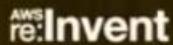


# AWS re:Invent

## Operating Your Serverless API at Scale

Bob Kinney — Senior SDE

November 29, 2017



## What to expect from this session

Brief review of serverless (API Gateway/Lambda)

Customizing your API

- Custom Timeouts

- Gateway Responses

Monitoring Your API

- Amazon CloudWatch Metrics/Alarms

- Amazon CloudWatch Logs

Protecting Your API

- Throttling

- Authorization

- Usage Plans

Updating Your API

- Canary Release Deployments

## Serverless means...



No servers to provision  
or manage



Scales with usage

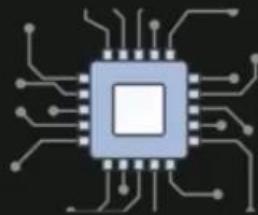


Never pay for idle



Availability and fault  
tolerance built in

## Amazon API Gateway



Create a unified  
API frontend for  
multiple micro-  
services



DDoS protection  
and throttling for  
your backend

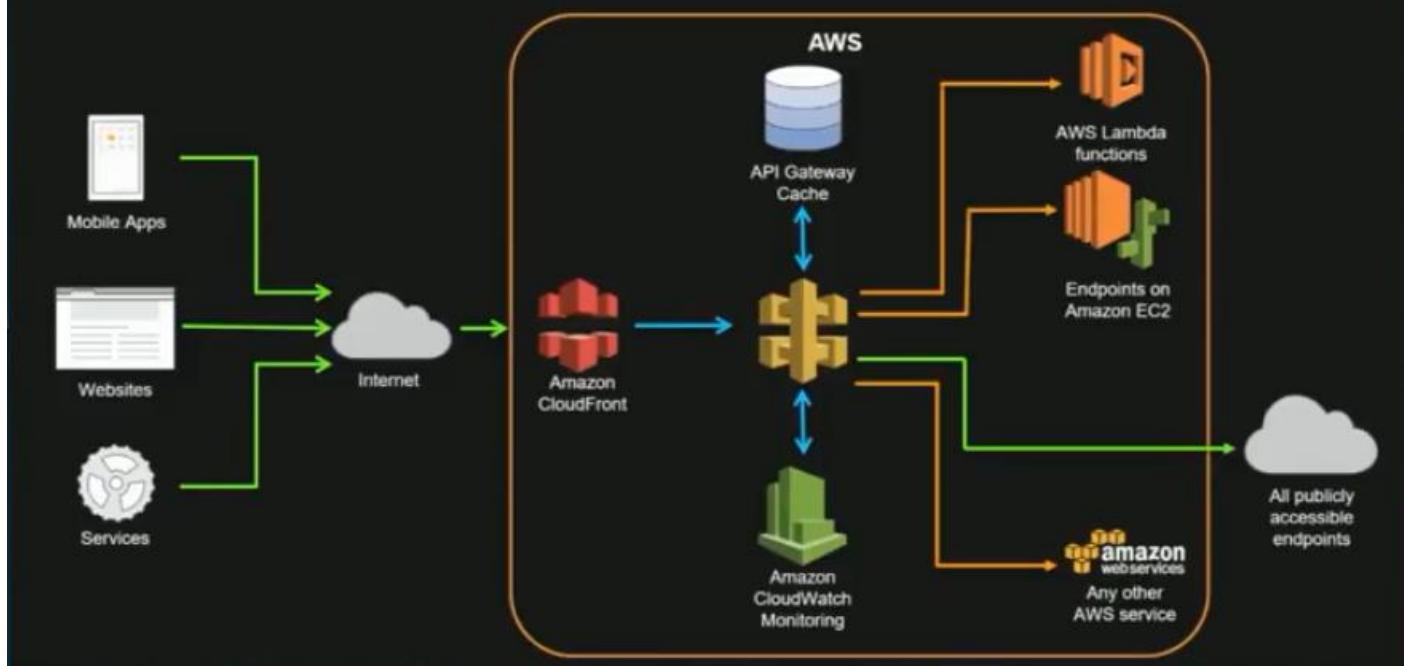


Authenticate and  
authorize  
requests to a  
backend

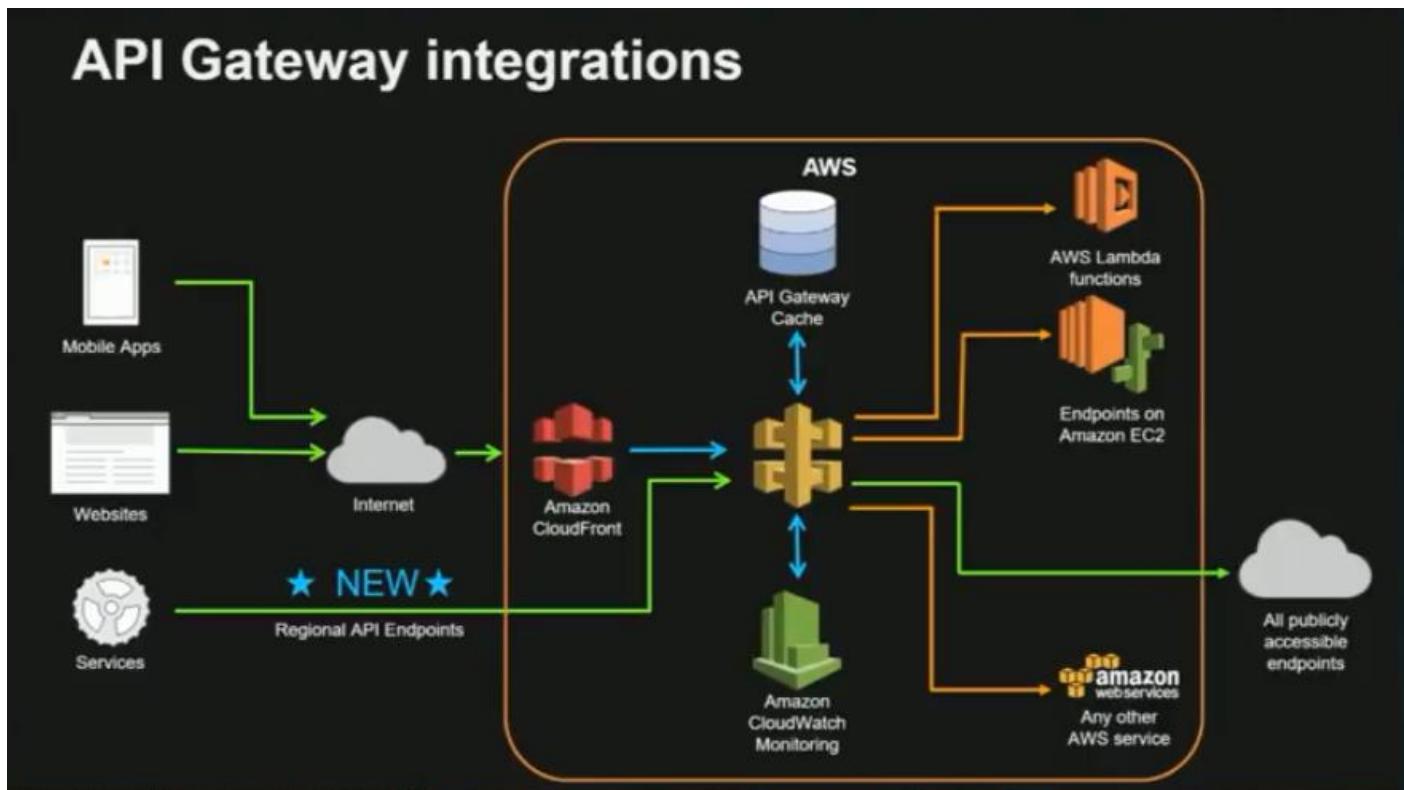


Throttle, meter,  
and monetize API  
usage by third-  
party developers

# API Gateway integrations



We can front our API Gateway with CloudFront as above



You can also remove CloudFront from the loop if desired as above

# AWS Lambda



## Bring your own code

- Node.js, Java, Python, C#
- Bring your own libraries (even native ones)



## Simple resource model

- Select power rating from 128 MB to 1.5 GB
- CPU and network allocated proportionately



## Flexible use

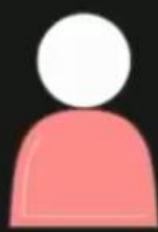
- Synchronous or asynchronous
- Integrated with other AWS services



## Flexible authorization

- Securely grant access to resources and VPCs
- Fine-grained control for invoking your functions

## Meet Doug



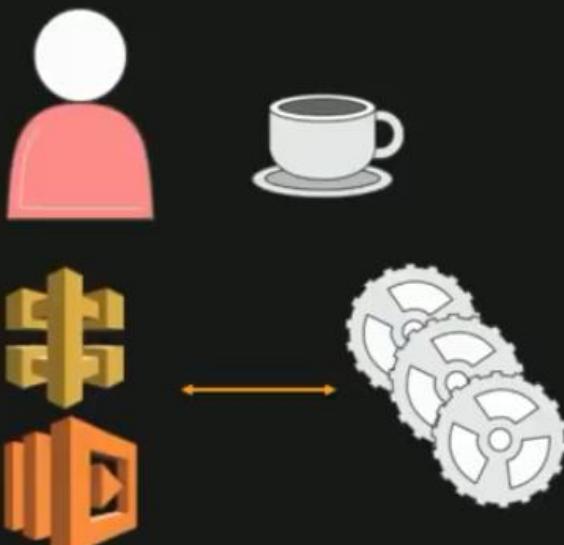
Doug loves coffee.

Doug also writes apps.

Doug built TAMPR—a service for sharing reviews of coffee and coffee shops.

Doug built the TAMPR backend serverless, with API Gateway and AWS Lambda.

## External data sources



Doug built the first version of TAMPR in part by aggregating data from other sources. The service will fetch some data on demand.

Unfortunately, the service is not as reliable as he'd like, and sometimes requests timeout after 30 seconds.

Doug would like to be able to fail fast in these cases so his clients can retry.

## Customizing Your API: Custom Timeouts

### Custom timeouts

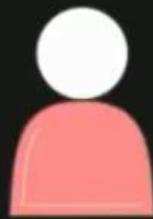
#### AWS Lambda

- Set your maximum invocation time
- Set per function

#### API Gateway★ NEW★

- Set your integration timeout (1–29 s)
- Works with any integration type (HTTP/Lambda/AWS)
- Set per method

## Check in with Doug



Doug now can configure his API to fail fast and build retry logic in his application for a more reliable customer experience.

## TAMPR website



Doug has already built native mobile applications, but wants to add a website with at least a subset of the functionality before going live with TAMPR.

He's gotten CORS working in the happy path, but a lot of his error handling is failing due to lack of CORS headers.

He needs a way to customize the error responses coming from API Gateway to add CORS headers.

# Customizing Your API: Gateway Responses

## Gateway responses

Allows customization of various error responses

- Change HTTP status code
- Modify body content
- Add headers

Can customize specific responses and/or modify default  
4XX/5XX

## Demo



Kinney, Bob

..... ↗

ComputerID: f45c89a374b5



Cancel

Secure | https://us-west-2.console.aws.amazon.com/apigateway/home?region=us-west-2#apis

API Gateway

Inbox - reinvent2017.svr307@...

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Services Resource Groups

Amazon API Gateway APIs

Reinvent2017

Usage Plans

API Keys

Custom Domain Names

Client Certificates

Settings

+ Create API

Reinvent2017

Created on 11/07/2017

No description.

Endpoint Configuration

Endpoint Type Edge Optimized

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Secure | https://us-west-2.console.aws.amazon.com/apigateway/home?region=us-west-2#apis/sbp1tkffq1/resources/kzxf12k52

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Show all hints

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Custom Domain Names

Client Certificates

Settings

Actions

/ Methods

GET

arn:aws:lambda:us-west-2:099174454562:function...

Authorization None

API Key Not required

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Secure | https://us-west-2.console.aws.amazon.com/apigateway/home?region=us-west-2#/apis/sbp1tkffq1/gateway-responses

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Services Resource Groups

Amazon API Gateway APIs > Reinvent2017 (sbp1tkffq1) > Gateway Responses Show all hints ?

**APIs**

Reinvent2017 Resources Stages Authorizers **Gateway Responses** Models Documentation Binary Support Dashboard Usage Plans API Keys Custom Domain Names Client Certificates Settings

**Gateway Responses**

Gateway Responses are responses triggered if something prevents a request from reaching the integration. Customizing them here will effect all errors of that type for the entire API.

For changes here to have effect, you must deploy your API.

- ▶ Default 4XX
- ▶ Default 5XX
- ▶ Access Denied (403) default setting
- ▶ API Configuration Error (500) default setting
- ▶ Authorizer Configuration Error (500) default setting
- ▶ Authorizer Failure (500) default setting
- ▶ Bad Request Body (400) default setting
- ▶ Bad Request Parameters (400) default setting

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We simply want to add CORS headers to all our error messages and so we need to override all our default 4xx and 5xx responses to do this.

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Notation

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ICP — 643832315590, 021878734477, 022334672126, 022471753906, 022078981708, 243740407517, 850044916194, 931196422807, 020501920863, 850998114841, 925717840731, 85055697052...	Nov 20, 2017
Krishanu — Q: Familiarity with AWS? A: Mostly just for personal projects. FuQ: What services are you've used A: Node.js hosting on AWS Q: Tell me about yourself A: Cognitive Solutions. Start up consulting services W...	Nov 10, 2017
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**Access-Control-Allow-Methods** GET, OPTIONS, PUT, POST, PATCH, DELETE  
**Access-Control-Allow-Headers** Content-Type,X-Amz-Date,Authorization,X-Api-Key,X-Amz-Security-Token  
**Access-Control-Allow-Origin**\*

```
arnaws:logs:us-west-2:099174454562:log-group:API-Gateway-Access-Logs
WWW-Authenticate 'Basic'

aws lambda remove-permission --function-name reinventEcho --statement-id wildcard-pdx
aws lambda add-permission --function-name reinventEcho --statement-id wildcard-pdx --action lambda:invokeFunction --principal apigateway.amazonaws.com --source-arn arn:aws:execute-api:us-west-2:099174454562:/GET/
```

APIs > Reinvent2017 (sbp1tkffq1) > Gateway Responses

**Gateway Responses**

Gateway Responses are responses triggered if something prevents a request from reaching the integration. Customizing them here will effect all errors of that type for the entire API.

For changes here to have effect, you must deploy your API.

**Status Code**: 200

**Response Headers**: Access-Control-Allow-Methods: static value or some.variable

**Body Mapping Templates**

Content Type: application/json

Body Mapping Template: {"message": \$context.error.messageString}

Add Body Mapping Template +

Cancel Reset Save

We add our headers as above for CORS

Notational Velocity

Title: re-invent

Content:

ICP — 643832315590, 021878734477, 022334672126, 022471753908, 022078981708, 243740407517, 850044916194, 931196422807, 020501920863, 850998114641, 925717840731, 85055607052...  
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 Date Modified  
 Nov 20, 2017  
 Nov 10, 2017  
 Nov 3, 2017,  
 Nov 2, 2017,  
 Nov 1, 2017,  
 Oct 31, 2017,  
 Oct 31, 2017,

Access-Control-Allow-Methods: GET, OPTIONS, PUT, POST, PATCH, DELETE  
 Access-Control-Allow-Headers: Content-Type,X-Amz-Date,Authorization,X-Api-Key,X-Amz-Security-Token  
 Access-Control-Allow-Origin: \*

```
arn:aws:logs:us-west-2:099174454562:log-group:API-Gateway-Access-Logs
WWW-Authenticate: Basic'

aws lambda remove-permission --function-name reinventEcho --statement-id wildcard-pdx
aws lambda add-permission --function-name reinventEcho --statement-id wildcard-pdx --action lambda.invokeFunction --principal apigateway.amazonaws.com --source-arn arn:aws:execute-api:us-west-2:099174454562:/GET/*
```

Then we add the messages too

Screenshot of the AWS API Gateway console showing the configuration of a gateway response for an API named "Reinvent2017".

**APIs** > Reinvent2017 (sbp1tkffq1) > Gateway Responses

**Gateway Responses**

Gateway Responses are responses triggered if something prevents a request from reaching the integration. Customizing them here will effect all errors of that type for the entire API.

For changes here to have effect, you must deploy your API.

**Status Code**: Default 4XX (unchecked)

**Response Headers**: Access-Control-Allow-Methods: PUT, POST, PATCH, DELETE

**Body Mapping Templates**

- Content Type**: application/json
- Body Mapping Template**: {"message":\$context.error.messageString}

**Default 5XX**

**Cancel** **Reset** **Save**

**Feedback** **English (US)**

**Notational Velocity** **Note** **Edit** **View** **Bookmarks** **Format** **Window** **Help**

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**Title**

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**Access-Control-Allow-Methods**: GET, OPTIONS, PUT, POST, PATCH, DELETE

**Access-Control-Allow-Headers**: Content-Type,X-Amz-Date,Authorization,X-Api-Key,X-Amz-Security-Token

**Access-Control-Allow-Origin**\*

arn:aws:logs:us-west-2:099174454562:log-group:API-Gateway-Access-Logs

WWW-Authenticate Basic'

```
aws lambda remove-permission --function-name reinventEcho --statement-id wildcard-pdx
aws lambda add-permission --function-name reinventEcho --statement-id wildcard-pdx --action lambda:invokeFunction --principal apigateway.amazonaws.com --source-arn arn:aws:execute-api:us-west-2:099174454562:/*/*GET/*
```

We then add our access control headers too

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Secure | https://us-west-2.console.aws.amazon.com/apigateway/home?region=us-west-2#/apis/sbp1tkffq1/gateway-responses

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Custom Domain Names

Client Certificates

Feedback English (US)

Gateway Responses

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For changes here to have effect, you must deploy your API.

Default 4XX *unused*

Status Code

Body Mapping Templates *0*

Content Type application/json

Body Mapping Template {"message":\${context.error.messageString})

Response Headers *0*

Access-Control-Allow-Methods : 'GET, OPTIONS, PUT, POST, PATCH, DELETE'

Access-Control-Allow-Headers : 'Content-Type,X-Amz-Date,Authorization,X-Api-Key,X-Amz-Security-Token'

Add Header +

Default 5XX

Cancel Save

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Access-Control-Allow-Origin \*

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Amazon API Gateway APIs > Reinvent2017 (sbp1tkffq1) > Gateway Responses

Bob Kinney Oregon Support

## Gateway Responses

Gateway Responses are responses triggered if something prevents a request from reaching the integration. Customizing them here will effect all errors of that type for the entire API.

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Default 4XX *unsaved*

<b>Status Code</b> <i>400</i>	<b>Body Mapping Templates</b>
<input type="text"/>	Content Type application/json
<b>Response Headers</b>	Body Mapping Template
Access-Control-Allow-Methods : 'GET, OPTIONS, PUT, POST, PATCH, DELETE'	{ "message": \${context.error.messageString} }
Access-Control-Allow-Headers : 'x-Api-Key,X-Amz-Security-Token'	
<a href="#">Add Header +</a>	

Add Body Mapping Template +

Cancel Save

Default 5XX

Feedback English (US)

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Access-Control-Allow-Methods GET, OPTIONS, PUT, POST, PATCH, DELETE

Access-Control-Allow-Headers 'Content-Type,X-Amz-Date,Authorization,X-Api-Key,X-Amz-Security-Token'

Access-Control-Allow-Origin \*

arn:aws:logs:us-west-2:099174454562:log-group:API-Gateway-Access-Logs

WWW-Authenticate 'Basic'

aws lambda remove-permission --function-name reinventEcho --statement-id wildcard-pdx

aws lambda add-permission --function-name reinventEcho --statement-id wildcard-pdx --action lambda:invokeFunction --principal [apigateway.amazonaws.com](https://apigateway.amazonaws.com) --source-arn arn:aws:execute-api:us-west-2:099174454562:/\*/\*/GET/\*

Feedback English (US)

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APIs > Reinvent2017 (sbp1tkffq1) > Gateway Responses

**Gateway Responses**

Gateway Responses are responses triggered if something prevents a request from reaching the integration. Customizing them here will effect all errors of that type for the entire API.

For changes here to have effect, you must deploy your API.

**Default 4XX** *unsaved*

**Status Code**

**Body Mapping Templates**

Content Type: application/json  
Body Mapping Template: {"message":\$context.error.messageString}

**Response Headers**

- Access-Control-Allow-Methods: 'GET, OPTIONS, PUT, POST, PATCH'
- Access-Control-Allow-Headers: 'Content-Type,X-Amz-Date,Authorization,X-AMZ-Security-Token'
- Access-Control-Allow-Origin: '\*' [Add Header +](#)

**Default 5XX**

**Content Type** application/json

**Body Mapping Template** {"message":\$context.error.messageString}

[Add Body Mapping Template +](#)

[Cancel](#) [Reset](#) [Save](#)

We then add our origin. We can also lock this down to a specific domain like [www.ssceexams.com](http://www.ssceexams.com) instead of using the generic \* as above

APIs > Reinvent2017 (sbp1tkffq1) > Gateway Responses

**Default 4XX**

**Content Type** application/json

**Body Mapping Template** {"message":\$context.error.messageString}

**Response Headers**

- Access-Control-Allow-Methods: 'GET, OPTIONS, PUT, POST, PATCH'
- Access-Control-Allow-Headers: 'Content-Type,X-Amz-Date,Authorization,X-AMZ-Security-Token'
- Access-Control-Allow-Origin: '\*' [Add Header +](#)

**Access Denied | 403**

**Content Type** application/json

**Body Mapping Template** {"message":\$context.error.messageString}

**API Configuration Error | 500**

**Content Type** application/json

**Body Mapping Template** {"message":\$context.error.messageString}

**Authorizer Configuration Error | 500**

**Content Type** application/json

**Body Mapping Template** {"message":\$context.error.messageString}

**Authorizer Failure | 500**

**Content Type** application/json

**Body Mapping Template** {"message":\$context.error.messageString}

[Cancel](#) [Reset](#) [Save](#)

**Default 5XX**

**Content Type** application/json

**Body Mapping Template** {"message":\$context.error.messageString}

[Add Body Mapping Template +](#)

[Cancel](#) [Reset](#) [Save](#)

**Access Denied | 403**

**Content Type** application/json

**Body Mapping Template** {"message":\$context.error.messageString}

[Add Body Mapping Template +](#)

[Cancel](#) [Reset](#) [Save](#)

**API Configuration Error | 500**

**Content Type** application/json

**Body Mapping Template** {"message":\$context.error.messageString}

[Add Body Mapping Template +](#)

[Cancel](#) [Reset](#) [Save](#)

**Authorizer Configuration Error | 500**

**Content Type** application/json

**Body Mapping Template** {"message":\$context.error.messageString}

[Add Body Mapping Template +](#)

[Cancel](#) [Reset](#) [Save](#)

**Authorizer Failure | 500**

**Content Type** application/json

**Body Mapping Template** {"message":\$context.error.messageString}

[Add Body Mapping Template +](#)

[Cancel](#) [Reset](#) [Save](#)

Now we can additionally go ahead and update the error message to be displayed as above

The screenshot shows the AWS API Gateway console. On the left, a sidebar lists various API management features like APIs, Resources, Stages, Authorizers, and Gateway Responses. The 'Gateway Responses' section is currently selected. In the main content area, a modal window is open for configuring a gateway response. It has sections for 'Response Headers' (with fields for Access-Control-Allow-Methods, Access-Control-Allow-Headers, and Access-Control-Allow-Origin) and 'Body Mapping Template' (containing the JSON message: {"message": "These aren't the droids you're looking for."}). Below the modal, a list of standard error responses is shown, each with a 'default setting' link. At the bottom right of the modal is a 'Save' button.

