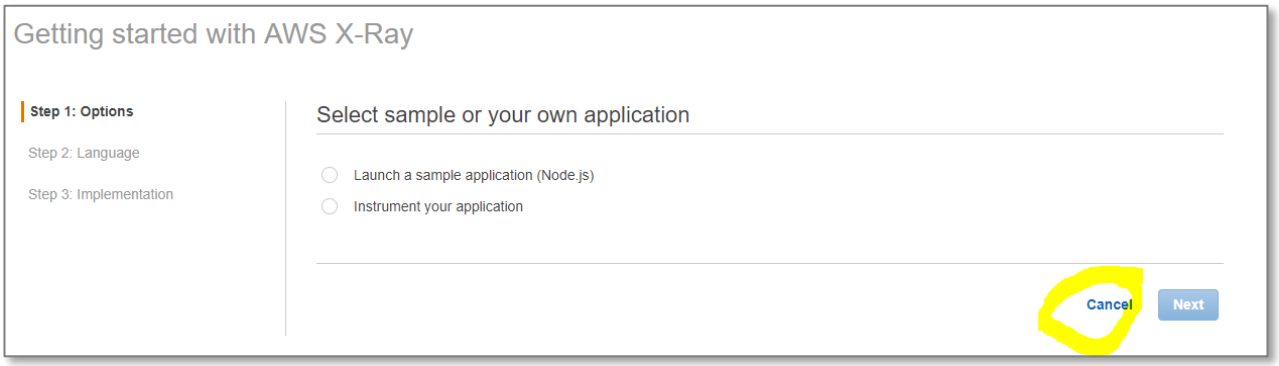
Analyzing Application Performance with the AWS X-Ray Console

In this section, we will use the AWS X-Ray console to view the service diagram and traces.

