RUNNING CFML ON AWS LAMBDA WITH

FUSELESS

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AGENDA

- AWS Lambda Basics (What, When, Where, Why, How)
- Using FuseLess (CFML for Lambda)
- Deploying to Lambda
- Events
- Roadmap

WHAT IS AWS LAMBDA?

- "Serverless" code execution environment
    - A code zip
    - minimal config (RAM, timeout, etc)
- Execution is caused by a **trigger**

MYTHBUSTERS

- The zip will be huge because it includes lucee right?
  - It will ring in around 20mb and can be decreased further
- Node apps will be smaller right?
  - It is not hard for node_modules to get to 50-100mb
- Java must be the slowest way to run code?
  - Cold Starts may be slightly slower, but warm performance is exceptional

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WHAT TRIGGERS DOES LAMBDA SUPPORT?

- A HTTP Request (API Gateway, Application Load Balancer)
- S3 Event (eg: when new file is added run my code)
- SNS (can be used for scheduled tasks)
- SQS (queue message)
- Aurora / DynamoDB (database triggers)
- And many more…

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WHAT IS SERVERLESS?

- Yes, there are still servers
- The server / OS is abstracted away and managed by AWS
- Stateless
- You have just two dials
  - RAM
  - Max Concurrency
- There are limitations

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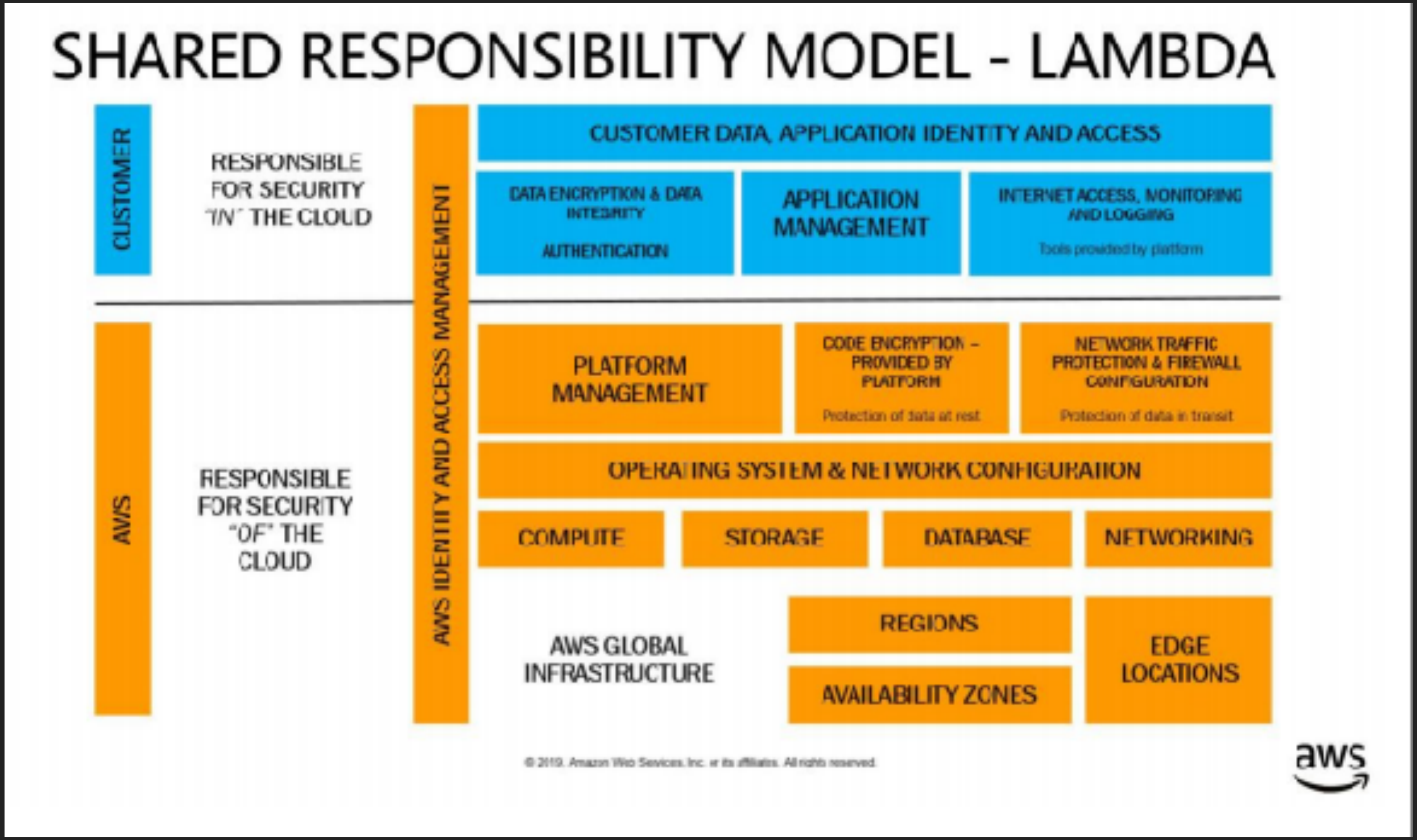
BENEFITS OF SERVERLESS

