Dive into edge computing and explore how to leverage edge services for low-latency applications.

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What is Edge Computing?

Edge computing is the process of bringing information storage and computing abilities closer to the devices that produce that information and the users who consume it. Traditionally, applications have transmitted data from smart devices like sensors and smartphones to a central data center for processing. However, the unprecedented complexity and scale of data have outpaced network capabilities. By shifting processing capabilities closer to users and devices, edge computing systems significantly improve application performance, reduce bandwidth requirements, and give faster real-time insights.

What is Amazon CloudFront?

Amazon CloudFront is a web service that speeds up distribution of your static and dynamic web content, such as .html, .css, .js, and image files, to your users. CloudFront delivers your content through a worldwide network of data centers called edge locations. When a user requests content that you're serving with CloudFront, the request is routed to the edge location that provides the lowest latency (time delay), so that content is delivered with the best possible performance.

- If the content is already in the edge location with the lowest latency, CloudFront delivers it immediately.
- If the content is not in that edge location, CloudFront retrieves it from an origin that you've defined—such as an Amazon S3 bucket, a MediaPackage channel, or an HTTP server (for example, a web server) that you have identified as the source for the definitive version of your content.

How you set up CloudFront to deliver content?

You create a CloudFront distribution to tell CloudFront where you want content to be delivered from, and the details about how to track and manage content delivery. Then CloudFront uses computers—edge servers—that are close to your viewers to deliver that content quickly when someone wants to see it or use it.

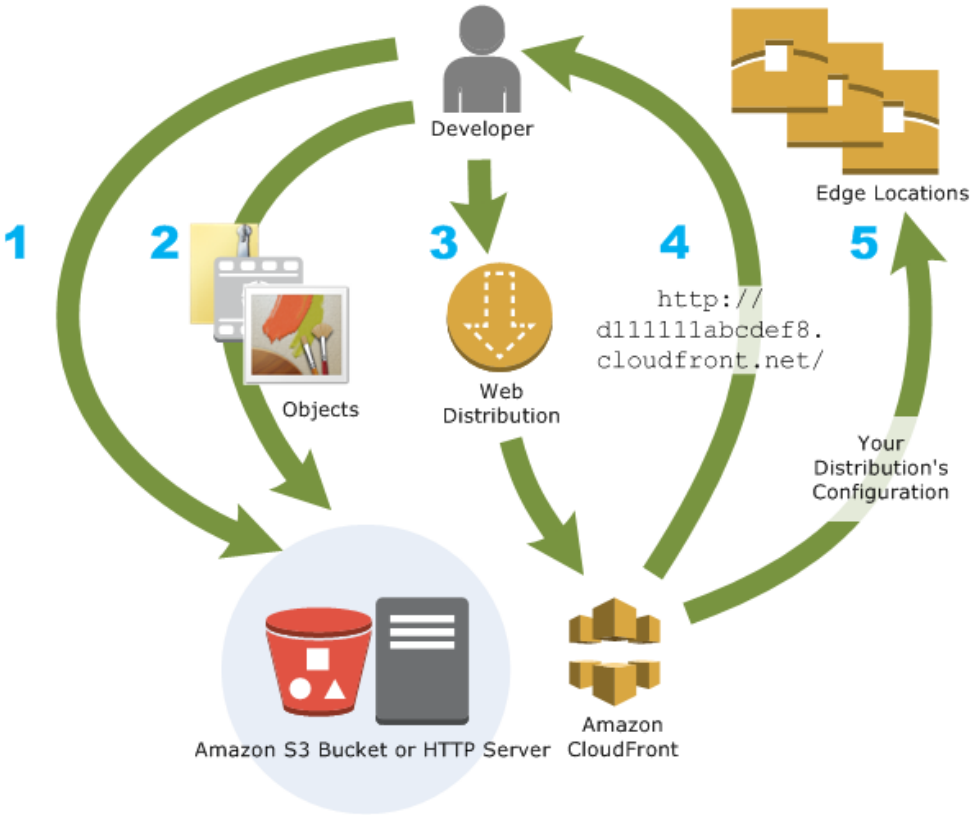

Figure 1: Simple architecture of S3 bucket connected to a CloudFront distribution

Getting Started

1. Create an S3 bucket, can keep it private; will be made accessible from CloudFront
2. Create the folder and files you need to store your static sample website. Aim to add an index.html file as root.
3. Create a CloudFront Distribution using the AWS cloud.
    a. Select the domain as the S3 bucket.
    b. Include Origin path & Name of origin.
    c. Set Cache policy.
    d. Configure firewall settings.
    e. Set default root object – use index.html

