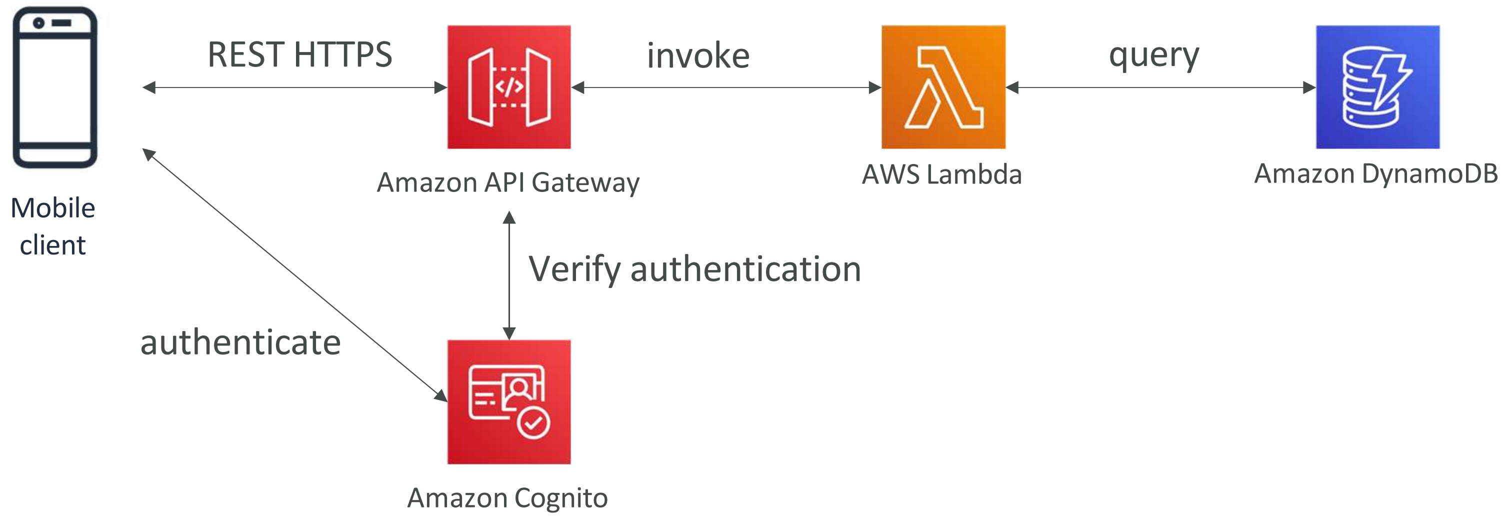
Serverless Architectures

Mobile application: MyTodoList

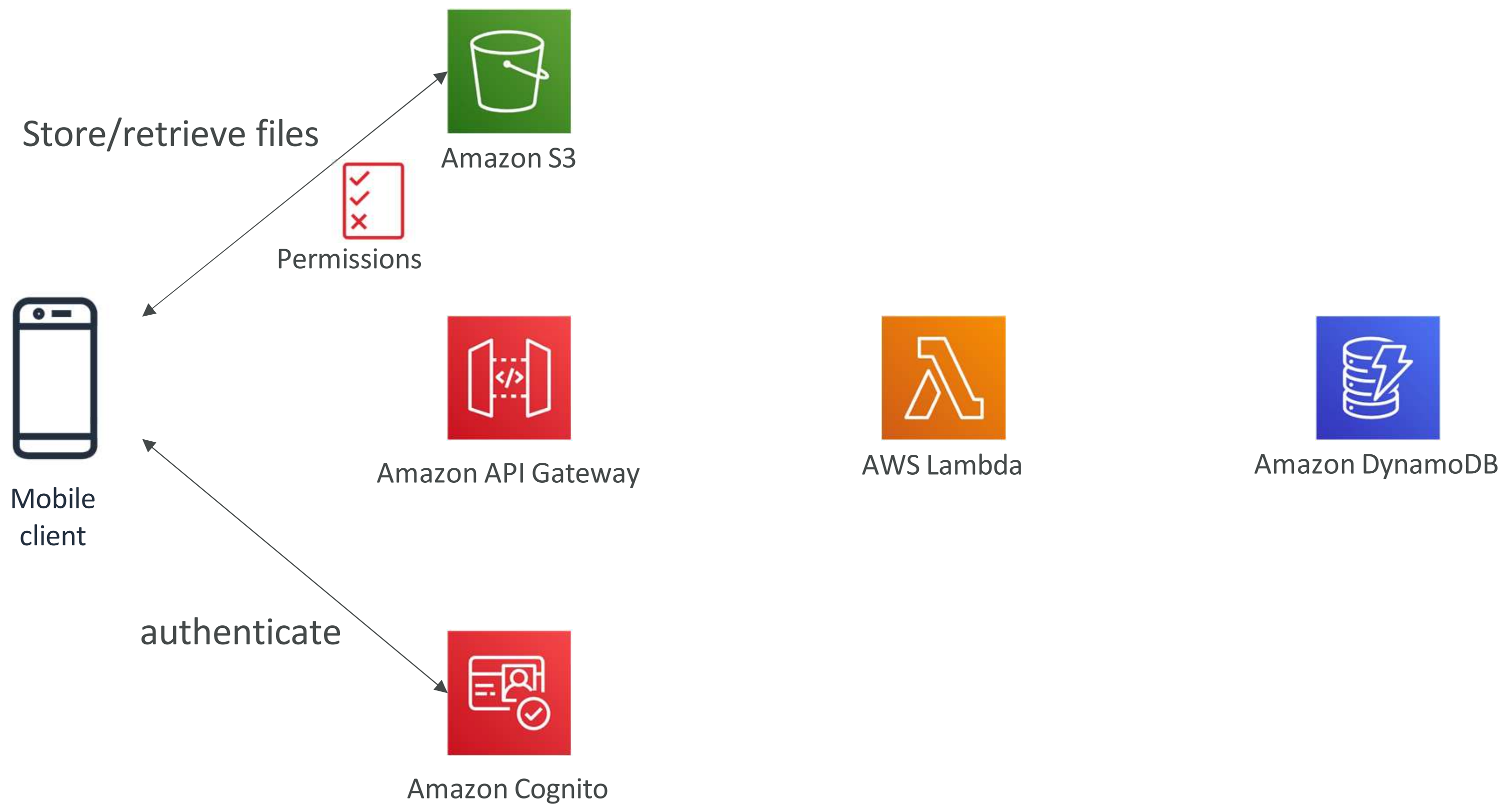
- We want to create a mobile application with the following requirements