- Zero "Wasted" Spend
- Zero OS Patching
- Automatically Scales
- Least Privilege Execution (IAM)
- Cheap Compute
  - Sub Second Billing

https://faasandfurious.com/39

AWS LAMBDA SECURITY

- White paper: https://d1.awsstatic.com/whitepapers/Overview-AWS-Lambda-Security.pdf
- AWS has more security responsibility on Lambda vs EC2 based ops
- Compliance:
  - PCI
  - HIPAA
  - SOC 1,2,3


SHARED RESPONSIBILITY MODEL - LAMBDA
CUSTOMER
RESPONSIBLE FOR SECURITY "IN" THE CLOUD
AWS
RESPONSIBLE FOR SECURITY "OF" THE CLOUD
AWS IDENTITY AND ACCESS MANAGEMENT
CUSTOMER DATA, APPLICATION IDENTITY AND ACCESS
DATA ENCRYPTION & DATA INTEGRITY AUTHENTICATION
APPLICATION MANAGEMENT
INTERNET ACCESS, MONITORING AND LOGGING
Tools provided by platform
PLATFORM MANAGEMENT
CODE ENCRYPTION – PROVIDED BY PLATFORM
Protection of data at rest
NETWORK TRAFFIC PROTECTION & FIREWALL CONFIGURATION
Protection of data in transit
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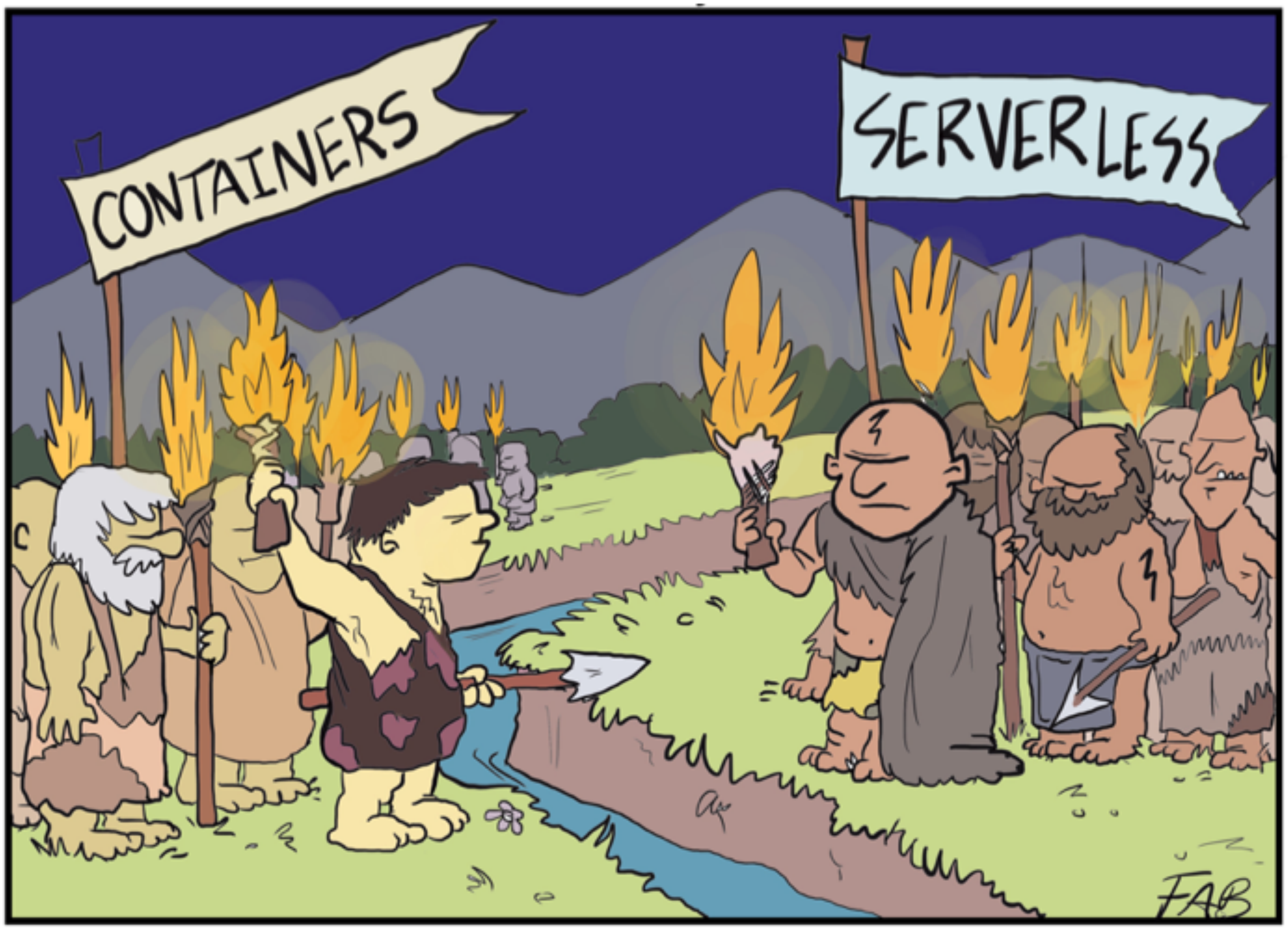
LIMITATIONS OF AWS LAMBDA

