AGENCY FOR STATE TECHNOLOGY

Cloud Topics Part I

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Cloud Topics

Presentation Overview

- Code Concepts
- Sample .NET Application
- Provisioning in the Cloud
- Moving the .NET Application to the Cloud
- Serverless Computing and Cloud Paradigm
- Code Reuse and Microservices

Code Concepts

- Threads
- Callbacks
- Chaining Callbacks

- There are other constructs for async

Asynchronous I/O

```
'use strict';

var AWS = require('aws-sdk');
var s3 = new AWS.S3();

console.log('running');

         var params = { Bucket: 'burt.ast.sample', MaxKeys: 999 };
         s3.listObjectsV2(params, function(err, data) {
           if (err) {
              console.log('Tallahassee a problem: ' + JSON.stringify(err));
           }
           else {
              console.log('Tally information number of file in directory: ' + JSON.stringify(data.KeyCount));
           }
           console.log('I am LAST!');
         });

console.log('am I last????  FIRE AND FORGET!');


/*

OUTPUT


running
am I last????  FIRE AND FORGET!
Tally information number of file in directory: 2
I am LAST!

*/
```

Chaining Callbacks

```
var AWS = require('aws-sdk');
var s3 = new AWS.S3();

//GET FIRST FILE
var bucketName = 'burt.ast.sample';

        var params = { Bucket: bucketName, MaxKeys: 999 };
        s3.listObjectsV2(params, function(err, data) {
          if (err) {
             console.log('Tallahassee a problem: ' + JSON.stringify(err));
          }
          else {

                var fileName  = data.Contents[0].Key;

                //CHAINING getObject is ASYNC also!
                var params = { Bucket: bucketName, Key: fileName };
                s3.getObject(params, function(err, data) {
                  if (err) {
                     console.log('issue getting file ' + fileName);
                  }
                  else {

                     //convert the string from a binary array back to a string
                     var fileContents = '';
                     data.Body.forEach(function(x) { fileContents = fileContents + String.fromCharCode(x); });
                     console.log('file contents!: '+ fileContents);
                  }
                 });
          }
        });


/*
OUTPUT

file contents!: my stuff is here hhhhhhh

*/
```

Sample .NET Application

- Upload files
- Get word count statistics about files
- Web API 2 application
- Single Page Application front end

Application Front End

Get File Statistics

Choose file from which to get statistics

- burt.txt
- kathy.txt
- linc.txt
- liam.txt
- extra.txt

File Name:

Choose File no file selected

Submit

Application Front End

Get File Statistics

Choose file from which to get statistics

File Statistics

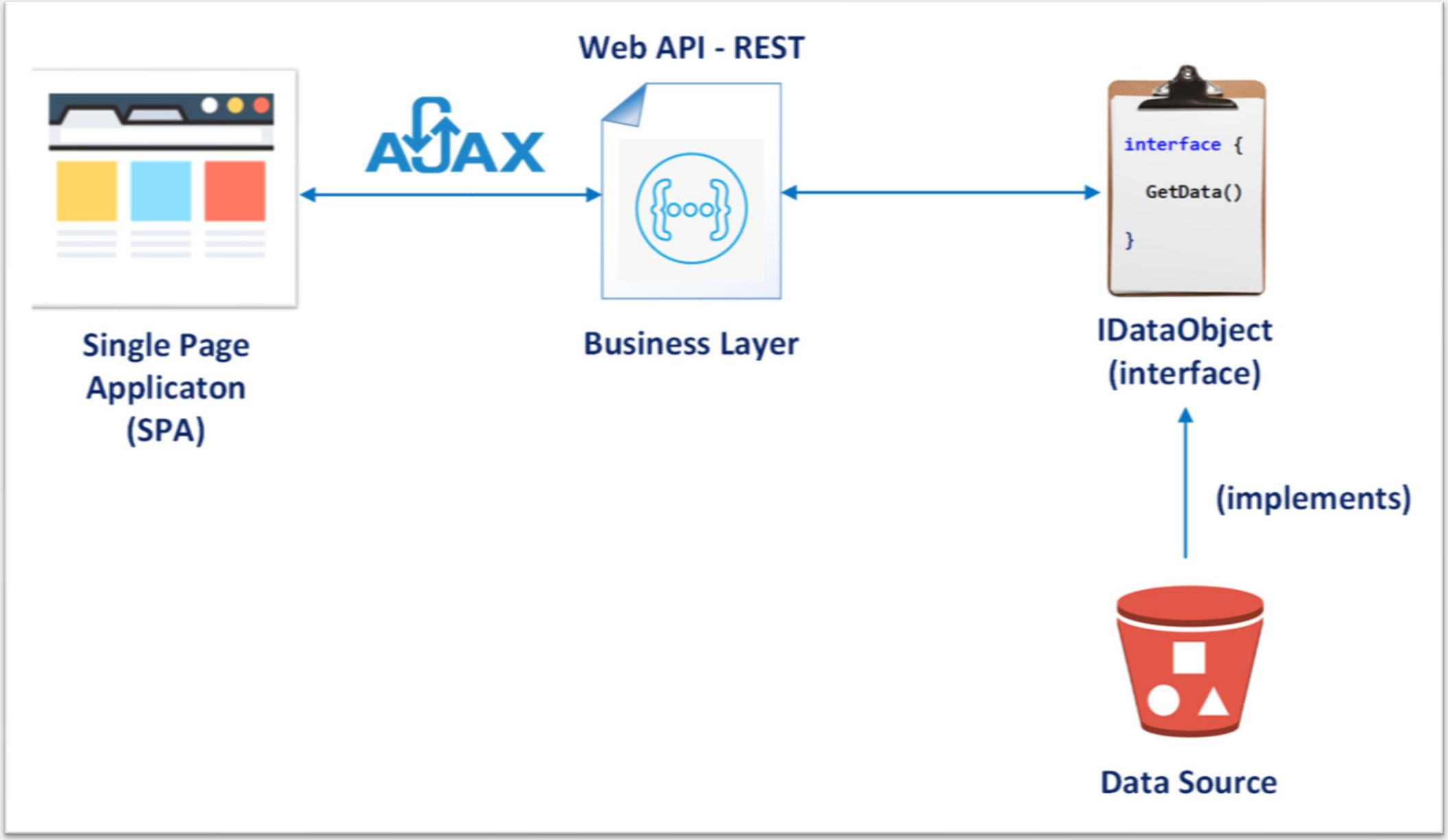
{"WordCount":{"Keep":1,"Linc":1,"and":1,"Liam":1,"going":1},"FileName":"kathy.txt"}

File Name:

Choose File no file selected

Submit

Asynchronous I/O and REST



REST Call to C# App
(call from the web page to get stats for selected file)

```
//make a REST call of the server to get the word distribution in the indicated file
function getFileStats(fileName) {

          $.ajax({
              type: "GET",
              url: projectURL + '/getstats/' + fileName,
              crossDomain: true,
              success: function(data) {

                  //put the returned JSON into the TEXTAREA in the SPA
                  //indicating the word count for the choosen file
                  document.getElementById("fileStats").value = data;
              },
              error: function(jqXHR, textStatus, errorThrown) {
                  document.getElementById("fileStats").value = "Could not get stats for file: " + fileName;
              }
          });
}
```

C# REST API Code

```
//this could be injected or DataAccessObject could be a singleton in the future
private static IDataAccessObject dataAccessObject = new DataAccessObject();

//uses a helper to get word count (distribution) in the indicated file
[HttpGet("getstats/{fileName}")]

//NOT
//public async Task<IActionResult> GetDocumentStats(string fileName)
public IActionResult GetDocumentStats(string fileName)
{

    //get the indicated file from the DICTIONARY using the DAO
    var file = dataAccessObject.GetFileAsString(fileName);

    //get the word count with the helper
    FileSpecs fileSpecs = new FileSpecs(fileName);

    //send the data back to the web page (SPA) as an Http response
    var obj = fileSpecs.GetSpecsFromStringFile(file);
    var json = Newtonsoft.Json.JsonConvert.SerializeObject(obj);

    return Ok(json);
}
```

Ajax Uploading a File

```
$("#uploadForm").submit(function(e) {

    e.preventDefault();

    //The form data (this) is the file contents of the choosen file
    //and the fileName which is stored in the hidden input name="fileName" (see below)
    var formData = new FormData(this);

    $.ajax({
      url: projectURL + '/create',
      type: 'POST',
      data: formData,
      success: function (data) {
        buildCurrentList();
      },
      error: function(err) {
         alert('error ' + err);
      },
      cache: false,
      contentType: false,
      processData: false
    });
 });
```