We then click the Save button to update our API Gateway response for 4xx and 5xx errors. This will save it into the API Gateway service, we still need to deploy these changes as below

The screenshot shows the AWS API Gateway console. The left sidebar is identical to the previous one. In the main area, the user is navigating through an API named 'Reinvent2017'. They have selected a resource path and are viewing its methods. A context menu is open over one of the method entries, specifically for a 'GET' method under the '/auth' resource. The menu options include 'Create Method', 'Create Resource', 'Enable CORS', 'Edit Resource Documentation', 'Deploy API' (which is highlighted with a mouse cursor), 'Import API', 'Edit API Documentation', and 'Delete API'. The URL in the browser bar is https://us-west-2.console.aws.amazon.com/apigateway/home?region=us-west-2#/apis/sbp1tkffq1/resources/kzxf12k52.

Chrome FILE EDIT View History Bookmarks People Window Help

Inbox - reinvent2017.srv307@...

Secure | https://us-west-2.console.aws.amazon.com/apigateway/home?region=us-west-2#/apis/sbp1tkffq1/resources/kzxf1t2k52

Apps Customer Information OnCall K2 Dashboard Runbook ES Dashboard Fleet Management C... Drive https://w.amazon.co... API Gateway Wiki

AWS Services Resource Groups

Amazon API Gateway APIs > Reinvent2017 [sbp1tkffq1]

APIs Resources Actions

Reinvent2017

Resources

Stages

Authorizers

Gateway Responses

Models

Documentation

Binary Support

Dashboard

Usage Plans

API Keys

Custom Domain Names

Client Certificates

Settings

Feedback English (US)

Show all hints ?

Deploy API

Choose a stage where your API will be deployed. For example, a test version of your API could be deployed to a stage named beta.

Deployment stage: prod

Deployment description:

Cancel Deploy

Chrome FILE EDIT VIEW HISTORY BOOKMARKS PEOPLE WINDOW HELP

Inbox - reinvent2017.srv307@...

Secure | https://us-west-2.console.aws.amazon.com/apigateway/home?region=us-west-2#/apis/sbp1tkffq1/stages/prod

Apps Customer Information OnCall K2 Dashboard Runbook ES Dashboard Fleet Management C... Drive https://w.amazon.co... API Gateway Wiki

AWS Services Resource Groups

Amazon API Gateway APIs > Reinvent2017 [sbp1tkffq1] > Stages > prod

APIs Stages Create Delete Stage

Reinvent2017

Resources

Stages

Authorizers

Gateway Responses

Models

Documentation

Binary Support

Dashboard

Usage Plans

API Keys

Custom Domain Names

Client Certificates

Settings

Feedback English (US)

Show all hints ?

prod Stage Editor

Invoke URL: https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod

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

Configure the metering and caching settings for the prod 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 account level throttling rate is 10000 requests per second with a burst of 5000 requests.

Enable throttling

Client Certificate

Select the client certificate that API Gateway will use to call your integration endpoints in this stage.

Certificate: None

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```

{
  "statusCode": 200,
  "headers": {},
  "body": {
    "body-json": {},
    "params": {
      "path": {},
      "querystring": {}
    },
    "header": {
      "Accept": "text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,image/apng,*/*;q=0.8",
      "Accept-Encoding": "gzip, deflate, br",
      "Accept-Language": "en-US,en;q=0.9",
      "CloudFront-Forwarded-Proto": "https",
      "CloudFront-Is-Desktop-Viewer": "true",
      "CloudFront-Is-Mobile-Viewer": "false",
      "CloudFront-Is-SmartTV-Viewer": "false",
      "CloudFront-Is-Tablet-Viewer": "false",
      "CloudFront-Viewer-Country": "US",
      "Host": "sbp1tkffq1.execute-api.us-west-2.amazonaws.com",
      "Referer": "https://us-west-2.console.aws.amazon.com/apigateway/home?region=us-west-2",
      "Upgrade-Insecure-Requests": "1",
      "User-Agent": "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_11_6) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/62.0.3202.94 Safari/537.36"
    }
  }
}

```

Using the API Gateway endpoint, we can see what a 200 response looks like with some actual values as above.

```

{
  "statusCode": 200,
  "headers": {},
  "body": {
    "body-json": {},
    "params": {
      "path": {},
      "querystring": {}
    },
    "header": {
      "Accept": "text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,image/apng,*/*;q=0.8",
      "Accept-Encoding": "gzip, deflate, br",
      "Accept-Language": "en-US,en;q=0.9",
      "CloudFront-Forwarded-Proto": "https",
      "CloudFront-Is-Desktop-Viewer": "true",
      "CloudFront-Is-Mobile-Viewer": "false",
      "CloudFront-Is-SmartTV-Viewer": "false",
      "CloudFront-Is-Tablet-Viewer": "false",
      "CloudFront-Viewer-Country": "US",
      "Host": "sbp1tkffq1.execute-api.us-west-2.amazonaws.com",
      "Referer": "https://us-west-2.console.aws.amazon.com/apigateway/home?region=us-west-2",
      "Upgrade-Insecure-Requests": "1",
      "User-Agent": "Mozilla/5.0 (Macintosh; Intel Mac OS X 10_11_6) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/62.0.3202.94 Safari/537.36"
    }
  }
}

```

We can use a path that is not mapped in our API Gateway to test the error message for 4xx and 5xx as above. We can see that we are getting back our custom error message

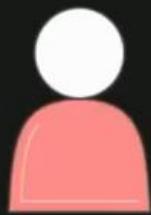
```

f45c89a374b5:gatling-charts-highcharts-bundle-2.3.0 bkinney$ curl -v https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod/foo
* Trying 52.84.64.129...
* Connected to sbp1tkffq1.execute-api.us-west-2.amazonaws.com (52.84.64.129) port 443 (#0)
* TLS 1.2 connection using TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256
* Server certificate: * execute-api.us-west-2.amazonaws.com
* Server certificate: Symantec Class 3 Secure Server CA - G4
* Server certificate: VeriSign Class 3 Public Primary Certification Authority - G5
> GET /prod/foo HTTP/1.1
> Host: sbp1tkffq1.execute-api.us-west-2.amazonaws.com
> User-Agent: curl/7.43.0
> Accept: */*
>
< HTTP/1.1 403 Forbidden
< Content-Type: application/json
< Content-Length: 56
< Connection: keep-alive
< Date: Wed, 29 Nov 2017 03:11:07 GMT
< x-amzn-RequestId: f178c3e6-d4b2-11e7-85dc-617305d61675
< Access-Control-Allow-Origin: *
< Access-Control-Allow-Headers: Content-Type,X-Amz-Date,Authorization,X-Api-Key,X-Amz-Security-Token
< x-amzn-ErrorType: MissingAuthenticationTokenException
< Access-Control-Allow-Methods: GET,OPTIONS, PUT, POST, PATCH, DELETE
< X-Cache: Error from cloudfront
< Via: 1.1 e200c7b587a33b4fb196671e961b895c.cloudfront.net (CloudFront)
< X-Amz-Cf-Id: mnldsXn0lzzg0nY3PCpgM6E4emt0_ybZlpnqB8iV-hLX2Mt5E5lg==
<
* Connection #0 to host sbp1tkffq1.execute-api.us-west-2.amazonaws.com left intact
{"message":"These aren't the droids you're looking for."}f45c89a374b5:gatling-charts-highcharts-bundle-2.3.0 bkinney$ 

```

Using curl, we can also see that we are also getting our CORS headers that we set earlier. This shows us how to customize the error responses for all the error cases for our API Gateway.

## Check in with Doug



Doug now has a functional web app to go along with his native mobile applications and is ready to release his app to the world.

Now that Doug is able to get CORS working with custom error handling, he is able to build his JS web app and ready to go live

## First reviews of TAMPR



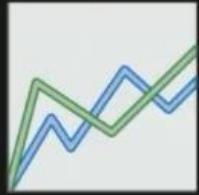
*"I want to love this app, but every time I try to check-in with my morning coffee, I get errors."*

*"The app works great if I'm getting an afternoon coffee, but during the mornings it's almost unusable."*

*"Too many errors, it never seems to work."*

## Monitoring Your API: Amazon CloudWatch Metrics

## Amazon CloudWatch Metrics



API Gateway Default metrics set

Count—total number of invokes received by API Gateway

4XXError—number of invokes that generated a 4XX error  
(includes throttling)

5XXError—number of invokes that generated a 5XX error

Latency—total time API Gateway took to fully process request

IntegrationLatency—time API Gateway took to call integration

CacheHitCount—number of successful cache fetches

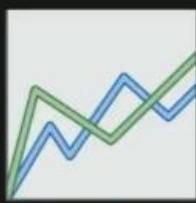
CacheMissCount—number of unsuccessful cache fetches

## Amazon CloudWatch Metrics

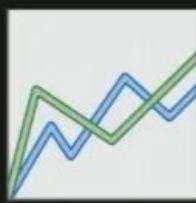
Detailed metrics

Same set of metrics at method level

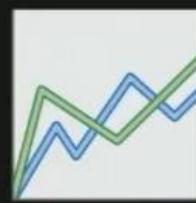
Can be enabled globally or only for specific methods



GET



PUT



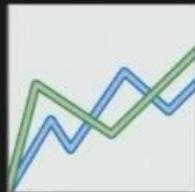
DELETE

## Amazon CloudWatch Metrics

### Default Metrics

Included for free

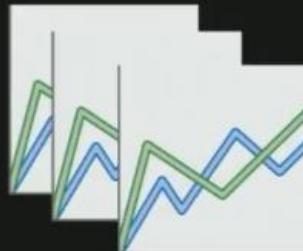
Broken down by API stage



### Detailed Metrics

Standard CloudWatch pricing

Broken down by method



## Amazon CloudWatch Alarms

Any metric can be tied to an alarm

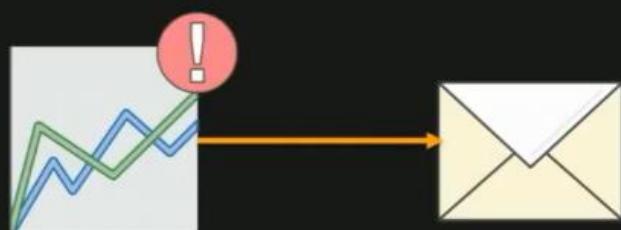
Alarm notifications can be sent to Amazon SNS topic

SNS topic can then send to any number of destinations

E-mail address

SQS queue

Lambda Function



Once we have metrics, then we are able to set alarms on those metrics.

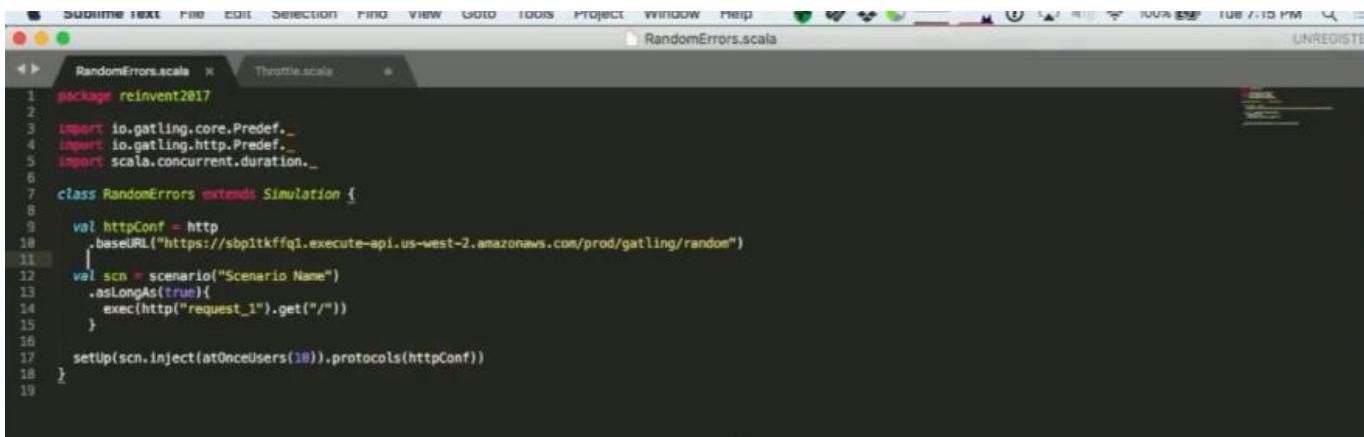
## Demo

Let us now see how we can set up some alarms based on our CloudWatch metrics.

The screenshot shows the AWS API Gateway interface. On the left, a sidebar lists various API-related services like APIs, Stages, Resources, and Documentation. The main area is titled "prod Stage Editor" and contains tabs for Settings, Logs, Stage Variables, SDK Generation, Export, Deployment History, Documentation History, and Canary. Under the Settings tab, there are sections for Cache Settings (with an "Enable API cache" button), Default Method Throttling (with an "Enable throttling" button), and Client Certificate (with a "Certificate" dropdown set to "None"). A note states that the current account level throttling rate is 10000 requests per second with a burst of 5000 requests.

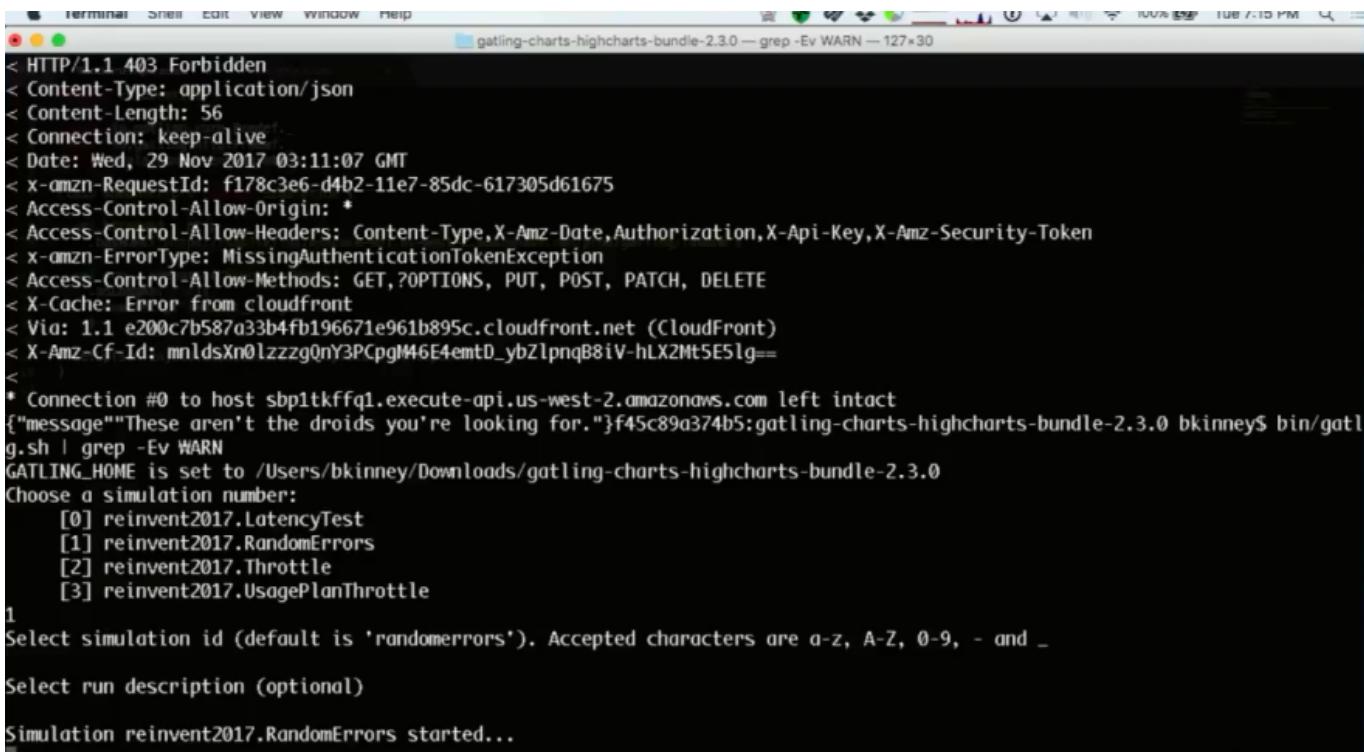
We still have our API Gateway as above

The screenshot shows the AWS API Gateway interface. The left sidebar is identical to the previous screenshot. The main area is titled "/ Methods" and shows a list of methods for a specific resource. One method is highlighted: "arn:aws:lambda:us-west-2:099174454562:function:...". It is a "GET" method under the "/auth" endpoint. The "Authorization" field is set to "None" and "API Key" is noted as "Not required".



```
RandomErrors.scala  Throttle.scala
1 package reinvent2017
2
3 import io.gatling.core.Predef._
4 import io.gatling.http.Predef._
5 import scala.concurrent.duration._
6
7 class RandomErrors extends Simulation {
8
9   val httpConf = http
10    .baseUrl("https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod/gatling/random")
11    [
12      val scn = scenario("Scenario Name")
13        .asLongAs(true){
14          exec(http("request_1").get("/"))
15        }
16    }
17    setUp(scn.inject(atOnceUsers(10)).protocols(httpConf))
18  }
19
```

We can use a tool called Gatlin to generate some traffic to our API. This will hit a particular lambda function that will generate different error messages



```
Terminal Shell Edit View Window Help gatling-charts-highcharts-bundle-2.3.0 — grep -Ev WARN — 127×30
< HTTP/1.1 403 Forbidden
< Content-Type: application/json
< Content-Length: 56
< Connection: keep-alive
< Date: Wed, 29 Nov 2017 03:11:07 GMT
< x-amzn-RequestId: f178c3e6-d4b2-11e7-85dc-617305d61675
< Access-Control-Allow-Origin: *
< Access-Control-Allow-Headers: Content-Type,X-Amz-Date,Authorization,X-Api-Key,X-Amz-Security-Token
< x-amzn-ErrorType: MissingAuthenticationTokenException
< Access-Control-Allow-Methods: GET,OPTIONS, PUT, POST, PATCH, DELETE
< X-Cache: Error from cloudfront
< Via: 1.1 e200c7b587a33b4fb196671e961b895c.cloudfront.net (CloudFront)
< X-Amz-Cf-Id: mnldsXn0lzzgQnY3PCpgM46E4emtD_ybZlpnqB8iV-hLX2Mt5E5lg==
<
* Connection #0 to host sbp1tkffq1.execute-api.us-west-2.amazonaws.com left intact
{"message":"These aren't the droids you're looking for."}f45c89a374b5:gatling-charts-highcharts-bundle-2.3.0 bkinney$ bin/gatling.sh | grep -Ev WARN
GATLING_HOME is set to /Users/bkinney/Downloads/gatling-charts-highcharts-bundle-2.3.0
Choose a simulation number:
[0] reinvent2017.LatencyTest
[1] reinvent2017.RandomErrors
[2] reinvent2017.Throttle
[3] reinvent2017.UsagePlanThrottle
1
Select simulation id (default is 'randomerrors'). Accepted characters are a-z, A-Z, 0-9, - and _
Select run description (optional)
Simulation reinvent2017.RandomErrors started...
```

```
Terminal Shell Edit View Window Help gatling-charts-highcharts-bundle-2.3.0 — grep -Ev WARN — 127×30
{"message":"These aren't the droids you're looking for."}f45c89a374b5:gatling-charts-highcharts-bundle-2.3.0 bkinney$ bin/gatling.sh | grep -Ev WARN
GATLING_HOME is set to /Users/bkinney/Downloads/gatling-charts-highcharts-bundle-2.3.0
Choose a simulation number:
[0] reinvent2017.LatencyTest
[1] reinvent2017.RandomErrors
[2] reinvent2017.Throttle
[3] reinvent2017.UsagePlanThrottle
1
Select simulation id (default is 'randomerrors'). Accepted characters are a-z, A-Z, 0-9, - and _.
Select run description (optional).
Simulation reinvent2017.RandomErrors started...