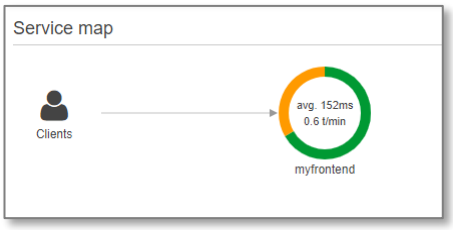
From the AWS console click *Services*

Select *X-Ray*

If you see a Getting Started screen click *Cancel*

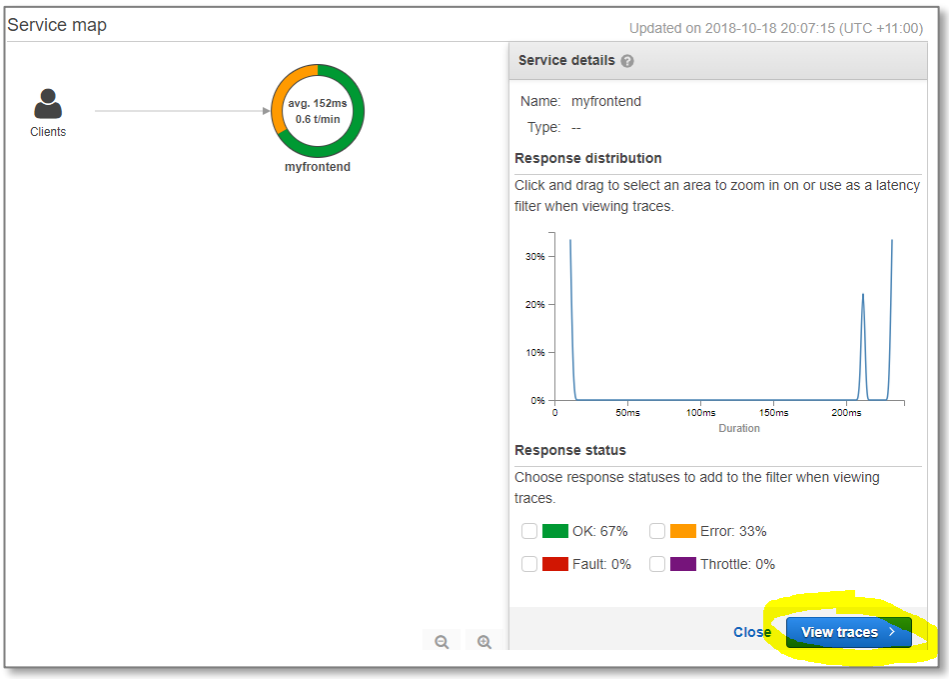


After about a minute the Service map will appear



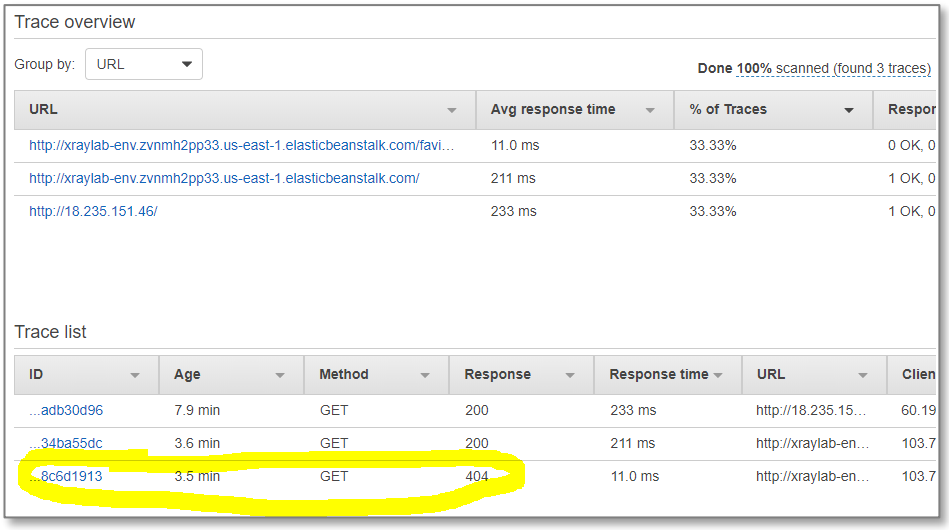
Click on *myFrontEnd* node

Click on *View traces*

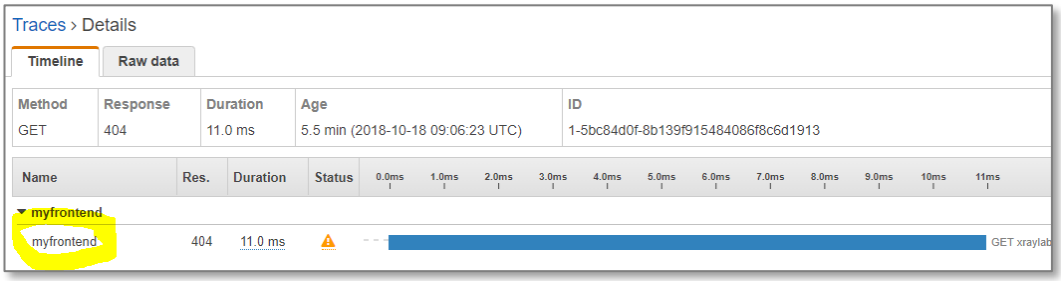


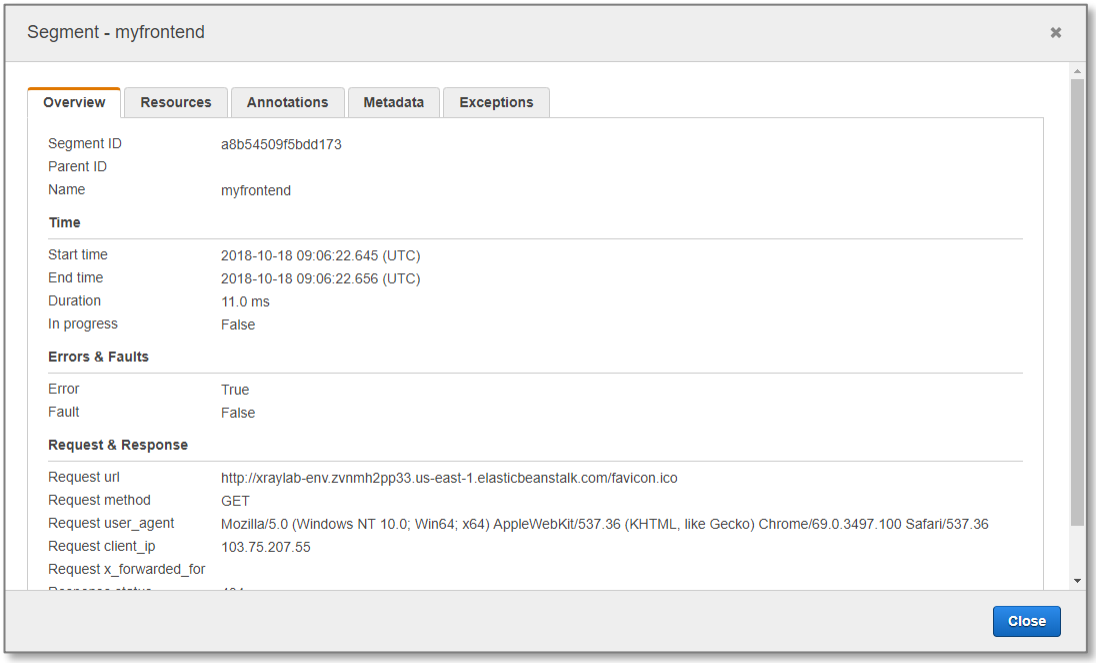
You will now be able to see more performance information about the requests to the table

Click on the trace with a 404 error to see the timeline



Click on the trace to get more information





Capturing Calls to the AWS SDK with X-Ray

In this section, we will use the AWS X-Ray SDK to capture calls to Amazon S3.

Open App.js in a code editor

Add code to:

- initialise AWS S3
- call S3.listBuckets
- render page in the listBuckets callback

```
// Include the AWS X-Ray SDK
var XRay = require('aws-xray-sdk');
// Capture calls to the AWS SDK
var AWS = XRay.captureAWS(require('aws-sdk'));
// Capture http traffic
var http = XRay.captureHTTPs(require('http'));
// Initialise S3
var S3 = new AWS.S3();

var express = require('express');
var bodyParser = require('body-parser');

// Set region for AWS SDKs
AWS.config.region = process.env.REGION

// Configure sampling rules
XRay.middleware.setSamplingRules('sampling-rules.json');

var app = express();

app.set('view engine', 'pug');
app.set('views', __dirname + '/views');
app.use(bodyParser.urlencoded({ extended: false }));

//Start X-ray segment myfrontend
app.use(XRay.express.openSegment('myfrontend'));

app.get('/', function (req, res) {
    XRay.captureAsyncFunc('Page Render', function (seg) {
        S3.listBuckets(function (err, data) {
            var bucketList = '';
            if (err) bucketList = JSON.stringify(err); // an error occurred
            else {                                     // successful response
                for (var a = 0; a < data.Buckets.length; a++) {
                    bucketList += JSON.stringify(data.Buckets[a].Name);
                }
```

```
            }
            // Render page after listBuckets finished
            res.render('index', {
                title: 'BackSpace Academy and AWS X-Ray',
                bucketList: bucketList
            });
            seg.close();
        });
    });
});

//Close X-ray segment myfrontend
app.use(XRay.express.closeSegment());

var port = process.env.PORT || 3000;

var server = app.listen(port, function () {
    console.log('Server running at http://127.0.0.1:' + port + '/');
});
```