- Expose as REST API with HTTPS
- Serverless architecture
- Users should be able to directly interact with their own folder in S3
- Users should authenticate through a managed serverless service
- The users can write and read to-dos, but they mostly read them
- The database should scale, and have some high read throughput

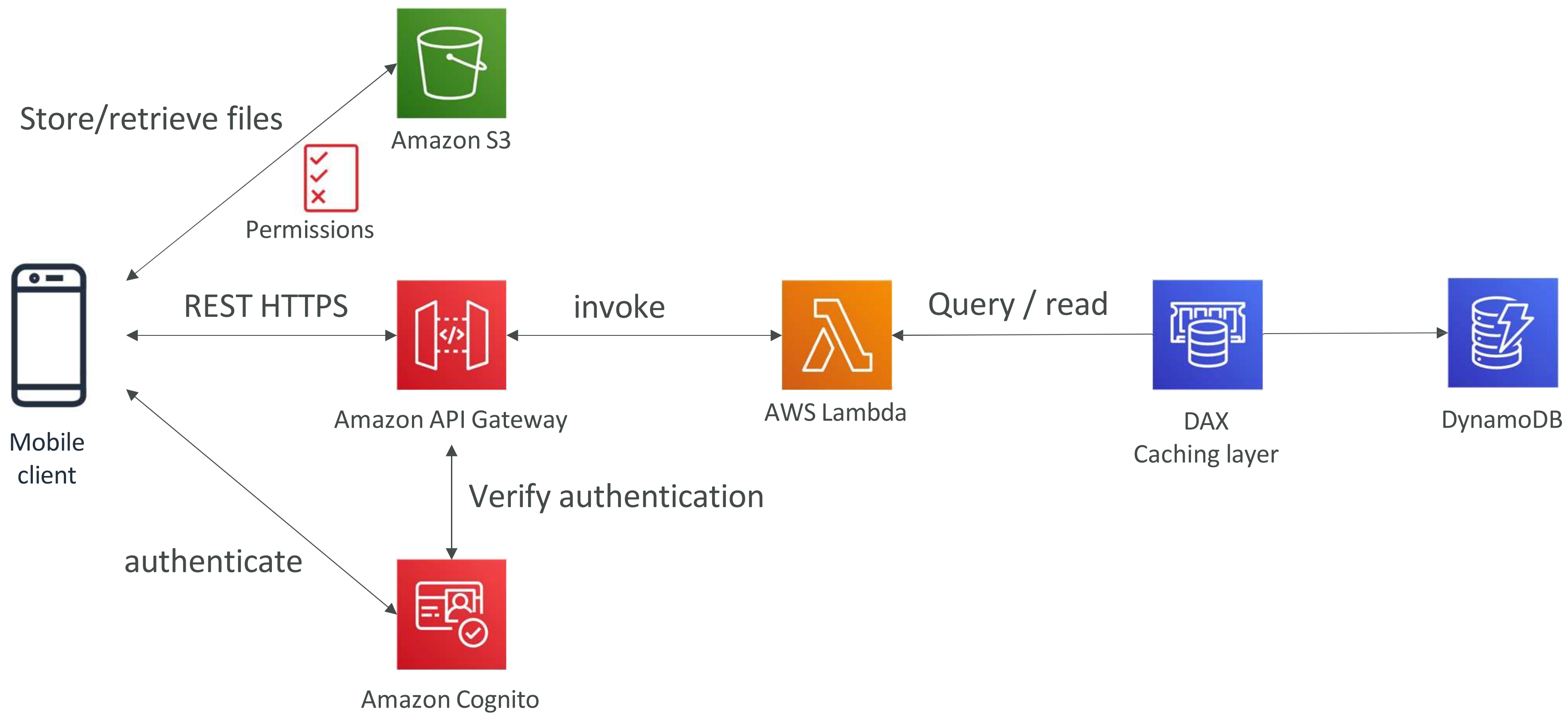
Mobile app: REST API layer



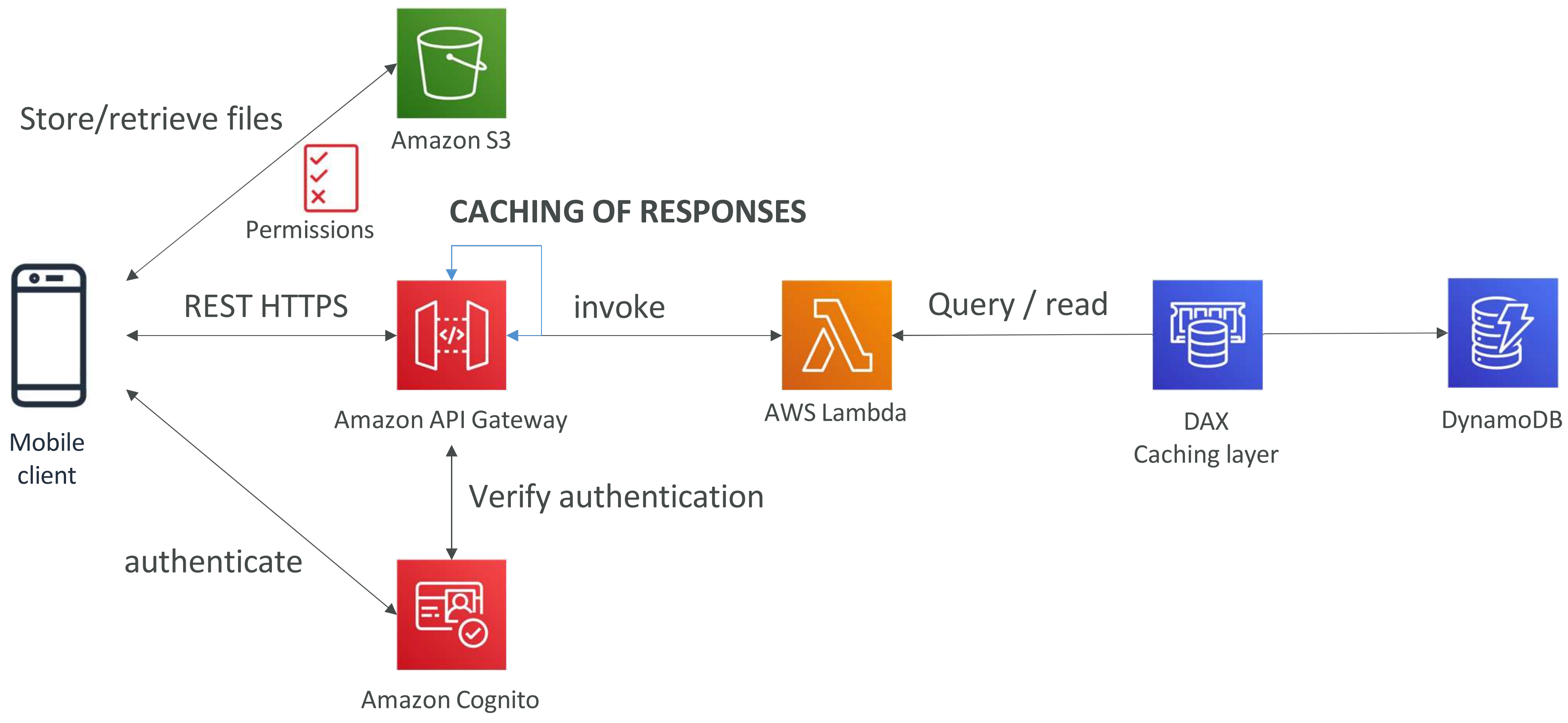
Mobile app: giving users access to S3



Mobile app: high read throughput, static data