2017-11-28 19:15:54                                     5s elapsed
---- Requests
> Global                                         (OK=0      KO=181   )
> request_1                                      (OK=0      KO=181   )
---- Errors
> status.find.in(200,304,201,202,203,204,205,206,207,208,209), b    181 (100.0%)
ut actually found 500

---- Scenario Name -----
[-----] 0%
    waiting: 0      / active: 10      / done:0
=====
```

```
Terminal Shell Edit View Window Help gatling-charts-highcharts-bundle-2.3.0 — grep -Ev WARN — 127×30
2017-11-28 19:15:54                                     5s elapsed
---- Requests
> Global                                         (OK=0      KO=181   )
> request_1                                      (OK=0      KO=181   )
---- Errors
> status.find.in(200,304,201,202,203,204,205,206,207,208,209), b    181 (100.0%)
ut actually found 500

---- Scenario Name -----
[-----] 0%
    waiting: 0      / active: 10      / done:0
=====

2017-11-28 19:15:59                                     10s elapsed
---- Requests
> Global                                         (OK=0      KO=749   )
> request_1                                      (OK=0      KO=749   )
---- Errors
> status.find.in(200,304,201,202,203,204,205,206,207,208,209), b    749 (100.0%)
ut actually found 500

---- Scenario Name -----
[-----] 0%
    waiting: 0      / active: 10      / done:0
=====
```

CloudWatch Management Console https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/cloudwatch/home?region=us-west-2

Secure | https://us-west-2.console.aws.amazon.com/cloudwatch/home?region=us-west-2

CloudWatch Metrics

Metric Summary

Amazon CloudWatch monitors operational and performance metrics for your AWS cloud resources and applications. You currently have 144 CloudWatch metrics available in the US West (Oregon) region.

Browse or search your metrics to get started graphing data and creating alarms.

Browse Metrics Search Metrics

Additional Info

Getting Started Guide  
Monitoring Scripts Guide  
Overview and Features  
Documentation  
Forums  
Report an issue

Alarm Summary

You do not have any alarms created in the US West (Oregon) region. Alarms allow you to send notifications or execute AutoScaling actions in response to any CloudWatch metric.

You can now use Amazon CloudWatch alarms to monitor the estimated charges on your AWS bill and receive email alerts whenever charges exceed a threshold you define. Visit the CloudWatch US East (N. Virginia) region to manage your billing alarms.

Create Alarm Go to CloudWatch US East (N. Virginia) region

Service Health

Current Status Details

Amazon CloudWatch Service Service is operating normally

View complete service health details

Feedback English (US)

CloudWatch Management Console https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/cloudwatch/home?region=us-west-2#metricsV2:

Secure | https://us-west-2.console.aws.amazon.com/cloudwatch/home?region=us-west-2#metricsV2:

CloudWatch Metrics

Untitled graph

1h 3h 12h 1d 3d 1w custom Line Actions

Your CloudWatch graph is empty.  
Select some metrics to appear here.

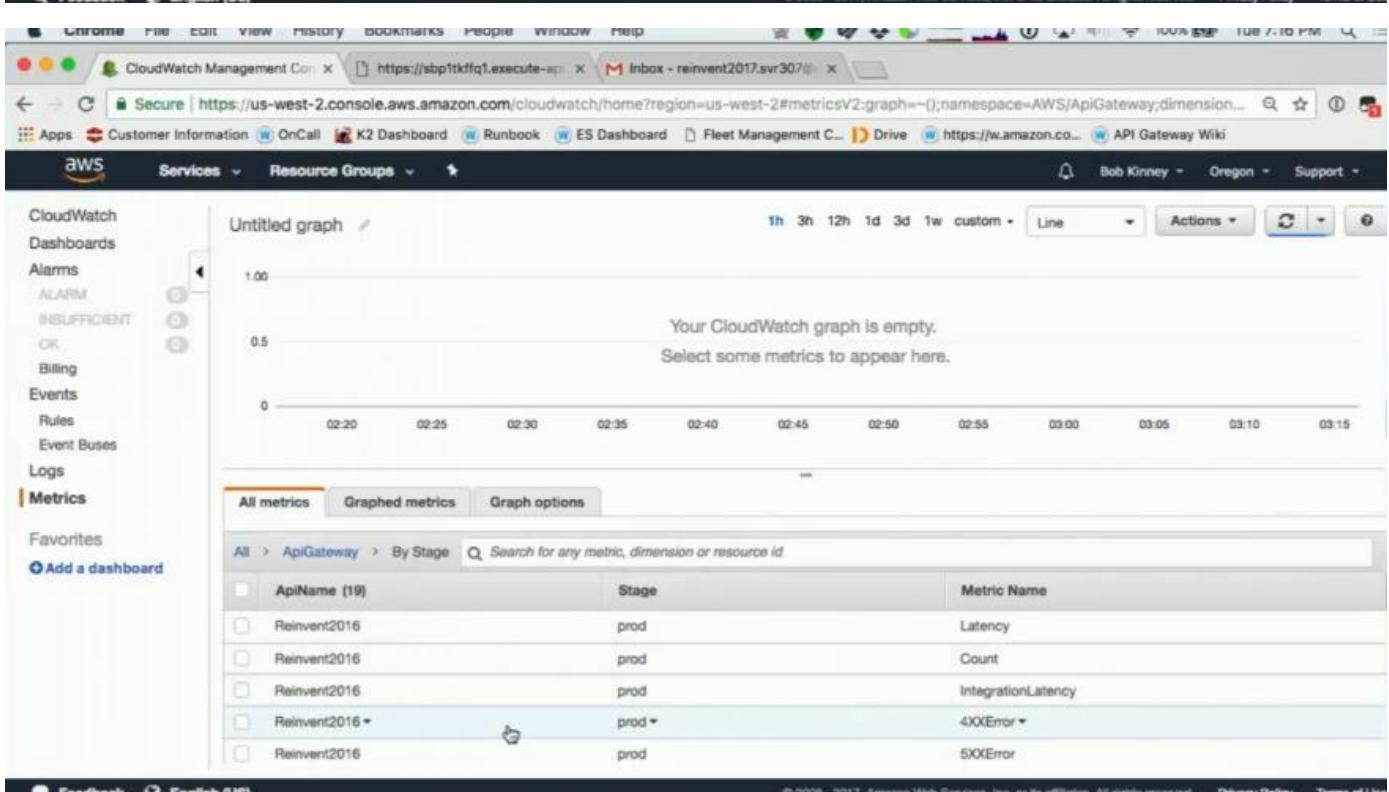
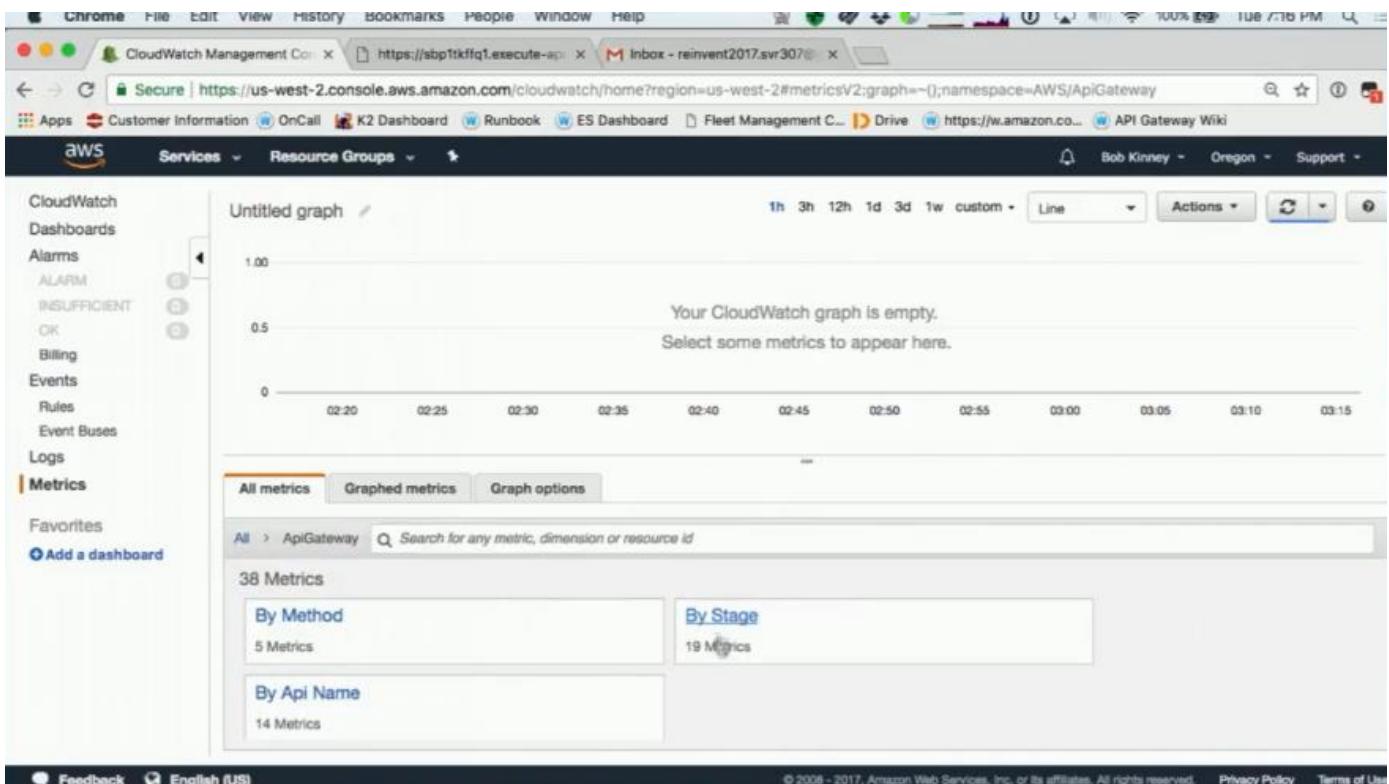
02:20 02:25 02:30 02:35 02:40 02:45 02:50 02:55 03:00 03:05 03:10 03:15

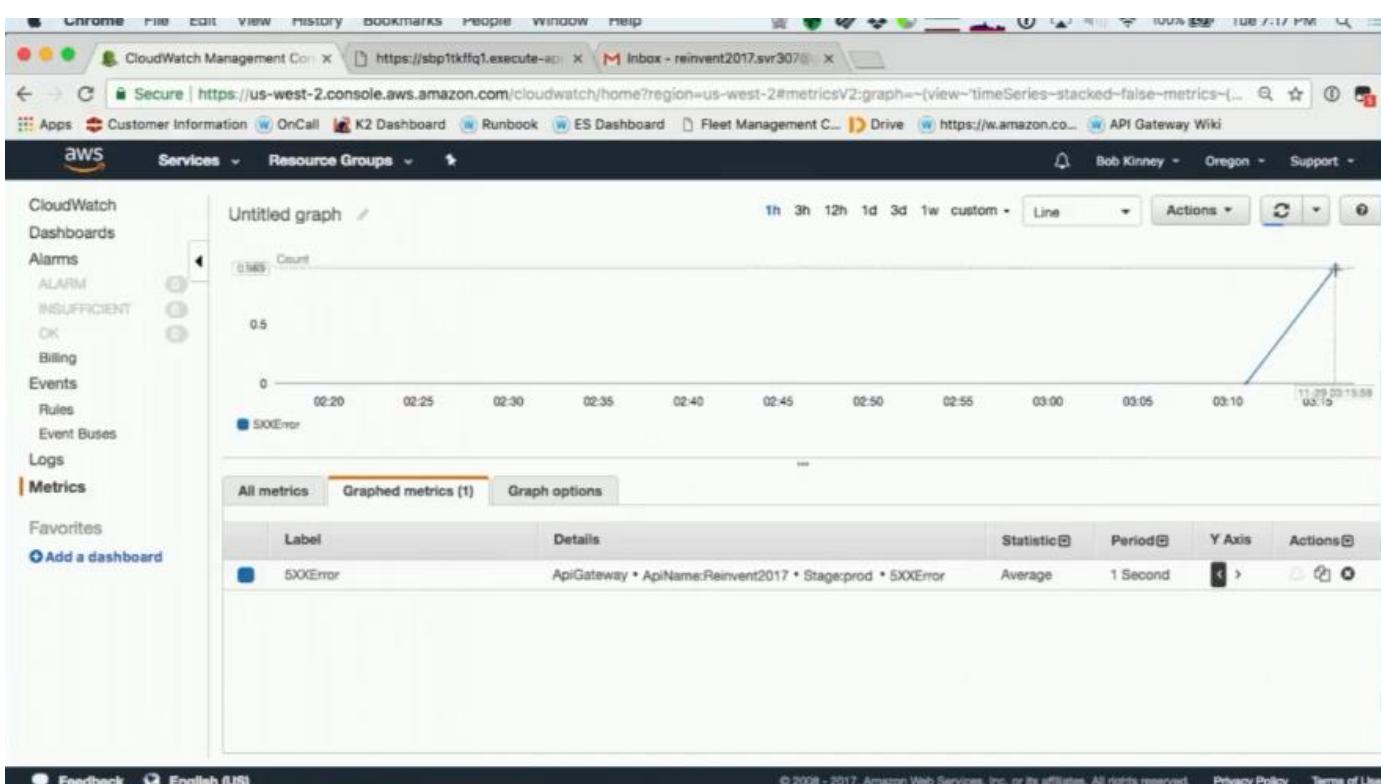
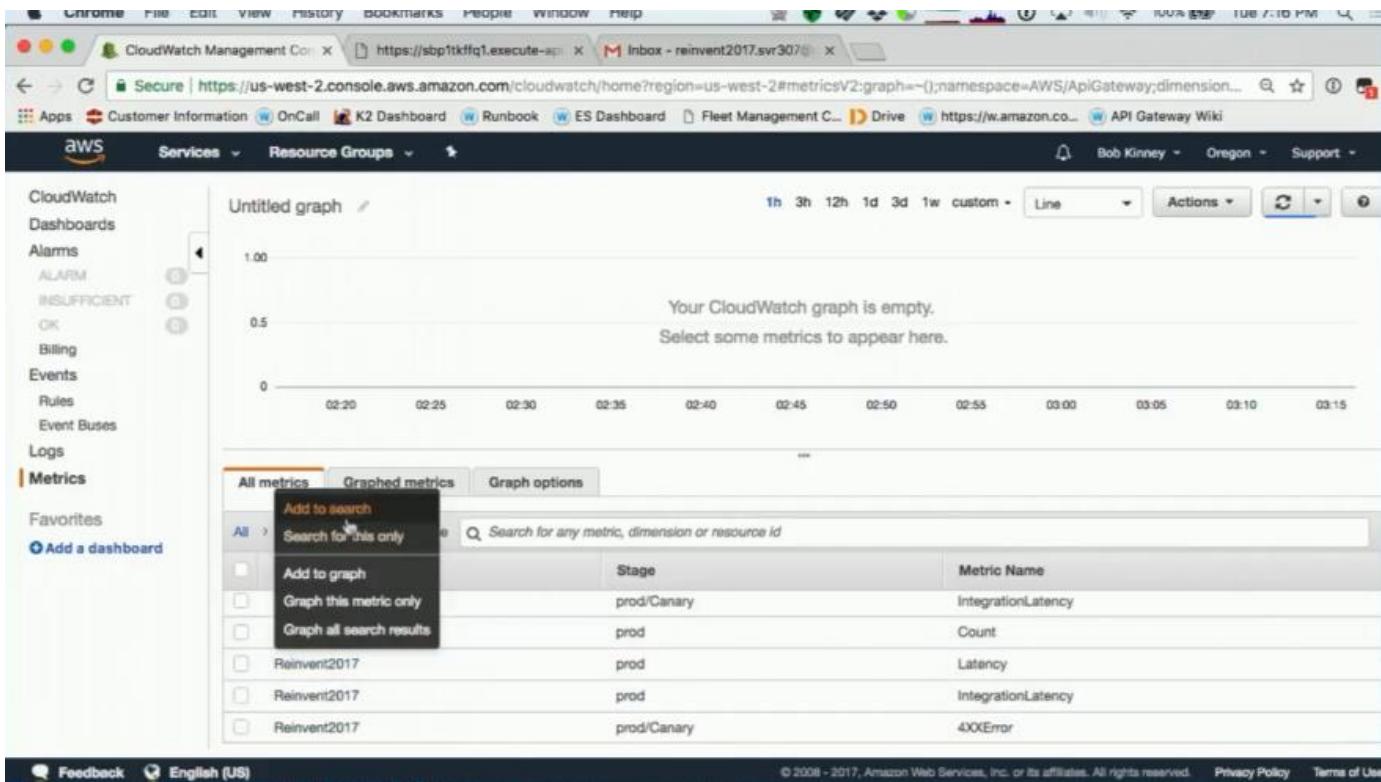
All metrics Graphed metrics Graph options

Search for any metric, dimension or resource id

144 Metrics

ApiGateway	DynamoDB	Lambda
38 Metrics	4 Metrics	36 Metrics
Logs	S3	SNS
18 Metrics	8 Metrics	8 Metrics





We can see the 500 error count as above. We can then set an alarm by clicking on the bell icon as below

Screenshot of the AWS CloudWatch Management Console showing the 'Create Alarm' wizard, step 2: Define Alarm.

**Alarm Threshold**

Provide the details and threshold for your alarm. Use the graph on the right to help set the appropriate threshold.

**Name:** 5XXError

**Description:** Whenever: 5XXError

**Whenever:** 5XXError  
is:  $\geq 0$   
for: 1 consecutive period(s)

**Additional settings**

Provide additional configuration for your alarm.

Treat missing data as: missing

**Actions**

Cancel Previous Next Create Alarm

**Alarm Preview**

This alarm will trigger when the blue line goes up to or above the red line for a duration of 1 minute.

5XXError  $\geq 0$

Namespace: AWS/ApiGateway  
Apiname: Reinvent2017  
Stage: prod  
Metric Name: 5XXError

Period: 1 Minute  
Statistic: Standard (Average)

Screenshot of the AWS CloudWatch Management Console showing the 'Create Alarm' wizard, step 2: Define Alarm.

**Alarm Threshold**

Provide the details and threshold for your alarm. Use the graph on the right to help set the appropriate threshold.

**Name:** High 5XX errors

**Description:**

**Whenever:** 5XXError  
is:  $\geq .05$   
for: 1 consecutive period(s)

**Additional settings**

Provide additional configuration for your alarm.

Treat missing data as: good (not breaching threshold), bad (breaching threshold), ignore (maintain the alarm state)

**Actions**

Cancel Previous Next Create Alarm

**Alarm Preview**

This alarm will trigger when the blue line goes up to or above the red line for a duration of 1 minute.

5XXError  $\geq 0.05$

1.25  
1  
0.75  
0.5  
0.25  
0

11/29 01:00 11/29 02:00 11/29 03:00

Namespace: AWS/ApiGateway  
Apiname: Reinvent2017  
Stage: prod  
Metric Name: 5XXError

Period: 1 Minute  
Statistic: Standard (Average)

We are going to create an alarm for getting 500 responses 50% of the calls within a duration

Screenshot of the AWS CloudWatch Management Console showing the 'Create Alarm' wizard. The current step is '2. Define Alarm'. The configuration includes:

- Metric:** 5XXError (greater than or equal to 0.05)
- For:** 1 consecutive period(s)
- Graph:** A line graph showing a sharp increase from 0 to approximately 0.25 over a one-minute period.
- Additional settings:** Namespace: AWS/APIGateway, ApiName: Reinvent2017, Stage: prod, Metric Name: 5XXError
- Actions:** Whenever this alarm: State is ALARM. Send notification to: reinvent2017@gmail.com

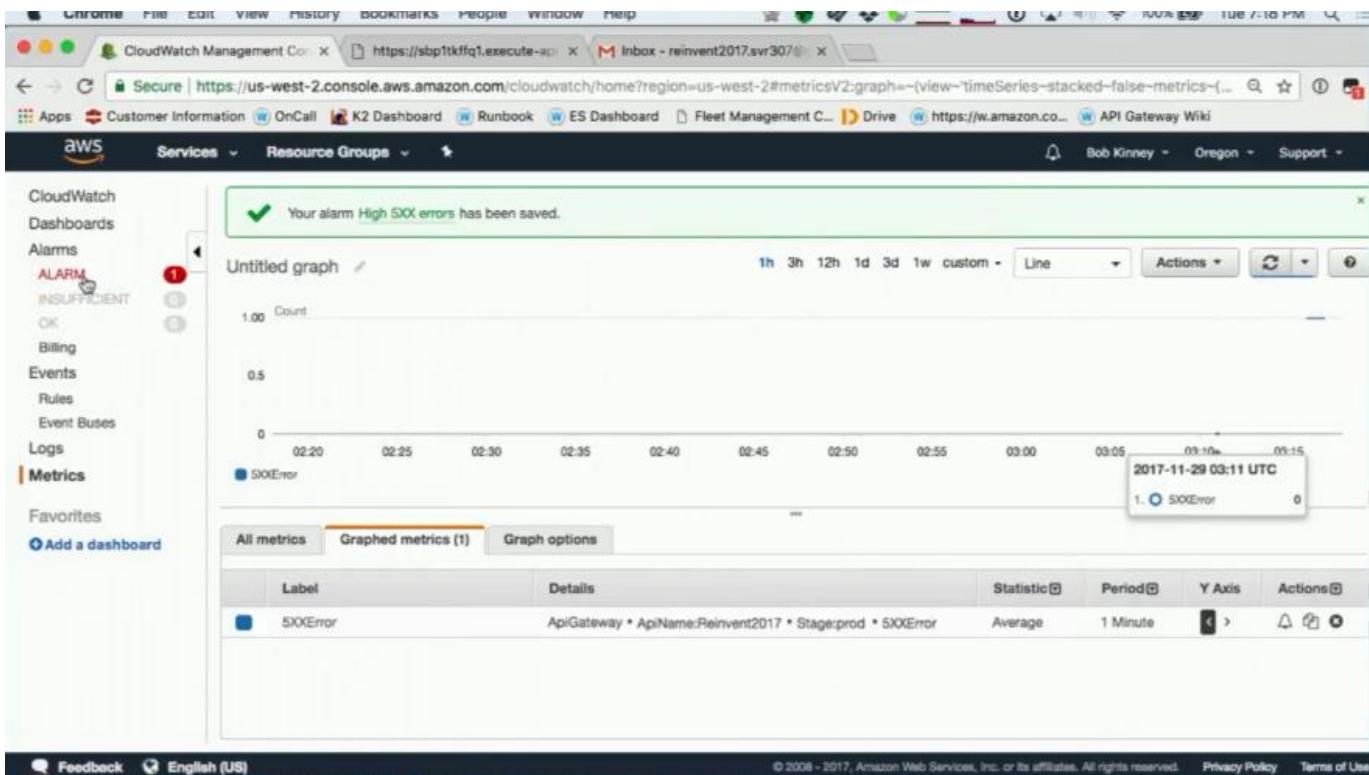
The 'Create Alarm' button is highlighted at the bottom right.

We then supply an email address to have the alarm notification sent to

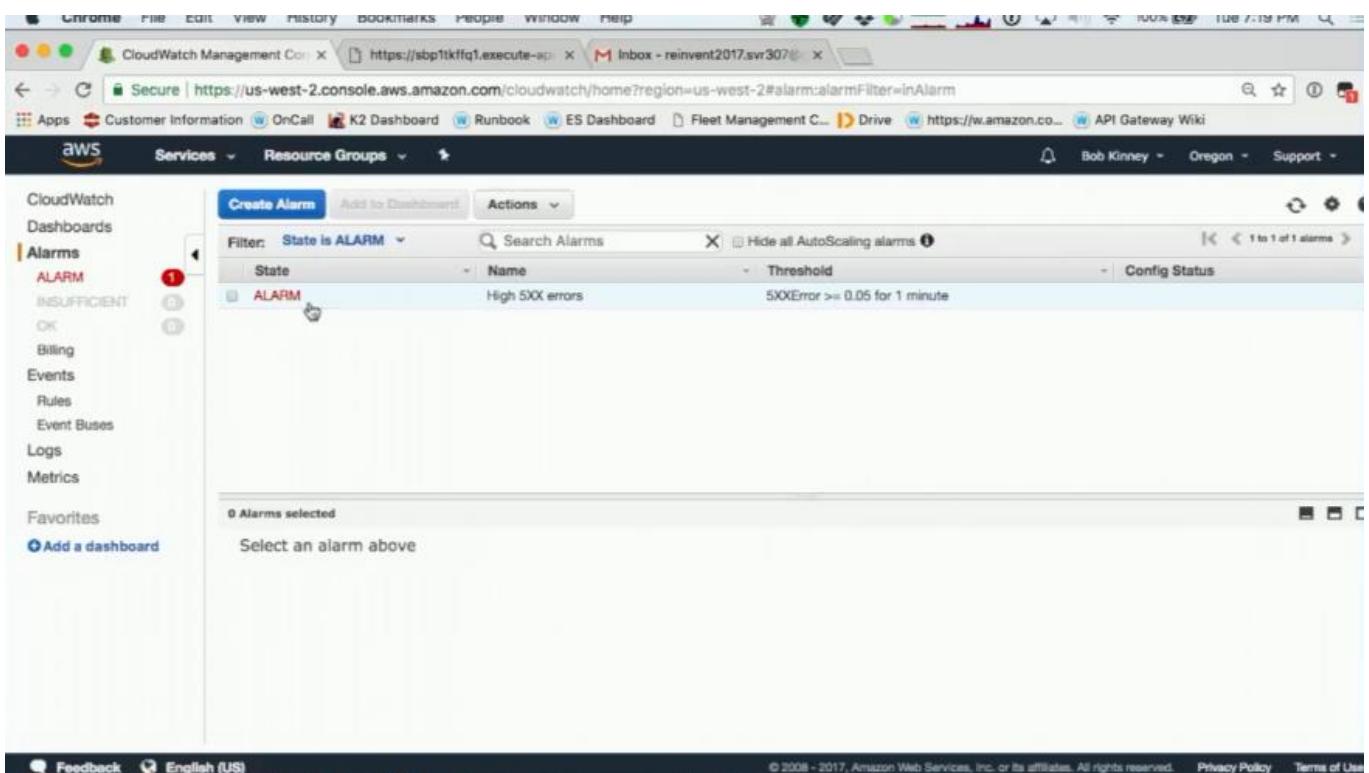
Screenshot of the AWS CloudWatch Metrics console showing the 'Untitled graph' for the 'High 5XX errors' alarm. The graph displays a single metric named '5XXError' with a value of 1.00. The graph options show:

- Graphed metrics: 1 (5XXError)
- Statistic: Average
- Period: 1 Minute
- Y Axis: Count

A success message at the top indicates: "Your alarm High 5XX errors has been saved."



We can then see an alarm and can check our email address.



We are now in an alarmed state

The screenshot shows a Gmail inbox with one unread email. The subject of the email is "ALARM: 'High 5XX errors' in US West (Oregon)". The email is from "AWS Notifications <no-reply@sns.amazonaws.com>" and was sent via "amazonse.ses.com" at 7:21 pm. The message body contains the following text:

You are receiving this email because your Amazon CloudWatch Alarm "High 5XX errors" in the US West (Oregon) region has entered the ALARM state, because "Threshold Crossed: 1 datapoint [1.0 (29/11/17 03:16:00)] was greater than or equal to the threshold (0.05)." at "Wednesday 29 November, 2017 03:17:54 UTC".

View this alarm in the AWS Management Console:  
<https://console.aws.amazon.com/cloudwatch/home?region=us-west-2&s=Alarms&alarm=High%205XX%20errors>

Alarm Details:

- Name: High 5XX errors
- Description: INSUFFICIENT\_DATA -> ALARM
- Reason for State Change: Threshold Crossed: 1 datapoint [1.0 (29/11/17 03:16:00)] was greater than or equal to the threshold (0.05).
- Timestamp: Wednesday 29 November, 2017 03:17:54 UTC
- AWS Account: 099174454562

Threshold:

- The alarm is in the ALARM state when the metric is GreaterThanOrEqualToThreshold 0.05 for 60 seconds.

No recent chats  
Start a new one

And we can see the email sent to us about the alarm from CloudWatch

The screenshot shows the same Gmail inbox as the previous one, but this time the email has been opened. The subject is "ALARM: 'High 5XX errors' in US West (Oregon)". The message body is identical to the one in the inbox, providing details about the alarm state change and how to view it in the AWS Management Console.

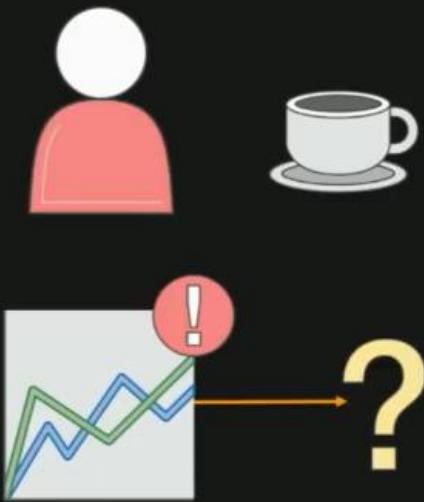
Below the message, there is a section titled "Monitored Metric:" which lists the following details:

- MetricNamespace: AWS/ApiGateway
- MetricName: 5XXError
- Dimensions: [ApiName = Reinvent2017] [Stage = prod]
- Period: 60 seconds
- Statistic: Average
- Unit: not specified

No recent chats  
Start a new one

# Demo

## Check in with Doug



Doug now has alarms to be alerted *when* his customers get errors calling his API, but how does he know *why* his customers get errors?

We now know when we are having problems in our APIs but we don't yet know why we are having those errors.

## Monitoring Your API: Amazon CloudWatch Logs

This talks about logging using Amazon CloudWatch Logs.

### Amazon CloudWatch Logs

#### API Gateway Logging

Two levels of logging, ERROR and INFO

Optionally log method request/body content

Set globally in stage, or override per method

#### API Gateway Access Logging NEW★

Customizable format for machine parsable logs

#### Lambda Logging

Logging directly from your code

Basic request information included

#### Log Pivots

Build metrics based on log filters

Jump to logs that generated metrics

