Serverless Content Delivery

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github.com/symphoniacloud/sacon-nyc-2019-serverless-content
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- Former VP Engineering, Technical Lead
  - Data Engineering and Data Science teams
- 20+ yrs experience in govt, healthcare, travel, and ad-tech
- Intent Media, RoomKey, Meddius, SAIC, Booz Allen
Symphonia resources

- **What is Serverless?** Our 2017 report, published by O'Reilly

- **Programming AWS Lambda** - Our upcoming full-length book with O'Reilly.

- **Serverless Architectures** - Mike's de facto industry primer on Serverless.

- **Learning Lambda** - A 9-part blog series to help new Lambda devs get started.

- **Serverless Insights** - Our email newsletter covering Serverless news, event, etc.

- **blog.symphonia.io** - The Symphonium (our blog), featuring technical content and analysis.
Agenda

• What is Serverless?
• Static content using S3 + CloudFront
• Custom domains using Route 53
• SSL using AWS Certificate Manager
• Logic on the edge using Lambda@Edge
• Discussion
What is Serverless?
Serverless benefits

- Free O'Reilly report!
- Cloud benefits ++
  - Reduced cost
  - Scaling flexibility
  - Shorter lead time

What is Serverless?
Understanding the Latest Advances in Cloud and Service-Based Architecture
Mike Roberts & John Chapin
Serverless attributes

- No managing of hosts or processes
- Self auto-scaling and provisioning
- Costs based on precise usage
- Performance specified in terms other than host size/count
- Implicit high availability
Serverless = FaaS + BaaS!

- Same benefits and attributes!
- FaaS = Functions as a Service
  - AWS Lambda, Auth0 Webtask, Azure Functions, Google Cloud Functions, etc...
- BaaS = Backend as a Service
  - Auth0, Google Firebase, Parse, Amazon CloudFront, DynamoDB, S3, etc...
The Original Serverless Service!
S3 overview

- Simple Storage Service
- Launched in March 2006
- Key/value store, optimized for large amounts of data
- 99.999999999% durability (given 10k objects, you'll lose one every 10M years)
- 99.99% availability (4.38 minutes of downtime per month)
- Resource-level access control via ACLs, bucket policies
Hosting a website on S3

- Create an S3 bucket
- Upload content via CLI (or API)
- Set bucket policy allowing public read
- CORS - Allow Javascript cross-origin requests
- CNAME - Use a custom domain with your S3 bucket (names must match)
S3 website demo

http://serverless-content-bucket-1hxhjbgikftko.s3-website-us-east-1.amazonaws.com
S3 is Serverless!

- No servers (from our perspective)
- Pay by the request (and the byte)
- Highly available (intra-region)
- Highly scalable
S3 latency (milliseconds)
S3 website caveats

- S3 is relatively slow
- S3 is regional, so requests must go to the regional data center
- Custom domain require a specific bucket name
  - S3 global bucket namespace == squatting, requires support intervention
- S3 request/transfer pricing
S3 website pricing example (us-east-1)

- 10GB data storage ($0.23)
- 100,000,000 HTTP GET requests ($40)
- 10TB data transfer out to the internet ($921)
- $961/month
Serverless to the rescue!
CloudFront basics

- Content delivery network (CDN)
- Launched in November, 2008
- 96-112-149 edge locations, 11 regional caches
- Faster for serving static content, cheaper for bandwidth
- More difficult to update, requests and invalidations cost $
S3 + CloudFront demo

http://d18yca1tnmc9js.cloudfront.net/
S3 vs CloudFront latency
## S3 vs CloudFront latency

<table>
<thead>
<tr>
<th></th>
<th>Min</th>
<th>Max</th>
<th>Average</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S3</strong></td>
<td>175 ms</td>
<td>791 ms</td>
<td>206 ms</td>
<td>78 ms</td>
</tr>
<tr>
<td><strong>CloudFront</strong></td>
<td>55 ms</td>
<td>71 ms</td>
<td>59 ms</td>
<td>3 ms</td>
</tr>
</tbody>
</table>
Aesthetics

- S3 URLs (especially for auto-generated buckets) can be very long:
  - http://serverless-content-bucket-1hxhjbgikftko.s3-website-us-east-1.amazonaws.com

- CloudFront URLs are shorter, but ugly:
  - http://d18yca1tnmc9js.cloudfront.net/
Serverless to the rescue (again)!
Route 53 basics

- Managed "Cloud" DNS
- Capabilities like...
  - Health checks / failover
  - Round-robin
  - ALIAS records (pointers to AWS resources)
CloudFront + Route 53 demo

http://hello.serverless-content.symphonia.io
This still isn't up to 2019 standards...
Your connection to this site is not secure

You should not enter any sensitive information on this site (for example, passwords or credit cards), because it could be stolen by attackers. Learn more
__________ to the rescue!
ACM basics

- AWS Certificate Manager
- Managed SSL/TLS certificates
- API-driven
- Human-in-the-loop for verification
- Integrated with CloudFront, Elastic Load Balancer, API Gateway
- Supports wildcard domains
CloudFront + SSL demo

https://hello.serverless-content.symphonia.io
S3 + CloudFront + Route 53 + ACM

- S3 stores our content
  - No restrictions on bucket name
- CloudFront distributes it to edge locations
  - 70% lower latency than S3
- Route 53 adds custom domain names
- AWS Certificate Manager adds transport security
It wouldn't be a Serverless presentation without...
Lambda@Edge basic

- A "flavor" of Lambda that runs *in* CloudFront!
- Hooks into viewer and origin request/response events
- Node.js runtime only
- Viewer request/response has limited capability (5 secs runtime, 128MB memory, 1MB max function size)
- Origin request/response capabilities like "normal" Lambda, but 30 secs runtime
Lambda@Edge demo

https://hello.serverless-content.symphonia.io/secure/secret.html
The final configuration

- S3 + CloudFront + Route 53 + ACM as described earlier
- Lambda@Edge function on "viewer-request"
- CloudFront distribution, two origins
  - Pass OriginAccessIdentity to secure origin
- S3 Bucket policy to lock down "/secure" path using OriginAccessIdentity
Discussion
Discussion topics

- General Serverless
  - Testing / debugging / tracing
  - Vendor lock-in
  - BaaS-only applications
  - Cost management
  - Deployment

- Serverless Content Delivery
  - CloudFront vs other CDNs
  - Lambda@Edge limitations
  - API Gateway
  - CloudFormation delays
  - S3 vs CloudFront costs
Stay in touch!

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