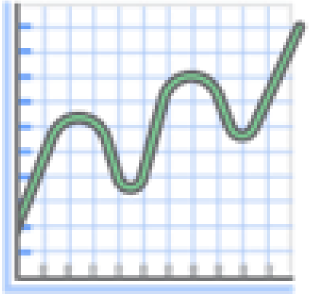
Let’s talk about Lambda!

Serverless compute platform for stateless code execution in response to events

More important benefits

No servers to manage

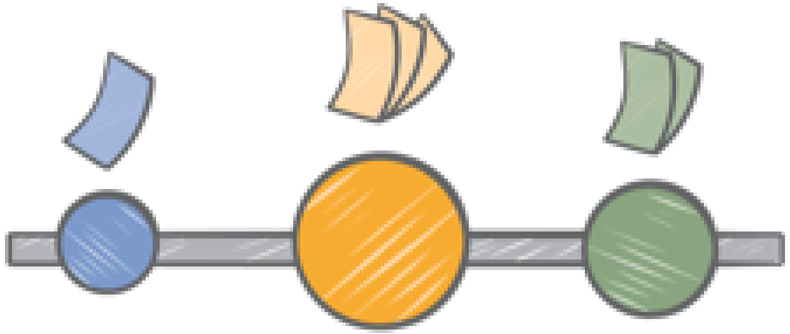


Continuous scaling

No idle/cold servers

Pay per request

- Buy compute time in 100ms increments
- Low request charge
- No hourly, daily or monthly minimums
- No per-device fees
- Never pay for idle

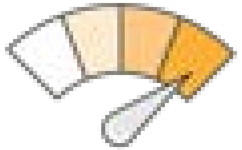


Free tier: 1 million requests, and 400,000 GBs of compute every month, for every customer.

Working with Lambda

Bring your own code

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



Simple resource model

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

Working with Lambda

Flexible use

- Call or send events
- Integrated with other AWS services
- Build serverless ecosystems

Flexible authorization

- Securely grant access to resources, including VPCs
- Fine-grained control over what can call your functions

Working with Lambda

Programming model

- Built-in AWS SDK
- Front end is Lambda
- Use processes, threads, /tmp and sockets normally

Authoring functions

- Author directly with WYSIWYG editor in console
- Package code as .zip and upload to Lambda or S3
- Plugins for Eclipse and Visual Studio
- Command line tools

Working with Lambda

Stateless

- Persist data using Amazon S3, RDS, Elasticache or non-relational database
- No affinity to infrastructure (can’t login to host)

Monitoring and logging

- Built in metrics for requests, latency, errors and throttles
- Built in logging with CloudWatch

Common use cases

Data triggers

- Trigger functions on data updates in S3, SNS, etc.

Big data

- Real time processing of streaming data updates using Kinesis.