Open *index.pug* in the views folder

Add a place for the bucketList variable to be displayed.

```
doctype html
html(lang="en")
  head
    meta(charset="utf-8")
    meta(name="viewport" content="width=device-width, initial-scale=1.0")
    meta(name="description" content="")
    meta(name="author" content="")
    title #{title} Example
    // Bootstrap core CSS
    link(href="static/bootstrap/css/theme/flatly/bootstrap.css" rel="stylesheet")
    // Custom styles for this template
    link(href="static/bootstrap/css/jumbotron-narrow.css" rel="stylesheet")
  body
    .container
      .header
        ul.nav.nav-pills.pull-right
          li.active
            a(href="#") Home
          li
            a(href="#") About
          li
            a(href="#") Blog
          li
            a(href="#") Press
        h3.text-muted A New Startup
      .jumbotron
        h1 Welcome to #{title}...
        p.lead
          | We're pretty thrilled to show you the cool things you can do with #{title}!
        h2 Bucket List
        p
```

```
        #{bucketList}
      p
        a.btn.btn-lg.btn-success(data-toggle="modal" href="#") Sign up today
    .footer
      p © A New Startup 2016
    script(src="static/jquery/jquery-1.11.3.min.js")
    script(src="static/bootstrap/js/bootstrap.min.js")
```

Save the changed files and create a new zip file.

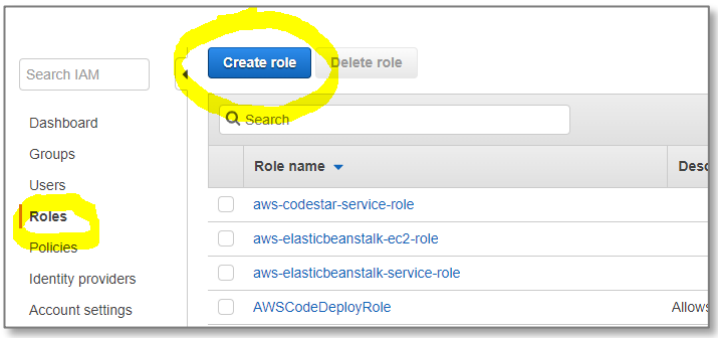
Create a Role to Access S3

By default, Elastic Beanstalk uses *aws-elasticbeanstalk-ec2-role* for instances it launches. This role doesn't have read access for S3 so we need to create a new role.