REST Calls are Web Calls

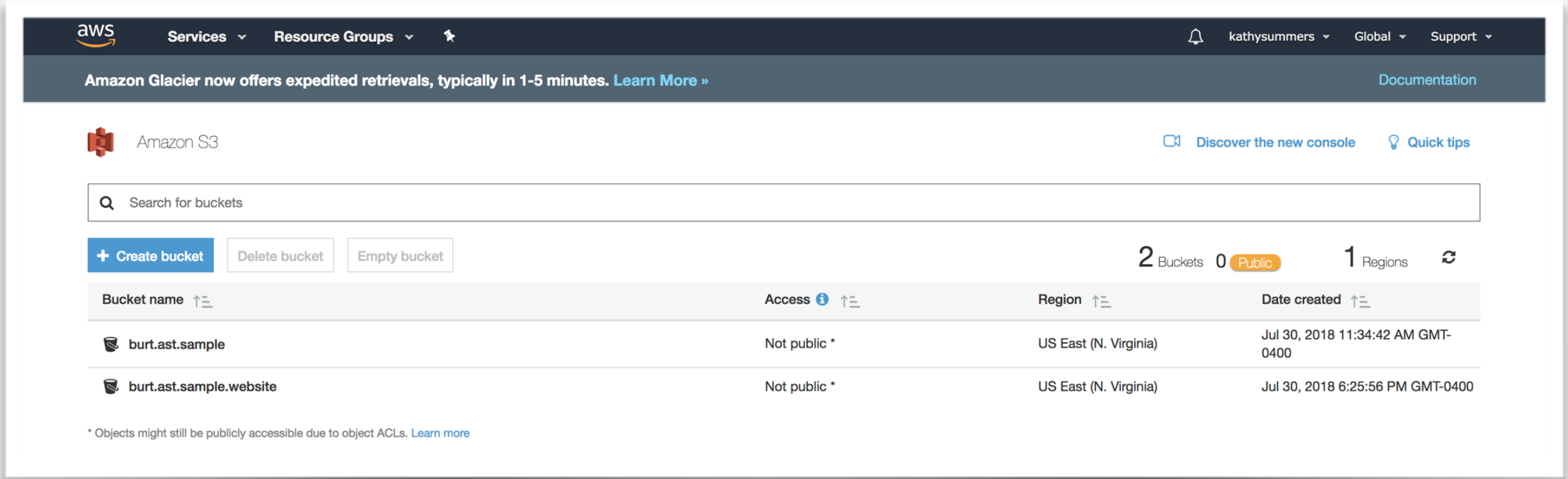
Secure https://localhost:5001/document/getstats/kathy.txt

{"WordCount":{"Keep":1,"Linc":1,"and":1,"Liam":1,"going":1},"FileName":"kathy.txt"}

Putting SPA HTML File in an S3 Bucket

- S3 is a collection of directories that contain files
- It is an AWS file store for files and objects

AWS S3 Buckets (Data File/Object Storage)



Single Page Application HTML File on S3

aws Services Resource Groups kathysummers Global Support

Amazon S3 > burt.ast.sample.website

SinglePageApplication.html Latest version

Overview | Properties | Permissions | Select from

Open | Download | Download as | Make public | Copy path

Owner
summersklo

Last modified
Jul 30, 2018 6:29:47 PM GMT-0400

Etag
0032e547d7a9451ecb741aef8b0ef5ea

Storage class
Standard

Server-side encryption
None

Size
4881

Link
https://s3.amazonaws.com/burt.ast.sample.website/SinglePageApplication.html

File Permissions on S3

aws Services Resource Groups kathysummers Global Support

Amazon S3 > burt.ast.sample.website

SinglePageApplication.html Latest version

Overview | Properties | Permissions | Select from

Access for your AWS account

Account	Read object	Read object permissions	Write object permissions
175807e8ba4a9318ec1c3c5dd5705830ca7a7975563dc8c59a289a284a312a67	Yes	Yes	Yes