Control systems

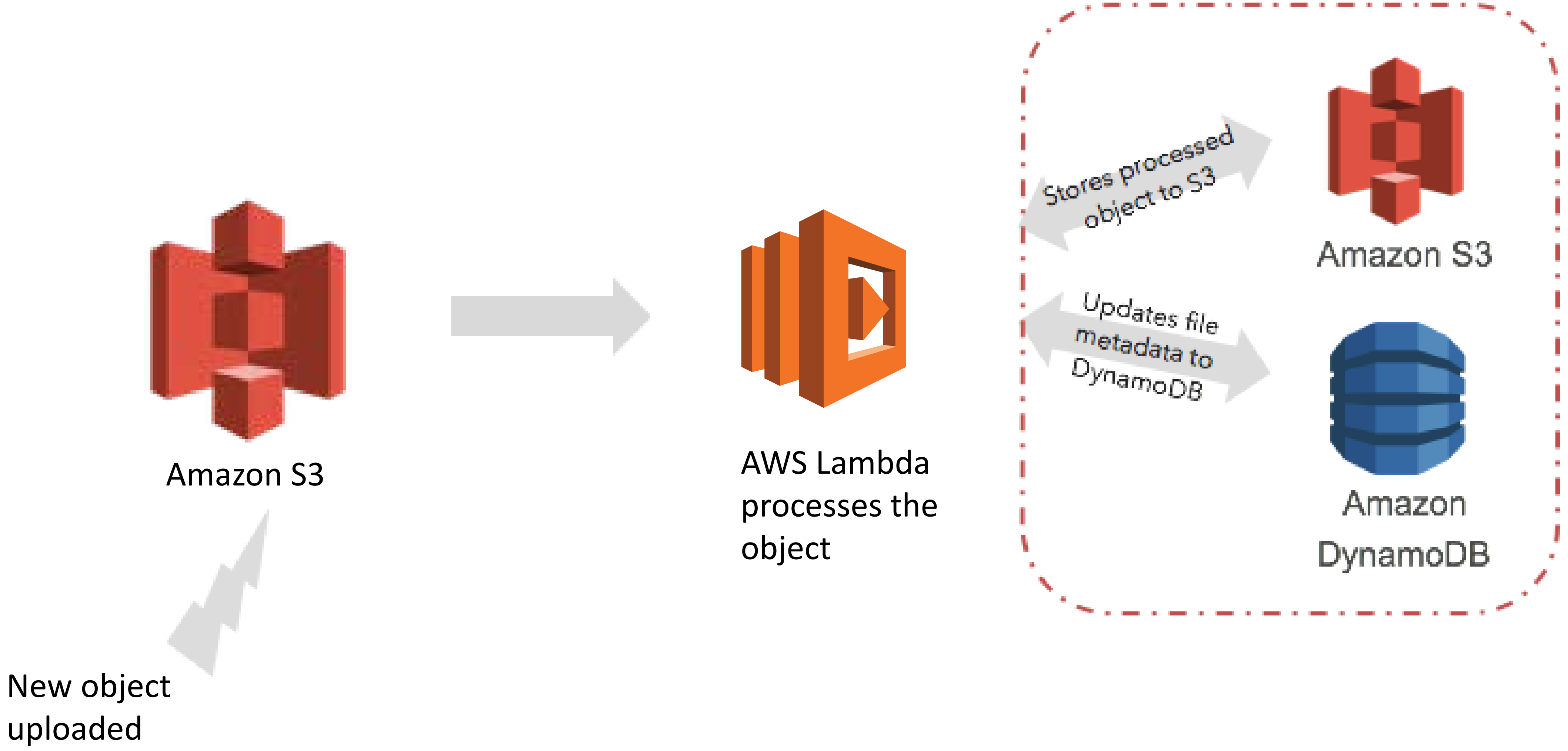
- Customize responses and workflows to state changes within AWS.