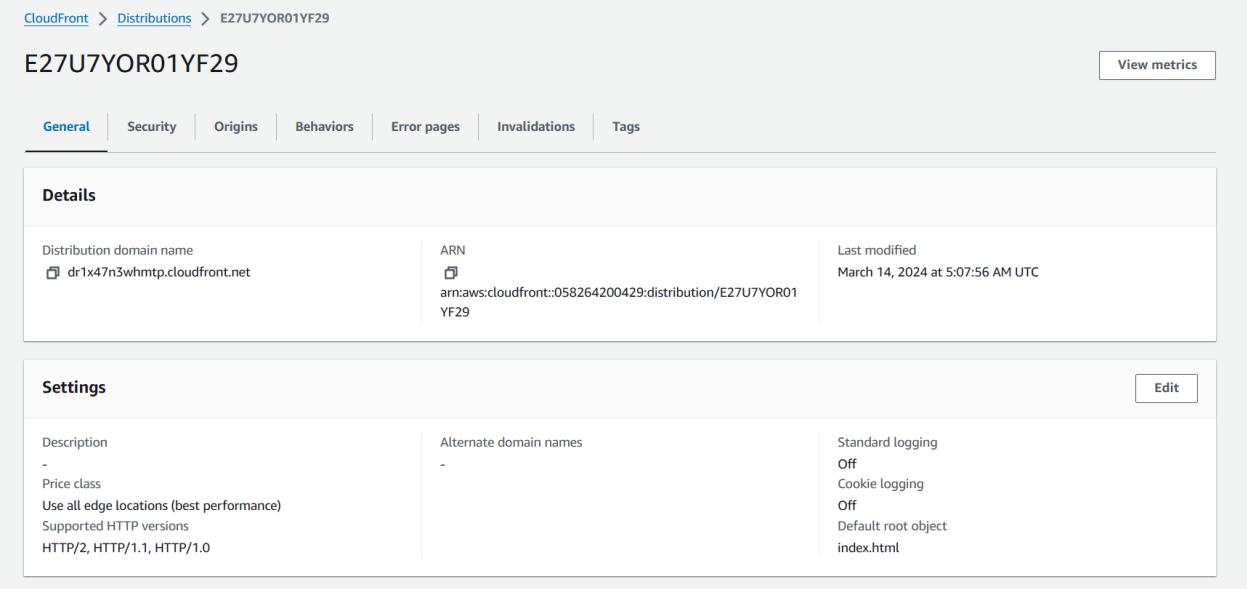

Figure 2: CloudFront distribution setup

4. Set up Bucket policy to allow CloudFront access S3 bucket

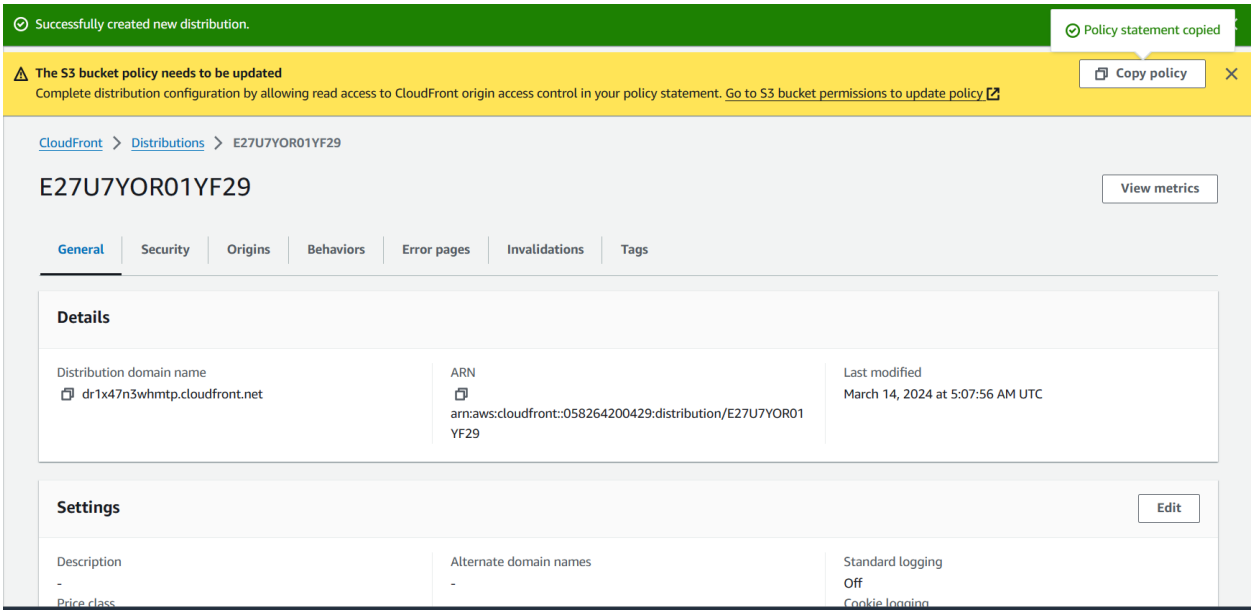

Figure 3: Configure Bucket Policy for CloudFront access

```
{
    "Version": "2008-10-17",
    "Id": "PolicyForCloudFrontPrivateContent",
    "Statement": [
      {
        "Sid": "AllowCloudFrontServicePrincipal",
        "Effect": "Allow",
        "Principal": {
          "Service": "cloudfront.amazonaws.com"
        },
        "Action": "s3:GetObject",
        "Resource": "arn:aws:s3:::acebucket0303/*",
        "Condition": {
          "StringEquals": {
           "AWS:SourceArn": "arn:aws:cloudfront::058264200429:distribution/E27U7YOR01YF29"
          }
        }
      }
    ]
  }
```

Test Distribution

For my example using a sample website with a 1 mb loading image, the image take initially 1.2 seconds to load, but when cached takes about 600 ms; which is a 50% speed improvement for this relatively small image; this showing how caching can be used to reduce latency.

Name	Status	Type	Initiator	Size	Time
dr1x47n3whmtp.cloudfront.net	200	docume...	Other	970 B	63 ms
Free_Test_Data_1MB_JPG.jpg	200	jpeg	(index):41	1.1 MB	1.21 s

Figure 4: Image load time on first load ~1.2 seconds

Name	Status	Type	Initiator	Size	Time
dr1x47n3whmtp.cloudfront.net	304	docume...	Other	291 B	67 ms
Free_Test_Data_1MB_JPG.jpg	304	jpeg	(index):41	270 B	637 ms

Figure 5: Image load time after cache ~600 milli seconds

References

https://aws.amazon.com/what-is/edge-computing
https://docs.aws.amazon.com/AmazonCloudFront/latest/DeveloperGuide/Introduction.html
https://www.youtube.com/watch?v=GUfAQUjA3a0&ab_channel=TinyTechnicalTutorials
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