Mobile app: caching at the API Gateway



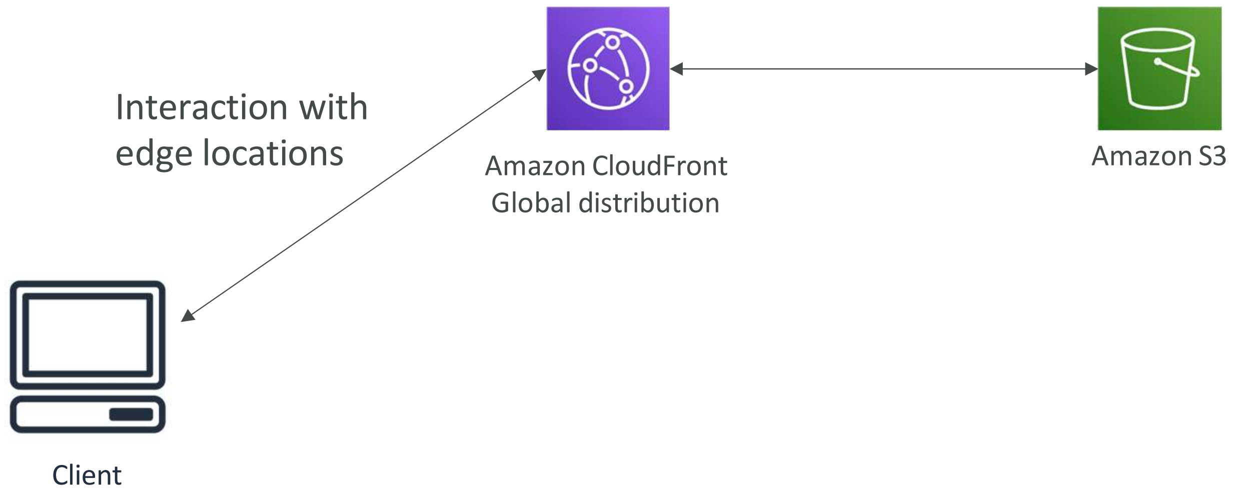
Summary

- Serverless REST API: HTTPS, API Gateway, Lambda, DynamoDB
- Using Cognito to generate temporary credentials to access S3 bucket with restricted policy. App users can directly access AWS resources this way. Pattern can be applied to DynamoDB, Lambda…
- Caching the reads on DynamoDB using DAX
- Caching the REST requests at the API Gateway level
- Security for authentication and authorization with Cognito