Go to the IAM Management Console

Select Roles

Click *Create role*

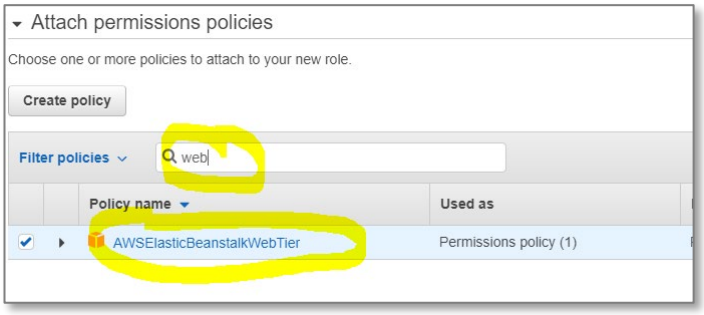


Select *AWS Service*

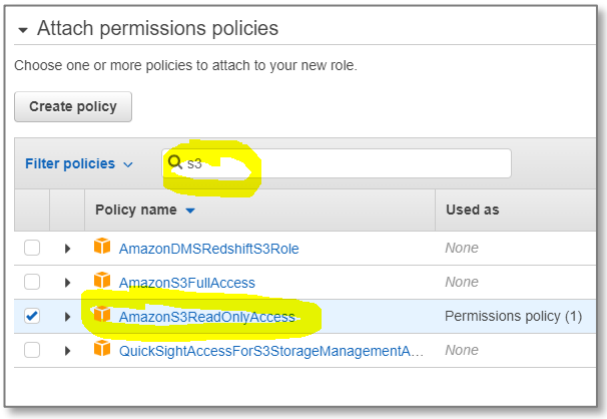
Select *EC2*

Click *Next: Permissions*

Select *AWSElasticBeanstalkWebTier* policy



Select *AmazonS3ReadOnlyAccess*

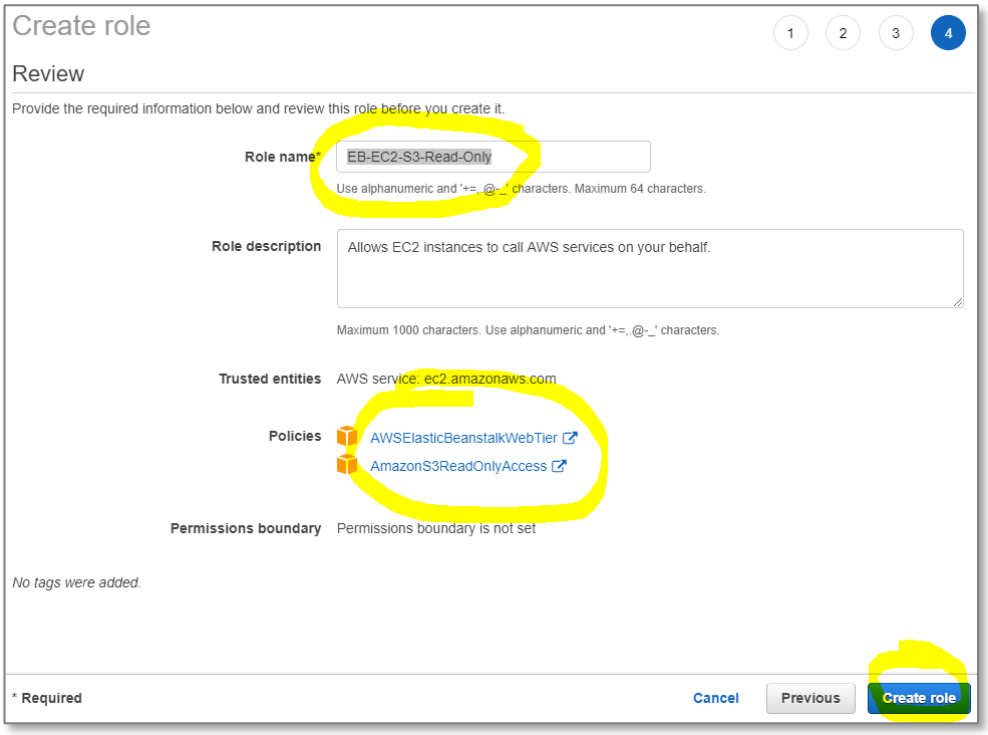


Click *Next: Tags*

Click *Next: Review*

Call the role *EB-EC2-S3-Read-Only*

Make sure both policies are attached and click *Create role*



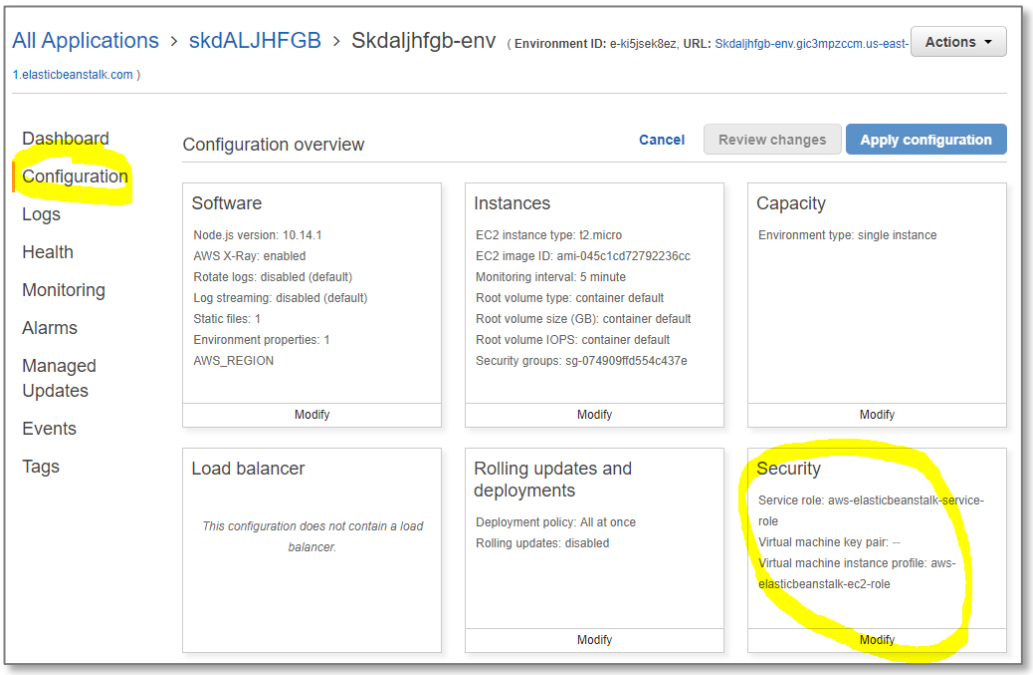
Associate IAM Role to Elastic Beanstalk Instances