Serverless backends

- Execute server-side backend logic

A more specific use case: Lambda + S3

Dynamic data ingestion with Lambda + S3



Amazon S3

New object uploaded

AWS Lambda processes the object

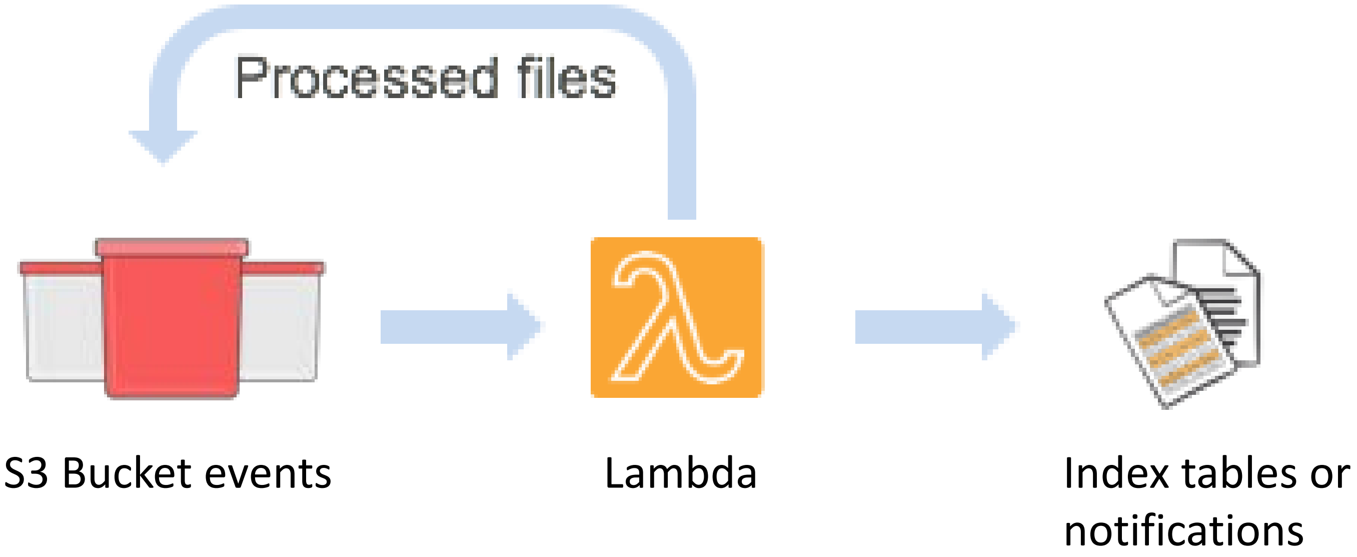
Stores processed object to S3
Amazon S3
Updates file metadata to DynamoDB
Amazon DynamoDB

Customers using S3 and Lambda

THOMSON REUTERS CMP.LY NETFLIX The Seattle Times FireEye

Apply custom logic to process content being uploaded into Amazon S3

- Watermarking / thumbnail creation
- Transcoding
- Indexing and de-duplication
- Aggregation and filtering
- Pre processing
- Content validation
- WAF updates