```
5c9-11e7-8228-318bf0a162b7) Verifying Usage Plan for request: 59b1  
5c9-11e7-8228-318bf0a162b7) API Key authorized because method  
5c9-11e7-8228-318bf0a162b7) Usage Plan check succeeded for AP  
5c9-11e7-8228-318bf0a162b7) Starting execution for request: 59b1  
5c9-11e7-8228-318bf0a162b7) HTTP Method: GET, Resource Path:  
5c9-11e7-8228-318bf0a162b7) Method request path: {}  
5c9-11e7-8228-318bf0a162b7) Method request query string: {}  
5c9-11e7-8228-318bf0a162b7) Method request headers: {Accept=t  
5c9-11e7-8228-318bf0a162b7) Method request body before transfo  
5c9-11e7-8228-318bf0a162b7) Endpoint request URI: https://lambd  
5c9-11e7-8228-318bf0a162b7) Endpoint request headers: {x-amz-  
5c9-11e7-8228-318bf0a162b7) Endpoint request body after transfor  
5c9-11e7-8228-318bf0a162b7) Sending request to https://lambda.u  
5c9-11e7-8228-318bf0a162b7) Received response. Integration latenc  
5c9-11e7-8228-318bf0a162b7) Endpoint response body before trans  
5c9-11e7-8228-318bf0a162b7) Endpoint response headers: {x-amz-  
5c9-11e7-8228-318bf0a162b7) Method response body after transfo  
5c9-11e7-8228-318bf0a162b7) Method response headers: {X-Amzn  
5c9-11e7-8228-318bf0a162b7) Successfully completed execution  
5c9-11e7-8228-318bf0a162b7) Method completed with status: 200
```

API Gateway offers 2 basic logging types. **Logging logs** for the basic request/response, API transformation logging and **Access logs, Lambda Logs** for console.logs within your lambda functions.

# Demo

Let us now try to diagnose what exactly is going on with our API.

The screenshot shows the AWS API Gateway console in a web browser. The URL is <https://us-west-2.console.aws.amazon.com/apigateway/home?region=us-west-2#/apis>. The page displays a list of APIs under the 'APIs' section. A new API named 'Reinvent2017' is being created, as indicated by the modal window. The modal shows the following details:

- Created on 11/27/2017
- No description
- Endpoint Configuration
- Endpoint Type: Edge Optimized

The browser's address bar shows the URL <https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/>.

The screenshot shows the AWS API Gateway console with the path <https://us-west-2.console.aws.amazon.com/apigateway/home?region=us-west-2#/apis/sbp1tkffq1/resources/kzxf12k52>. The left sidebar shows the navigation tree for the 'Reinvent2017' API, with 'Resources' selected. On the right, the 'Methods' tab is active, showing a list of methods for the root resource ('/'). One method, 'GET /', is highlighted. The details for this method are shown in a modal window:

- Method: GET
- ARN: arn:aws:lambda:us-west-2:099174454562:function:...
- Authorization: None
- API Key: Not required

The browser's address bar shows the URL <https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/>.

API Gateway ALARM: "High 5XX errors" in

Secure | https://us-west-2.console.aws.amazon.com/apigateway/home?region=us-west-2#apis/sbp1tkffq1/stages

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AWS Services Resource Groups

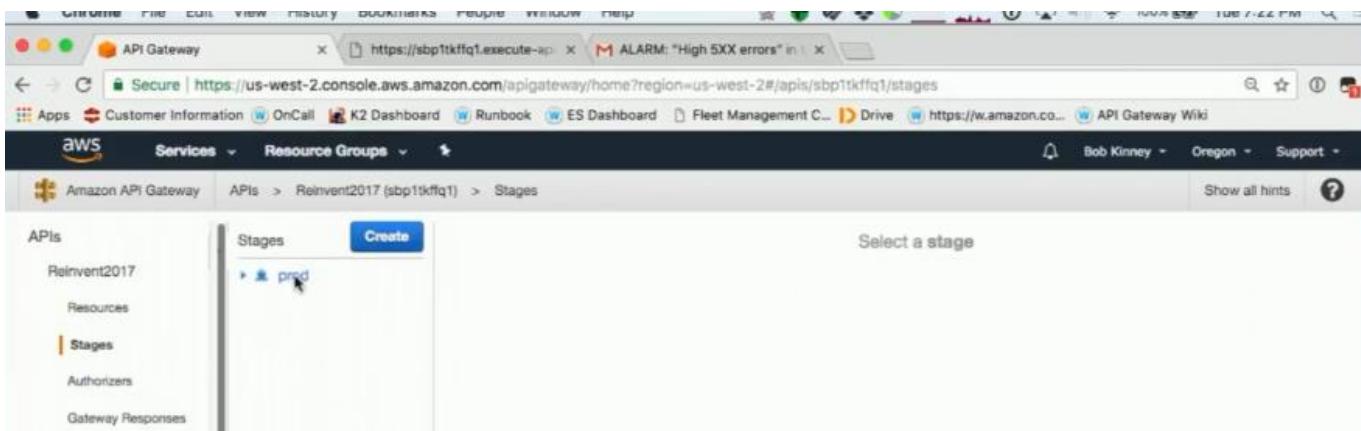
Amazon API Gateway APIs > Reinvent2017 (sbp1tkffq1) > Stages

Show all hints ?

APIs Stages Create Select a stage

Reinvent2017 Resources Stages Authorizers Gateway Responses

prod



API Gateway ALARM: "High 5XX errors" in

Secure | https://us-west-2.console.aws.amazon.com/apigateway/home?region=us-west-2#apis/sbp1tkffq1/stages/prod

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AWS Services Resource Groups

Amazon API Gateway APIs > Reinvent2017 (sbp1tkffq1) > Stages > prod

Show all hints ?

APIs Stages Create Delete Stage

Reinvent2017 Resources Stages Authorizers Gateway Responses Models Documentation Binary Support Dashboard Usage Plans API Keys Custom Domain Names Client Certificates Retiring

prod Stage Editor

Invoke URL: https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod

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

Configure the metering and caching settings for the prod 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 account level throttling rate is 10000 requests per second with a burst of 5000 requests. ?

Enable throttling  ?

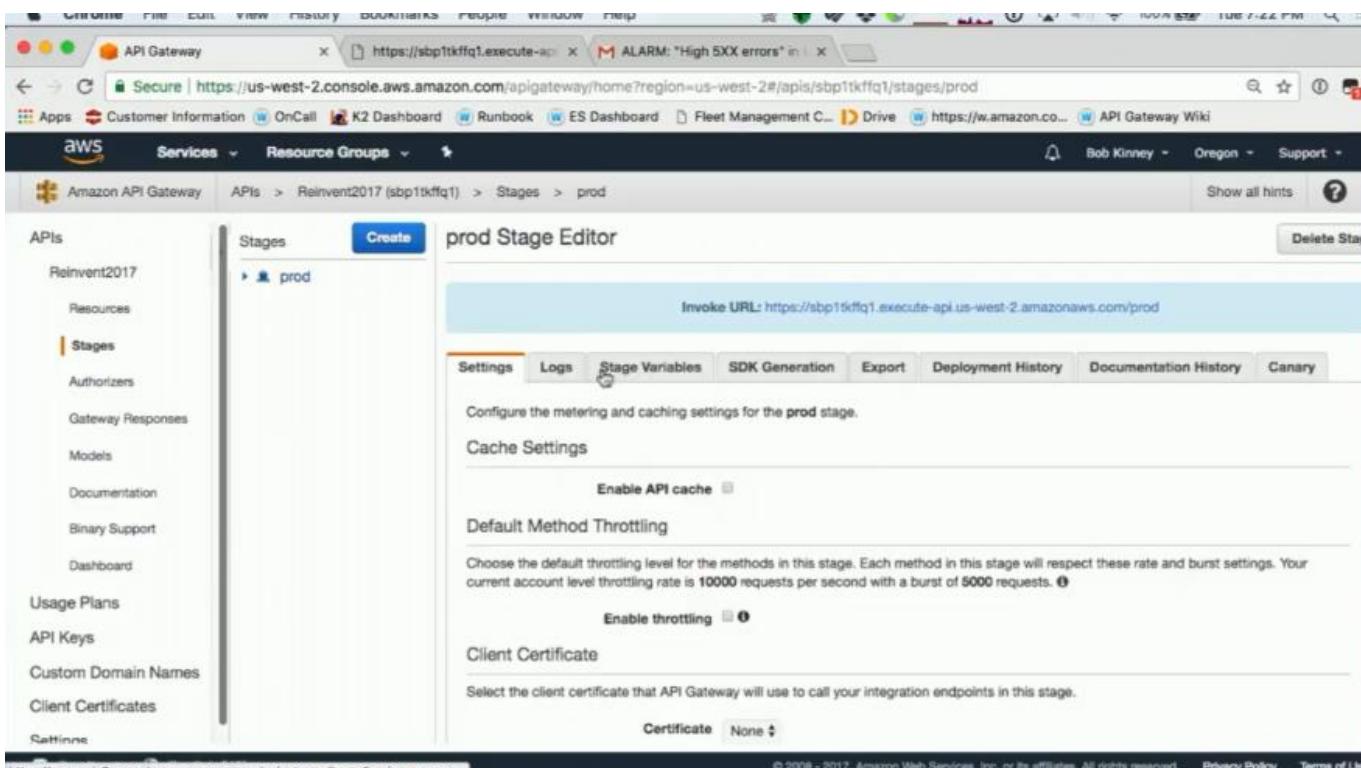
**Client Certificate**

Select the client certificate that API Gateway will use to call your integration endpoints in this stage.

Certificate: None ?

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https://us-west-2.console.aws.amazon.com/apigateaway/home?region=us-west-2#apis/sbp1tkffq1/stages/prod



The screenshot shows the AWS API Gateway prod Stage Editor. On the left sidebar, under the 'Stages' section, 'prod' is selected. The main panel displays the 'Logs' tab of the stage editor. At the top, it says 'Invoke URL: https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod'. Below this, there are tabs for 'Settings', 'Logs', 'Stage Variables', 'SDK Generation', 'Export', 'Deployment History', 'Documentation History', and 'Canary'. The 'Logs' tab is active. Under 'CloudWatch Settings', 'Enable CloudWatch Logs' is checked. Under 'Custom Access Logging', 'Enable Access Logging' is checked. A blue 'Save Changes' button is located at the bottom right of the editor.

This screenshot is identical to the one above, but the 'Log level' dropdown in the 'Logs' tab is now set to 'ERROR'. The rest of the configuration remains the same, with 'Enable CloudWatch Logs' and 'Enable Access Logging' both checked.

We then enabled logs at the ERROR and Access levels as above.

APIs

Stages

Create

Reinvent2017

Resources

Stages

Authorizers

Gateway Responses

Models

Documentation

Binary Support

Dashboard

Usage Plans

API Keys

Custom Domain Names

Client Certificates

Ratings

Configure the metering and caching settings for the stage.

CloudWatch Settings

Enable CloudWatch Logs

Log level **ERROR**

Log full requests/responses data

Enable Detailed CloudWatch Metrics

Custom Access Logging

Enable Access Logging

CloudWatch Group

Log Format

Insert Example: **CLF** **JSON** **XML** **CSV**

Feedback English (US)

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For Access logging, we can actually provide a Log Group to provide all of our Access logs to. This will allow you to aggregate all your access logs across multiple APIs if you want.

Title	Date Modified
ICP — 643832315590, 021878734477, 022334672126, 022471753906, 022078981708, 243740407517, 850044918194, 931196422807, 020501920863, 850998114841, 925717640731, 85055607052...	Nov 20, 2017,
Krishanu — Q: Familiarity with AWS? A: Mostly just for personal projects. FuQ: What services are you've used A: Node.js hosting on AWS. Q: Tell me about yourself A: Cognitive Solutions Start up consulting services. W...	Nov 1, 2017,
Oncall Follow Ups — CS - 15 CS CFN - 9 ES - 3 (2 rollbacks) ES CFN - 14 TH - 7 TH CFN - 24 TD - 13 TD CFN - 40 FM - 0 FM CFN - 30 CS Canary - 39 App Config - 29 https://n.im.amazon.com/issues/BPL-8007...	Nov 3, 2017,
Akash — Q: Any previous work. A: 8 months at NDS. 6 months at SAP. Static code analysis for IDE IT Analytics Juniper . Q: What interests you about Amazon(AWS) A: Work on the tech I'm already familiar with Custom...	Nov 2, 2017,
Reddit — We already have customers with workloads in the 1000s of RPS. Default limits for API Gateway are up to 10,000 RPS per account and Lambda concurrency limits by default are 1000. These limits c...	Nov 1, 2017,
Isaac — Q: Any familiarity with AWS? A: Use EC2 to run an webstack. Q: Tell me about your most recent work. A: Data analysis, machine learning Python scripts processing data Compare process. Graphs of trends Resu...	Oct 31, 2017,
Harsha — Q: Any familiarity with AWS? A: I know of AWS, haven't used it. Q: Tell me about most recent experience? A: Product management platform, no internships... Q: Tell me about your most proudest technical envir...	Oct 31, 2017,

**Access-Control-Allow-Methods** GET, OPTIONS, PUT, POST, PATCH, DELETE  
**Access-Control-Allow-Headers** 'Content-Type,X-Amz-Date,Authorization,X-Api-Key,X-Amz-Security-Token'  
**Access-Control-Allow-Origin**\*

```
arn:aws:logs:us-west-2:099174454562:log-group:API-Gateway-Access-Logs
```

WWW-Authenticate 'Basic'

