# Serverless Architecture meets Continous Delivery

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Following

# This should be interesting!

> **Eric Hammond** @esh
> Number 1 question at #aws #reinvent: "Oh, you use AWS Lambda... How do you manage deployment?" Retweet & reply w your answer(s)

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|---|---|
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11:20 PM - 3 Dec 2016 from SeaTac, WA

4 4 11

https://twitter.com/jeffbarr/status/805175000906928128

# Ops

Ops

Scale

Ops
Scale
High Availability

Ops
Scale
High Availability
Saturation

Ops
Scale
High Availability
Saturation 💸

# 🎉 Serverless Architecture 🎊

AWS Lambda

Function as a Service (FaaS)

cost estimates: serverlesscalc.com

~~Ops~~

~~Scale~~

~~High Availability~~

~~Saturation~~

Lambda > Functions > bedcon-test

**ARN** - arn:aws:lambda:eu-central-1:925165623454:function:bedcon-test

# bedcon-test

Qualifiers ▼ | Actions ▼ | Test

Code | Configuration | Triggers | Tags | Monitoring

Code entry type

Edit code inline ▼

```
1
2  import json
3  import urllib.parse
4  import boto3
5
6  print('Loading function')
7
8  s3 = boto3.client('s3')
9
10
11 def lambda_handler(event, context):
12     #print("Received event: " + json.dumps(event, indent=2))
13
14     # Get the object from the event and show its content type
15     bucket = event['Records'][0]['s3']['bucket']['name']
16     key = urllib.parse.unquote_plus(event['Records'][0]['s3']['object']['key'], encoding='utf-8')
17     try:
18         response = s3.get_object(Bucket=bucket, Key=key)
19         print("CONTENT TYPE: " + response['ContentType'])
20         return response['ContentType']
21     except Exception as e:
22         print(e)
23         print('Error getting object {} from bucket {}. Make sure they exist and your bucket is in the same
24         raise e
```

**ARN** - arn:aws:lambda:eu-central-1:925165623454:function:bedcon-test

# bedcon-test

Qualifiers ▼ Actions ▼ Test

## Execution result: succeeded (logs)

▼ **Details**

The area below shows the result returned by your function execution.

```
"Hello World!"
```

### Summary

Code SHA-256

krrT1Qm9oSrGcf3XUs
RTJTi7J3yCaSU+bBTW
psEvvsg=

Request ID

c6681d17-9e30-11e7-
86ff-6becc3092acb

Duration

0.34 ms

Billed duration

100 ms

Resources configured

128 MB

### Log output

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

```
START RequestId: c6681d17-9e30-11e7-86ff-6becc3092acb Version: $LATEST
END RequestId: c6681d17-9e30-11e7-86ff-6becc3092acb
REPORT RequestId: c6681d17-9e30-11e7-86ff-6becc3092acb  Duration: 0.34 ms
Billed Duration: 100 ms         Memory Size: 128 MB     Max Memory Used: 31 MB
```

cosee Rewards

REWARD Home Users Logout

## Last rewards

Alex

23

"Die vielen emojis"

-Andreas

Zuschauer

100

"Danke fürs zahlreiche Erscheinen!"

-Andreas

Alex

5

"Coole Demo!"

-Andreas

Alex

5

"Für gutes Essen vom Thai!"