Go to the Elastic Beanstalk console

Go to your environment

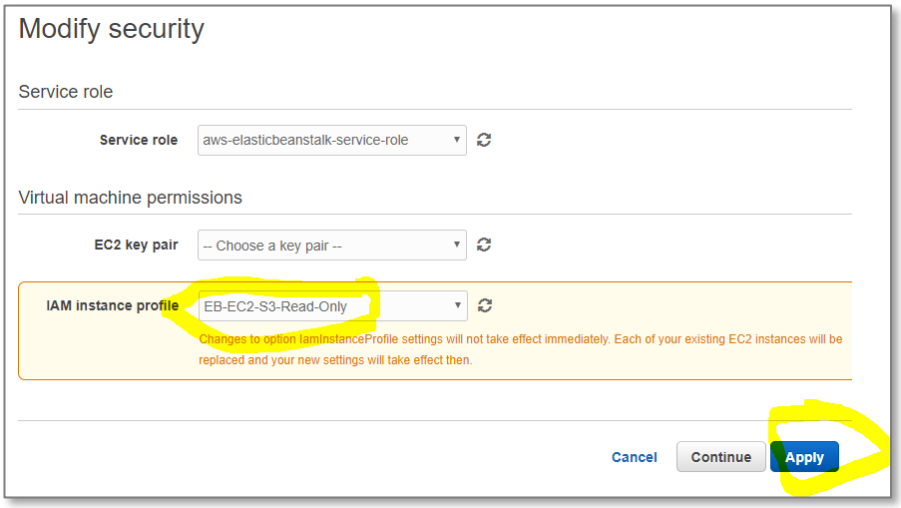
Select *Configuartion*

Select *Security – Modify*

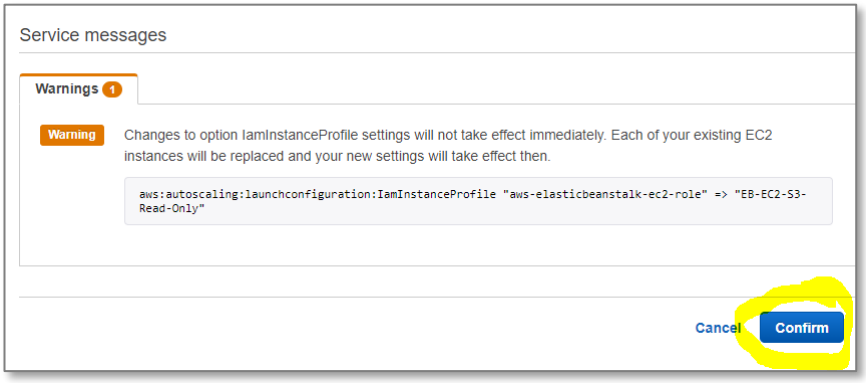


Select the IAM role you created previously for *IAM instance profile*.