```
aws lambda remove-permission --function-name reinventEcho --statement-id wildcard-pdx
aws lambda add-permission --function-name reinventEcho --statement-id wildcard-pdx --action lambda:InvokeFunction --principal apigateway.amazonaws.com --source-arn arn:aws:execute-api:us-west-2:099174454562:/GET/*
```

We are going to be using the CLF for the Common Log Format option as above. We then Save the changes.

To test, we can then hit this 500 error response endpoint a couple of times

In CloudWatch, we should now be able to find and see the specific request Ids for those 500 calls inside our access logs.

Screenshot of the AWS CloudWatch Log Groups page. The left sidebar shows navigation links for CloudWatch, Dashboards, Alarms, INSUFFICIENT, OK, Billing, Events, Rules, Event Buses, Logs (selected), Metrics, Favorites, and Add a dashboard. The main content area shows a table of log groups under the heading "Log Groups".

Log Groups	Expire Events After	Metric Filters	Subscriptions	ARN
/aws/apigateway/welcome	Never Expire	0 filters	None	arn:aws:logs:us-west-2:099174454562:log-group:/aws/apigateway/welcome
/aws/lambda/reinventAuthResult	Never Expire	0 filters	None	arn:aws:logs:us-west-2:099174454562:log-group:/aws/lambda/reinventAuthResult
/aws/lambda/reinventAuthorizer	Never Expire	0 filters	None	arn:aws:logs:us-west-2:099174454562:log-group:/aws/lambda/reinventAuthorizer
/aws/lambda/reinventEcho	Never Expire	0 filters	None	arn:aws:logs:us-west-2:099174454562:log-group:/aws/lambda/reinventEcho
/aws/lambda/reinventErrors	Never Expire	0 filters	None	arn:aws:logs:us-west-2:099174454562:log-group:/aws/lambda/reinventErrors
API-Gateway-Access-Logs	Never Expire	0 filters	None	arn:aws:logs:us-west-2:099174454562:log-group:API-Gateway-Access-Logs
API-Gateway-Execution-Logs_sb1tkffq1/prod	Never Expire	0 filters	None	arn:aws:logs:us-west-2:099174454562:log-group:API-Gateway-Execution-Logs_sb1tkffq1/prod

Screenshot of the AWS CloudWatch Log Streams page for the "API-Gateway-Access-Logs" group. The left sidebar shows the same navigation links as the previous screenshot. The main content area shows a table of log streams under the heading "Log Streams".

Log Streams	Last Event Time
6f3ef77ac0e3619e98159e9b6/ebf557	2017-11-28 19:24 UTC-8
ec8ce6abb0e952a85b6551ba726a1227	2017-11-28 19:24 UTC-8
7f6faa6bb0b408017b62254211691b5	2017-11-28 19:23 UTC-8
c16a5320fa475530d9583c34fd356ef5	2017-11-28 19:23 UTC-8
e9fd3930a/bdc5b5d2b32ed45989c61f	2017-11-28 19:23 UTC-8
c0c7c76d30bd3dcaefc96f40275bdc0a	
c51ce410c124a10e0db5e4b97fc2af39	
0f9c89d1e7298bb9930789c8ed59d48	
b1d10e7bafa4421218a51b1e1fb0ba2	
85d1cc6590ad8981ca2c8289f79f59954	
a1d0c6e6b31027327d8461063f4ac58a6	
6ea9ab1baa0efb9e18094440c317e21b	
d57d8ab4f4c10bf22aa353e27879133c	
c24cd76e1ce41366a4bbe8a49b02a028	
13fe9d84310e77113a6d184dbf1232f3	
e4da3b7bbce2345d7772b0674a318d5	

This is our Access Logs group filtered by time

Chrome FILE EDIT VIEW History Bookmarks People Window Help

Secure | https://us-west-2.console.aws.amazon.com/cloudwatch/home?region=us-west-2#logStream;group=API-Gateway-Access-Logs

CloudWatch Management Console https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/ ALARM: "High 5XX errors" in

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aWS Services Resource Groups

CloudWatch Dashboards Alarms ALARM INSUFFICIENT OK Billing Events Rules Event Buses Logs Metrics Favorites Add a dashboard

CloudWatch > Log Groups > Streams for API-Gateway-Access-Logs

Search Log Group Create Log Stream Delete Log Stream

Filter: Log Stream Name Prefix

Last Event Time

Log Stream	Last Event Time
6f3ef77ac0e3619e98159e9b6feb557	2017-11-28 19:24 UTC-8
ecdc0e5abb3e952e85b655 726a1227	2017-11-28 19:24 UTC-8
7f6faa6bb0b408017b62254211691b5	2017-11-28 19:23 UTC-8
c16a5320fa475530d9583c341d356e5	2017-11-28 19:23 UTC-8
e0d03930a7b6c95bd2b32ed45989c61f	2017-11-28 19:23 UTC-8
c0c7c78d30bd3dcafc96740275bd0a	
c51ce410c124a10e0db5e4b97fc2af39	
0f49c89d1e7298bb9930789c8ed59d48	
b1d10e7bafa4421218a51b1e1f1b0ba2	
85d8ce590ad8981ca2c8280f79f59954	
a1d0c6e83f027327d846106314ac58a8	
6ea9ab1baa0effb9e19094440c317e21b	
d6708ab44c10b22aa353e27879133c	
c24cd76e1ce41366a4bbe8a49b02a028	
13fe9b84310e77f13a6d184dbf12323	
e4da3b7fbfce2345d7772b0674a318d5	

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Chrome FILE EDIT VIEW History Bookmarks People Window Help

Secure | https://us-west-2.console.aws.amazon.com/cloudwatch/home?region=us-west-2#logEventViewer;group=API-Gateway-Access-Logs;stream=6f3ef77ac0e3619e98159e9b6feb557

CloudWatch Management Console https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/ ALARM: "High 5XX errors" in

Apps Customer Information OnCall K2 Dashboard Runbook ES Dashboard Fleet Management C... Drive https://w.amazon.co... API Gateway Wiki

aWS Services Resource Groups

CloudWatch Dashboards Alarms ALARM INSUFFICIENT OK Billing Events Rules Event Buses Logs Metrics Favorites Add a dashboard

CloudWatch > Log Groups > API-Gateway-Access-Logs > 6f3ef77ac0e3619e98159e9b6feb557

Filter events

Time (UTC +00:00) Message

2017-11-29 No older events found at the moment. Retry.

03:24:05 208.78.236.25 - [29/Nov/2017:03:24:05 +0000] "GET /auth HTTP/1.1" 500 36 c0d6971a-d4b4-11e7-8268-c7eccffa1da No newer events found at the moment. Retry.

Expand all Row Text

all 30s 5m 1h 6h 1d 1w custom

The screenshot shows the AWS CloudWatch Log Groups interface. On the left sidebar, under the 'Logs' section, there is a red notification badge with the number '1'. The main area displays a single log entry from 'API-Gateway-Access-Logs' on November 29, 2017, at 03:24:05. The log message is: "288.78.236.25 - - [29/Nov/2017:03:24:05 +0000] \"GET /unauth HTTP/1.1\" 500 36 c8d6971a-d4b4-11e7-8268-c7ecccfa1de". Below the log message, it says "No newer events found at the moment. Retry."

We get a single log line with all the details we need for debugging issues. This also helps us search for the actual logs as below for more context

The screenshot shows the AWS CloudWatch Log Groups interface. On the left sidebar, under the 'Logs' section, there is a red notification badge with the number '1'. The main area lists several log groups: '/aws/apigateway/welcome', '/aws/lambda/reinventAuthResult', '/aws/lambda/reinventAuthorizer', '/aws/lambda/reinventEcho', '/aws/lambda/reinventErrors', 'API-Gateway-Access-Logs', and 'API-Gateway-Execution-Logs\_sbp1tkffq1/prod'. Each log group has its 'Expire Events After' set to 'Never Expire', 'Metric Filters' set to '0 filters', 'Subscriptions' set to 'None', and an ARN listed.

Log Groups	Expire Events After	Metric Filters	Subscriptions	ARN
/aws/apigateway/welcome	Never Expire	0 filters	None	arn:aws:logs:us-west-2:099174454562:log-group:/aws/apigateway/we
/aws/lambda/reinventAuthResult	Never Expire	0 filters	None	arn:aws:logs:us-west-2:099174454562:log-group:/aws/lambda/reinv
/aws/lambda/reinventAuthorizer	Never Expire	0 filters	None	arn:aws:logs:us-west-2:099174454562:log-group:/aws/lambda/reinv
/aws/lambda/reinventEcho	Never Expire	0 filters	None	arn:aws:logs:us-west-2:099174454562:log-group:/aws/lambda/reinv
/aws/lambda/reinventErrors	Never Expire	0 filters	None	arn:aws:logs:us-west-2:099174454562:log-group:/aws/lambda/reinv
API-Gateway-Access-Logs	Never Expire	0 filters	None	arn:aws:logs:us-west-2:099174454562:log-group:API-Gateway-Acces
API-Gateway-Execution-Logs_sbp1tkffq1/prod	Never Expire	0 filters	None	arn:aws:logs:us-west-2:099174454562:log-group:API-Gateway-Execu

This is our regular detailed logs

The screenshot shows the AWS CloudWatch Log Streams page. On the left, there's a sidebar with navigation links like CloudWatch, Dashboards, Alarms, and Logs. The Logs section is currently selected. The main area displays a table of log streams with columns for 'Log Streams' and 'Last Event Time'. There are 15 entries listed, all from November 28, 2017, between 19:23 UTC and 19:24 UTC.

Log Streams	Last Event Time
d1c58a09acc34845c6be3a127a5acaf	2017-11-28 19:24 UTC-8
da4fb5c6ef63e74d3df8527599f626242	2017-11-28 19:24 UTC-8
1d77abc18fcba43975065399b0d1e48e	2017-11-28 19:23 UTC-8
f718499c1c8cef6730f0d03c8125cab	2017-11-28 19:23 UTC-8
b53b3a3d6ab90ce0268229151c9bde11	2017-11-28 19:23 UTC-8
06138bc5a60223648eda0e17c1eac75	
d296c101daa88a51f6cafcfc1ac79b50	
57aeee35c98205091e18d1140e9f38cf	
ec8956637a99787bd197eacd77acce5e	
f2217062e9a397a1dca429e7d70bc5ca	
b3e3e393c77e35a4a3f3cbd1e429b5dc	
...	

The screenshot shows the AWS CloudWatch Log Events page for a specific stream. The sidebar shows the Logs section is selected. The main area has a 'Filter events' input field containing 'Message'. Below it, a table lists log messages from November 29, 2017, at 03:23:07. All messages are identical, indicating execution failed due to configuration errors related to Lambda function permissions.

Message
(9e19c4bb-d4b4-11e7-9e0d-41f7429ae710) Execution failed due to configuration error: Invalid permissions on Lambda function
(a037e97f-d4b4-11e7-97fc-c5efe74bb449) Execution failed due to configuration error: Invalid permissions on Lambda function
(a19c5bab-d4b4-11e7-b130-7dd42ab51756) Execution failed due to configuration error: Invalid permissions on Lambda function
(bf92f384-d4b4-11e7-97fc-c5efe74bb449) Execution failed due to configuration error: Invalid permissions on Lambda function
(c0d6971a-d4b4-11e7-8268-c7ecccfa1da) Execution failed due to configuration error: Invalid permissions on Lambda function

The screenshot shows the AWS CloudWatch Log Events page with a specific filter applied. The filter input field contains the identifier 'c0d6971a-d4b4-11e7-8268-c7ecccfa1da'. The table below shows one log message for this ID, which is identical to the ones above. A tooltip indicates that no older events were found for the selected filter.

Message
(c0d6971a-d4b4-11e7-8268-c7ecccfa1da) Execution failed due to configuration error: Invalid permissions on Lambda function

We can now see the actual error message that was recorded by API Gateway for the 500 response. We can see that the permissions we have set are not correct

Title	Date Modified
ICP — 643832315500, 02187834477, 022334672126, 022471753905, 022078981708, 243740407517, 850044918194, 931196422807, 020501920863, 850985114841, 925717640731, 85055697052... Krishanu — Q: Familiarity with AWS? A: Mostly just for personal projects FuQ: What services are you've used A: Node.js hosting on AWS Q: Tell me about yourself? A: Cognitive Solutions. Start up consulting services W... Oncall Follow Ups — CS - 15 CS CFN - 9 ES - 3 (2 rollbacks) ES CFN - 14 TH - 7 TH CFN - 24 TD - 13 TD CFN - 40 FM - 0 FM CFN - 30 CS Canary - 39 App Config - 29 https://im.amazon.com/issues/BPL-8007... Akash — Q: Any previous work? A: 8 months at NDS. 6 months at SAP. Static code analysis for IDE IT Analytics Juniper - Q: What interests you about Amazon/AWS A: Work on the tech I'm already familiar with. Custom... Reddit — We already have customers with workloads in the 1000s of RPS. Default limits for API Gateway are up to 10,000 RPS per account per region and Lambda concurrency limits by default are 1,000. These limits c... Isaac — Q: Any familiarity with AWS? A: Use EC2 to run webstack Q: Tell me about your most recent work? A: Data analysis, machine learning Python scripts processing data Company process. Graphs of trends Resu... Harsha — Q: Any familiarity with AWS? A: I know of AWS, haven't used it. Q: Tell me about most recent experience? A: Product management platform, no interrahips. Q: Tell me about your most proudest technical env... Notation	Nov 10, 2017, Nov 3, 2017, Nov 2, 2017, Nov 1, 2017, Oct 31, 2017, Oct 31, 2017,

```
Access-Control-Allow-Methods: GET, OPTIONS, PUT, POST, PATCH, DELETE  
Access-Control-Allow-Headers: 'Content-Type,X-Amz-Date,Authorization,X-Api-Key,X-Amz-Security-Token'  
Access-Control-Allow-Origin: *
```

arn:aws:logs:us-west-2:099174454562:log-group:API-Gateway-Access-Logs

WWW-Authenticate: Basic

```
aws lambda remove-permission --function-name reinventEcho --statement-id wildcard-pdx
```

```
aws lambda add-permission --function-name reinventEcho --statement-id wildcard-pdx --action lambda.invokeFunction --principal apigateway.amazonaws.com --source-arn arn:aws:execute-api:us-west-2:099174454562/*/*GET/
```

We can now set the correct permissions to resolve this problem.

We then use the CLI to set the correct permissions

```
curl -X POST https://sbpltkffq1.execute-api.us-west-2.amazonaws.com/prod/authn \
-H "Content-Type: application/x-www-form-urlencoded" \
-d "username=...&password=..."
```

We are now getting back a 200 response with the correct data from that endpoint.

API Gateway

Secure | https://us-west-2.console.aws.amazon.com/apigateway/home?region=us-west-2#apis/sbp1tkffq1/stages/prod

CloudWatch Management Con...

ALARM: "High 5XX errors" in API Gateway

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aws Services Resource Groups

Amazon API Gateway APIs > Reinvent2017 (sbp1tkffq1) > Stages > prod

Show all hints ?

**APIs**

**Reinvent2017**

- Resources
- Stages**
- Authorizers
- Gateway Responses
- Models
- Documentation
- Binary Support
- Dashboard
- Usage Plans
- API Keys
- Custom Domain Names
- Client Certificates
- Certificates

**Stages**

**Create**

**Log level** ERROR

**Log full requests/responses data**

**Enable Detailed CloudWatch Metrics**

**Custom Access Logging**

**Enable Access Logging**

**CloudWatch Group** arn:aws:logs:us-west-2:099174454562:log-group:API-Gateway-Access-Log

**Log Format**

```
$context.identity.sourceIp $context.identity.caller $context.identity.user
[$context.requestTime] "$context.httpMethod $context.resourcePath
$context.protocol" $context.status $context.responseLength
$context.requestId
```

Insert Example: CLF JSON XML CSV

List of Log Variables

**Save Changes**

Feedback English (US)

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API Gateway

Secure | https://us-west-2.console.aws.amazon.com/cloudwatch/home?region=us-west-2#logEventViewer:group=API-Gateway-Execution-Logs\_sbp1tkffq1/prod

CloudWatch Management Con...

ALARM: "High 5XX errors" in API Gateway

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aws Services Resource Groups

CloudWatch Dashboards Alarms ALARM INSUFFICIENT OK Billing Events Rules Event Buses Logs Metrics Favorites Add a dashboard

CloudWatch > Log Groups > API-Gateway-Execution-Logs\_sbp1tkffq1/prod > All streams

Expand all Row Text

Filter: "c0d6971a-d4b4-11e7-8268-c7eecffa1da"

all 30s 5m 1h 6h 1d 1w custom

**Message**

2017-11-29 03:24:05 No older events found for the selected filter. clear filter.

(c0d6971a-d4b4-11e7-8268-c7eecffa1da) Execution failed due to configuration error: Invalid permissions on Lambda function

No newer events found for the selected filter. clear filter.

API Gateway

Secure | https://us-west-2.console.aws.amazon.com/cloudwatch/home?region=us-west-2#logs

CloudWatch Management Con...

ALARM: "High 5XX errors" in API Gateway

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aws Services Resource Groups

CloudWatch Dashboards Alarms ALARM INSUFFICIENT OK Billing Events Rules Event Buses Logs Metrics Favorites

CloudWatch > Log Groups

Create Metric Filter Actions

Filter: Log Group Name Prefix

Log Groups	Expire Events After	Metric Filters	Subscriptions	ARN
/aws/apigateway/welcome	Never Expire	0 filters	None	arn:aws:logs:us-west-2:099174454562:log-group:/aws/apigateway/welcome
/aws/lambda/reinventAuthResult	Never Expire	0 filters	None	arn:aws:logs:us-west-2:099174454562:log-group:/aws/lambda/reinventAuthResult
/aws/lambda/reinventAuthorizer	Never Expire	0 filters	None	arn:aws:logs:us-west-2:099174454562:log-group:/aws/lambda/reinventAuthorizer
/aws/lambda/reinventEcho	Never Expire	0 filters	None	arn:aws:logs:us-west-2:099174454562:log-group:/aws/lambda/reinventEcho
/aws/lambda/reinventErrors	Never Expire	0 filters	None	arn:aws:logs:us-west-2:099174454562:log-group:/aws/lambda/reinventErrors
API-Gateway-Access-Logs	Never Expire	0 filters	None	arn:aws:logs:us-west-2:099174454562:log-group:API-Gateway-Access-Logs
API-Gateway-Execution-Logs_sbp1tkffq1/prod	Never Expire	0 filters	None	arn:aws:logs:us-west-2:099174454562:log-group:API-Gateway-Execution-Logs_sbp1tkffq1/prod

CloudWatch > Log Groups > Streams for API-Gateway-Access-Logs

Log Stream	Last Event Time
a684ecccc76fc522773286a895bc8436	2017-11-28 19:25 UTC-8
8f3ef77ac0e3619e98159e9b6f1ebf557	2017-11-28 19:24 UTC-8
ec8ce8abb3e952a85c8551ba726a1227	2017-11-28 19:24 UTC-8
7f6ffaa5bb0b408017b62254211691b5	2017-11-28 19:23 UTC-8
c16a5320fa475530d9583c34fd356ef5	2017-11-28 19:23 UTC-8
ef0d3930a7b6c95bd2b32ed45989c61f	2017-11-28 19:23 UTC-8
c51ce410c124a10e0db5e4b97fc2af39	
b1d10e7bafa4421218a51b1e1ff1b0ba2	
0f49c89d1e7298bb9930789c8ed59d48	
5ea9ab1baa0efb9e18094440c317e21b	
a1d0c5e83f027327d8461063f4c58a6	
85d8cce590ad8981ca2cd828879f59954	
d67d8ab4f4c10bf22aa353e27879133c	
13fe9db84310e77f13a6d184dbf1232f3	
c24cd76e1ca41366a4bbe8a49b02a028	
149e9677a5989fd342ae44213df58868	

CloudWatch > Log Groups > API-Gateway-Access-Logs > a684ecccc76fc522773286a895bc8436

Message

2017-11-29 03:25:44

No older events found at the moment. Retry.

288.78.236.25 - - [29/Nov/2017:03:25:44 +0000] "GET /unauth HTTP/1.1" 200 1926 fc@oefc5-d4b4-11e7-879f-c9803db9c8e4

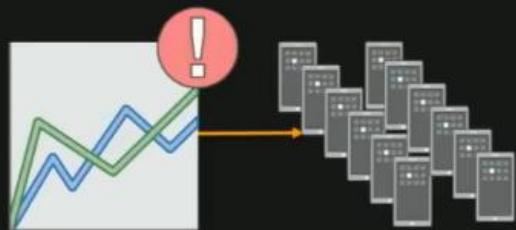
No newer events found at the moment. Retry.

We can now see a 200 response with the same data and request Ids. This is a great way to look at the errors being generated and then use the request ids to see what is happening using the logs in the API Gateway or lambdas.

## Check in with Doug



Thanks to logging, Doug now knows that his API is generating errors during peak loads because there's spurious traffic hitting a legacy API method at a much higher than expected rate due to a bug in a previous version of the app.



He now needs a way to limit the traffic from those devices to let other traffic through from updated devices.

## Protecting Your API: Throttling

### API Gateway throttling

Three levels of throttling for APIs

API Key level throttling—configurable in usage plan

Method level throttling—configurable in stage settings

Account level throttling—limits can be increased



# API Gateway throttling

Token bucket algorithm

Burst—the maximum size of the bucket

Rate—the number of tokens added to the bucket



## Demo

Let us now see a demo about enabling throttling

CloudWatch > Log Groups > API-Gateway-Access-Logs > a584e0eee76fc522773286a895bc8436

Filter events

Message

2017-11-29 03:25:44

No older events found at the moment. Retry.

288.78.236.25 - - [29/Nov/2017:03:25:44 +0000] "GET /usauth HTTP/1.1" 200 1926 fc800fc5-d4b4-11e7-879f-c9883db9c0e4

No newer events found at the moment. Retry.