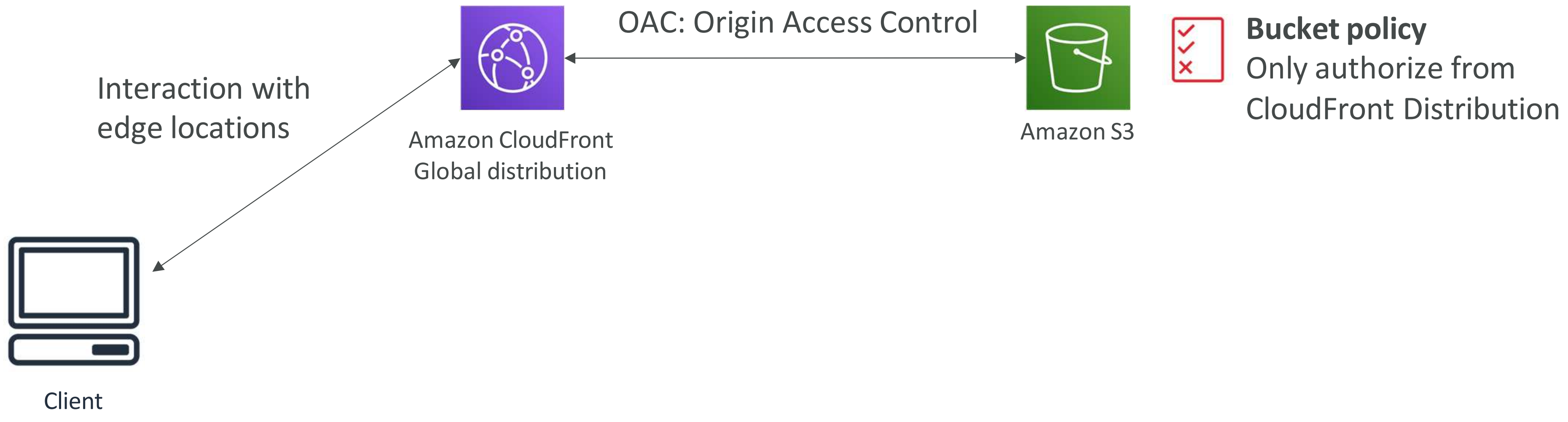
Serverless hosted website: MyBlog.com

- This website should scale globally
- Blogs are rarely written, but often read
- Some of the website is purely static files, the rest is a dynamic REST API
- Caching must be implement where possible
- Any new users that subscribes should receive a welcome email
- Any photo uploaded to the blog should have a thumbnail generated