Access for other AWS accounts

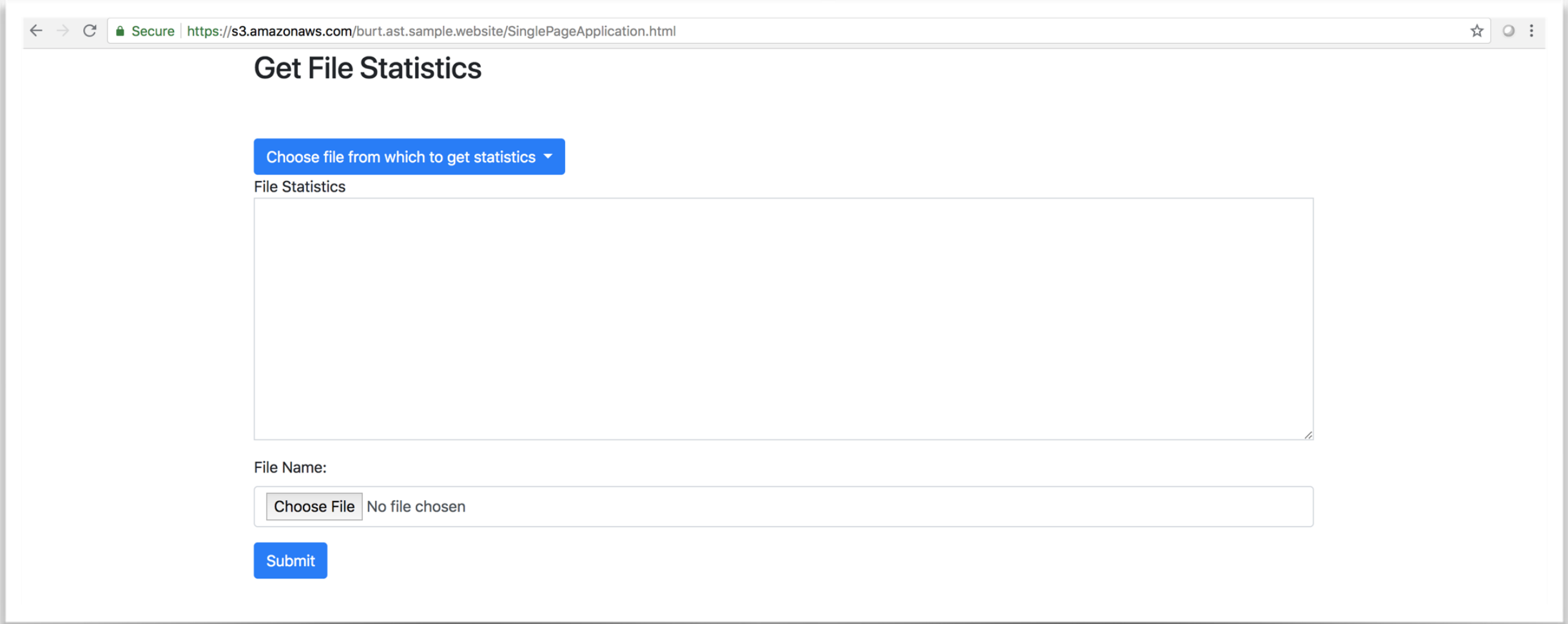
+ Add account | Delete

Account	Read object	Read object permissions	Write object permissions

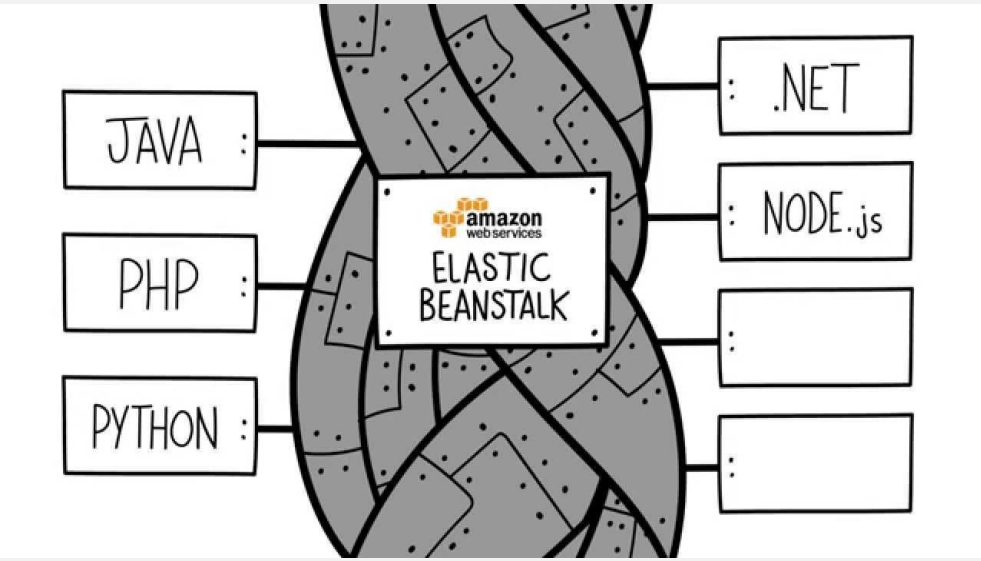
Public access

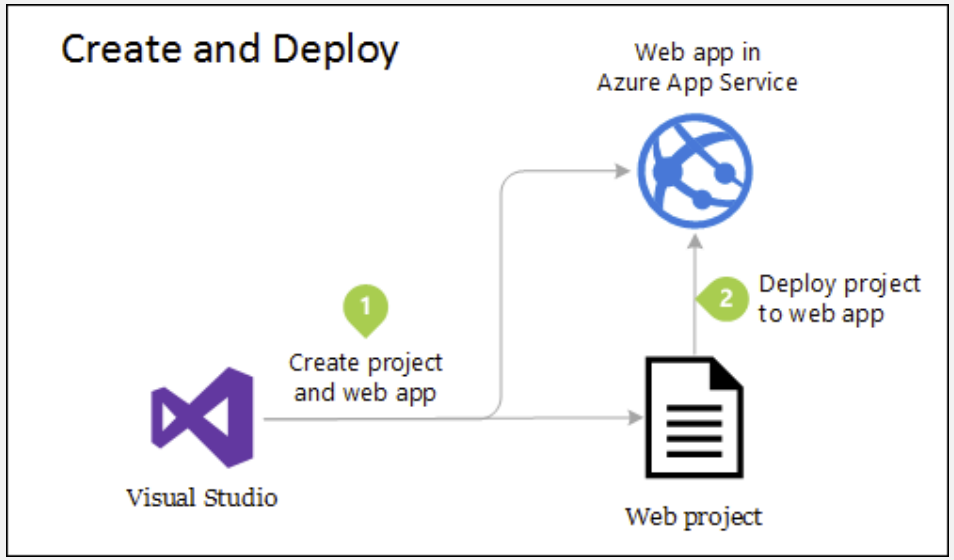
Group	Read object	Read object permissions	Write object permissions
Everyone	Yes	-	-

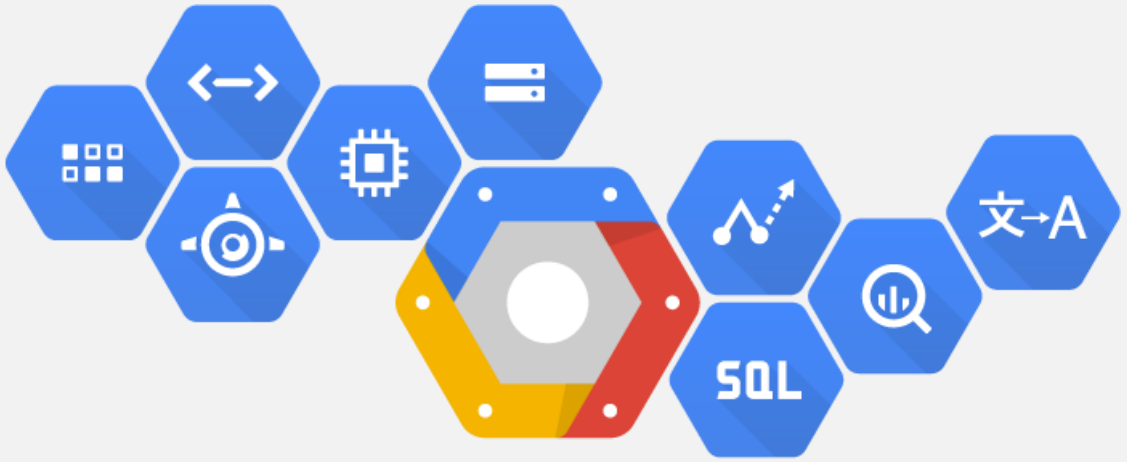
Single Page Application (from S3)