Processed files

S3 Bucket events

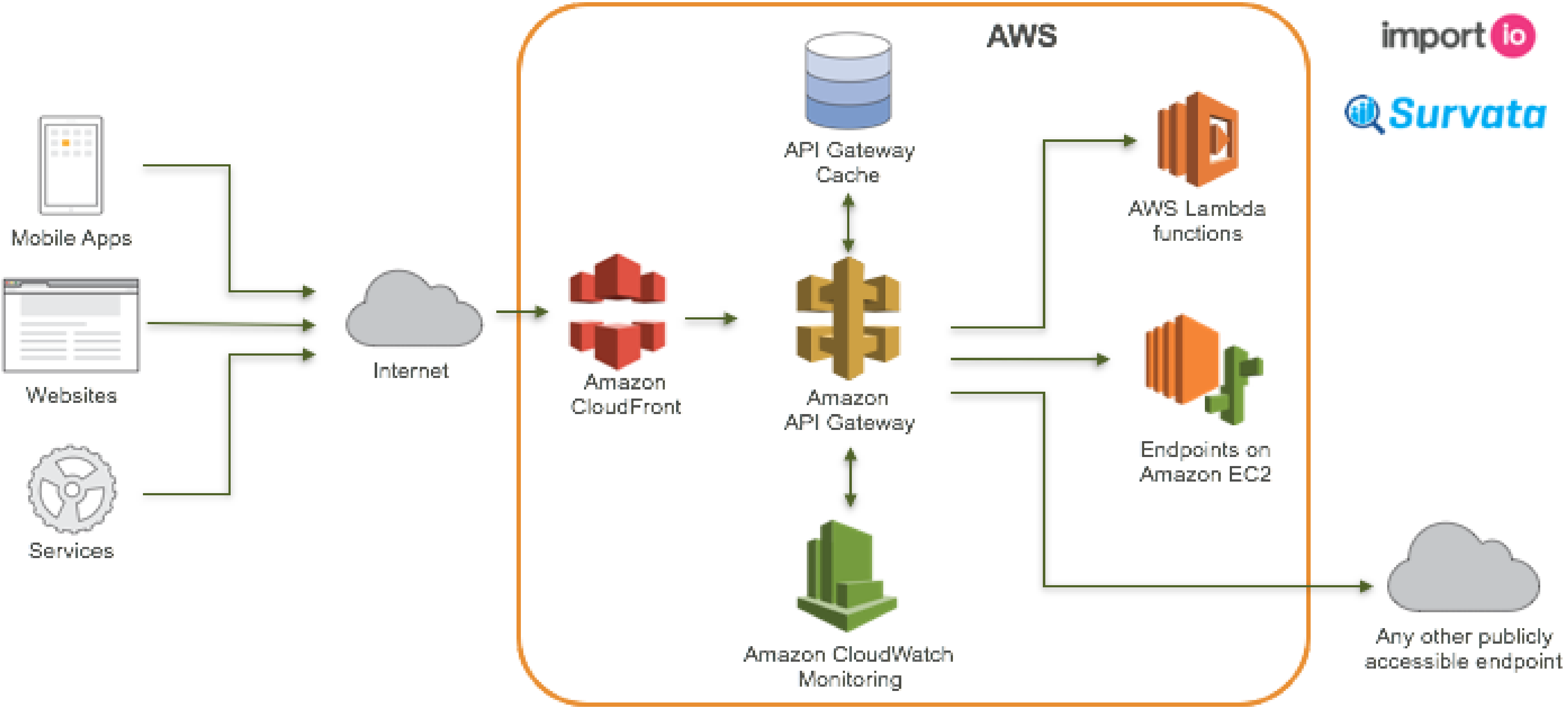
Lambda

Index tables or notifications

Lambda and Kinesis

Lambda powered APIs

An API call flow



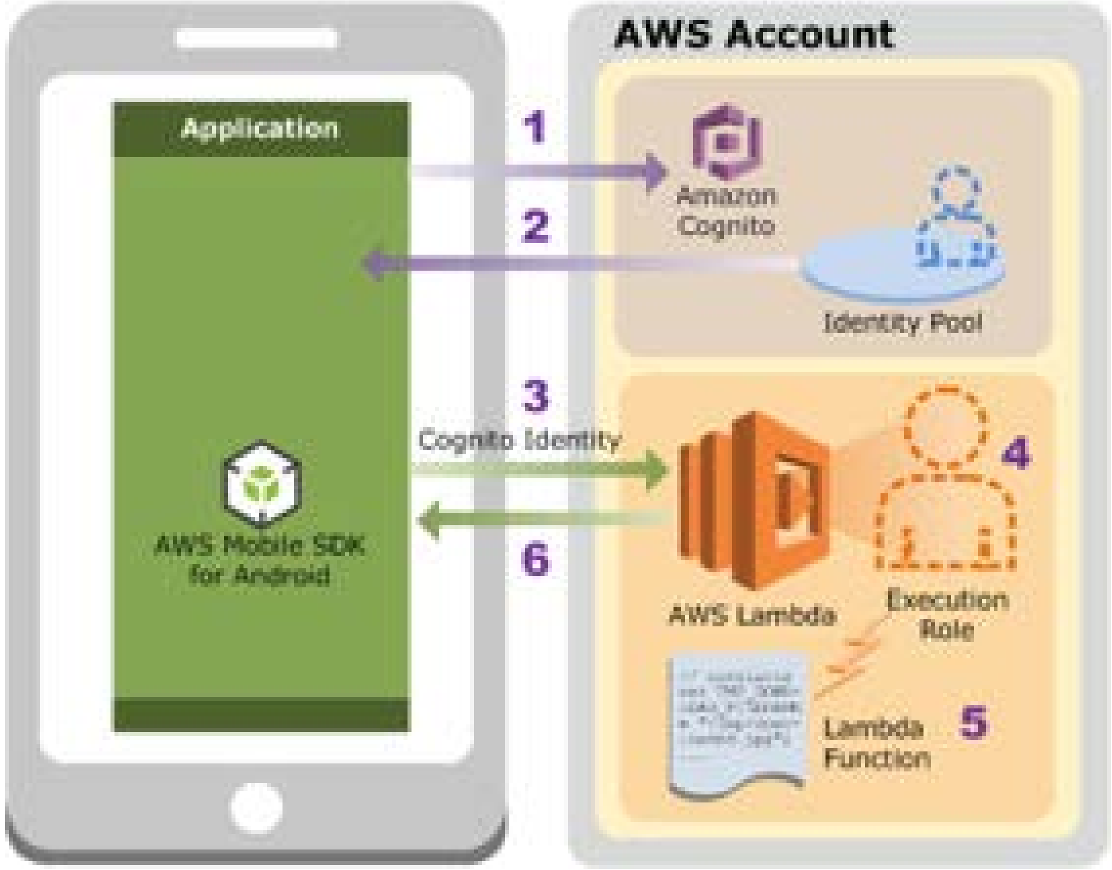
import io

Survata

Lambda + Cognito and mobile apps

Building mobile backends with Lambda

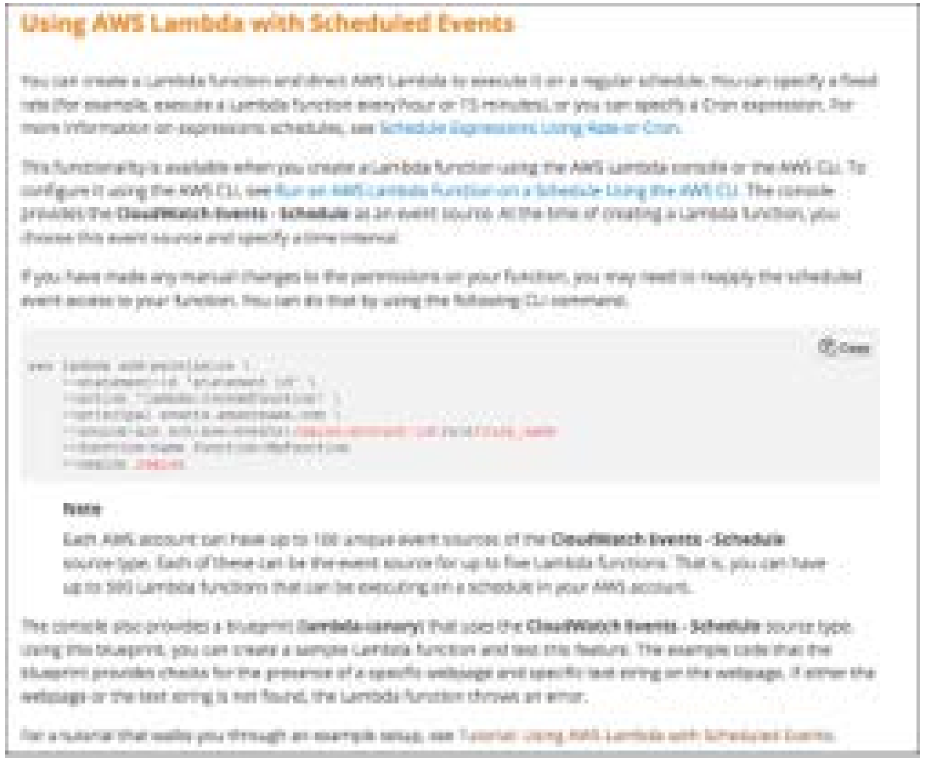
- No backend experience? No problem.
- You can use Lambda as the backend for mobile apps!
- Easy personalization for users and devices



Other use cases

Scheduled events (cron)

- Start or stop an environment at a specific time
- Log cleanup
- Batch data jobs
- Alarm clock
- Infrastructure automation
- Scheduled backups



Using AWS Lambda with Scheduled Events

You can create a Lambda function and direct AWS Lambda to execute it on a regular schedule. You can specify a fixed rate (for example, execute a Lambda function every hour or 15 minutes), or you can specify a Cron expression. For more information on expressions schedules, see Schedule Expressions Using Rate or Cron.