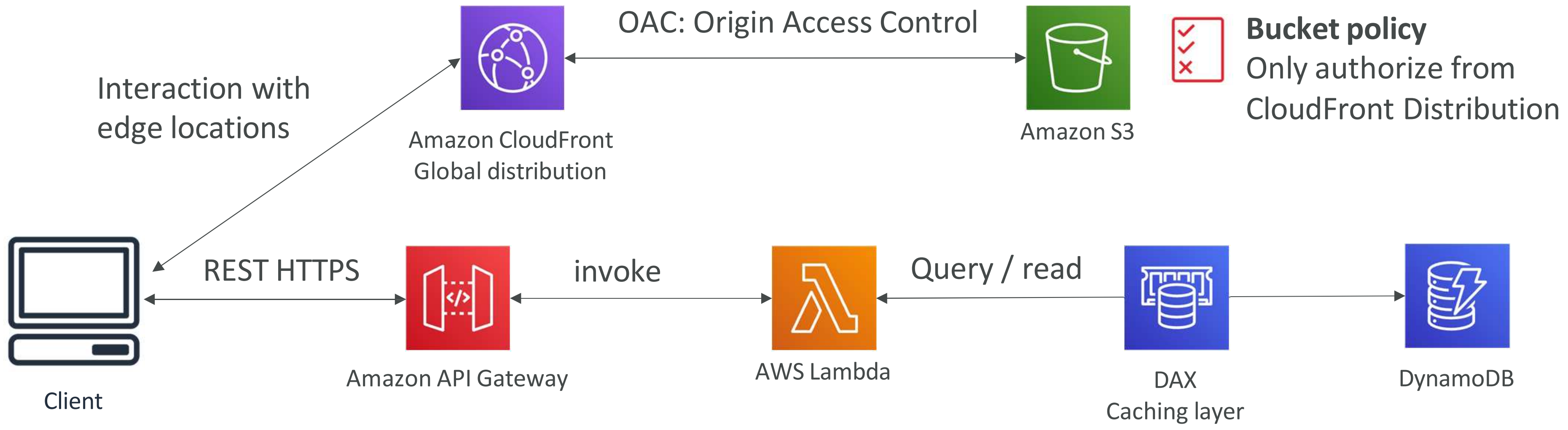
Serving static content, globally



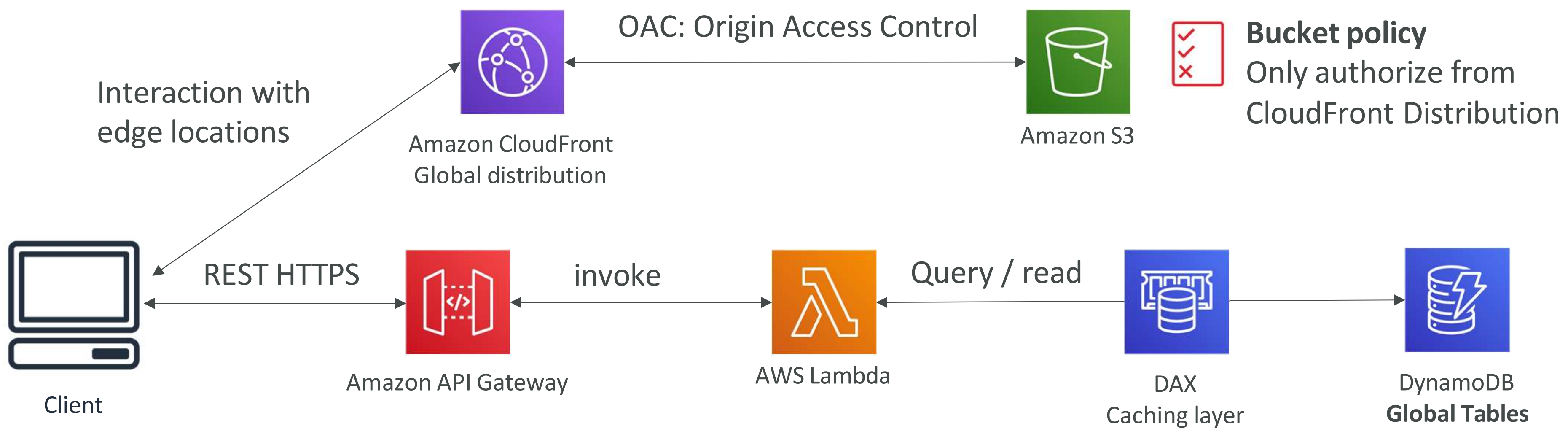
Serving static content, globally, securely


Interaction with edge locations
Amazon CloudFront
Global distribution
OAC: Origin Access Control
Amazon S3
Bucket policy
Only authorize from CloudFront Distribution
Client