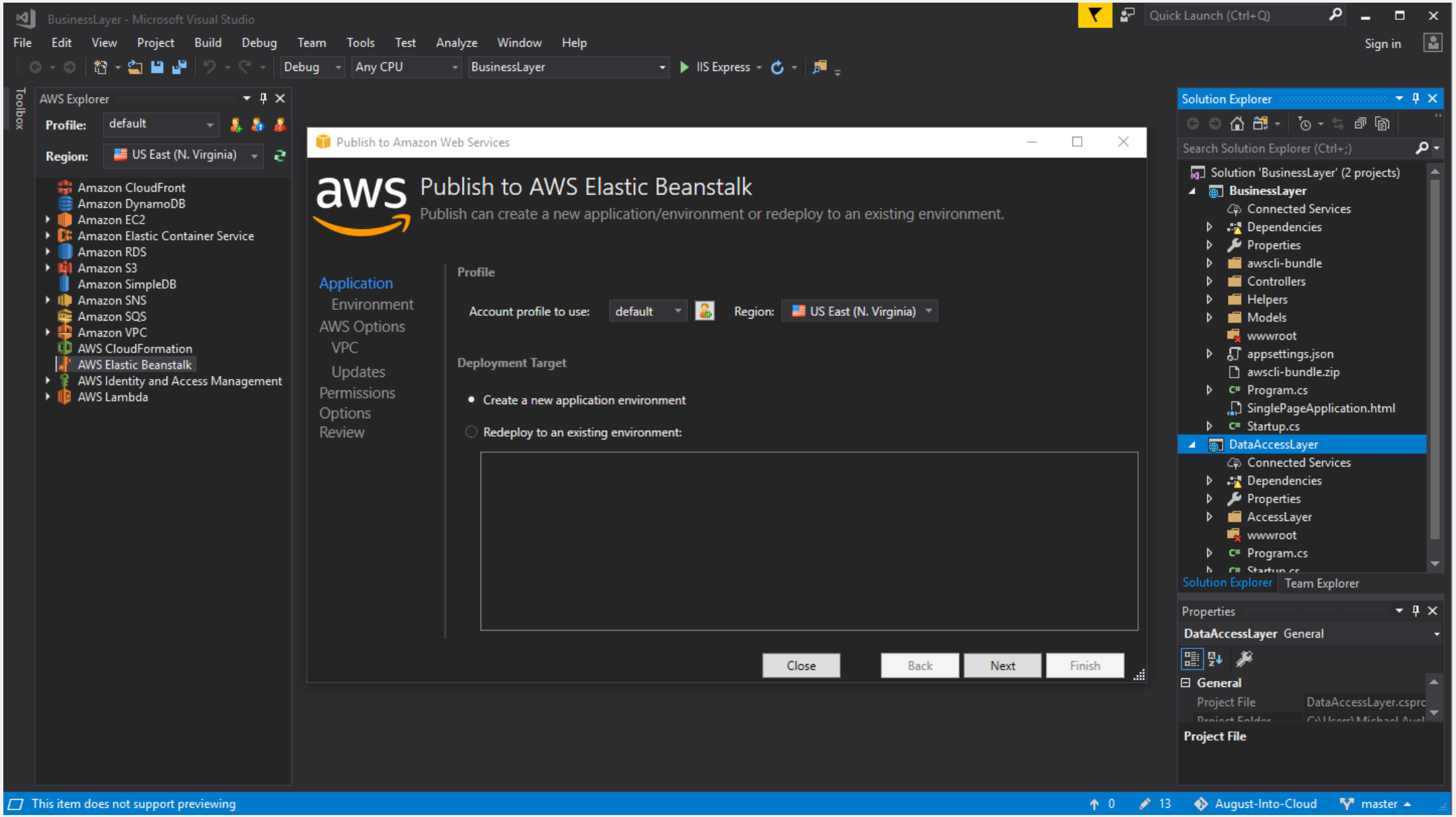
Pushing the App to the Cloud



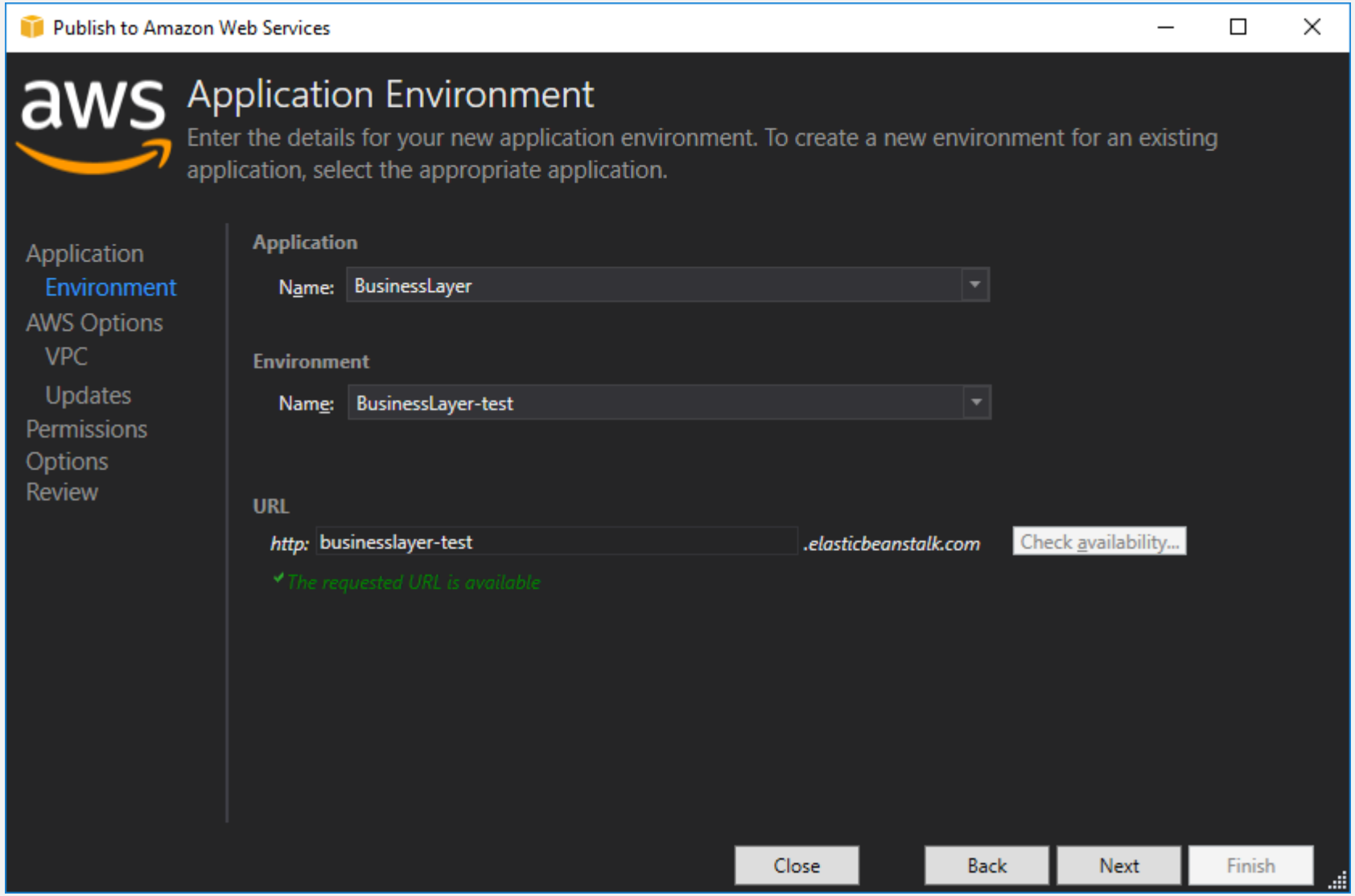




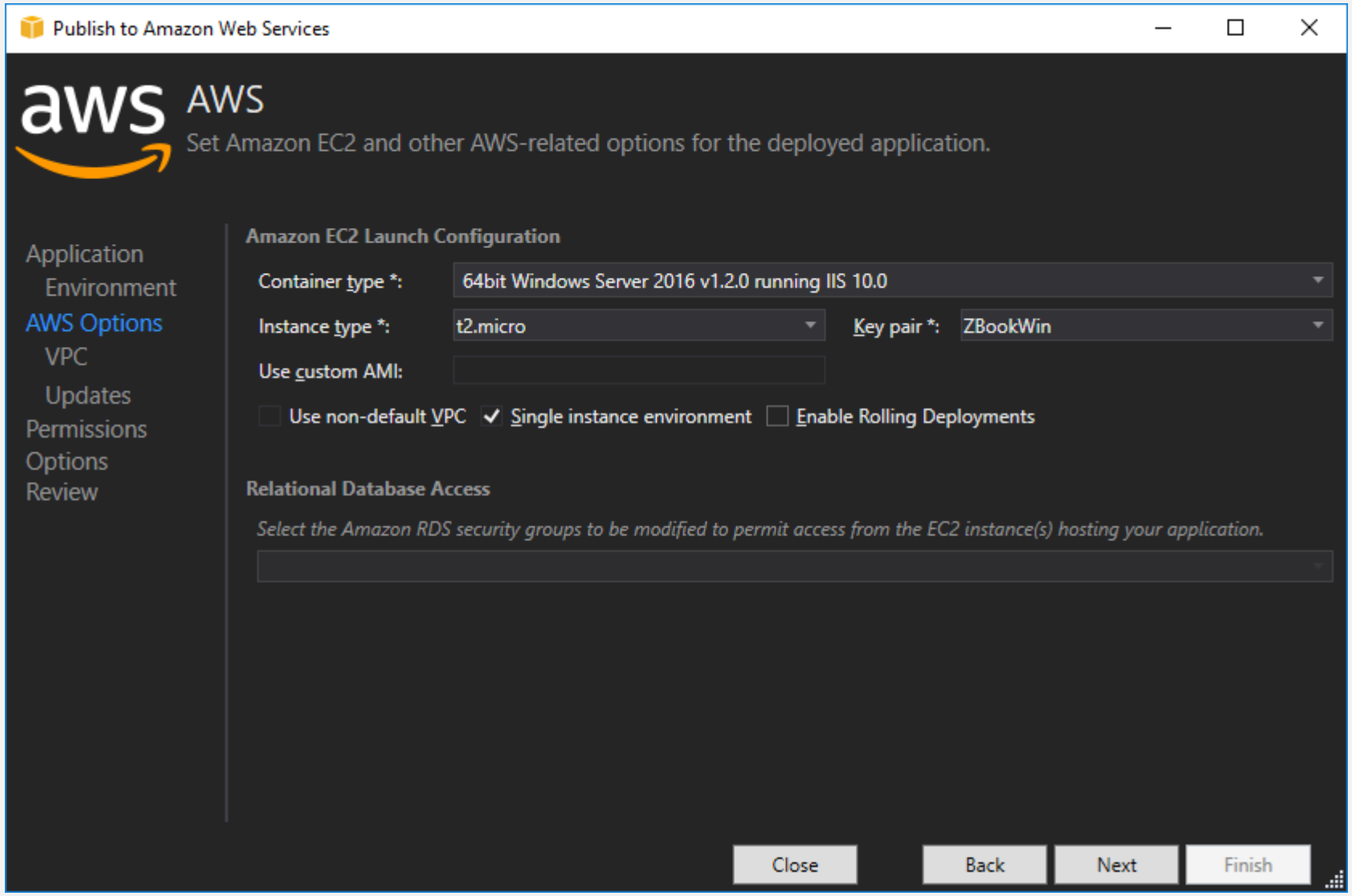
Pushing the App to the Cloud



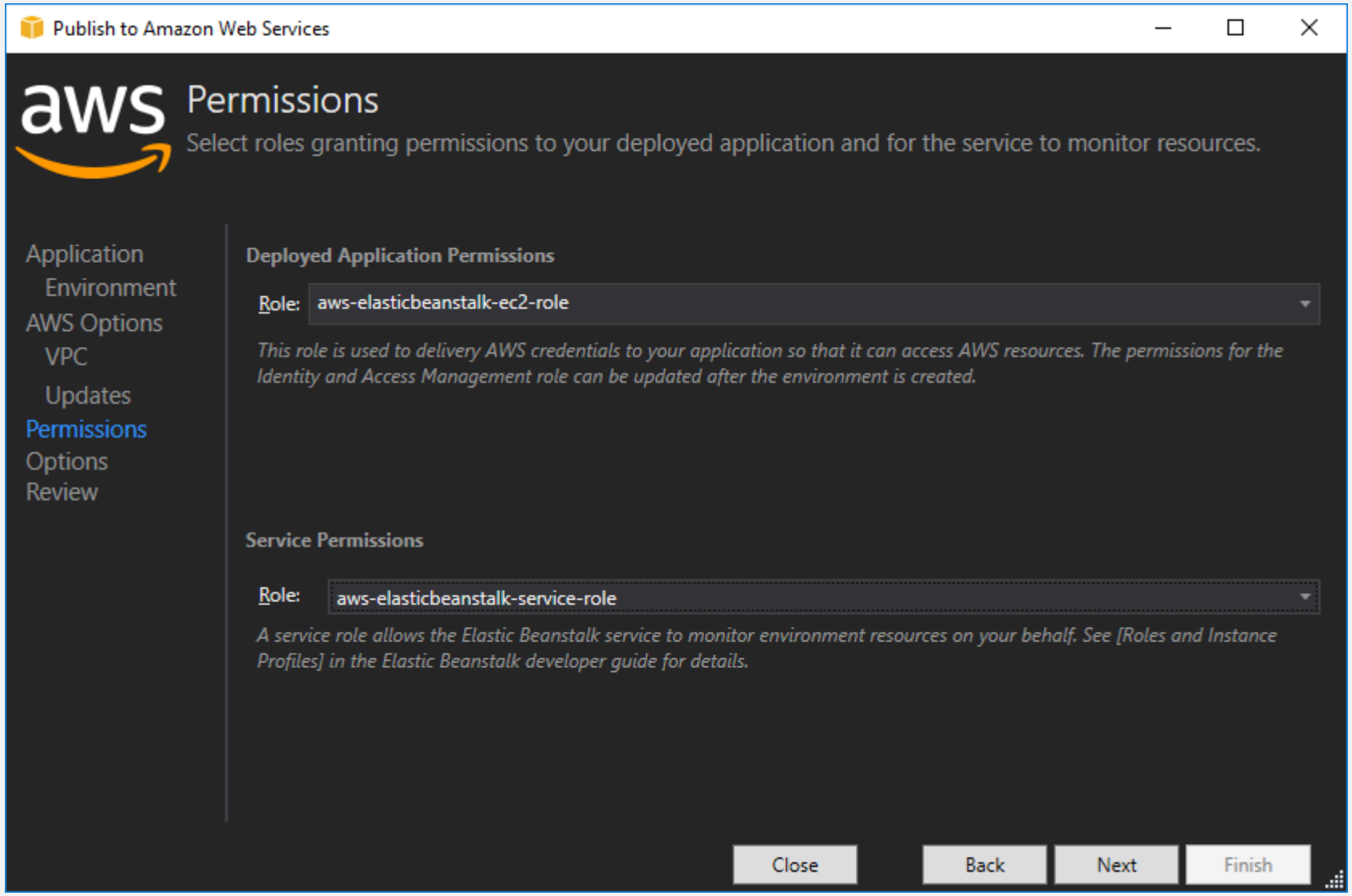
Pushing the App to the Cloud



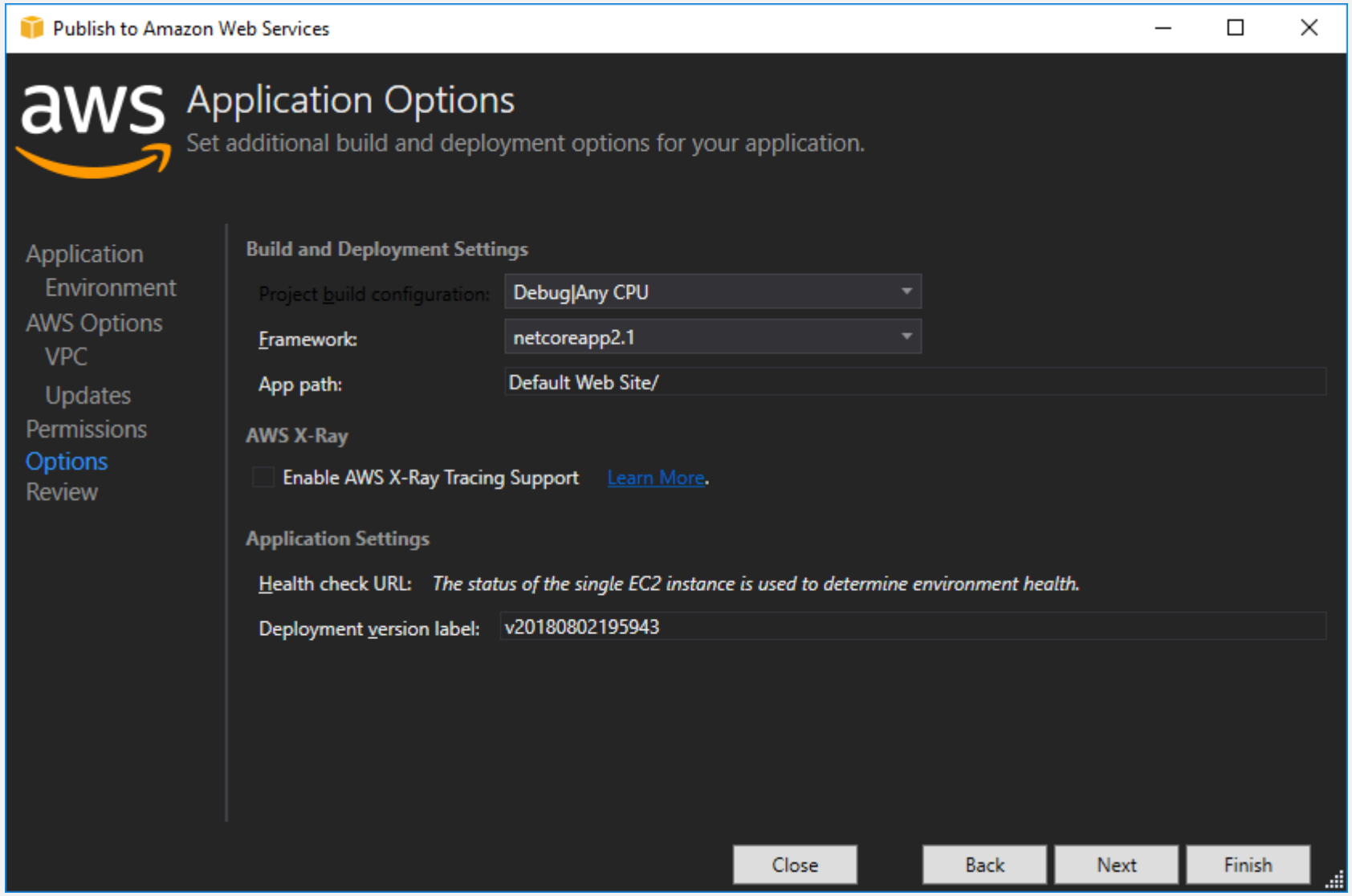
Pushing the App to the Cloud



Pushing the App to the Cloud



Pushing the App to the Cloud



Pushing the App to the Cloud

aws Services Resource Groups

Elastic Beanstalk BusinessLayer

All Applications › BusinessLayer › BusinessLayer-test (Environment ID: e-ap25usymnd, URL: businesslayer-test.us-east-1.elasticbeanstalk.com)

Creating BusinessLayer-test

This will take a few minutes..

4:56pm Successfully launched environment: BusinessLayer-test

4:56pm Application available at businesslayer-test.us-east-1.elasticbeanstalk.com.

4:56pm Environment health has been set to GREEN

4:54pm Added EC2 instance 'i-0aa3b819d5a41666a' to Auto Scaling Group 'awseb-e-ap25usymnd-stack-AWSEBAutoScalingGroup-179IWSC4PKNOO'.

4:54pm Adding instance 'i-0aa3b819d5a41666a' to your environment.

4:53pm Waiting for EC2 instances to launch. This may take a few minutes.

4:52pm Created EIP: 34.206.144.206

4:52pm Created security group named: sg-03f71e69c639ebef8

4:51pm Using elasticbeanstalk-us-east-1-446262009862 as Amazon S3 storage bucket for environment data.

4:51pm createEnvironment is starting.

Pushing the App to the Cloud

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Elastic Beanstalk BusinessLayer Create New Application