```
SUBLINE TEXT FILE EDIT SELECTION FIND VIEW GOTO TOOLS PROJECT WINDOW help RandomErrors.scala UNREGISTERED  
RandomErrors.scala Throttle.scala  
1 package reinvent2017  
2  
3 import io.gatling.core.Predef._  
4 import io.gatling.http.Predef._  
5 import scala.concurrent.duration._  
6  
7 class RandomErrors extends Simulation {  
8  
9   val httpConf = http  
10    .baseUrl("https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod/gatling/random")  
11  
12   val scn = scenario("Scenario Name")  
13    .asLongAs(true){  
14      exec(http("request_1").get("/"))  
15    }  
16  
17   setUp(scn.inject(atOnceUsers(10)).protocols(httpConf))  
18 }  
19
```

```
SUBLINE TEXT FILE EDIT SELECTION FIND VIEW GOTO TOOLS PROJECT WINDOW Help Throttle.scala UNREGISTERED  
RandomErrors.scala Throttle.scala  
1 package reinvent2017  
2  
3 import io.gatling.core.Predef._  
4 import io.gatling.http.Predef._  
5 import scala.concurrent.duration._  
6  
7 class Throttle extends Simulation {  
8  
9   val httpConf = http  
10    .baseUrl("https://sbp1tkffq1a.execute-api.us-west-2.amazonaws.com/prod/gatling/throttle")  
11  
12   val scn = scenario("Scenario Name")  
13    .asLongAs(true){  
14      exec(http("request_1").get("/"))  
15    }  
16  
17   setUp(scn.inject(atOnceUsers(100)).protocols(httpConf))  
18 }  
19
```

We have another Gatling script that hits a specific method in our API, we are going to start this up and then enable throttling

```
gatling-charts-highcharts-bundle-2.3.0 — grep -Ev WARN — 127.30  
"Statement": {"Sid": "\wildcard-pdx\", \"Effect\": \"Allow\", \"Principal\": {\"Service\": \"apigateway.amazonaws.com\"}, \"Action\": \"Lambda:InvokeFunction\", \"Resource\": \"arn:aws:lambda:us-west-2:099174454562:function:reinventEcho\", \"Condition\": {}  
\"ArnLike\": \"AWS:SourceArn\": \"arn:aws:execute-api:us-west-2:099174454562:/*/*/*\"}}}"  
f45c89a374b5:gatling-charts-highcharts-bundle-2.3.0 bkinney$ bin/gatling.sh | grep -Ev WARN  
GATLING_HOME is set to /Users/bkinney/Downloads/gatling-charts-highcharts-bundle-2.3.0  
Choose a simulation number:  
[0] reinvent2017.LatencyTest  
[1] reinvent2017.RandomErrors  
[2] reinvent2017.Throttle  
[3] reinvent2017.UsagePlanThrottle  
2  
Select simulation id (default is 'throttle'). Accepted characters are a-z, A-Z, 0-9, - and _  
Select run description (optional)  
Simulation reinvent2017.Throttle started...  
  
=====  
2017-11-28 19:30:12 5s elapsed  
---- Requests -----  
> Global (OK=523 K0=0 )  
> request_1 (OK=523 K0=0 )  
---- Scenario Name -----  
[ waiting: 0 / active: 100 / done:0 ] 0%  
=====
```

All of these requests are generating 200 status codes for about 100 requests per second RPS to the API endpoint, this is because we have not enabled any request throttling at all. We can apply throttling to keep the RPS lower allowed to this endpoint.

The screenshot shows the AWS API Gateway interface. The left sidebar lists various API-related sections like APIs, Stages, Resources, Authorizers, etc. The main content area is focused on the 'Stages' tab for the 'prod' stage of the 'Reinvent2017' API. The prod stage has a single endpoint '/'. Underneath the stage list, there are tabs for Settings, Logs, Stage Variables, SDK Generation, Export, Deployment History, Documentation History, and Canary. The 'Settings' tab is active. It contains several configuration sections: 'Configure the metering and caching settings for the prod stage.', 'Cache Settings' with an 'Enable API cache' checkbox, 'Default Method Throttling' with a note about a rate of 10000 requests per second, 'Enable throttling' checkbox, 'Client Certificate' section with a 'Certificate' dropdown set to 'None', and a 'Save Changes' button at the bottom right.

We can set throttling on the entire stage API as above, or set throttling on the specific GET endpoint only as below

The screenshot shows the AWS API Gateway interface. The left sidebar is titled "APIs" and lists various API resources like Reinvent2017, Resources, Stages, Authorizers, etc. The "Stages" section is currently selected. The main content area shows the "prod" stage configuration for the "Reinvent2017" API. The URL is https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod/gatling/throttle. The "Method" dropdown is set to "GET". The "Invoke URL" is displayed as https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod/gatling/throttle. There are two radio buttons for "Settings": "Inherit from stage" (selected) and "Override for this method". A "Save Changes" button is at the bottom right.

The screenshot shows the AWS API Gateway console with the URL <https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod/gatling/throttle>. The left sidebar shows the navigation path: APIs > Reinvent2017 (sbp1tkffq1) > Stages > prod > /gatling/throttle > GET. The main content area displays the configuration for the 'prod - GET - /gatling/throttle' method. It includes an 'Invoke URL' field with the value <https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod/gatling/throttle>. Below it, a note says 'Use this page to override the prod stage settings for the GET to /gatling/throttle method.' There are two radio button options: 'Settings' (selected) and 'Inherit from stage', and 'Override for this method'. Under 'CloudWatch Settings', there is an 'Enable CloudWatch Logs' checkbox (unchecked), a 'Log level' dropdown set to 'ERROR', and a 'Log full requests/responses data' checkbox (unchecked). At the bottom, there is a 'Method Throttling' section with a note about the current account level throttling rate.

CloudWatch Settings

Enable CloudWatch Logs

Log level: **ERROR**

Method Throttling

Choose the throttling level for this method. Your current account level throttling rate is **10000** requests per second with a burst of **5000** requests.

Enable throttling

Rate: **2** requests per second

Burst: **2** requests

**Save Change**

Set this to a lower RPS like 2 for Rate and 2 for Burst as above

```

2017-11-28 19:31:07          60s elapsed
---- Requests -----
> Global                      (OK=35350 K0=0   )
> request_1                    (OK=35350 K0=0   )

---- Scenario Name -----
[ waiting: 0 / active: 100 / done:0 ] 0%
  CloudWatch Metrics Log level: ERROR

2017-11-28 19:31:12          65s elapsed
---- Requests -----
> Global                      Create Detailed CloudWatch Metrics Log level: ERROR
> request_1                    Method Throttling (OK=38545 K0=14   )
> request_1                    (OK=38545 K0=14   )

---- Errors -----
> status.find.in(200,304,201,202,203,204,205,206,207,208,209), b    e 14 (100.0%)
ut actually found 429

---- Scenario Name -----
[ waiting: 0 / active: 100 / done:0 ] 0%
  CloudWatch Metrics Log level: ERROR

```

We are now getting 429 responses from the API for some requests, this will save us API calls cost.

Screenshot of the AWS API Gateway CloudWatch Settings page for the 'prod' stage of the 'Reinvent2017' API.

**CloudWatch Settings**

- Enable CloudWatch Logs**: Log level set to **ERROR**.
- Log full requests/responses data**: Unchecked.
- Enable Detailed CloudWatch Metrics**: Unchecked.

**Method Throttling**

Choose the throttling level for this method. Your current account level throttling rate is **10000** requests per second with a burst of **5000** requests.

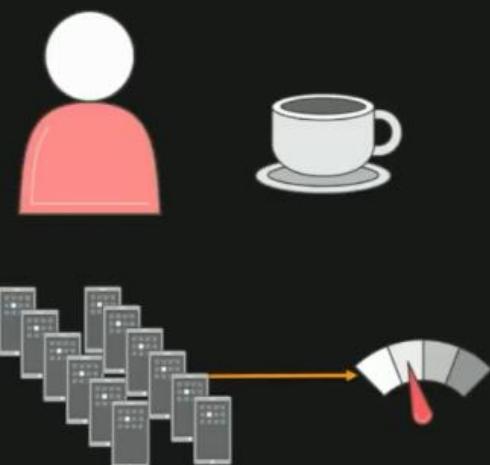
- Enable throttling**: Checked.
- Rate**: Set to **2** requests per second.
- Burst**: Set to **2** requests.

**Save Change**

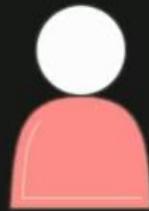
## Check in with Doug

Thanks to throttling, Doug has limited the impact from the buggy version of the application by limiting the call rate to the legacy method call.

Customers with the older version may see some throttling errors, but users who have upgraded to the latest version are unaffected by the bad actor.



## TAMPR promotions



TAMPR has become popular and coffee shops and roasters are contacting Doug to discuss possibilities of promotions through the app.

Doug needs a way to allow these shops to create accounts and create and edit promotions on demand.



Doug needs to open up a portion of his API so that the coffee shops wanting to run promotions can submit their promotions without him having to be a go-between.

## Protecting Your API: Authentication/Authorization

## Authentication type comparison ★ NEW ★

Feature	AWS_IAM	TOKEN	REQUEST	COGNITO
Authentication	X	X	X	X
Authorization	X	X	X	
Signature V4	X			
Cognito User Pools		X	X	X
Third-Party Authentication		X	X	
Multiple Header Support			X	
Additional Costs	NONE	Pay per authorizer invoke	Pay per authorizer invoke	NONE

## Demo

Let us now see a custom authorizer

The screenshot shows the AWS API Gateway console. On the left, there's a navigation sidebar with links like APIs, Stages, Authorizers, and Documentation. The main area shows the configuration for a stage named 'prod' under an API named 'Reinvent2017'. Under the 'Stages' section, there's a tree view showing resources like '/auth', '/gatling', and '/unauth'. To the right, there are several tabs: 'CloudWatch Settings', 'Method Throttling', and 'Save Changes'. In the 'CloudWatch Settings' tab, there are options to enable CloudWatch Logs (checked), set Log level to 'ERROR', and log full requests/responses data. In the 'Method Throttling' tab, there's a note about account-level throttling and a form to set the rate and burst for the 'GET' method under the '/gatling' resource.

We are going to be implementing basic HTTP **auth** for our API Gateway API

The screenshot shows the AWS API Gateway console. The left sidebar navigation includes: APIs, Resources, Stages, Authorizers, Gateway Responses, Models, Documentation, Binary Support, Dashboard, Usage Plans, API Keys, Custom Domain Names, Client Certificates, and Settings. The main content area displays the 'Reinvent2017 (sbp1tkffq1)' API under the 'Stages' section. It lists several stages: prod, dev, test, and canary. Under the prod stage, there are resources like /, /auth, /gatling, and /unauth. The '/auth' resource has three methods: GET, /auth/custom, and /auth/custom/allow. The '/auth/custom/allow' method is selected, showing its configuration: Authorization is set to CUSTOM, and API Key is Not required. The URL for this method is https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod/auth/custom/allow.

The screenshot shows the AWS API Gateway console. The left sidebar navigation includes: APIs, Resources, Stages, Authorizers, Gateway Responses, Models, Documentation, Binary Support, Dashboard, Usage Plans, API Keys, Custom Domain Names, Client Certificates, and Settings. The main content area displays the 'Reinvent2017 (sbp1tkffq1)' API under the 'Authorizers' section. It shows a single authorizer named 'reinventRequestAuthorizer'. This authorizer is configured as a Lambda Function, specifically 'reinventAuthorizer (us-west-2)'. It uses a Request Lambda Event Payload and does not have Authorization Caching enabled. There are 'Edit' and 'Test' buttons at the bottom of the authorizer card.

We have set up our authorizer as a Request Authorizer, basic auth does not usually require multiple headers. In this case, we are using the authorization header.

Chrome File Edit View History Bookmarks People Window Help

Secure | https://us-west-2.console.aws.amazon.com/lambda/home?region=us-west-2#/functions

CloudWatch Management Con... https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/ ALARM: "High 5XX errors" in

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aWS Services Resource Groups

AWS Lambda

Dashboard Functions

Lambda Functions

Functions (4)

Actions Create function

Filter by tags and attributes or search by keyword

Function name	Description	Runtime	Code size	Last Modified
reinventAuthzr	Blueprint for API Gateway custom authorizers, implemented in NodeJS	Node.js 4.3	3.5 kB	9 hours ago
reinventEcho		Node.js 4.3	271 bytes	last year
reinventAuthResult		Node.js 6.10	322 bytes	10 hours ago
reinventErrors		Node.js 4.3	288 bytes	3 hours ago

Feedback English (US)

Secure | https://us-west-2.console.aws.amazon.com/lambda/home?region=us-west-2#/functions/reinventAuthorizer?tab=configuration

CloudWatch Management Con... https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/ ALARM: "High 5XX errors" in

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aWS Services Resource Groups

AWS Lambda

Dashboard Functions

Lambda Functions reinventAuthorizer

ARN - arn:aws:lambda:us-west-2:099174454562:function:reinventAuthorizer

Qualifiers Actions Select a test event... Test

Configuration Triggers Monitoring

Function code

Code entry type: Edit code inline Runtime: Node.js 4.3 Handler info: index.handler

```
index.js
1 'use strict';
2
3 console.log('Loading function');
4
5
6 /**
7 * AuthPolicy receives a set of allowed and denied methods and generates a valid
8 * AWS policy for the API Gateway authorizer. The constructor receives the calling
9 * user principal, the AWS account ID of the API owner, and an apiOptions object.
10 * The apiOptions can contain an API Gateway RestApi Id, a region for the RestApi, and a
11 * stage that calls should be allowed/denied for. For example
```

Feedback English (US)

The screenshot shows the AWS Lambda Management Console interface. The left sidebar is titled "AWS Lambda" and lists "Dashboard" and "Functions". The main content area displays the code for a function named "index.js". The code is a JavaScript file that handles API Gateway requests. It includes logic to parse the "Authorization" header, decode the base64 string, split it into "username:password", and then extract the "username" and "password" parts. It also sets "apiOptions" for the "AuthPolicy" based on the extracted region, stage, and rest API ID.

```
index.js
64 // of objects and each object has two properties: a resource ARN and a nullable
65 // conditions statement. The build method processes these lists and generates
66 // the appropriate statements for the final policy.
67 this.allowMethods = [];
68 this.denyMethods = [];
69 this.contextValues = {};
70
71 if (!apiOptions || !apiOptions.restApiId) {
72     this.restApiId = '*';
73 } else {
74     this.restApiId = apiOptions.restApiId;
75 }
76 if (!apiOptions || !apiOptions.region) {
77     this.region = '*';
78 } else {
79     this.region = apiOptions.region;
80 }
81 if (!apiOptions || !apiOptions.stage) {
82     this.stage = '*';
83 } else {
84     this.stage = apiOptions.stage;
85 }
86
87 /**
88 * A set of existing HTTP verbs supported by API Gateway. This property is here
89 * to support the "methodArn" property in the "AuthPolicy" object.
90 */
91
```

This screenshot is identical to the one above, showing the AWS Lambda Management Console interface with the "index.js" code. The code is a JavaScript file that handles API Gateway requests. It includes logic to parse the "Authorization" header, decode the base64 string, split it into "username:password", and then extract the "username" and "password" parts. It also sets "apiOptions" for the "AuthPolicy" based on the extracted region, stage, and rest API ID.

```
index.js
325     if (!header) {
326         callback("Unauthorized");
327     }
328     else {
329
330         var encoded = header.split(' '); // Split on a space, the original auth looks like "Ba
331
332         var buf = new Buffer(encoded[1], 'base64'); // create a buffer and tell it the data coming
333         var plain_auth = buf.toString(); // read it back out as a string
334
335         console.log("Decoded Authorization ", plain_auth);
336
337         var creds = plain_auth.split(':'); // split on a ':'
338         var username = creds[0];
339         var password = creds[1];
340
341
342         // build apiOptions for the AuthPolicy
343         const apiOptions = {};
344         const tmp = event.methodArn.split(':');
345         const apiGatewayArnTmp = tmp[5].split('/');
346         const awsAccountId = tmp[4];
347         const regionName = tmp[3];
348         apiOptions.region = tmp[3];
349         apiOptions.restApiId = apiGatewayArnTmp[0];
350         apiOptions.stage = apiGatewayArnTmp[1];
351     }
352 }
```

Our request authorizer lambda is going to take the request header, get the authorization header bearer token, and figure out what the username and password is,

```

index.js
357
358
359
360     var policy;
361     if (username === "bkinney" && password === "letmein") {
362         policy = new AuthPolicy("normalUser", awsAccountId, apiOptions);
363         policy.allowMethod(AuthPolicy.HttpVerb.GET, "/auth/custom/allow");
364         policy.addContext("firstName", "Bob");
365         policy.addContext("lastName", "Kinney");
366         callback(null, policy.build());
367     }
368     else if (username === "admin" && password === "secret") {
369         policy = new AuthPolicy("superUser", awsAccountId, apiOptions);
370         policy.allowMethod(AuthPolicy.HttpVerb.GET, "/auth/custom/allow");
371         policy.allowMethod(AuthPolicy.HttpVerb.GET, "/auth/custom/deny");
372         policy.addContext("firstName", "Admin");
373         policy.addContext("lastName", "User");
374         callback(null, policy.build());
375     }
376     else {
377         callback("Unauthorized");
378     }
379 }
380 }
381 };
382

```

Then compare it against some hard-coded set of credentials as above. We can instead have asked a database for the details like username and password for the token credentials and validate if we want. Above, we will be returning an unauthorized response back for any unauthorized user, this will then lead to the request being rejected.

**APIs**

- Reinvent2017
- Usage Plans
- API Keys
- Custom Domain Names
- Client Certificates
- Settings

**+ Create API**

**Reinvent2017**

Created on 1/27/2017

No description.

**Endpoint Configuration**

Endpoint Type: Edge Optimized

We also need to configure the response we want to give when no authentication is configured or a 401 response,

Safari - API Gateway https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/api/v2/apis/sbp1tkffq1/resources/kzxf1t2k52

Secure | https://us-west-2.console.aws.amazon.com/apigateway/home?region=us-west-2#/apis/sbp1tkffq1/resources/kzxf1t2k52

CloudWatch Management CloudWatch Metrics CloudWatch Metrics CloudWatch Metrics ALARM: "High 5XX errors" in

API Gateway Wiki

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aws Services Resource Groups Bob Kinney Oregon Support

Amazon API Gateway APIs Reinvent2017 (sbp1tkffq1) Resources / (kzxf1t2k52) Show all hints

APIs Resources Actions / Methods

Reinvent2017 Resources Stages Authorizers Gateway Responses Models Documentation Binary Support Dashboard Usage Plans API Keys Custom Domain Names Client Certificates Settings

GET /auth /custom /allow /deny /gating /random /throttle /nauth

arn:aws:lambda:us-west-2:099174454562:function:... Authorization None API Key Not required

http://us-west-2.console.aws.amazon.com/apigateway/home?region=us-west-2

Chrome - API Gateway https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/api/v2/apis/sbp1tkffq1/gateway-responses

Secure | https://us-west-2.console.aws.amazon.com/apigateway/home?region=us-west-2#/apis/sbp1tkffq1/gateway-responses

CloudWatch Management CloudWatch Metrics CloudWatch Metrics CloudWatch Metrics ALARM: "High 5XX errors" in

API Gateway Wiki

Customer Information OnCall K2 Dashboard Runbook ES Dashboard Fleet Management Drive https://www.amazon.co...

aws Services Resource Groups Bob Kinney Oregon Support

Amazon API Gateway APIs Reinvent2017 (sbp1tkffq1) Gateway Responses Show all hints

APIs Resources Stages Authorizers Gateway Responses Models Documentation Binary Support Dashboard Usage Plans API Keys Custom Domain Names Client Certificates Settings

Gateway Responses

Gateway Responses are responses triggered if something prevents a request from reaching the integration. Customizing them here will effect all errors of that type for the entire API.

For changes here to have effect, you must deploy your API.

Default 4XX

Default 5XX

Access Denied [403] using settings from 400

API Configuration Error [500] default setting

Authorizer Configuration Error [500] default setting

Authorizer Failure [500] default setting

Bad Request Body [400] using settings from 400

Bad Request Parameters [400] using settings from 400

Feedback English (US)

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Screenshot of the AWS API Gateway console showing the 'Gateway Responses' configuration for the 'Reinvent2017' API. The 'Default 4XX' response is being edited. The status code is set to 404. The response headers include 'Content-Type' and 'X-Amz-Date'. The body mapping template is set to return a JSON object with the message: "message": "These aren't the droids you're looking for.".

APIs > Reinvent2017 > Gateway Responses

Default 4XX

Status Code: 404

Response Headers:

- Access-Control-Allow-Header : Content-Type,X-Amz-Date,AWS-Auth
- Access-Control-Allow-Methods : GET, OPTIONS, PUT, POST, PATCH, DELETE
- Access-Control-Allow-Origin : \*

Body Mapping Templates:

Content Type: application/json

Body Mapping Template:

```
{"message": "These aren't the droids you're looking for."}
```

Save

A confirmation dialog box is displayed, asking if the user is sure they want to clear all changes to the Default 4XX gateway response. The 'Reset' button is highlighted.

Reset Default 4XX to its defaults

Are you sure you want to clear all changes to the Default 4XX gateway response?

Cancel Reset

APIs > Reinvent2017 (sbp1tkffq1) > Gateway Responses

**Gateway Responses**

- Resource Not Found | 404
- Throttled | 429
- Unauthorized | 401
- Unsupported Media Type | 415

Status Code: 401

Response Headers: WWW-Authenticate : 'Basic'

Body Mapping Templates:

- Content Type: application/json
- Body Mapping Template: {"message":\$context.error.messageString}

Add Body Mapping Template +

Cancel Reset Save

We add the 'WWW-Authenticate' header with the value 'Basic'. This means that when we hit this API without credentials configured, we should get a 401 response back

APIs > Reinvent2017 (sbp1tkffq1) > Stages > prod

**prod Stage Editor**

Invoke URL: https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod

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

Configure the metering and caching settings for the prod 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 account level throttling rate is 10000 requests per second with a burst of 5000 requests.

Enable throttling

**Client Certificate**

Select the client certificate that API Gateway will use to call your integration endpoints in this stage.

Certificate: None

The screenshot shows the AWS API Gateway console. On the left, a sidebar lists various API-related sections like APIs, Stages, Resources, and Documentation. The main area is titled "prod - GET - /auth/custom/allow". It displays the "Invoke URL" as <https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod/auth/custom/allow>. Below the URL, there's a note: "Use this page to override the prod stage settings for the GET to /auth/custom/allow method." There are two radio button options: "Settings" (selected) and "Override for this method". A "Save Changes" button is located at the bottom right. The URL bar at the top shows the full path: <https://us-west-2.console.aws.amazon.com/apigateway/home?region=us-west-2#/apis/sbp1tkffq1/stages/prod/resources/~1auth~1custom~1allow>.

The screenshot shows a browser window with the URL <https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod/auth/custom/allow>. A modal dialog box titled "Authentication Required" is displayed, prompting for a "Username" and "Password". The URL in the address bar is also <https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod/auth/custom/allow>.

As you can see when we hit this API having basic auth, we get the 401 response back and the browser prompts us to enter the username and password details.

The screenshot shows a browser window with the URL <https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod/auth/custom/allow>. The same "Authentication Required" dialog box is shown, but the "Password" field now contains the value "bkinney". The "Cancel" and "Log In" buttons are visible at the bottom of the dialog.

A screenshot of a Chrome browser window. The address bar shows the URL: <https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod/auth/custom/allow>. The page content displays the message "Hello, Bob Kinney". The browser's status bar indicates it is 7:38 PM on Tuesday.

We then can get the correct response having providing the details. This can use any contextual key/value information that we can pass back in the custom authorizer. Note that this user is only allowed access to this specific method, if we try to access other privileged APIs like below, we should get an unauthorized response back

A screenshot of a Chrome browser window. The address bar shows the URL: <https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod/auth/custom/deny>. The page content displays the message {"message": "These aren't the droids you're looking for."}. The browser's status bar indicates it is 7:39 PM on Tuesday.

We get the default error message in this case showing that we don't have access to this method

A screenshot of a Chrome browser window. The address bar shows the URL: <https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod/auth/custom/allow>. A modal dialog box titled "Authentication Required" is displayed, asking for a Username (admin) and Password. The browser's status bar indicates it is 7:39 PM on Tuesday.

We can again log in as a privileged user as above

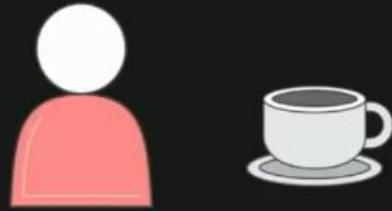
A screenshot of a Chrome browser window. The address bar shows the URL: <https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod/auth/custom/allow>. The page content displays the message "Hello, Admin User". The browser's status bar indicates it is 7:39 PM on Tuesday.

We then get logged in and able to see all API endpoints. This is because the authorizer has sent back the contextual details that we are logged in as the admin user

A screenshot of a Chrome browser window. The address bar shows the URL: <https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod/auth/custom/deny>. The page content displays the message "Hello, Admin User". The browser's status bar indicates it is 7:39 PM on Tuesday.

We also can see the privileged resource also. We are now able to protect portions of our APIs from non-privileged users

## Check in with Doug



TAMPR promotions have been a hit, and the app is more popular than ever. Doug is now speaking with other services, such as a new site focused on brunch spots, on how they can work together.

Doug wants a way he can expose portions of his API to these third parties, but track their usage for potential billing opportunities.

## Protecting Your API: Usage Plans

### API Gateway usage plans

API Key Throttling

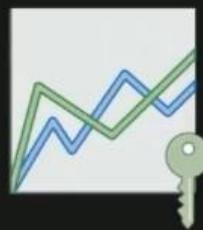
Rate/Burst per API Key

API Key Quota

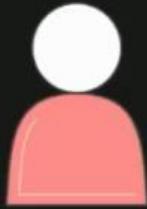
Periodic limits per API Key

API Key Usage

Daily usage records



## Check in with Doug



TAMPR is continuing to grow and some design decisions Doug made in the early versions are causing scaling issues.

Doug has rewritten and optimized a large portion of the backend, but he's worried that despite automated tests passing that there may be issues switching 100% of the TAMPR traffic to the new code.

He needs a way to test his new code with a portion of his live traffic.

## Managing Your API: Canary Release Deployments

### Canary release deployments ★ NEW ★

Tag a new deployment as a “canary” for a stage

Control the percentage of traffic the canary receives

Isolated metrics and logging

STAGE/canary

Any changes that can be tied to a deployment can be tested

Including stage variables

# Demo

Let us see a demo of using canary deployments

The screenshot shows the AWS API Gateway prod Stage Editor. On the left, the API structure is listed under the 'Stages' tab, showing a single stage named 'prod'. The prod stage contains several resources and methods, including '/auth/custom/allow', '/auth/custom/deny', and '/gatling/random'. On the right, the 'prod Stage Editor' interface is displayed. It includes tabs for Settings, Logs, Stage Variables, SDK Generation, Export, Deployment History, Documentation History, and Canary. The 'Settings' tab is active, showing options for Cache Settings (with 'Enable API cache' checked) and Default Method Throttling (with 'Enable throttling' checked). A note indicates that the current account level throttling rate is 10000 requests per second with a burst of 5000 requests.

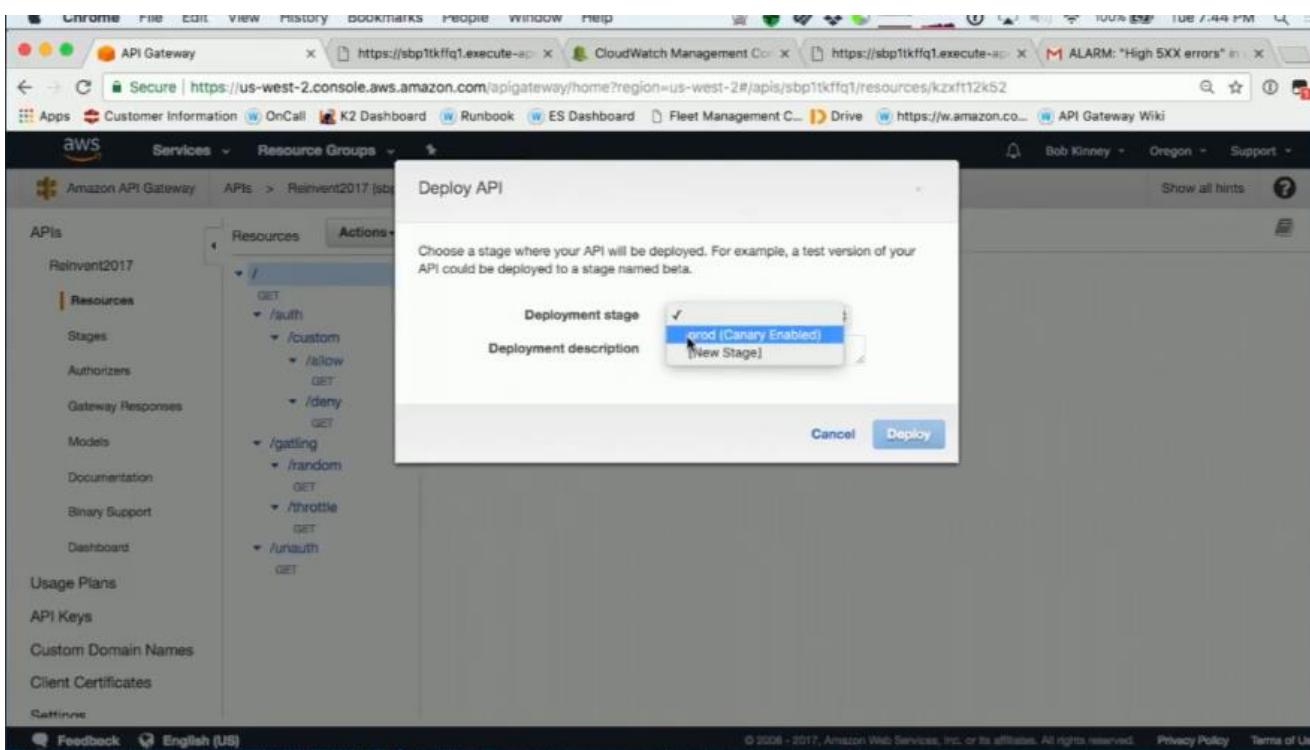
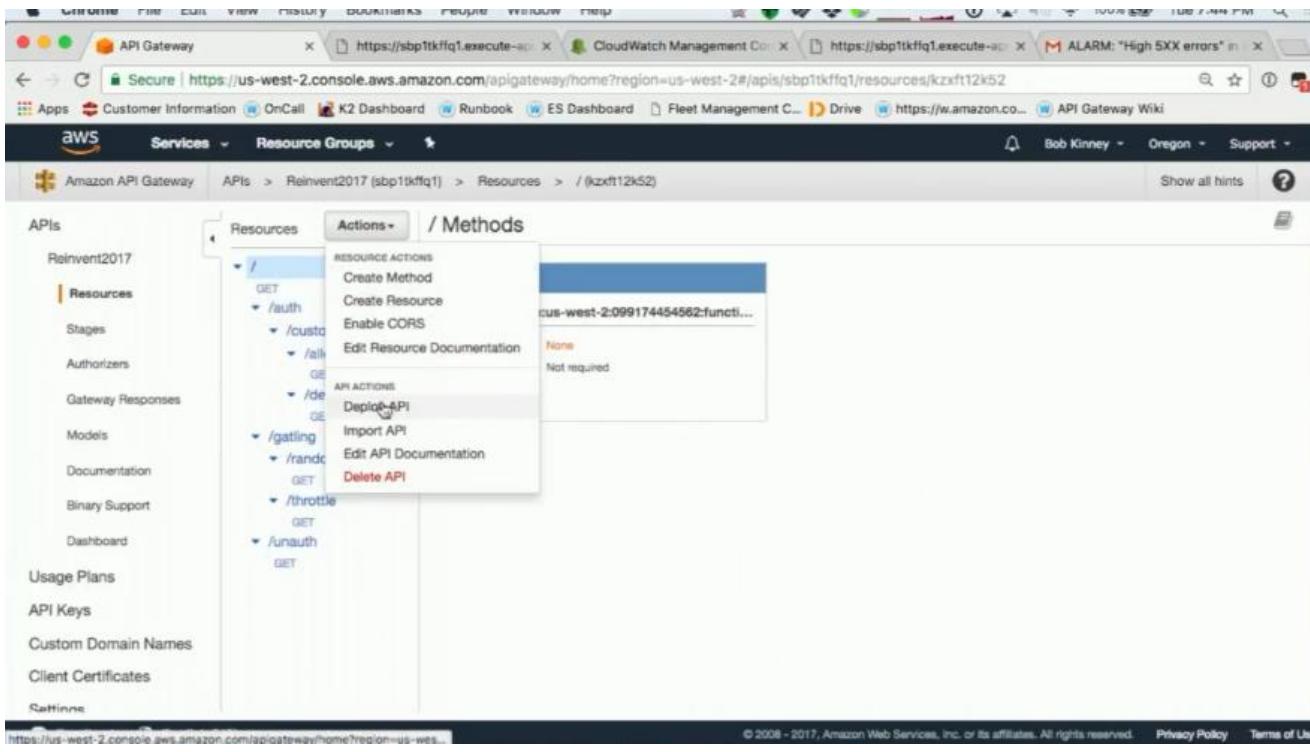
This screenshot shows the same prod Stage Editor interface as the previous one, but with the 'Canary' tab selected. The 'Canary' tab is highlighted in blue. Below the tabs, a descriptive text explains that a Canary is used to test new API deployments and/or changes to stage variables. It states that a Canary can receive a percentage of requests going to your stage, and API deployments will be made to the Canary first before being promoted to the entire stage. At the bottom right of the editor area, there is a prominent blue 'Create Canary' button.

The screenshot shows the AWS API Gateway interface. On the left, a sidebar lists various API resources like Reinvent2017, Resources, Stages, Authorizers, etc. The 'Stages' section is expanded, showing the 'prod' stage. Under 'prod', there are several API methods: GET, /auth, /gatling, and /unauth. The '/auth' method has two sub-methods: /auth/custom/allow and /auth/custom/deny. The '/gatling' method also has two sub-methods: /gatling/random and /gatling/throttle. The '/unauth' method has one sub-method: GET. In the main panel, titled 'prod Stage Editor', there is a 'Canary' tab selected. It displays the 'Stage's Request Distribution' section with two rows: 'Percentage of requests directed to Canary' (0%) and 'Percentage of requests directed to prod' (100%). Below this is the 'Canary Deployment' section, which includes a deployment date of 'Nov 28, 2017 7:10:34 PM' and a 'Description' field containing 'No description.' At the bottom, there is a table for 'Canary Stage Variables' with columns for 'Name', 'Stage Value', and 'Canary Override Value'. A note states: 'By default, your Canary inherits stage variables from the stage. You can override these stage variables or add new ones. When promoting a Canary's settings to the stage, the stage is able to update its stage variables to reflect any overridden values and include any new stage variables created by the Canary.'

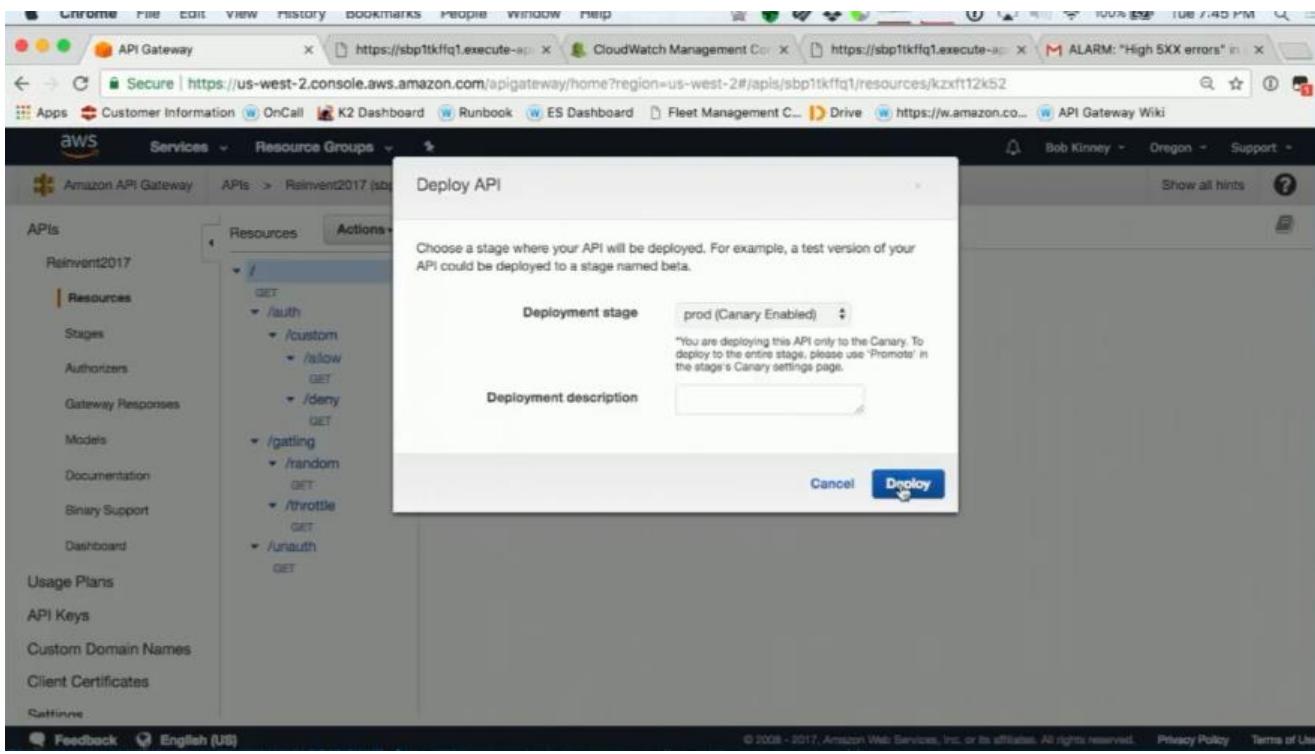
When we create a canary, API Gateway sets up the same deployment that is set up as 'prod' in this case as the canary.

This screenshot is identical to the one above, but it shows a different configuration for the 'Stage's Request Distribution'. The 'Percentage of requests directed to Canary' is now set to 10%, while 'Percentage of requests directed to prod' is set to 90%. All other elements, including the deployment history and stage variables table, remain the same.

We then set the amount of traffic that we want to sent to our canary like 10% above



The console by default will force you to deploy to your canary first, then you can promote your canary up to the prod stage after you have validated it is good. The API Gateway also can allow you to bypass this initial stage and just promote your canary if you want, but this 2-stage approach is the recommended way.



The screenshot shows the 'prod Stage Editor' page. The left sidebar lists stages: 'Reinvent2017' and 'prod'. The main area is titled 'prod Stage Editor' with an 'Invoke URL' of 'https://sbp1tkffq1.execute-api.us-west-2.amazonaws.com/prod'. The top navigation bar includes tabs for 'Settings', 'Logs', 'Stage Variables', 'SDK Generation', 'Export', 'Deployment History', 'Documentation History', and 'Canary' (which is selected). The 'Settings' tab displays 'Manage Canary settings here. A Canary is used to test new API deployments and/or changes to stage variables. A Canary can receive a percentage of requests going to your stage. In addition, API deployments will be made to the Canary first before being able to be promoted to the entire stage.' Below this are sections for 'Stage's Request Distribution' (with 10% to Canary and 90% to prod) and 'Canary Deployment' (with a deployment date of Nov 28, 2017, 7:45:06 PM and a 'No description.' note). The bottom of the page shows 'Canary Stage Variables'.

Once we deploy our canary, we can then start up our Gatlin calling code to test as below

```
SUBLINE TEXT File Edit Selection Find View GOTO TOOLS Project Window Help Throttle.scala UNREGISTERED
RandomErrors.scala Throttle.scala
1 package reinvent2017
2
3 import io.gatling.core.Predef._
4 import io.gatling.http.Predef._
5 import scala.concurrent.duration._
6
7 class Throttle extends Simulation {
8
9   val httpConf = http
10    .baseURL("https://sbpltkffq1.execute-api.us-west-2.amazonaws.com/prod/gatling/throttle")
11
12   val scn = scenario("Scenario Name")
13     .asLongAs(true){
14       exec(http("request_1").get("/"))
15     }
16
17   setUp(scn.inject(atOnceUsers(100)).protocols(httpConf))
18 }
19
```

```
SUBLINE TEXT File Edit Selection Find View GOTO TOOLS Project Window Help RandomErrors.scala Throttle.scala UNREGISTERED
RandomErrors.scala Throttle.scala
1 package reinvent2017
2
3 import io.gatling.core.Predef._
4 import io.gatling.http.Predef._
5 import scala.concurrent.duration._
6
7 class RandomErrors extends Simulation {
8
9   val httpConf = http
10    .baseURL("https://sbpltkffq1.execute-api.us-west-2.amazonaws.com/prod/gatling/random")
11
12   val scn = scenario("Scenario Name")
13     .asLongAs(true){
14       exec(http("request_1").get("/"))
15     }
16
17   setUp(scn.inject(atOnceUsers(10)).protocols(httpConf))
18 }
19
```

```
f45c89a374b5:gatling-charts-highcharts-bundle-2.3.0 bkinney$ bin/gatling.sh | grep -Ev WARN
GATLING_HOME is set to /Users/bkinney/Downloads/gatling-charts-highcharts-bundle-2.3.0
Choose a simulation number:
[0] reinvent2017.LatencyTest
[1] reinvent2017.RandomErrors
[2] reinvent2017.Throttle
[3] reinvent2017.UsagePlanThrottle
2
Select simulation id (default is 'throttle'). Accepted characters are a-z, A-Z, 0-9, - and _
Select run description (optional)
Simulation reinvent2017.Throttle started...
```