Adding a public serverless REST API

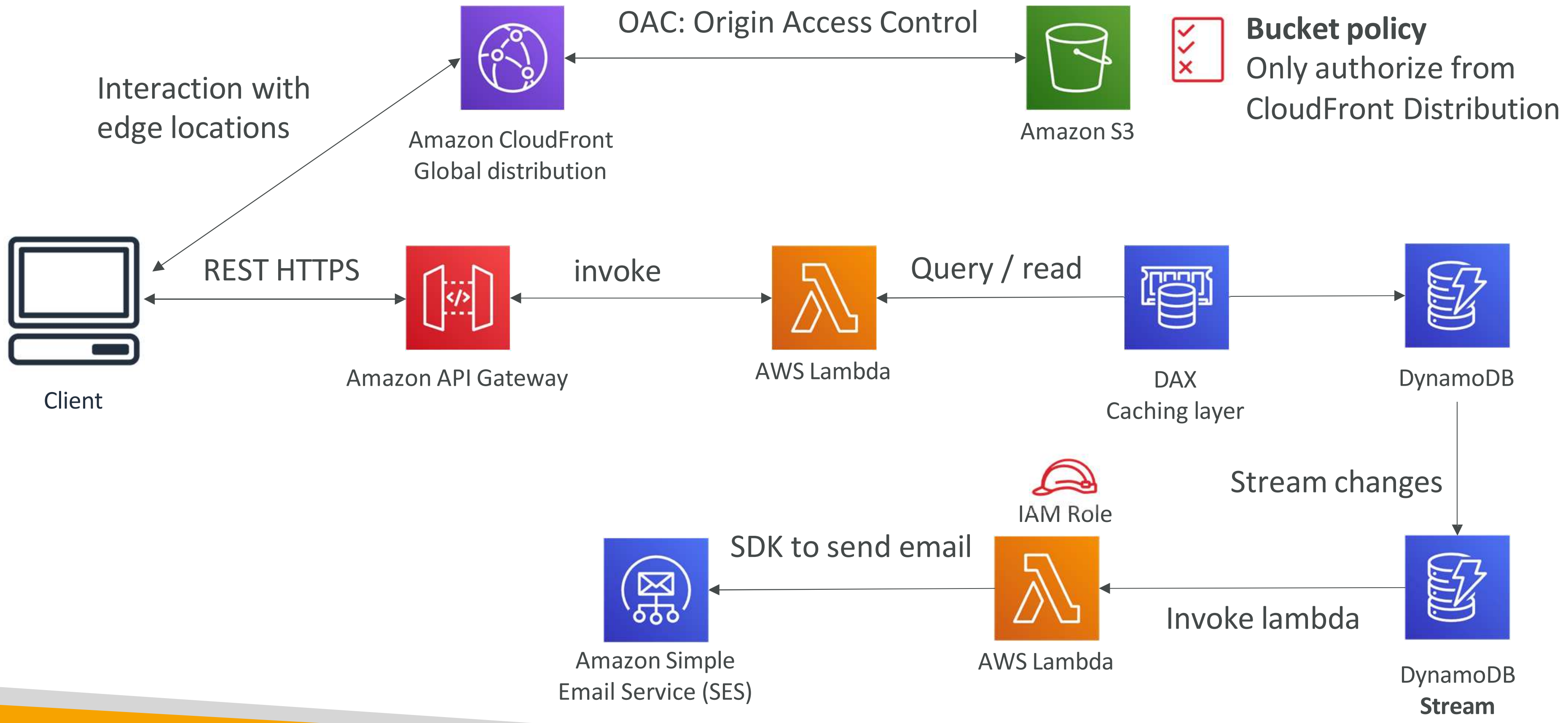


Leveraging DynamoDB Global Tables

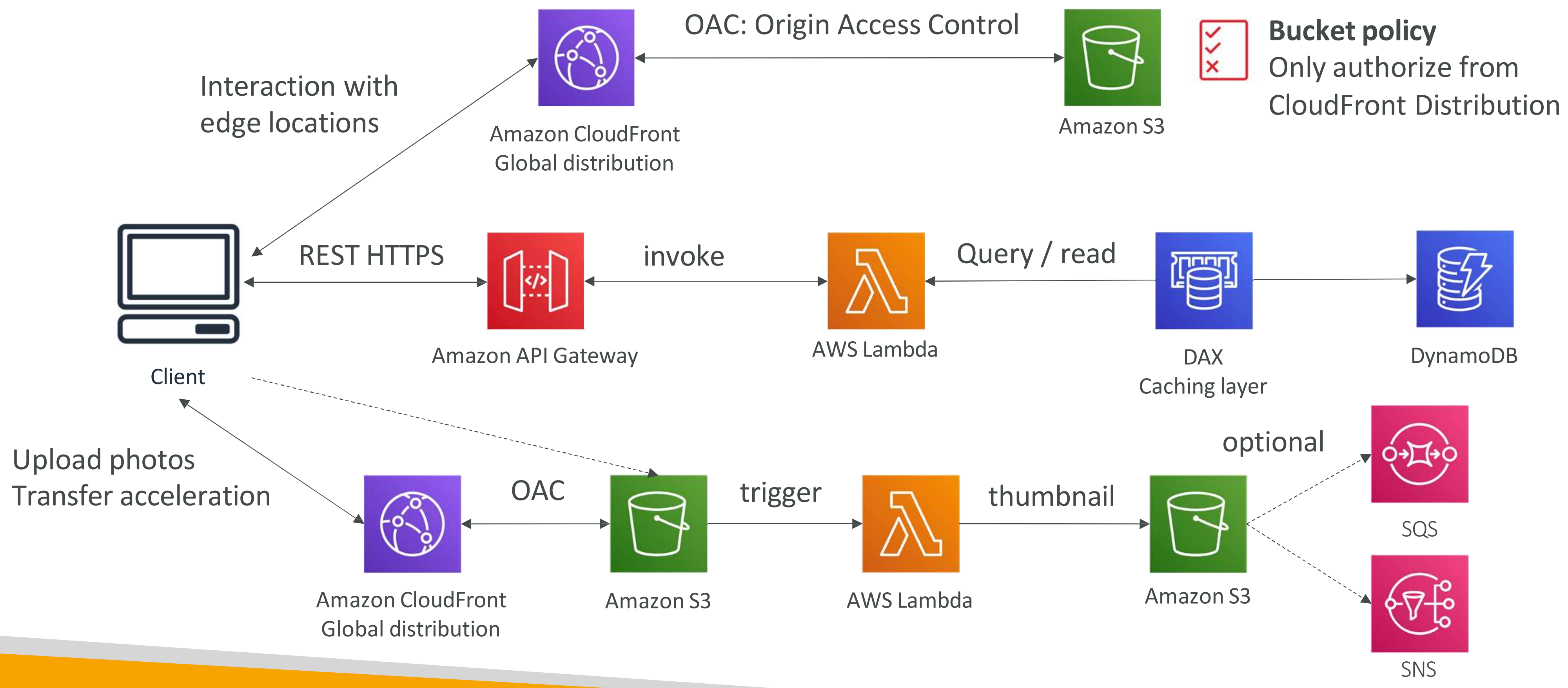


OAC: Origin Access Control
Bucket policy
Only authorize from CloudFront Distribution
Interaction with edge locations
Amazon CloudFront Global distribution
Amazon S3
REST HTTPS
invoke
Query / read
Client
Amazon API Gateway
AWS Lambda
DAX Caching layer
DynamoDB Global Tables

User Welcome email flow



Thumbnail Generation flow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Query / read
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DynamoDB
Upload photos Transfer acceleration