All Applications > BusinessLayer > BusinessLayer-test (Environment ID: e-ap25usymnd, URL: businesslayer-test.us-east-1.elasticbeanstalk.com) Actions

- Dashboard
- Configuration
- Logs
- Monitoring
- Alarms
- Events
- Tags

Overview

Refresh

Health
Green
Causes

Running Version
v20180802204912
Upload and Deploy

Configuration
IIS 10.0 running on 64bit Windows Server 2016/1.2.0
Change

Recent Events

Show All

Time	Type	Details
2018-08-02 17:36:53 UTC-0400	INFO	Adding instance 'i-0916495d39339b99f' to your environment.
2018-08-02 17:36:53 UTC-0400	INFO	Added EC2 instance 'i-0916495d39339b99f' to Auto Scaling Group 'awseb-e-ap25usymnd-stack-AWSEBAutoScalingGroup-179IWSC4PKNOO'.

Pushing the App to the Cloud

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Elastic Beanstalk BusinessLayer Create New Application

All Applications > BusinessLayer > BusinessLayer-test (Environment ID: e-ap25usymnd, URL: businesslayer-test.us-east-1.elasticbeanstalk.com) Actions

- Dashboard
- Configuration
- Logs
- Monitoring
- Alarms
- Events
- Tags

Configuration overview Cancel Apply configuration

Software
AWS X-Ray: disabled
Rotate logs: disabled (default)
Log streaming: disabled (default)
Environment properties: 0
Modify

Instances
EC2 instance type: t2.micro
EC2 image ID: ami-440b083b
Monitoring interval: 5 minute
Root volume type: General Purpose (SSD)
Root volume size (GB): container default
Root volume IOPS: container default
Security groups: sg-03f71e69c639ebef8, sg-7a18c231
Modify

Capacity
Environment type: single instance
Modify

Load balancer
This configuration does not contain a load balancer.