-Andreas

## Best colleagues

Zuschauer

Alex

Andreas

Markus

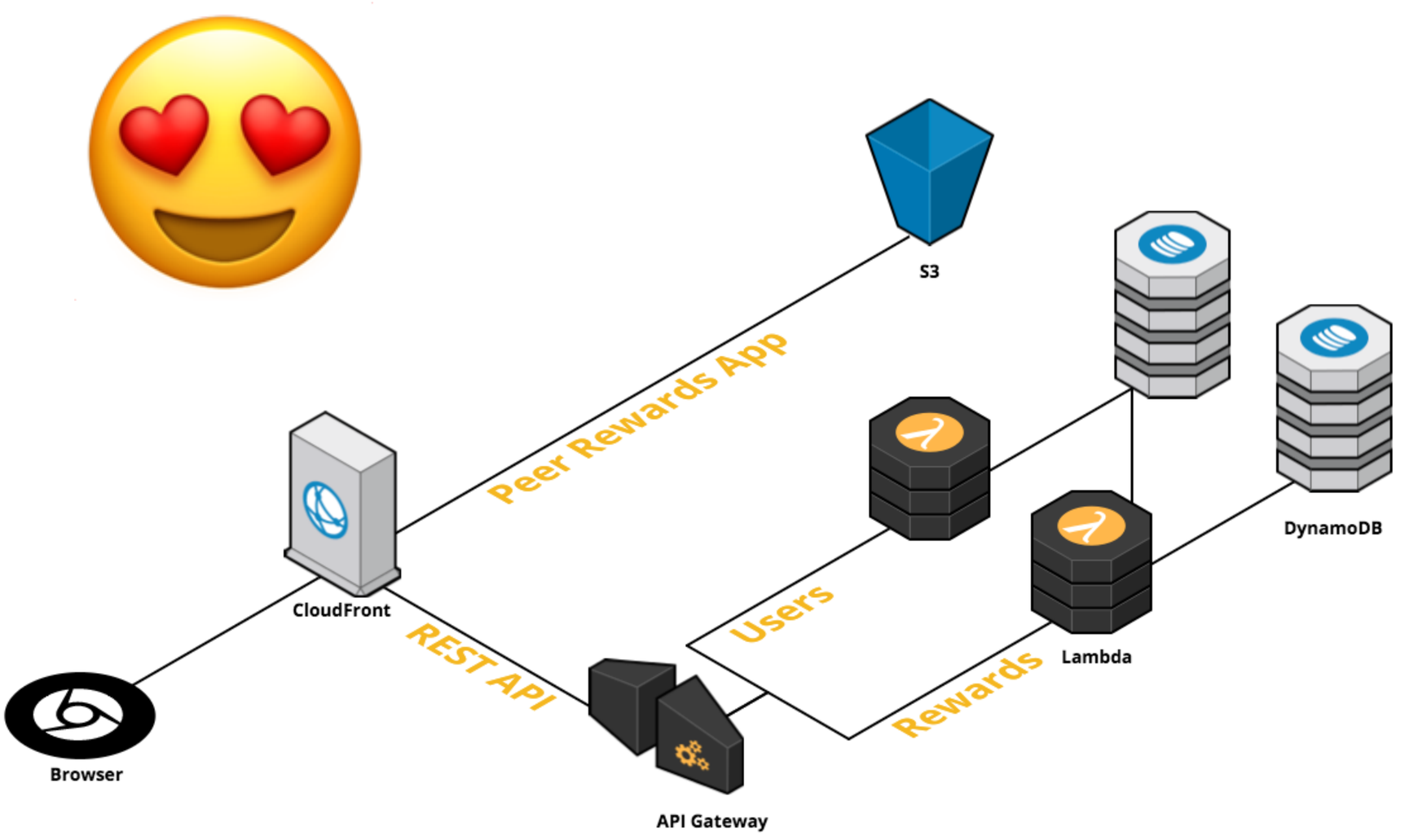
## ... and their BFFs

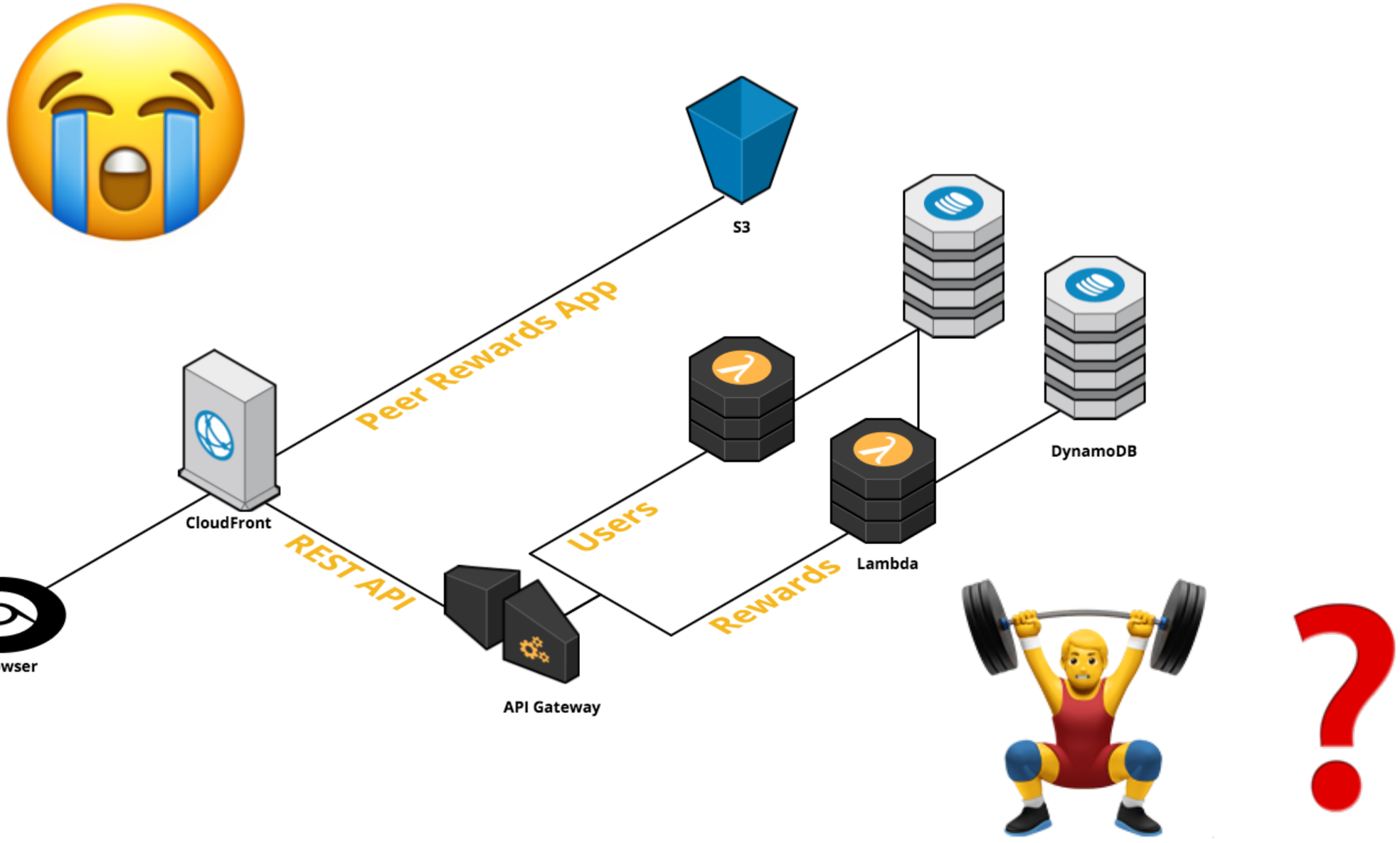
Zuschauer

Zuschauer

Alex

Markus


S3
Peer Rewards App
CloudFront
Users
REST API
Rewards
Lambda
DynamoDB
Browser
API Gateway