Amazon CloudFront Global distribution
OAC
Amazon S3
trigger
AWS Lambda
thumbnail
Amazon S3
optional
SQS
SNS

AWS Hosted Website Summary

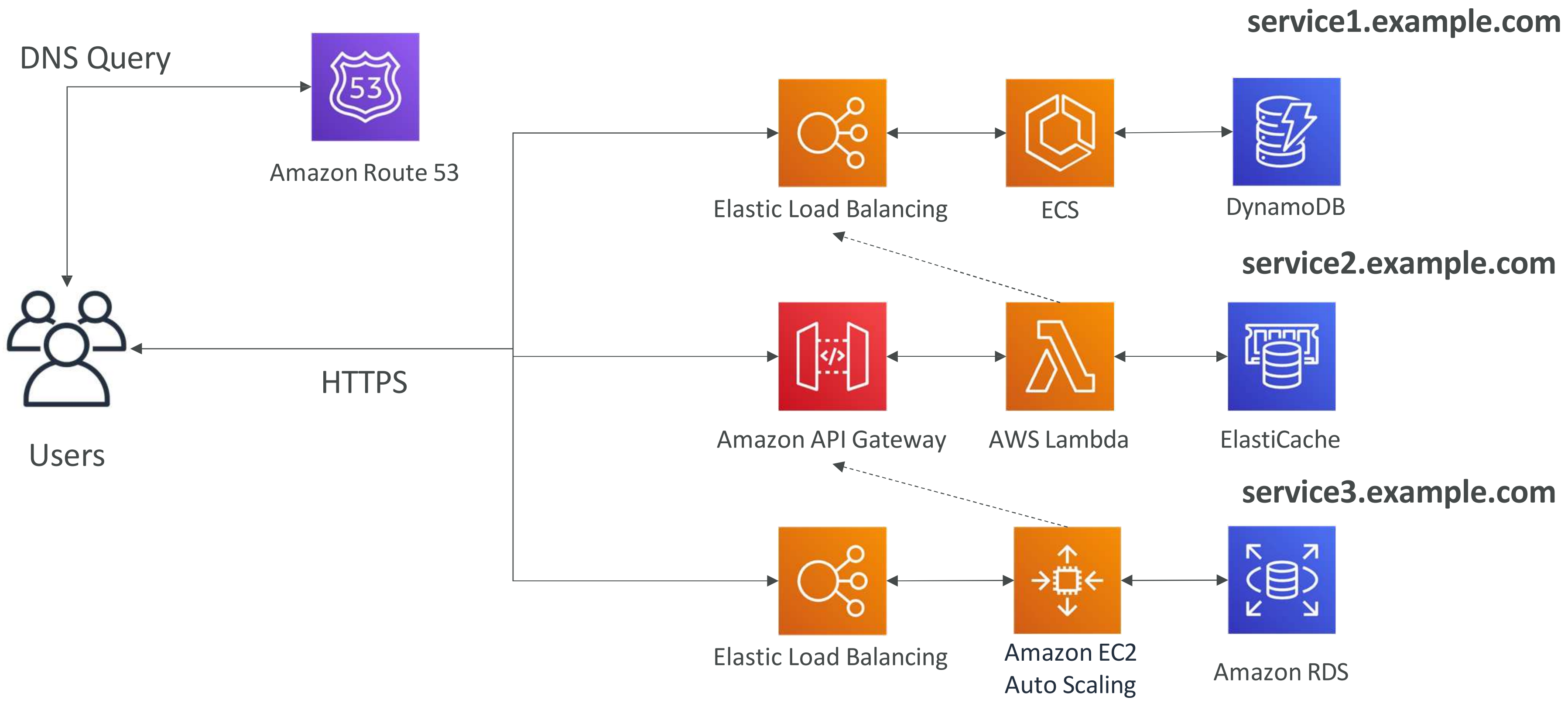
- We've seen static content being distributed using CloudFront with S3
- The REST API was serverless, didn't need Cognito because public
- We leveraged a Global DynamoDB table to serve the data globally
- (we could have used Aurora Global Database)
- We enabled DynamoDB streams to trigger a Lambda function
- The lambda function had an IAM role which could use SES
- SES (Simple Email Service) was used to send emails in a serverless way
- S3 can trigger SQS / SNS / Lambda to notify of events