Rolling updates and deployments
Deployment policy: All at once
Rolling updates: disabled
Health check: enabled
Modify

Security
Service role: aws-elasticbeanstalk-service-role
Virtual machine key pair: ZBookWin
Virtual machine instance profile: aws-elasticbeanstalk-ec2-role
Modify

Pushing the App to the Cloud

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Elastic Beanstalk BusinessLayer Create New Application

All Applications > BusinessLayer > BusinessLayer-test (Environment ID: e-ap25usymnd, URL: businesslayer-test.us-east-1.elasticbeanstalk.com) Actions

Dashboard

Configuration overview Cancel Apply configuration

Monitoring

Health event log streaming: disabled

Modify

Managed updates

Managed updates: --

Weekly update window: --

Notifications

Email address: --

Modify

Network

VPC: vpc-451d073e (172.31.0.0/16) (default)

Associate public IP address: disabled

Instance subnets: subnet-ae21cd90

Modify

Database

Engine: --

Instance class: --

Storage (GB): --

Multi-AZ: --

Modify

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Pushing the App to the Cloud – S3 Instance

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EC2 Dashboard
Events
Tags
Reports
Limits

INSTANCES
- Instances
- Launch Templates
- Spot Requests
- Reserved Instances
- Dedicated Hosts
- Scheduled Instances

IMAGES
- AMIs
- Bundle Tasks

ELASTIC BLOCK STORE
- Volumes
- Snapshots
- Lifecycle Manager

NETWORK & SECURITY
- Security Groups
- Elastic IPs
- Placement Groups
- Key Pairs
- Network Interfaces

LOAD BALANCING
- Load Balancers
- Target Groups

AUTO SCALING

Launch Instance | Connect | Actions

Filter by tags and attributes or search by keyword — 1 to 4 of 4

Name	Instance ID	Instance Type	Availability Zone	Instance State	Status Checks	Alarm Status	Public DNS (IPv4)	IPv4 Public IP	IPv6 IPs	Key Name	Monitoring
ubuntu-docker01	i-092e8cfbd84df8cee	t2.micro	us-east-1d	stopped		None		-	-	ZBook	disabled
win-server-jpd01	i-0cc8497920c455c26	t2.micro	us-east-1a	stopped		None		-	-	ZBookWin	disabled
ubuntu-docker02	i-0dfd222730e5c619a	t2.micro	us-east-1c	stopped		None		-	-	SP3	disabled
BusinessLayer-test	i-0aa3b819d5a4166...	t2.micro	us-east-1e	running	2/2 checks ...	None	ec2-34-206-144-206.co...	34.206.144.206	-	ZBookWin	disabled

Security groups	awseb-e-ap25usymnd-stack-AWSEBSecurityGroup-61YWBMJ89MCN, default. view inbound rules. view outbound rules
Scheduled events	No scheduled events
AMI ID	aws-elasticbeanstalk-amzn-2018.07.11.x86_64-WindowsServer2016-hvm-201807230721 (ami-440b083b)
Platform	windows
IAM role	aws-elasticbeanstalk-ec2-role
Key pair name	ZBookWin
EBS-optimized	False
Root device type	ebs
Root device	/dev/sda1

Secondary private IPs	
VPC ID	vpc-451d073e
Subnet ID	subnet-ae21cd90
Network interfaces	eth0
Source/dest. check	True
T2 Unlimited	Disabled
Owner	446262009862
Launch time	August 2, 2018 at 4:52:45 PM UTC-4 (less than one hour)
Termination protection	False
Lifecycle	normal

Feedback | English (US)

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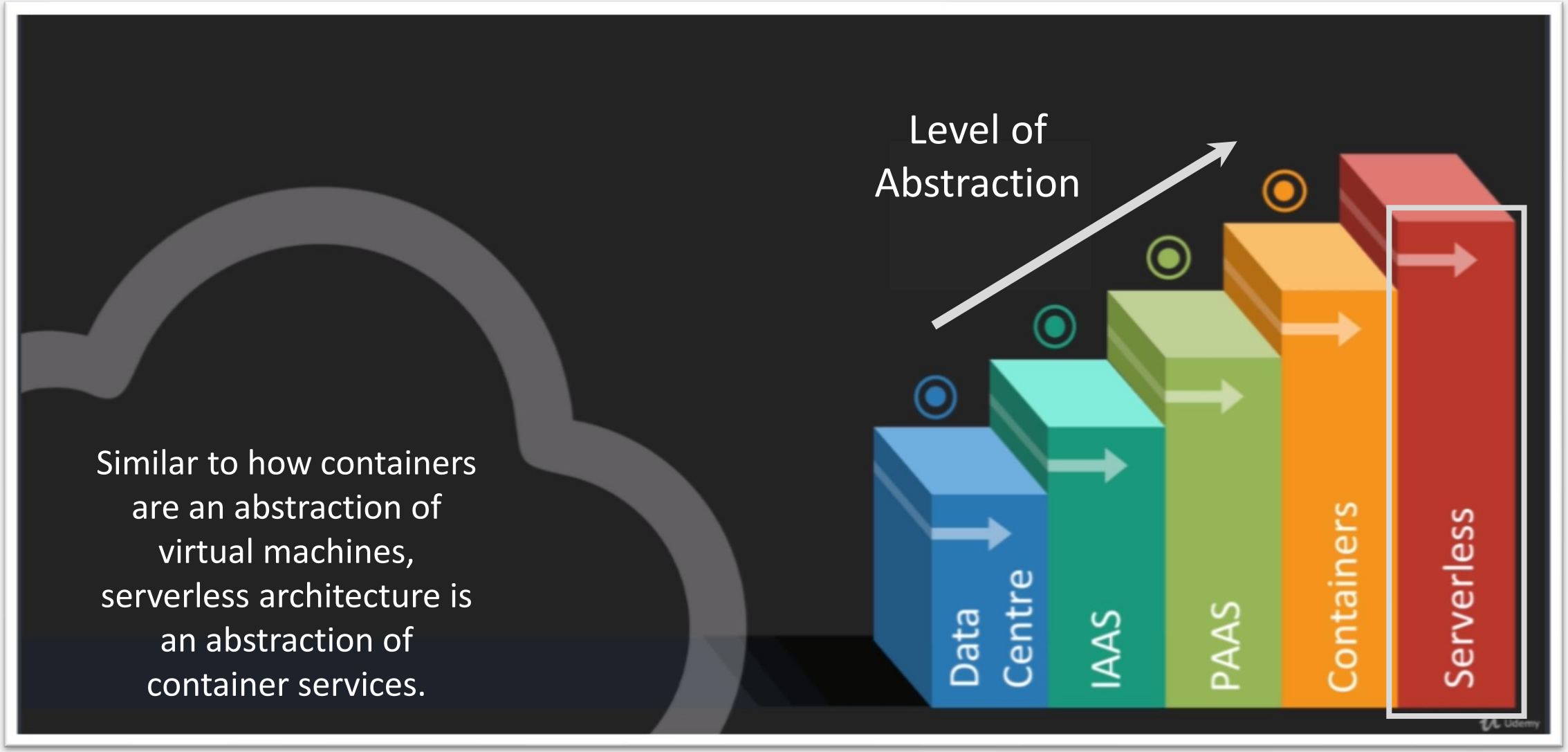
Serverless Computing



Lambda “Serverless” Functions

- The really do run on a server
- There are a pool of servers to field the request
- You only pay for compute, networking, memory while the Lambda is running
- Can leverage libraries

Create the Node.js Function

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Lambda > Functions > Create function

Create function

Author from scratch
Start with a simple "hello world" example.

Blueprints
Choose a preconfigured template as a starting point for your Lambda function.

Serverless Application Repository
Find and deploy serverless apps published by developers, companies, and partners on AWS.

Author from scratch Info

Name
Tester

Runtime
Node.js 6.10

Role
Defines the permissions of your function. Note that new roles may not be available for a few minutes after creation. Learn more about Lambda execution roles.
Choose an existing role

Existing role
You may use an existing role with this function. Note that the role must be assumable by Lambda and must have Cloudwatch Logs permissions.
service-role/BusinessLayerRole

Cancel Create function

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BusinessLayer

Throttle | Qualifiers | Actions | BusinessLayerEvent | Test | Save

Code entry type: Edit code inline

Runtime: Node.js 6.10

Handler Info: index.handler

File Edit Find View Goto Tools Window

Environment

BusinessLayer
index.js

index.js

```
var AWS = require('aws-sdk');
var s3 = new AWS.S3();

exports.handler = (event, context, callback) => {


    switch (event.httpMethod) {

        case 'GET':

            callback(null, { 'statusCode' : 200, 'body' : event.httpMethod + ':::' + event.path});
            break;

        case 'POST' :

            callback(null, { 'statusCode' : 200, 'body' : event.httpMethod + ':::' + event.path});
            break;

        default:
            callback(null, { 'statusCode' : 200, 'body' : 'No DICE! DEFAULT '});
    }
}
```

Create Test Event

A function can have up to 10 test events. The events are persisted so you can switch to another computer or web browser and test your function with the same events.