Click *Apply*



Click *Confirm*



Upload new Application Version to Elastic Beanstalk

Wait for the update to complete (this will take some time)

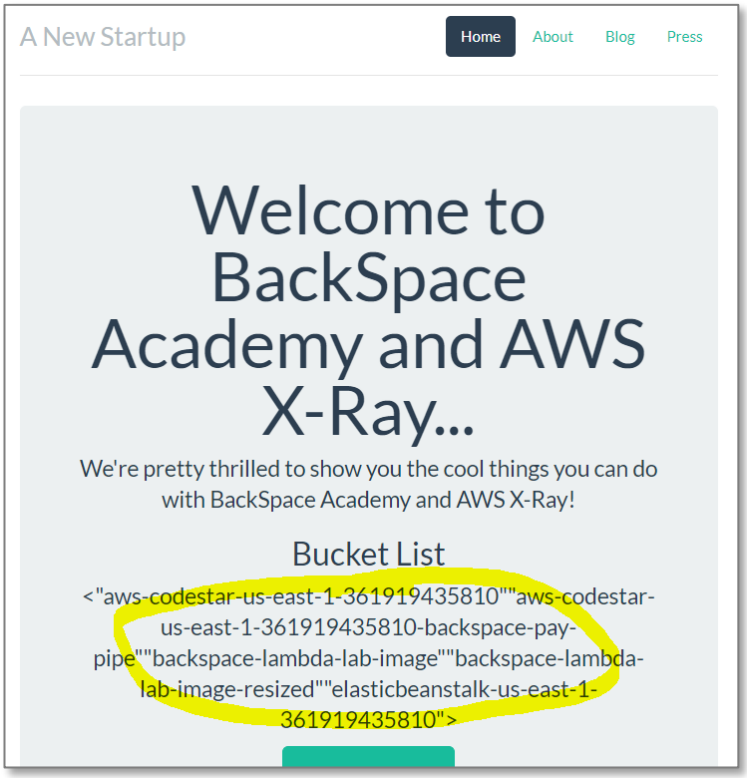
Go to the Dashboard

Click *Upload and Deploy*

Upload the new zip file

When the environment has been updated click on the endpoint again

You should see the list of buckets in your account.



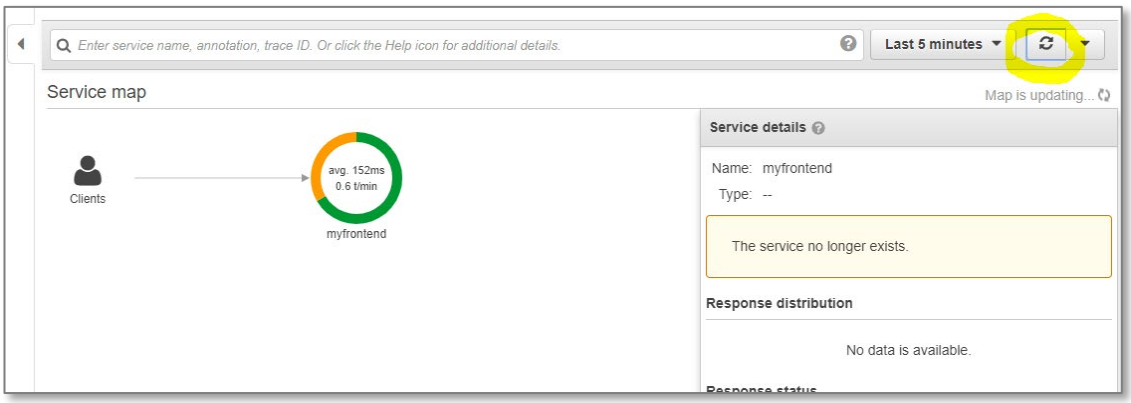
Troubleshooting

If you don't see a list of buckets there is most probably an error with your code. You can download the completed master branch from:

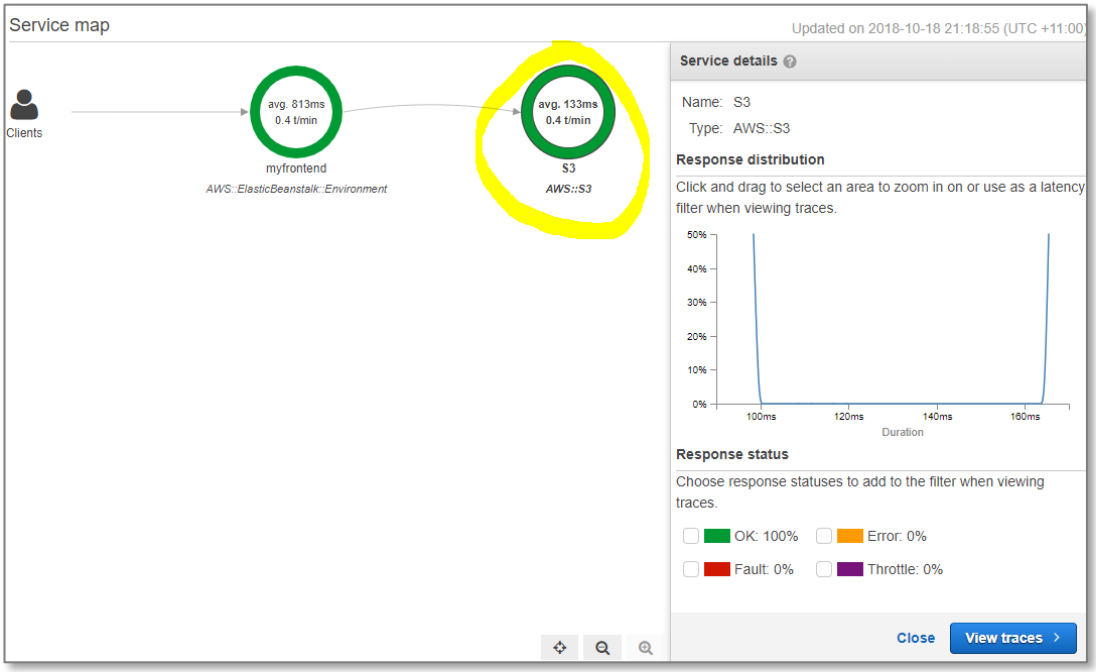
https://github.com/backspace-academy/aws-nodejs-eb-x-ray/tree/master

Analyse with X-Ray

Go to the X-Ray console to and click the refresh button



You should see the new node for the call to S3 from the AWS SDK



Cleaning Up

Deleting the Elastic Beanstalk application will delete the resources created.

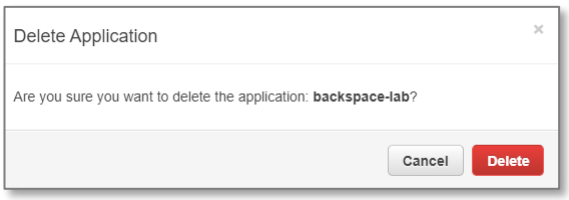
From the AWS console click *Services*

Select *Elastic Beanstalk*

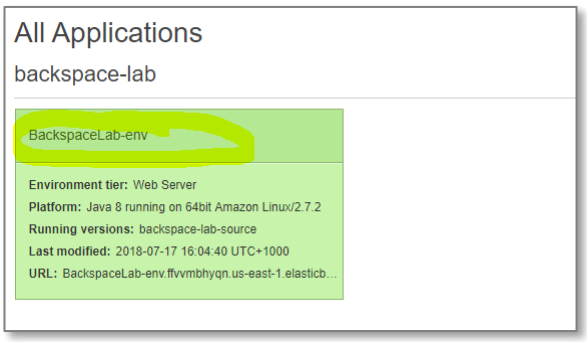
Select *Actions*

Click *Delete application*

Click *Delete*



Click on the environment to check it is being deleted



Your environment should now be terminating