Micro Services architecture

- We want to switch to a micro service architecture
- Many services interact with each other directly using a REST API
- Each architecture for each micro service may vary in form and shape

- We want a micro-service architecture so we can have a leaner development lifecycle for each service

Micro Services Environment



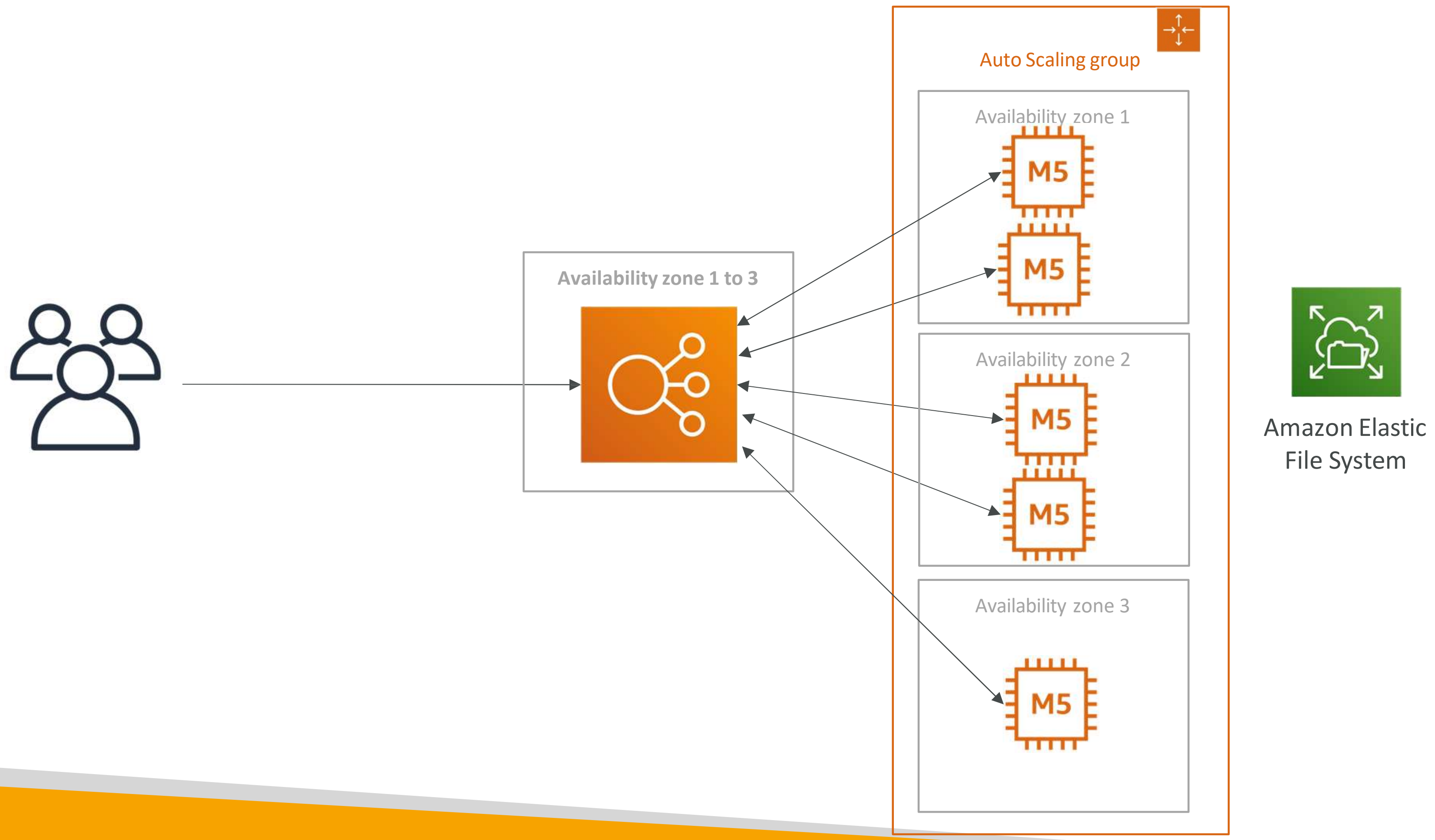
Summary on Micro Services

- You are free to design each micro-service the way you want
- Synchronous patterns: API Gateway, Load Balancers
- Asynchronous patterns: SQS, Kinesis, SNS, Lambda triggers (S3)
- Challenges with micro-services:
  - repeated overhead for creating each new microservice,
  - issues with optimizing server density/utilization
  - complexity of running multiple versions of multiple microservices simultaneously
  - proliferation of client-side code requirements to integrate with many separate services.
- Some of the challenges are solved by Serverless patterns:
  - API Gateway, Lambda scale automatically and you pay per usage
  - You can easily clone API, reproduce environments
  - Generated client SDK through Swagger integration for the API Gateway

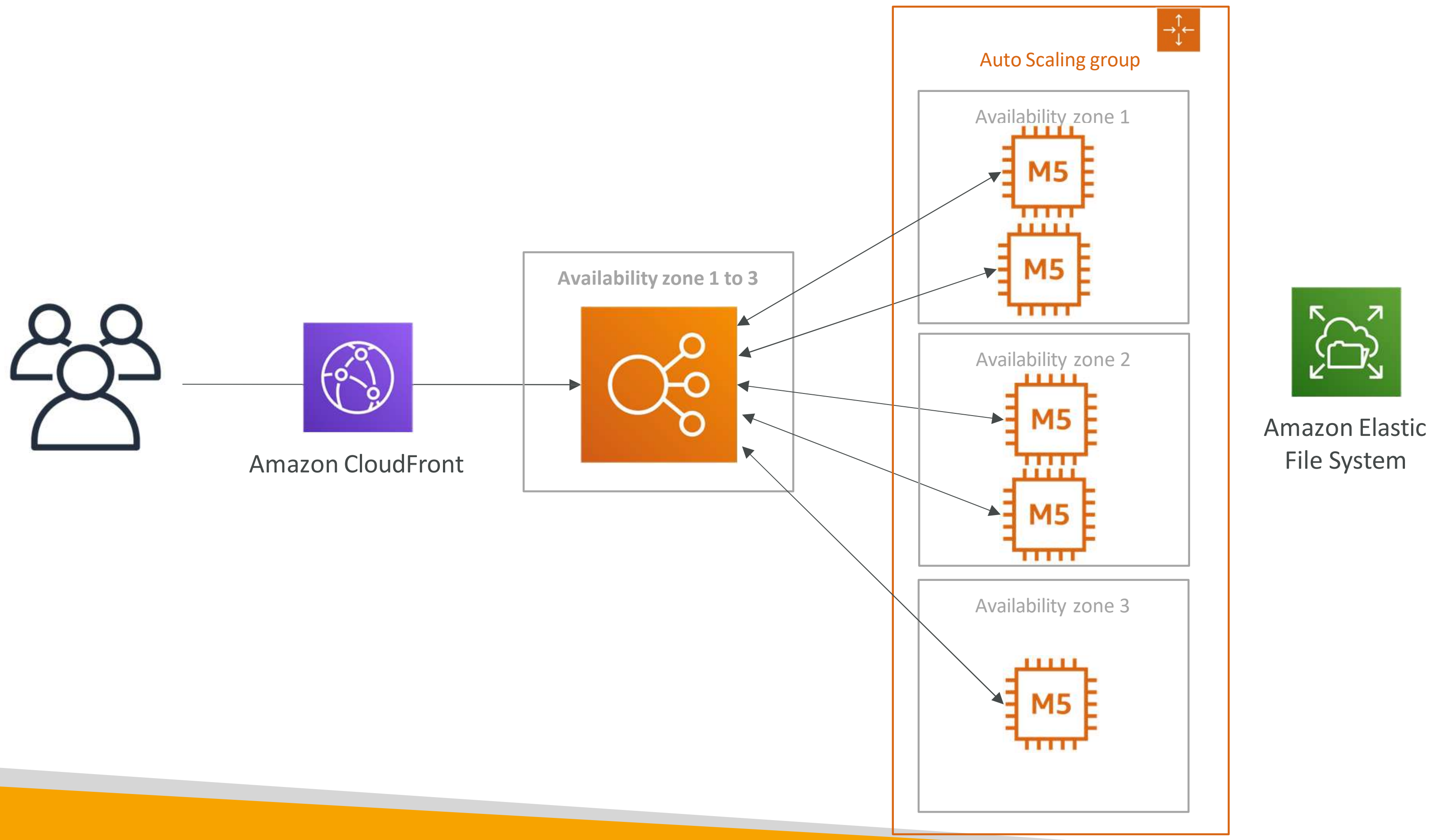
Software updates offloading

- We have an application running on EC2, that distributes software updates once in a while
- When a new software update is out, we get a lot of request and the content is distributed in mass over the network. It's very costly
- We don't want to change our application, but want to optimize our cost and CPU, how can we do it?

Our application current state



Easy way to fix things!



Why CloudFront?

- No changes to architecture
- Will cache software update files at the edge
- Software update files are not dynamic, they're static (never changing)
- Our EC2 instances aren't serverless
- But CloudFront is, and will scale for us
- Our ASG will not scale as much, and we'll save tremendously in EC2
- We'll also save in availability, network bandwidth cost, etc
- Easy way to make an existing application more scalable and cheaper!