- (●) Create new test event
- ( ) Edit saved test events

Event template

Hello World

CloudFormation Create Request
Kinesis Firehose Cloudwatch Logs Processor
SES Email Receiving
Rekognition S3 Request
CloudFront HTTP Redirect
API Gateway AWS Proxy
Kinesis Firehose streams as
API Gateway AWS Proxy
Scheduled Event
CloudWatch Logs
SNS
AWS Batch Get Job Request
DynamoDB Update
SQS
Kinesis Firehose Syslog

Create Test Event

Event template

API Gateway AWS Proxy

Event name

BusinessLayerTestEvent

```
    "CloudFront-Is-Desktop-Viewer": "true",
    "CloudFront-Is-SmartTV-Viewer": "false",
    "CloudFront-Is-Mobile-Viewer": "false",
    "X-Forwarded-For": "127.0.0.1, 127.0.0.2",
    "CloudFront-Viewer-Country": "US",
    "Accept": "text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,*/*;
    "Upgrade-Insecure-Requests": "1",
    "X-Forwarded-Port": "443",
    "Host": "1234567890.execute-api.us-east-1.amazonaws.com",
    "X-Forwarded-Proto": "https",
    "X-Amz-Cf-Id": "cDehVQoZnx43VYQb9j2-nvCh-9z396Uhbp027Y2JvkCPNLmGJHqlaA==",
    "CloudFront-Is-Tablet-Viewer": "false",
    "Cache-Control": "max-age=0",
    "User-Agent": "Custom User Agent String",
    "CloudFront-Forwarded-Proto": "https",
    "Accept-Encoding": "gzip, deflate, sdch"
  },
  "pathParameters": {
    "proxy": "/getstats"
  },
  "httpMethod": "GET",
  "stageVariables": {
    "baz": "qux"
  },
  "path": "/path/to/resource"
}
```

Cancel Create

BusinessLayer

Throttle | Qualifiers | Actions | BusinessLayerTestEvent | Test | Save

Execution result: succeeded (logs)

Details

The area below shows the result returned by your function execution. Learn more about returning results from your function.

```
{
  "statusCode": 200,
  "body": "GET:::/path/to/resource"
}
```

Summary

Code SHA-256 cAeB1dJj8MPk+LJBJYunwjs0vqqLuxFX6aL39WnGyZo=	Request ID aa8af729-9664-11e8-b9f1-e765d435d8ab
Duration 7.15 ms	Billed duration 100 ms
Resources configured 128 MB	Max memory used 37 MB

Log output

The area below shows the logging calls in your code. These correspond to a single row within the CloudWatch log group corresponding to this Lambda function. Click here to view the CloudWatch log group.

```
START RequestId: aa8af729-9664-11e8-b9f1-e765d435d8ab Version: $LATEST
END RequestId: aa8af729-9664-11e8-b9f1-e765d435d8ab
REPORT RequestId: aa8af729-9664-11e8-b9f1-e765d435d8ab  Duration: 7.15 ms       Billed Duration: 100 ms         Memory Size: 128 MB     Max Memory Used: 37 MB
```


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Exposing the REST API

{RESTful API}

API Gateway

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Amazon API Gateway APIs > Create Show all hints

Create new API

In Amazon API Gateway, an API refers to a collection of resources and methods that can be invoked through HTTPS endpoints.

New API Import from Swagger Example API

Settings

Choose a friendly name and description for your API.

API name* BusinessLayer

Description

Endpoint Type
- ✓ Regional
- Edge optimized
- Private

* Required

Create API

API Proxy Resource Setup

aws Services Resource Groups kathysummers N. Virginia Support

Amazon API Gateway | APIs > BusinessLayer (q9pvyisv0c) > Resources > / (31naukvtd8) > Create | Show all hints

- APIs
  - BusinessLayer
    - Resources
    - Stages
    - Authorizers
    - Gateway Responses
    - Models
    - Resource Policy
    - Documentation
    - Settings
- Usage Plans
- API Keys
- Custom Domain Names
- Client Certificates
- VPC Links
- Settings

Resources | Actions

/
ANY

New Child Resource

Use this page to create a new child resource for your resource.

Configure as proxy resource ☑

Resource Name* {proxy+}

Resource Path* / {proxy+}

You can add path parameters using brackets. For example, the resource path **{username}** represents a path parameter called 'username'. Configuring /{proxy+} as a proxy resource catches all requests to its sub-resources. For example, it works for a GET request to /foo. To handle requests to /, add a new ANY method on the / resource.

Enable API Gateway CORS ☑

*** Required**

Cancel | Create Resource

API ANY Proxy Setup

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Amazon API Gateway | APIs > BusinessLayer (q9pvyisv0c) > Resources > /{proxy+} (j4nj2j) > ANY | Show all hints

APIs
- BusinessLayer
  - Resources
  - Stages
  - Authorizers
  - Gateway Responses
  - Models
  - Resource Policy
  - Documentation
  - Settings
- Usage Plans
- API Keys
- Custom Domain Names
- Client Certificates
- VPC Links
- Settings

Resources | Actions

- /
  - ANY
  - /{proxy+}
    - ANY
    - OPTIONS

/{proxy+} - ANY - Setup

API Gateway will configure your ANY method as a proxy integration. Proxy integrations can communicate with HTTP endpoints or Lambda functions. API Gateway sends the entire request to HTTP endpoints, including resource path, headers, query string parameters, and body. For Lambda integrations, API Gateway applies a default mapping to send all of the request information and responses follow a default interface. To learn more read our documentation

Integration type
- (●) Lambda Function Proxy
- ( ) HTTP Proxy
- ( ) VPC Link

Lambda Region us-east-1

Lambda Function BusinessLayer

Use Default Timeout [x]

Save

Proxy is Wide Open

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Amazon API Gateway APIs > BusinessLayer (q9pvyisv0c) > Resources > /{proxy+} (j4nj2j) > ANY Show all hints

APIs
- BusinessLayer
  - Resources
  - Stages
  - Authorizers
  - Gateway Responses
  - Models
  - Resource Policy
  - Documentation
  - Settings
- Usage Plans
- API Keys
- Custom Domain Names
- Client Certificates
- VPC Links
- Settings

Resources Actions

- /
  - ANY
  - /{proxy+}
    - ANY
    - OPTIONS

← Method Execution /{proxy+} - ANY - Method Request

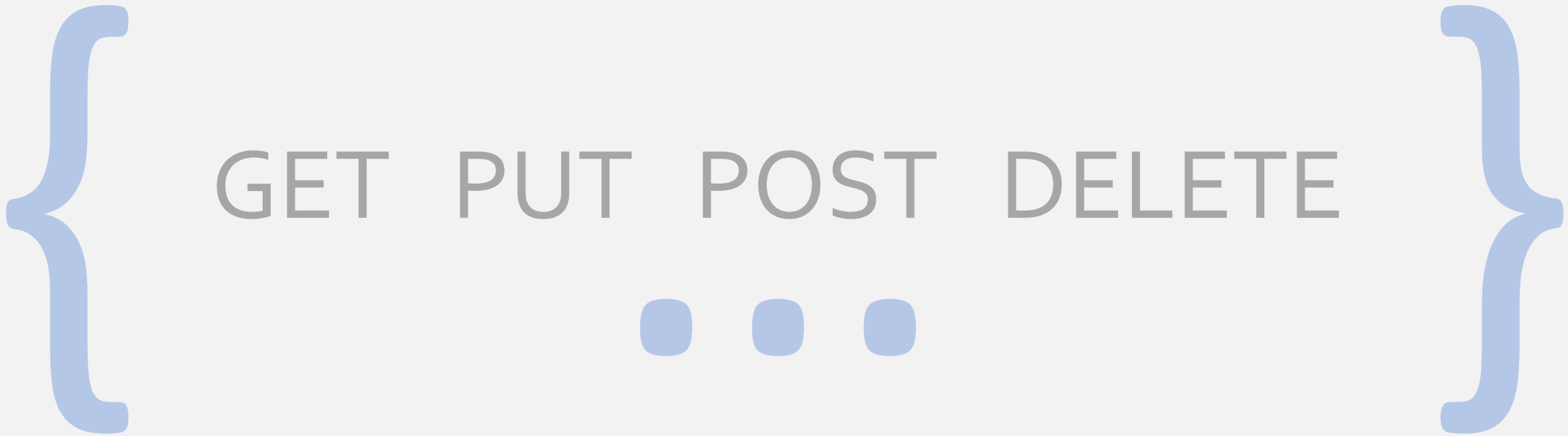
Provide information about this method's authorization settings and the parameters it can receive.

Settings

Authorization	NONE
Request Validator	NONE
API Key Required	false

- Request Paths
- URL Query String Parameters
- HTTP Request Headers
- Request Body
- SDK Settings

Deploying the API



Deploying the API

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Amazon API Gateway | APIs > BusinessLayer (q9pvyisv0c) > Resources > / (31naukvtd8) | Show all hints

APIs
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Resources | Actions | / Methods

/
- ANY
- /{proxy+}
  - ANY
  - OPTIONS

RESOURCE ACTIONS
- Create Method
- Create Resource
- Enable CORS
- Edit Resource Documentation

API ACTIONS
- Deploy API
- Import API
- Edit API Documentation
- Delete API

None

Not required

Stages Create

- test
  - /
    - DELETE
    - GET
    - HEAD
    - OPTIONS
    - PATCH
    - POST
    - PUT
    - /{proxy+}
      - DELETE
      - GET
      - HEAD
      - OPTIONS
      - PATCH
      - POST
      - PUT

test Stage Editor

Invoke URL: https://q9pvyisv0c.execute-api.us-east-1.amazonaws.com/test

Settings | Logs | Stage Variables | SDK Generation | Export | Deployment History | Documentation History | Canary

Configure the metering and caching settings for the **test** stage.