This functionality is available when you create a Lambda function using the AWS Lambda console or the AWS CLI. To configure it using the AWS CLI, see Run an AWS Lambda Function on a Schedule Using the AWS CLI. The console provides the **CloudWatch Events - Schedule** as an event source. At the time of creating a Lambda function, you choose this event source and specify a time interval.

If you have made any manual changes to the permissions on your function, you may need to reapply the scheduled event access to your function. You can do that by using the following CLI command:

```
aws lambda add-permission \
    --statement-id 'statement_id' \
    --action 'lambda:InvokeFunction' \
    --principal events.amazonaws.com \
    --source-arn arn:aws:events:region:account-id:rule/rule_name \
    --function-name function:NameOfFunction \
    --region region
```

Note

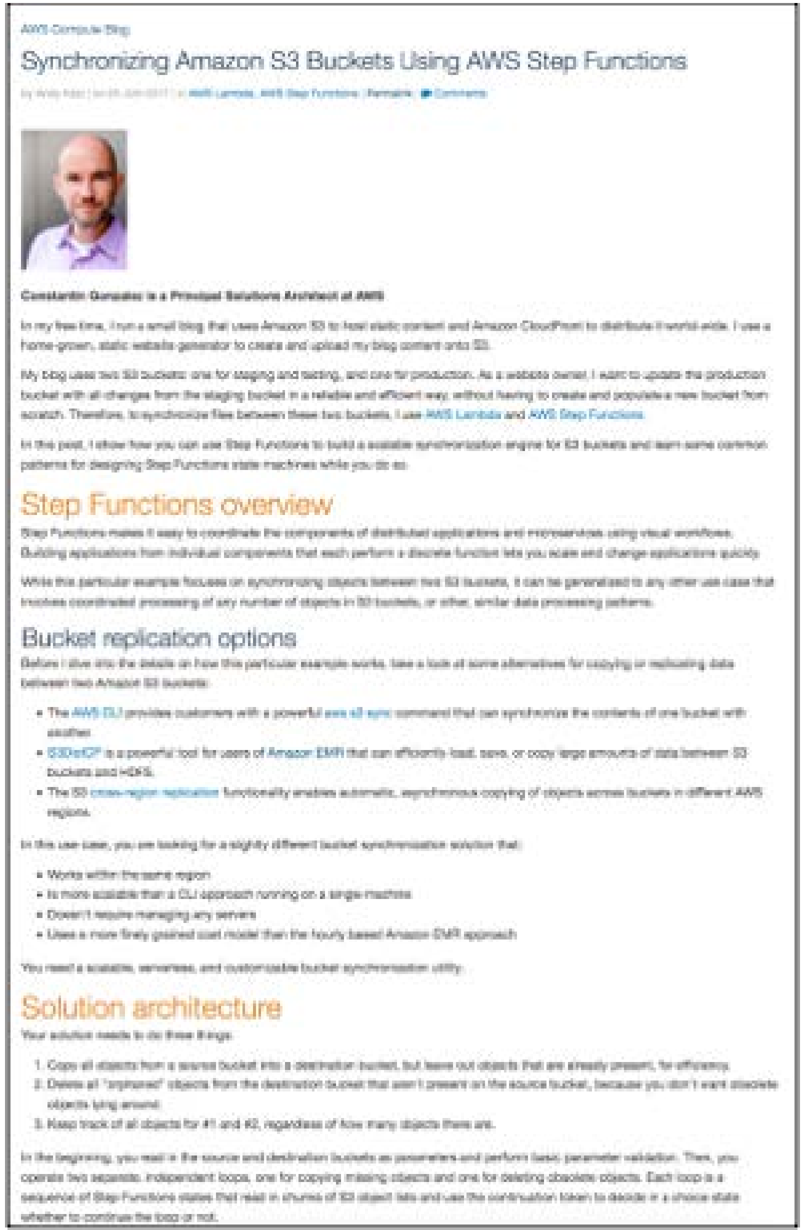
Each AWS account can have up to 100 unique event sources of the **CloudWatch Events - Schedule** source type. Each of these can be the event source for up to five Lambda functions. That is, you can have up to 500 Lambda functions that can be executing on a schedule in your AWS account.