- 15 minute maximum execution time
- Stateless - Your "Server" / "Container" / "Instance" will be recycled after an unspecified period of time (usually an hour or so)
- Max RAM 3008 MB

COLD STARTS

- The "server" instances recycled frequently.
- If an instance isn't available to handle a request, a new one is started.
- Performance hit of 0.8-2 seconds (or higher within a VPC)



The two tribes regarded each other suspiciously
in the glow of their blazing production environments.

https://faasandfurious.com/46

DEALING WITH COLD STARTS

- Reduce the size of the code zip
  - Your code must be downloaded from s3
  - Zip file extracted

DEALING WITH COLD STARTS

- Increase RAM (faster CPU, network speed)

RAM	Cold Start Duration
256mb	6 seconds
512mb	2-3 seconds
1024mb	1.5 seconds
2048mb	0.8 seconds

DEALING WITH COLD STARTS

- Pre-compile CFML
  - The more cfm, cfcs the more compilation time on first request

DEALING WITH COLD STARTS

- Function Warmers
  - Run a scheduled task (CloudWatch alarm) every 5-10 minutes to hit the function and keep it warm.
  - Hit concurrently to ensure multiple instances are warm

LAMBDA PRICING

- $0.20 per 1M Requests
  - First 1M free each month
- $0.00001667 per GB-SECOND
  - 1000 seconds at 1GB ram costs around 1 penny
  - $1 =~ 60,000 GB-SECONDs
  - First 400,000 GB-SECOND free each month
  - Billed in 100ms intervals

A GENEROUS FREE TIER

- You can play for free, you may even be a able to go to production for free.
- 800,000 requests at 1GB RAM running for 500ms is free
- Calculator: http://serverlesscalc.com/

API GATEWAY

- Free Tier 12 months - 1M Requests Free
- $3.50 per million requests
- Standard Data Transfer Pricing Applies

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I WILL SAY THAT I'VE YET TO SEE A LAMBDA BILL THAT'S SIGNIFICANT. $10K IN LAMBDA INVARIABLY MEANS ABOUT $1 MILLION IN EC2. (YES, THERE'S ALMOST CERTAINLY AN EXCEPTION CASE OR TWO LURKING AROUND, BUT I'VE NOT SEEN IT PERSONALLY.)

Corey Quinn (Cloud Economist)

via twitter

LET'S GET STARTED

SOME PRE-REQUISITE TOOLS

- Gradle: https://gradle.org/install/
- AWS SAM CLI: https://aws.amazon.com/serverless/sam/
    - Not technically required, used for local testing

STEP 1: GRAB FUSELESS TEMPLATE

- Download / clone from github.com/foundeo/fuseless-template/
    - Or just goto fuseless.org and click Download Template
- Run: init.sh
    - It downloads lucee.jar and fuseless.jar

WHAT VERSION OF LUCEE?