Cache Settings

Enable API cache ☐

Default Method Throttling

Choose the default throttling level for the methods in this stage. Each method in this stage will respect these rate and burst settings. Your current ac
rate is **10000** requests per second with a burst of **5000** requests. Read more about API Gateway throttling

Enable throttling ☑

Rate 10000 requests per second

Burst 5000 requests

Client Certificate

Executing the Lambda

Secure https://q9pvyisv0c.execute-api.us-east-1.amazonaws.com/test/mypath/ifyou/care

```
GET:::/mypath/ifyou/care
```

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BusinessLayer

Throttle | Qualifiers | Actions | BusinessLayerEvent | Test | Save

Code entry type: Edit code inline

Runtime: Node.js 6.10

Handler Info: index.handler

File Edit Find View Goto Tools Window

Environment

BusinessLayer
index.js

index.js

```
var AWS = require('aws-sdk');
var s3 = new AWS.S3();

exports.handler = (event, context, callback) => {


    switch (event.httpMethod) {

        case 'GET':

            callback(null, { 'statusCode' : 200, 'body' : event.httpMethod + ':::' + event.path});
            break;

         case 'POST' :

            callback(null, { 'statusCode' : 200, 'body' : event.httpMethod + ':::' + event.path});
            break;

         default:
            callback(null, { 'statusCode' : 200, 'body' : 'No DICE! DEFAULT '});
    }
}
```

Real Business Layer

- We need the business layer to function “like” the native app (really wanted more than the word counts)
- We need to leverage S3 for the document store
- It has to process web requests
- Would like to leverage cloud API features
- Could have moved the C#
  (using Node.js – exercise compare the code)

```
exports.handler = (event, context, callback) => {

    const s3Bucket = 'burt.ast.sample';
    const getFileStatsMethod = '/getstats';
    const listAllMethod = '/listall';


    switch (event.httpMethod) {

        case 'GET':

            if (event.path.indexOf(getFileStatsMethod) >= 0) {

               let fileName = event.path.substring(event.path.indexOf(getFileStatsMethod) + getFileStatsMethod.length + 1);
               let params = { Bucket: s3Bucket, Key: fileName };
               s3.getObject(params, function(err, data) {
                   if (err) {
                     callback(null, createResponse(404, JSON.stringify(err)));
                   }
                   else {

                      //convert the string from a binary array back to a string
                      var fileContents = '';
                      data.Body.forEach(function(x) { fileContents = fileContents + String.fromCharCode(x); });
                      console.log(fileContents);


                      //call comprehend on the file contents (there is a limit to 5000 characters
                      var resultMessage = '';
                      let params = { LanguageCode: 'en' , Text : fileContents };
                      comprehend.detectEntities(params, function(err, data) {

                          resultMessage += JSON.stringify(data);

                          let params = { LanguageCode: 'en' , Text : fileContents };
                          comprehend.detectSentiment(params, function(err, data) {

                              resultMessage += JSON.stringify(data);
                              callback(null, createResponse(200, JSON.stringify(resultMessage)));

                          });
                      });
```

```
    else if (event.path.indexOf(listAllMethod) >= 0) {

      var params = {
          Bucket: s3Bucket,
          MaxKeys: 999
      };
      s3.listObjects(params, function(err, data) {
         if (err) {
          callback(null, createResponse(502, JSON.stringify(err)));

         }
         else {

          let fileArray = [];
          if (data.Contents) {
            data.Contents.forEach(function(fileInformation) {
               fileArray.push({"fileName" : fileInformation.Key});
            });
          }


          callback(null, createResponse(200, JSON.stringify(fileArray)));


         }
      });
  }
```

Permissions

- The business layer needs to be able to access S3
- The business layer needs to be able to use Comprehend (AWS service for natural language processing & text analytics)
- The business layer lambda needs to be given the right to assume the role which houses the S3 permissions and comprehend permissions

Permissions

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Search IAM

- Dashboard
- Groups
- Users
- **Roles**
- Policies
- Identity providers
- Account settings
- Credential report

- Encryption keys

Roles > BusinessLayerRole

Summary

Delete role

Role ARN	arn:aws:iam::344091997522:role/service-role/BusinessLayerRole
Role description	Edit
Instance Profile ARNs	
Path	/service-role/
Creation time	2018-07-30 19:18 EDT
Maximum CLI/API session duration	1 hour Edit

Permissions | **Trust relationships** | **Access Advisor** | **Revoke sessions**

Permissions policies (2 policies applied)

Attach policies

Add inline policy

Policy name	Policy type	
AWSLambdaBasicExecutionRole-d8160ef2-58f5-4f29-9a9b-04569e5f1717	Managed policy	✖
APIAccess	Inline policy	✖

Permissions boundary (not set)

Permissions (continued)

Edit APIAccess

1 2

A policy defines the AWS permissions that you can assign to a user, group, or role. You can create and edit a policy in the visual editor and using JSON. Learn more

Visual editor | JSON

Import managed policy

```
1  {
2      "Version": "2012-10-17",
3      "Statement": [
4          {
5              "Effect": "Allow",
6              "Action": [
7                  "s3:Get*",
8                  "s3:List*"
9              ],
10             "Resource": "arn:aws:s3:::*"
11         },
12         {
13             "Effect": "Allow",
14             "Action": [
15                 "comprehend:Detect*"
16             ],
17             "Resource": "*"
18         }
19     ]
20 }
```

Permissions (continued)

Edit Trust Relationship

You can customize trust relationships by editing the following access control policy document.

Policy Document

```
1  {
2    "Version": "2012-10-17",
3    "Statement": [
4      {
5        "Effect": "Allow",
6        "Principal": {
7          "Service": "lambda.amazonaws.com"
8        },
9        "Action": "sts:AssumeRole"
10     }
11   ]
12 }
```

Selecting a File

Secure https://s3.amazonaws.com/burt.ast.sample.website/SinglePageApplication.html#

Get File Statistics

Choose file from which to get statistics

- life.txt
- mess.txt
- mine
- testfile

File Name:

Choose File No file chosen

Submit

Getting Statistics

Secure https://s3.amazonaws.com/burt.ast.sample.website/SinglePageApplication.html#

Get File Statistics

Choose file from which to get statistics

File Statistics

{"Entities":[{"Score":0.9931620955467224,"Type":"PERSON","Text":"Burt Walsh","BeginOffset":0,"EndOffset":10},
{"Score":0.9763126969337463,"Type":"LOCATION","Text":"643 Gold Nugget LN","BeginOffset":20,"EndOffset":38},
{"Score":0.9977035522460938,"Type":"PERSON","Text":"Kathy Summers","BeginOffset":58,"EndOffset":71},
{"Score":0.9964620471000671,"Type":"LOCATION","Text":"Orlando","BeginOffset":164,"EndOffset":171},
{"Score":0.9991668462753296,"Type":"LOCATION","Text":"Paris","BeginOffset":175,"EndOffset":180},
{"Score":0.8856638073921204,"Type":"PERSON","Text":"Burt","BeginOffset":183,"EndOffset":187},
{"Score":0.9974678754806519,"Type":"LOCATION","Text":"Florida","BeginOffset":211,"EndOffset":218},
{"Score":0.9992945194244385,"Type":"LOCATION","Text":"Florida","BeginOffset":234,"EndOffset":241}]}{"Sentiment":"NEUTRAL","SentimentScore":
{"Positive":0.23632429540157318,"Negative":0.002066499087959528,"Neutral":0.7418839931488037,"Mixed":0.019725147634744644}}

File Name:

Choose File No file chosen

Submit

Single Page Application: Popular Example

Progressive Web Apps – The Future of Mobile Web App Development

File Edit View Insert Format Tools Table Add-ons Help All changes saved in Drive

(Image Source- Google)

Benefits Of PWAs

Looks and Feels Just Like a Native App

The user won't notice any difference between PWA and the native app. It exactly looks and feels like a native app and even provides similar features like push notification, integration with the system, display icon on the home screen and app drawer, etc.

Installation

Making the user install your app from the store can be a pain in the neck. But with a PWA the user can install the app with just one tap. This frictionless installation lets users enjoy service instead of installing the bulky native app.

References

- https://developers.google.com/web/progressive-web-apps/
- https://docs.microsoft.com/en-us/aspnet/web-api/overview/getting-started-with-aspnet-web-api/tutorial-your-first-web-api
- https://docs.microsoft.com/en-us/azure/azure-functions/
- https://docs.aws.amazon.com/lambda/latest/dg/getting-started.html
- https://nodejs.org/en/
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Questions?

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