The console also provides a blueprint (**lambda-canary**) that uses the **CloudWatch Events - Schedule** source type. Using this blueprint, you can create a sample Lambda function and test this feature. The example code that the blueprint provides checks for the presence of a specific webpage and specific text string on the webpage. If either the webpage or the text string is not found, the Lambda function throws an error.

For a tutorial that walks you through an example setup, see Tutorial: Using AWS Lambda with Scheduled Events.

Backup and disaster recovery

- Cross-region replication
- Off-site backups
- But! Validation of backups can be hard.
  - Set rules on Lambda to define what needs to be checked and backed up
  - Alert on validation failure



AWS Compute Blog

Synchronizing Amazon S3 Buckets Using AWS Step Functions

by Andy Katz | on 05 JUN 2017 | in AWS Lambda, AWS Step Functions | Permalink | Comments

Constantin Gonzalez is a Principal Solutions Architect at AWS

In my free time, I run a small blog that uses Amazon S3 to host static content and Amazon CloudFront to distribute it world-wide. I use a home-grown, static website generator to create and upload my blog content onto S3.

My blog uses two S3 buckets: one for staging and testing, and one for production. As a website owner, I want to update the production bucket with all changes from the staging bucket in a reliable and efficient way, without having to create and populate a new bucket from scratch. Therefore, to synchronize files between these two buckets, I use AWS Lambda and AWS Step Functions.

In this post, I show how you can use Step Functions to build a scalable synchronization engine for S3 buckets and learn some common patterns for designing Step Functions state machines while you do so.

Step Functions overview

Step Functions makes it easy to coordinate the components of distributed applications and microservices using visual workflows. Building applications from individual components that each perform a discrete function lets you scale and change applications quickly.

While this particular example focuses on synchronizing objects between two S3 buckets, it can be generalized to any other use case that involves coordinated processing of any number of objects in S3 buckets, or other, similar data processing patterns.

Bucket replication options

Before I dive into the details on how this particular example works, take a look at some alternatives for copying or replicating data between two Amazon S3 buckets:

- The AWS CLI provides customers with a powerful aws s3 sync command that can synchronize the contents of one bucket with another.
- S3DistCP is a powerful tool for users of Amazon EMR that can efficiently load, save, or copy large amounts of data between S3 buckets and HDFS.
- The S3 cross-region replication functionality enables automatic, asynchronous copying of objects across buckets in different AWS regions.

In this use case, you are looking for a slightly different bucket synchronization solution that:

- Works within the same region
- Is more scalable than a CLI approach running on a single machine
- Doesn't require managing any servers
- Uses a more finely grained cost model than the hourly based Amazon EMR approach

You need a scalable, serverless, and customizable bucket synchronization utility.

Solution architecture

Your solution needs to do three things:

1. Copy all objects from a source bucket into a destination bucket, but leave out objects that are already present, for efficiency.
2. Delete all "orphaned" objects from the destination bucket that aren't present on the source bucket, because you don't want obsolete objects lying around.
3. Keep track of all objects for #1 and #2, regardless of how many objects there are.

In the beginning, you read in the source and destination buckets as parameters and perform basic parameter validation. Then, you operate two separate, independent loops, one for copying missing objects and one for deleting obsolete objects. Each loop is a sequence of Step Functions states that read in chunks of S3 object lists and use the continuation token to decide in a choice state whether to continue the loop or not.

Other resources

- Randall <3s Lambda!
  - @jrhunt on Twitter
  - Tons of examples and projects here: https://github.com/ranman
- AWS documentation: http://docs.aws.amazon.com/lambda/latest/dg/welcome.html
- Tons of compute blog posts: https://aws.amazon.com/blogs/compute/category/aws-lambda/