S3
Peer Rewards App
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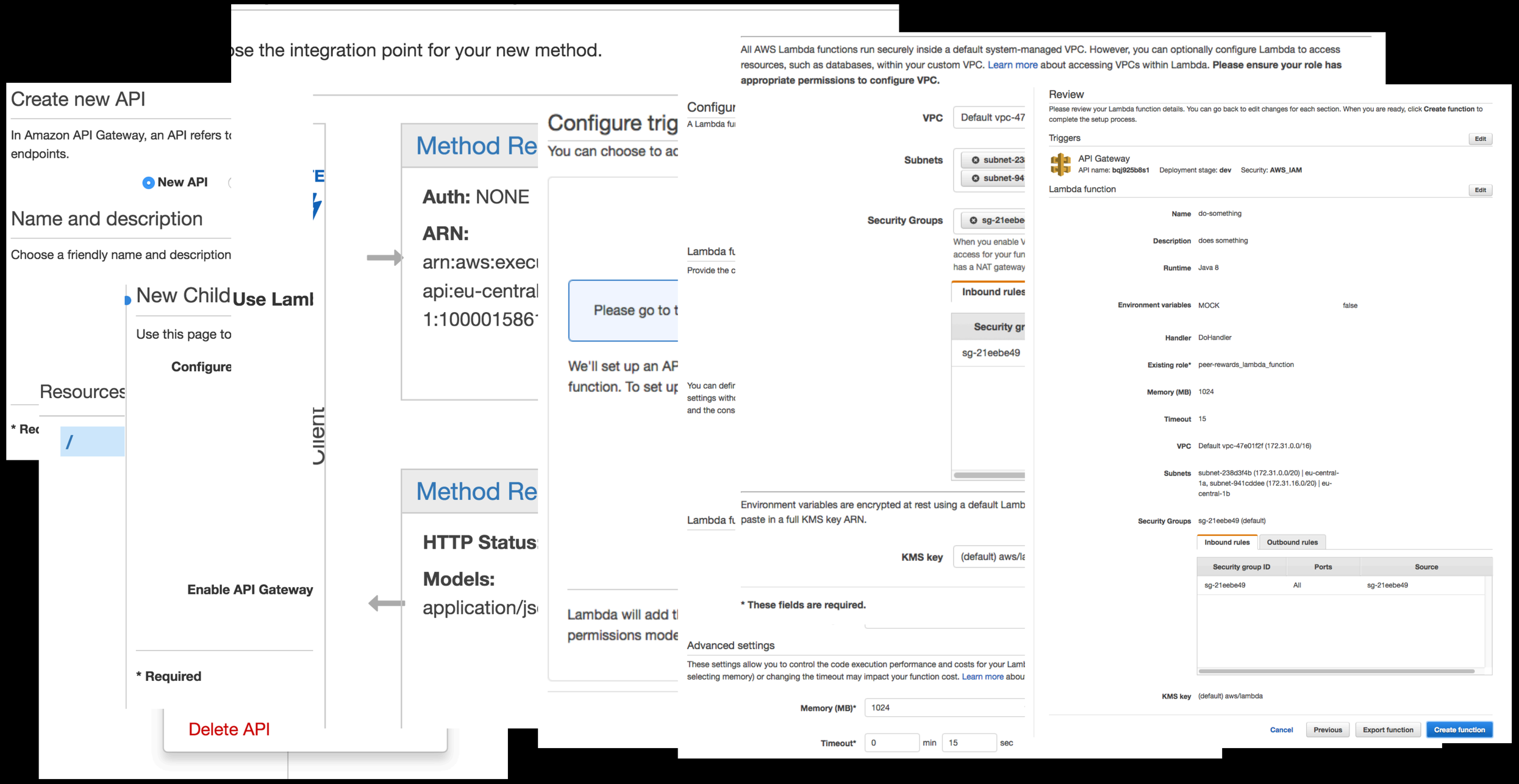
ose the integration point for your new method.
Create new API
In Amazon API Gateway, an API refers t
endpoints.
New API
Name and description
Choose a friendly name and description
New Child
Use Lamb
Use this page to
Configure
Resources
* Rec
/
Enable API Gateway
* Required
Delete API
Method Re
Auth: NONE
ARN:
arn:aws:execu
api:eu-central
1:100001586
Method Re
HTTP Status
Models:
application/js
Configure trig
You can choose to ac
Please go to t
We'll set up an AP
function. To set up
Lambda will add t
permissions mode
Configur
A Lambda fu
Lambda fu
Provide the c
You can defir
settings with
and the cons
Lambda fu
All AWS Lambda functions run securely inside a default system-managed VPC. However, you can optionally configure Lambda to access resources, such as databases, within your custom VPC. Learn more about accessing VPCs within Lambda. Please ensure your role has appropriate permissions to configure VPC.
VPC
Default vpc-47
Subnets
subnet-23
subnet-94
Security Groups
sg-21eebe
When you enable V
access for your fun
has a NAT gateway
Inbound rules
Security gr
sg-21eebe49
Environment variables are encrypted at rest using a default Lamb
paste in a full KMS key ARN.
KMS key
(default) aws/la
* These fields are required.
Advanced settings
These settings allow you to control the code execution performance and costs for your Lam
selecting memory) or changing the timeout may impact your function cost. Learn more abou
Memory (MB)*
1024
Timeout*
0
min
15
sec
Review
Please review your Lambda function details. You can go back to edit changes for each section. When you are ready, click Create function to complete the setup process.
Triggers
Edit
API Gateway
API name: bqj925b8s1 Deployment stage: dev Security: AWS_IAM
Lambda function
Edit
Name do-something
Description does something
Runtime Java 8
Environment variables MOCK false
Handler DoHandler
Existing role* peer-rewards_lambda_function
Memory (MB) 1024
Timeout 15
VPC Default vpc-47e01f2f (172.31.0.0/16)
Subnets subnet-238d3f4b (172.31.0.0/20) | eu-central-1a, subnet-941cddee (172.31.16.0/20) | eu-central-1b
Security Groups sg-21eebe49 (default)
Inbound rules
Outbound rules
Security group ID
Ports
Source
sg-21eebe49
All
sg-21eebe49
KMS key (default) aws/lambda
Cancel
Previous
Export function
Create function