- Because of size you want to use Lucee 5.3+ *light*
  - The light version of lucee excludes default extensions
  - No easy way to add extensions in FuseLess **yet**

FUSELESS FOLDER STRUCTURE

- **/cfml/app/** → Your CFML code goes here!
- **/jars/** → lucee.jar and fuseless.jar (any other jars you want)
- **/build.gradle** → a build script that packages everything
- **/template.yml** → a SAM template definition file

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LETS RUN IT LOCALLY

- In Terminal / Command Prompt from the template root:
  - **gradle build**
    - Packages your lambda function into a zip file
  - **sam local start-api**
    - Uses docker to start a local lambda emulator
    - Hit http://localhost:3000/dump.cfm

TESTING

- You will notice the sam local start-api method is slow
- Develop locally with commandbox, then test builds
  - There are differences and limitations to Lambda that make it important to test in both places.
  - Even still there are slight differences between sam local and the actual Lambda container.

OK LET'S DEPLOY

A BUNCH OF WAYS YOU CAN DEPLOY…

- Upload Zip File to AWS Console or S3
    - Generally discouraged, old school approach
- SAM - Generate CloudFormation Templates
- Code Build, Code Pipeline
- Code Deploy
    - Blue / Green, Canary

USING AWS CONSOLE

- Lambda → Create Function
  - Setup an IAM Role (it can create one for you)
    - Minimally needs to publish logs to CloudWatch
- Upload Zip: build/distributions/name.zip
- Set RAM, Timeout (template.yml is ignored)
- Handler: com.foundeo.fuseless.StreamLambdaHandler

AWS CODESTAR

- Create a new Project (you can use the Java AWS Lambda template)
- Connect it to AWS CodeCommit or GitHub
- Select Cloud9 IDE
- Warning: May cost you a few pennies or dollars / month

AWS CODESTAR

- Created a CodeCommit git repo (you can use github)
- Created a CodeBuild (controlled by buildspec.yml file)
  - Connected the CodeCommit repo as a trigger
- Created a Code Pipeline
  - Takes Code Build Output and Applies CloudFormation
- It setup CodeDeploy
  - Gradually Canary Deploy

AWS CODESTAR

- Created an API Gateway
  - Which gives it a URL
  - API Gateway can be configured with a custom domain

MODIFY BUILDSPEC.YML

- **gradle build**
- **sam deploy**
  - uses **template.yml** to define how much RAM the function uses, etc.

WHAT WAS THAT HANDLER?

- The java entry point that Lambda invokes (FuseLess)
- FuseLess has two handlers:
  - com.foundeo.fuseless.StreamLambdaHandler::**handleRequest**
    - Use for HTTP API
  - com.foundeo.fuseless.StreamLambdaHandler::**handleEventRequest**
    - Use for Events: S3, SNS, SQS, etc

HANDLING EVENTS

- Add your code to onRequest() in Application.cfc
- Event Payload
  - Call getLambdaContext().getEventPayload()

FUSELESS / LAMBDA CONTEXT

- getLambdaContext()
  - hasEventPayload() [FuseLess]
  - getEventPayload() [FuseLess]
  - getAwsRequestId()
  - getLogger()
  - getFunctionName()
  - getRemainingTimeInMillis()
  - (and more)

XRAY

- AWS Tracing Library
- To enabled:
  - Set environment variable FUSELESS_ENABLE_XRAY=true
  - Add AWS X-ray jar to build.gradle
- Call XRay API from your CFML to add exceptions, trace points, debugging metadata.

XRAY

```
xRay = createObject("java", "com.amazonaws.xray.AWSXRay");
try {
    xRay.beginSubsegment("Start Processing");
    for (i=0;i<3;i++) {
        xRay.beginSubsegment("Batch #i#");
        sleep(randRange(100,400));
        xRay.endSubsegment();
    }
    throw(message="Pew");
} catch (err) {
    xRay.getCurrentSubsegment().addException(
        javaCast("java.lang.Throwable", local.error)
    );
} finally {
    xRay.endSubsegment();
}
```

OTHER LAMBDA LIMITS

- File system is read only except for /tmp/ (512mb)
  - FuseLess uses part of /tmp/ (tip, use ram://)
- Code Size Limit: 250mb uncompressed
- No Lucee Admin, everything must be configured in Application.cfc or via Environment Variables

AWS API GATEWAY LIMITATIONS

- 29 Second Timeout
    - Not designed for long running HTTP requests

FUSELESS IN ACTION

- Fixinator runs on AWS Lambda with FuseLess
- "We’re happily deploying several projects on AWS Lambda with the Fuseless setup in combination with hybrid mobile and static sites in S3/Cloudfront." – Kees (Aan Zee Interactive, Netherlands)

DOWN THE ROAD

- FuseLess commandbox command
    - Replace gradle
    - Easy Template initialization
    - Perform CFML specific build optimizations
    - Inject Lucee Extensions
- FuseLess CFML API
    - Abstract common code

THANK YOU!

QUESTIONS?