```
Terminal Shell Edit View Window Help gatling-charts-highcharts-bundle-2.3.0 — grep -Ev WARN — 127.30
2017-11-28 19:46:47 - us-west-2.console.aws.amazon.com 55s elapsed
---- Requests ----
> Global Services - Resource Groups - (OK=112 K0=107369)
> request_1 Label Details (OK=112 K0=107369)
---- Errors ----
> status.find.in(200,304,201,202,203,204,205,206,207,208,209), b 107369 (100.0%)
ut actually found 429
---- Scenario Name ----
[ waiting: 0 / active: 100 / done:0 ] 0%
Events 100 00:00 00:00 00:00 00:10 00:10 00:20 00:20 00:30 00:30 00:40 00:40
Rules 0 0 0 0 0 0 0 0 0 0 0 0
2017-11-28 19:46:52 60s elapsed
---- Requests ----
> Global Services - Resource Groups - (OK=135 K0=117639)
> request_1 Label Details (OK=135 K0=117639)
---- Errors ----
> status.find.in(200,304,201,202,203,204,205,206,207,208,209), b 117639 (100.0%)
ut actually found 429
---- Scenario Name ----
[ waiting: 0 / active: 100 / done:0 ] 0%
```

Chrome FILE EDIT VIEW History Bookmarks People WINDOW Help

Secure | https://us-west-2.console.aws.amazon.com/cloudwatch/home?region=us-west-2#logEventViewer:group=API-Gateway-Access-Logs;stream=a684ecee... ALARM: "High 5XX errors" in

CloudWatch Management CloudWatch API Gateway

CloudWatch Log Groups API-Gateway-Access-Logs a684ecee... Expand all Row Text

Filter events all 30s 5m 1h 6h 1d 1w custom

Message

2017-11-29 03:25:44 No older events found at the moment. Retry.

288.78.236.25 - [29/Nov/2017:03:25:44 +0000] "GET /unauth HTTP/1.1" 200 1926 fc80afc5-d4b4-11e7-879f-c9803db9c8e4 No newer events found at the moment. Retry.

CloudWatch Dashboards Alarms ALARM INSUFFICIENT OK Billing Events Rules Event Buses Logs Metrics Favorites Add a dashboard

https://us-west-2.console.aws.amazon.com/cloudwatch/home?region=us-west-2#metricsV2 Chrome FILE EDIT VIEW History Bookmarks People WINDOW Help

Secure | https://us-west-2.console.aws.amazon.com/cloudwatch/home?region=us-west-2#metricsV2 ALARM: "High 5XX errors" in

CloudWatch Management CloudWatch API Gateway

Untitled graph 1h 3h 12h 1d 3d 1w custom Line Actions

Your CloudWatch graph is empty. Select some metrics to appear here.

0 0.5 1.00

02:50 02:55 03:00 03:05 03:10 03:15 03:20 03:25 03:30 03:35 03:40 03:45

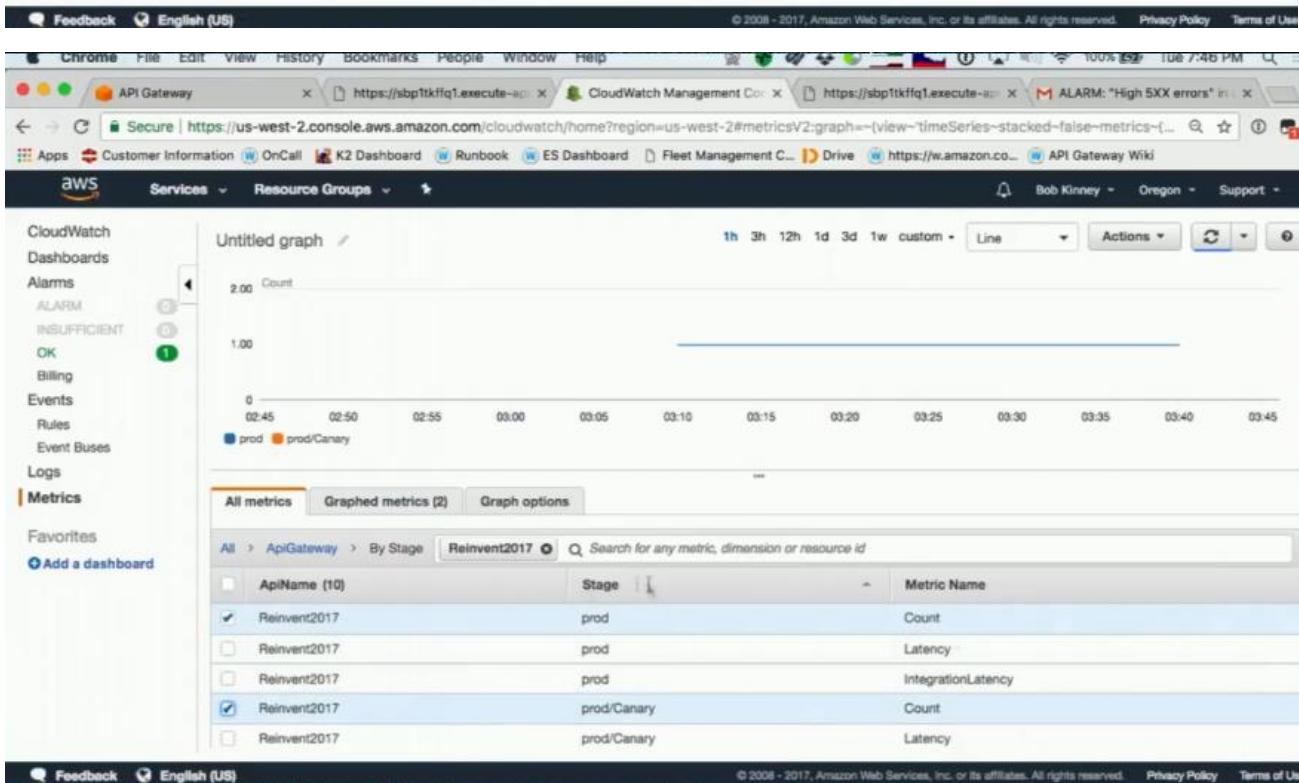
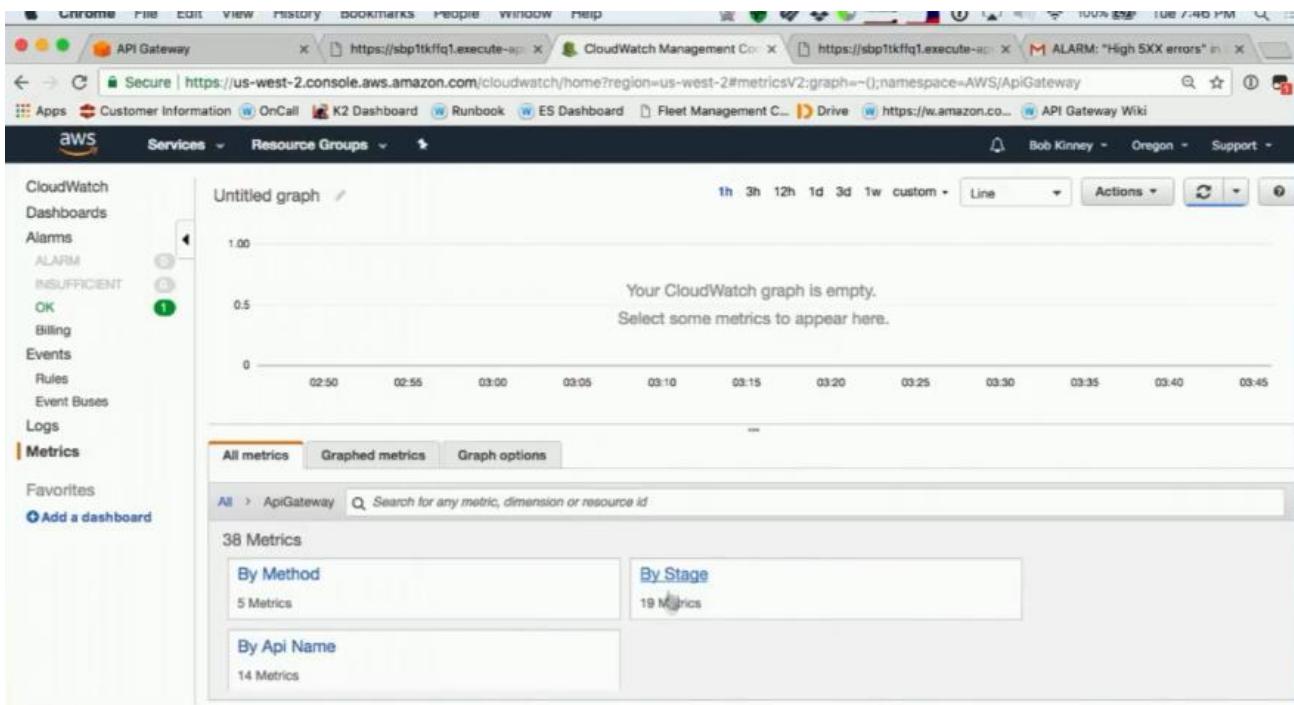
All metrics Graphed metrics Graph options

Q Search for any metric, dimension or resource id

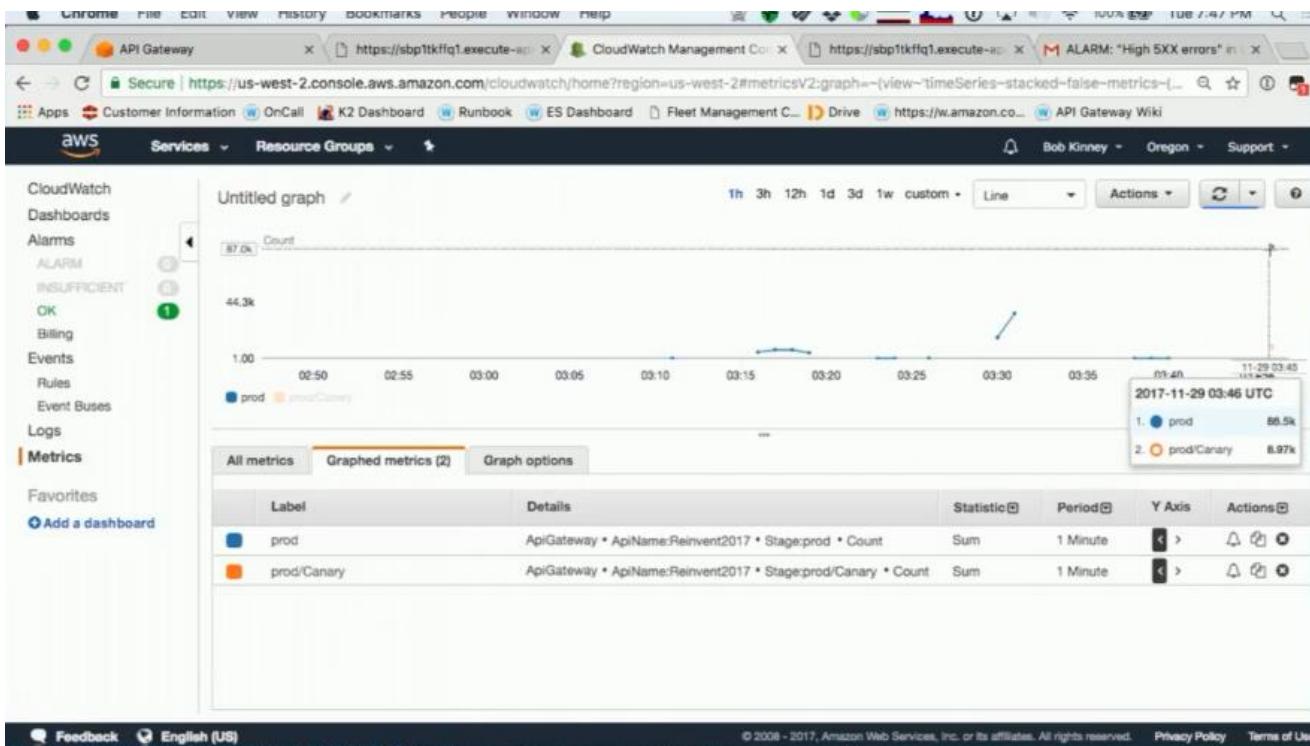
144 Metrics

ApiGateway	DynamoDB	Lambda
38 Metrics	4 Metrics	36 Metrics
Logs	S3	SNS
18 Metrics	8 Metrics	8 Metrics

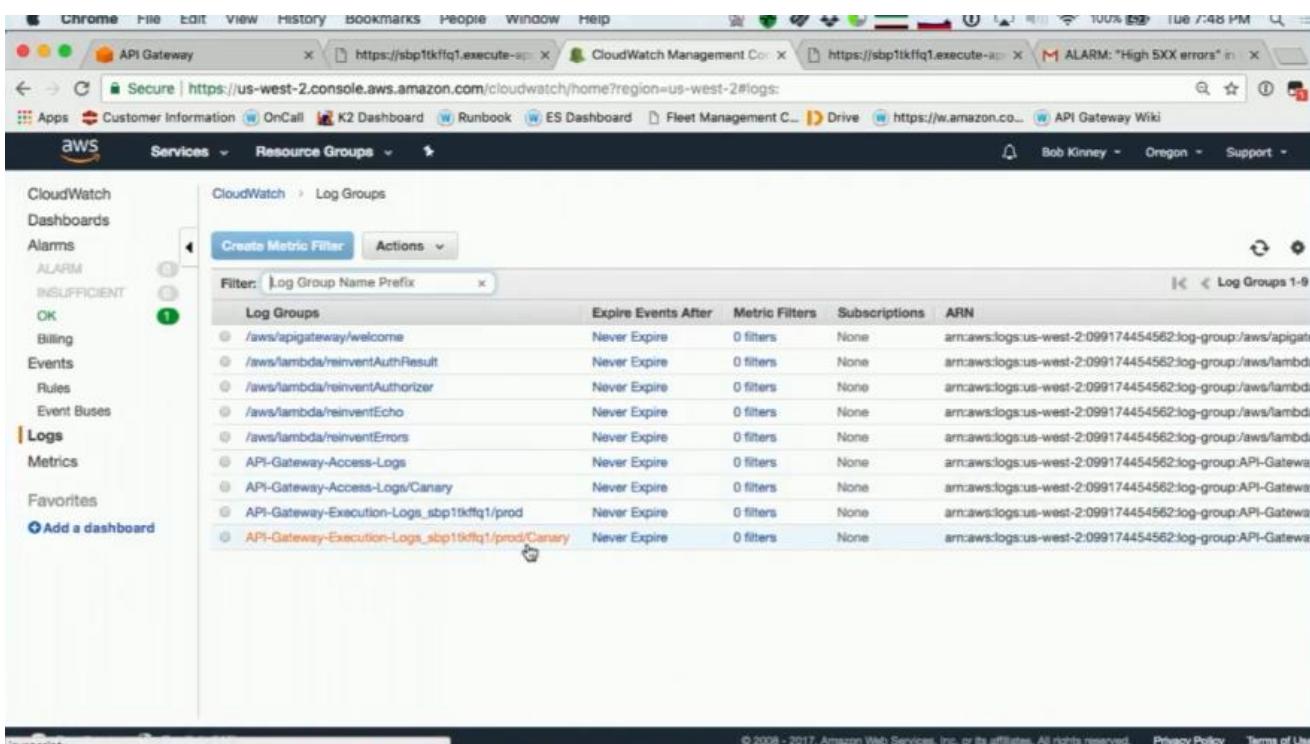
Feedback English (US) © 2006 – 2017, Amazon Web Services, Inc. or its affiliates. All rights reserved. Privacy Policy Terms of Use



Note that we now have metrics for both the prod stage and the prod/Canary stage.



We should start seeing about 10% of the requests going to our canary API as above. This allows us to check the metrics for both stages and also set up alarms and maybe do automatic rollbacks, or automate the promotion of the canary to prod using a lambda



Screenshot of the AWS CloudWatch Management Console showing the Log Groups page for the 'API-Gateway-Access-Logs/Canary' group. The left sidebar shows the 'Logs' section is selected. The main area displays a list of log streams with their last event times.

Log Stream	Last Event Time
839ab46820b524afda05122893c2fe8e	2017-11-28 19:47 UTC-8
182be0c5cdod507801864cde4d3d5e	2017-11-28 19:47 UTC-8
06905b7ef840fc74a814ec9237b6ec	2017-11-28 19:47 UTC-8
0266e33d3f546cb5436a1079be557d97	2017-11-28 19:47 UTC-8
eb163727917cbb1ee208541a643e74	2017-11-28 19:47 UTC-8
1f0e3dad99908345f7439ffabdf1c	2017-11-28 19:47 UTC-8
69adc1e10777fd335d7ba04342e1ca	2017-11-28 19:47 UTC-8
f0935e4cd5920aa6c7c996a5ee53a70f	2017-11-28 19:47 UTC-8
735b90b4568125ed6c3f678819b6e058	2017-11-28 19:47 UTC-8
9f61408e3afb633e50cd1b20deff466	2017-11-28 19:47 UTC-8
8c19f571e251e61cb8dd3612126d5ecf	2017-11-28 19:47 UTC-8
f2217062e9a397a1dca429e7d70bc6ca	2017-11-28 19:46 UTC-8
aab3238922bcc25a#f606eb525fdc56	2017-11-28 19:46 UTC-8
084b6fb10729ed4dafc3df5a3ae7c9	2017-11-28 19:46 UTC-8
92c8c964e4c37100777c7190b76d28233	2017-11-28 19:46 UTC-8
92cc227532d17e56e07902b254dfad10	2017-11-28 19:46 UTC-8

Screenshot of the AWS CloudWatch Management Console showing the log events for the '839ab46820b524afda05122893c2fe8e' stream. The left sidebar shows the 'Logs' section is selected. The main area displays a list of log messages with their timestamps.

Message	Timestamp
2017-11-29 03:48:01	2017-11-29 03:48:01
208.78.236.25 - - [29/Nov/2017:03:47:55 +0000] "GET /gotling/throttle HTTP/1.1" 429 31 158ooc?b-d4b8-11e7-93ab-2d8a3f36de9e	2017-11-29 03:48:01
208.78.236.25 - - [29/Nov/2017:03:47:56 +0000] "GET /gotling/throttle HTTP/1.1" 429 31 15e290d4-d4b8-11e7-93ab-2d8a3f36de9e	2017-11-29 03:48:01
208.78.236.25 - - [29/Nov/2017:03:47:58 +0000] "GET /gotling/throttle HTTP/1.1" 429 31 171607ef-d4b8-11e7-93ab-2d8a3f36de9e	2017-11-29 03:48:01
208.78.236.25 - - [29/Nov/2017:03:47:59 +0000] "GET /gotling/throttle HTTP/1.1" 429 31 17a80e60-d4b8-11e7-93ab-2d8a3f36de9e	2017-11-29 03:48:01
208.78.236.25 - - [29/Nov/2017:03:48:00 +0000] "GET /gotling/throttle HTTP/1.1" 429 31 182ef128-d4b8-11e7-93ab-2d8a3f36de9e	2017-11-29 03:48:01
208.78.236.25 - - [29/Nov/2017:03:47:58 +0000] "GET /gotling/throttle HTTP/1.1" 429 31 16f5124c-d4b8-11e7-8b9f-b1f665225f93	2017-11-29 03:48:01
208.78.236.25 - - [29/Nov/2017:03:47:59 +0000] "GET /gotling/throttle HTTP/1.1" 429 31 17d2ef1a-d4b8-11e7-8b9f-b1f665225f93	2017-11-29 03:48:01
208.78.236.25 - - [29/Nov/2017:03:48:03 +0000] "GET /gotling/throttle HTTP/1.1" 429 31 19f643b3-d4b8-11e7-858c-095899fed100	2017-11-29 03:48:01
208.78.236.25 - - [29/Nov/2017:03:48:05 +0000] "GET /gotling/throttle HTTP/1.1" 429 31 1b11c5e7-d4b8-11e7-858c-095899fed100	2017-11-29 03:48:01

We can also see the logs for both the canary and prod stages

## Check in with Doug



TAMPR is continuing to grow and Doug is now bringing in people to help work on updates.

He is looking for ways to formalize the update process.

## API stages

Stages are named links to a deployed version of your API

Recommended for managing API lifecycle

Dev/test/prod

Alpha/beta/gamma

Support for parameterized values through *stage variables*

## Custom domains

Run your APIs within your own DNS zone

Recommended for supporting multiple versions

`api.tampr.com/v1` -> restapi1

`api.tampr.com/v2` -> restapi2

★ NEW ★

Support for cross-region redundancy with regional API endpoints

# Swagger

Portable API definition  
JSON/YAML  
Import/Export your API  
API Gateway extensions  
API definition as code

```
1  "swagger": "2.0",
2  "info": {
3    "version": "2017-11-18T03:40:50Z",
4    "title": "Reinvent2017"
5  },
6  "host": "execute-api.us-west-2.amazonaws.com",
7  "basePath": "/prod",
8  "schemes": [
9    "https"
10 ],
11 "paths": {
12   "/": {
13     "get": {
14       "consumes": [
15         "application/json"
16       ],
17       "produces": [
18         "application/json"
19       ],
20       "responses": {
21         "200": {
22           "description": "200 response",
23           "schema": {
24             "$ref": "#/definitions/Empty"
25           }
26         }
27       }
28     }
29   }
30 },
31 "x-amazon-apigateway-integration": {
32   "responses": {
33     "default": {
34       "statusCode": "200"
35     }
36   },
37   "uri": "arn:aws:apigateway:us-west-2:lambda:path/2015-03-31/functions",
38   "passThroughBehavior": "when_no_templates",
39   "httpMethod": "POST",
40   "requestTemplates": {
41     "application/json": "#& See http://docs.aws.amazon.com/apigateway/"
42   },
43   "type": "aws"
44 },
45 "/auth/custom/allow": {
```

We need a way to describe our APIs using a definition file that we can treat as code. The default way with API Gateway is using Swagger 2.0. we can get the swagger representation of our API if we want.

## AWS Serverless Application Model (SAM)



CloudFormation extension optimized for serverless

New serverless resource types: functions, APIs, and tables

Supports anything CloudFormation supports

Open specification (Apache 2.0)

<https://github.com/awslabs/serverless-application-model>

## SAM template capabilities

- Can mix in other non-SAM CloudFormation resources in the same template
  - S3, Kinesis, Step Functions
- Supports use of Parameters, Mappings, Outputs, others
- Supports Intrinsic Functions
- Can use ImportValue
  - (exceptions for RestApild, Policies, StageName attributes)
- YAML or JSON



## Other frameworks

APEX

aws  
Chalice

Cloud  
Claudia.js

SERVERLESS

SPARTA

Zappa

## AWS CodeBuild

Fully managed build service that compiles source code, runs tests, and produces software packages



Scales continuously and processes multiple builds concurrently

You can provide custom build environments suited to your needs with Docker images

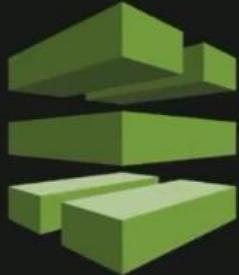
Only pay by the minute for the compute resources you use

Launched with CodePipeline and Jenkins integration

Can be used as a “Test” action in CodePipeline

## AWS CodePipeline

Continuous delivery service for fast and reliable application updates

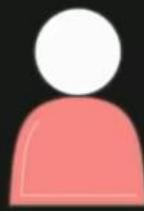


Model and visualize your software release process

Builds, tests, and deploys your code every time there is a code change

Integrates with third-party tools and AWS

## Be like Doug



- Customize your API to meet your operational needs
- Monitor your APIs with metrics and alarms to find problems
- Use logging to diagnose problems with your APIs
- Make use of throttling and authentication to limit blast radius and protect critical API components
- Make your API available to third parties through usage plans
- Manage your API with the tools that make your development/deployment easier

## aws.amazon.com/serverless

The screenshot shows the AWS Serverless homepage. At the top, there is a navigation bar with links for Menu, Amazon Web Services logo, Products, Solutions, Pricing, Software, Support, Customers, More, English, My Account, and Sign In to the Console. Below the navigation bar is a large blue header with the AWS Lambda logo (a stylized gear icon) and the text "Serverless Computing and Applications". A sub-header below it says "Build and run applications without thinking about servers". There is a yellow "Get Started" button. At the bottom of the page, there is a navigation bar with links for AWS Lambda, Getting Started Resources, Use Cases, Developer Tools, Partner Solutions, and Compute Blog. Below this is a section titled "Build Serverless Applications for Production" with a paragraph of text and a link to "Building serverless applications".

Build and run applications without thinking about servers

Get Started

AWS Lambda    Getting Started Resources    Use Cases    Developer Tools    Partner Solutions    Compute Blog

Build Serverless Applications for Production

Serverless computing allows you to build and run applications and services without thinking about servers. Serverless applications don't require you to provision, scale, and manage any servers. You can build them for virtually any type of application or backend service, and everything required to run and scale your application with high availability is handled for you.

Building serverless applications means that your developers can focus on their core product instead of worrying about managing and operating servers or runtime either in the cloud or on-premises. This makes it easier for developers to reclaim time and energy that can be spent on developing great

## **Other ways to connect**

AWS Forums

[forums.aws.amazon.com](https://forums.aws.amazon.com)

StackOverflow

GitHub

[github.com/aws](https://github.com/aws)

[github.com/awslabs](https://github.com/awslabs)