# CI

"keep team in sync and get fast feedback"

# CD

"be confident and get code to production"


Serverless Build

Unit Tests

Configuration

Integration Tests

Events / Triggers

Stress Testing

Complex Infrastructure

Versioning

Deployment

Rollback

Limits

# Unit Tests? 🤔

```
@Override
public LambdaProxyResponse handleRequest(LambdaProxyRequest request, Context context) {
  val query = request.getQueryStringParameters();

  List<User> results;
  if (query ≠ null && query.containsKey("usernames")) {
    val idAsString = Splitter.on(",").splitToList(query.get("usernames"));
    val usersForQuery = idAsString.stream()
      .map(s → User.builder().username(s).build())
      .collect(Collectors.toList());

    val userTableKeysAndAttributes = new TableKeysAndAttributes(dynamodbAdapter.userTableName);
    usersForQuery.forEach(
      u → userTableKeysAndAttributes
        .addHashOnlyPrimaryKey(DynamodbAdapter.UserTable.USERNAME, u.getUsername()));

    results = dynamodbAdapter.dynamodb
      .batchGetItem(userTableKeysAndAttributes)
      .getTableItems().get(dynamodbAdapter.userTableName).stream()
      .map(dynamodbAdapter::itemToUser)
      .collect(toList());
  } else {
    [...]
  }
  return wrapInResponse(results);
}
```

```
@Override
public LambdaProxyResponse handleRequest(LambdaProxyRequest request, Context c) {
    val query = request.getQueryStringParameters();
    List<User> results;
    if (query ≠ null && query.containsKey("usernames")) {
        List<User> usersForQuery = extractUsernamesFromQuery(query);
        results = userService.retrieveUsers(usersForQuery);
    } else {
        results = userService.retrieveUsers();
    }

    return wrapInResponse(results);
}
```

Unit Tests? 🤔

✅ focus on application code

✅ no  , keep your 🎩

# Integration Tests? 🤔

- ✅ disposable environments
- ✅ Serverless invoke local
- ✅ LambCI
- ✅ LocalStack
- ✅ SAM Local

```
$ docker run -v "$PWD":/var/task lambci/lambda \
  index.myHandler '{"some": "event"}'
```

Complex Infrastructure? 🤔

✅ 🤖 Infrastructure as Code

A lot of configuration, deploy scripts? 🤔

✅ Serverless, AWS SAM, Chalice, Sparta

```yaml
service: serverless-peer-reward
provider:
  name: aws
  runtime: java8
  memorySize: 512
  timeout: 10
  stage: dev
  region: eu-central-1

  environment:
    TBL_PREFIX: ${self:provider.stage}-rewards
  iamRoleStatements:
    - Effect: "Allow"
      Action:
        - "dynamodb:*"
      Resource: “arn:aws…table/*”
package:
  artifact: target/peer-rewards.jar
```

```yaml
functions:
  users:
    handler: biz.cosee…UserHandler
    events:
      - http:
          path: users
          method: get
          cors: true

  rewards:
    handler: biz.cosee…RewardHandler
    events:
      - http:
          path: rewards
          method: any
          cors: true

  generate:
    handler: biz.cosee…RandomRewardHandler
    events:
      - schedule:
          rate: rate(1 minute)
          enabled: false
```

# serverless

- language agnostic
- multi-cloud
- install via npm
- plugins

```
service: serverless-peer-reward
provider:
  name: aws
  runtime: java8
  memorySize: 512
  timeout: 10
  stage: dev
  region: eu-central-1

  environment:
    TBL_PREFIX: ${self:provider.stage}-rewards
  iamRoleStatements:
    - Effect: "Allow"
      Action:
        - "dynamodb:*"
      Resource: "*"
package:
  artifact: target/peer-rewards.jar
```

# chalice

- python
- micro framework
- focus on AWS

```
$ pip install chalice
$ chalice new-project helloworld && cd helloworld
$ cat app.py

from chalice import Chalice

app = Chalice(app_name="helloworld")

@app.route("/")
def index():
    return {"hello": "world"}

$ chalice deploy
...
https://endpoint/dev

$ curl https://endpoint/api
{"hello": "world"}
```

# Serverless Application Model

- based on Cloud-Formation
- cli available, not needed
- AWS only

```
AWSTemplateFormatVersion: '2010-09-09'
Transform: AWS::Serverless-2016-10-31
Description: Outputs the time
Resources:
TimeFunction:
Type: AWS::Serverless::Function
Properties:
Handler: index.handler
Runtime: nodejs6.10
CodeUri: ./
Events:
MyTimeApi:
Type: Api
Properties:
Path: /TimeResource
Method: GET
```

## SAM local

```
$ sam local validate
$ sam local start-api
$ sam local generate-event api > event.json
$ sam local invoke "ExampleFunction" -e event.json
$ sam package […]
$ sam deploy […]
```

# sparta

- config and app in go
- fast startup
- alternative to supported languages

```
func hello(event *json.RawMessage,
  context *sparta.LambdaContext,
  w http.ResponseWriter,
  logger *logrus.Logger) {
  logger.Info("Hello World: ", string(*event))
  fmt.Fprint(w, string(*event))
}
func main() {
  var functions []*sparta.LambdaAWSInfo
  lambdaFn :=
  sparta.NewLambda(sparta.IAMRoleDefinition{},
  hello, nil)
  lambdaFunctions = append(functions, lambdaFn)

  // Deploy it
  sparta.Main("SpartaHelloWorld",
    “Simple Sparta Example",
    lambdaFunctions,
    nil,
    nil)
}
```

# How to do versioning? 🤔

λ lambda

⚙ config

⚓ deployment ← #latest

⚓ deployment

⚓ deployment ← #dev

# How to do versioning? 🤔

✅ Lambda built-in Labels and Versioning
✅ API Gateway Stages (dev/prod)

What if I want to roll back? 🤔

✅ switching lambda labels (#blue <> #green)

✅ e.g. Serverless, built-in functionality

Pipeline 🔨📈🚀, where to run? 🤔

✅ CircleCI, Travis, Code{Star,Pipeline,Build}

❗ need comprehensive rights for AWS

# Pipeline

# What’s the catch? 🎣🤔

❗ 50MB per function
❗ 75GB per region

✅ careful with dependencies, try minification
✅ automate cleanups / just overwrite
✅ monitoring artifacts in pipeline

# Interesting things to share 👑

- ✅ goad, artillery
- ✅ Lambda for CI/CD tasks
- ✅ chromeless
- ✅ Serverless By Design

# The Big Picture

Keep your manners. 🍴🎩

Know your tools.🛠️

Don’t be afraid.😌

**Jeff Barr**
@jeffbarr

Following

This should be interesting!

> **Eric Hammond** @esh
> Number 1 question at #aws #reinvent: "Oh, you use AWS Lambda... How do you manage deployment?" Retweet & reply w your answer(s)

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11:20 PM - 3 Dec 2016 from SeaTac, WA

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> blog.cosee.biz
> jobs.cosee.biz
> talks.cosee.biz

# Verlosung und Panel
# 17h35 – Humboldtsaal