Serverless Video Content Delivery Network

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Abstract— Internet based cloud computing has the most efficient computational architecture. Cloud computing that began with Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS) is increasingly evolving into a Function-as-a-Service (FaaS) paradigm where consumers don't have to worry about servers. Serverless applications do not require the provisioning, server management or scaling, because the software itself provides everything necessary to run and scale high-availability applications. We've mainly focused on serverless video content delivery network with AWS in this article, but you'll get to learn how the serverless architecture actually works.

Keywords: Cloud computing, serverless, IaaS, PaaS, SaaS, FaaS, AWS, Lambda, S3, Cognito, IAM, API gateway, cloudfront

I. INTRODUCTION

Technologies are constantly evolving and so the framework that uses these technologies often requires gradation from time to time. Cloud application architecture has also shifted from tradition to monolithic premise architecture to cloud architecture, from cloud monolithic architecture to decoupled architecture involving micro services and now the latest trend is serverless.

Computer application hosting on the internet typically includes maintaining some form of infrastructure for servers. It usually means the virtual or physical server that needs to be handled, as well as the operating system and the other web server hosting processes that are needed for running your application. Using a virtual server from a cloud provider such as Amazon, Google or Microsoft means removing physical hardware issues, but it also needs some level of web server software and operating system management.

Developers simply build code with the aid of serverless computing, and cloud provider loads and executes the code in response to real-world events, so users don't need to think about the server or instance part of cloud deployment. Users pay only for the amount of transactions the feature performs at the time. Examples of serverless computing services include AWS Lambda, Azure Functions and Google Cloud Functions.

II. LITERATURE SURVEY

Following are the techniques generally used to deliver videos to customers-

A. Video delivery services through on premise servers -

Hardware and software on-premise that is built within the physical boundaries of an enterprise-mostly in the corporate data center-as opposed to running remotely on host servers or in the cloud.

Through installing and running the program on hardware installed inside the company premises, internet technology workers have physical access to data and can directly monitor computer data and network configuration, management & security.

Whether company places its applications in cloud or it decides to keep them on premises, data security will always be paramount. But for those companies in highly regulated sectors, they can already have to determine whether to house their applications on premise. And realizing that your data is stored inside your in-house servers, and The infrastructure will also give you more peace of mind.

The downside to on-site environments is that it can run considerably higher than a cloud storage infrastructure costs associated with handling and maintaining all the solution involved. In-house server equipment, software licenses, integration capabilities and IT employees are needed for on-premise setup to support and handle potential problems that may occur.

B. Video delivery through cloud native application -

This video distribution model is more cost effective. This is appropriate for organizations of small to medium scale. It does not take any significant quantities of resources because the infrastructure is applied in the cloud, and the company actually does not need to set up the software in the cloud and its maintenance is the responsibility of the company, rather it is the responsibility of the cloud service provider. It is appropriate for organizations which have data of GB's and TB's. Cloud center startup expenses are avoided but storage and distribution charges are incurred. In the cloud you have a range of solutions such as elasticity, scalability, etc.

In one critical way, cloud computing differs from on-premises software. In the on-premise world, a company manages it in-house, while a third party provider manages it for you in a cloud setting. This allows companies to pay as required and to easily scale up or down based on overall demand, consumer needs and the growth of a company. Cloud-based server allows use of virtual technologies to host offsite applications for a client. These are no capital costs, data can be periodically backed up and businesses just have to pay for the services they are using. The cloud has even greater potential for those companies that intend ambitious expansion internationally, as it allows you to connect with clients, partners and other businesses with minimal effort anywhere.

Additionally, cloud storage offers nearly immediate provisioning, as the service vendor itself already configures everything in the service. So any new product that is incorporated into the system is ready to use instantly after a client has subscribed. For automated provisioning the time

spent on installation and configuration is eliminated, and users are able to use the system immediately.

1) Advantages:
1) Cost Efficient.
2) Elasticity and Scalability.
3) Go global in minutes.

2) Disadvantages:
1) Skilled person is required.
2) Responsibility is shared with cloud service provider.
3) No dedicated system for your application, it operates under multi tenant environment.
4) You have to launch server in every region in which your application is used.

C. Serverless video delivery platform -

Serverless is the model of cloud computing execution where service provider handles server allocation and distribution dynamically. Serverless application runs in event-triggered, ephemeral (may last for one invocation) and completely controlled by the cloud provider in stateless computing containers. The price is based on the number of executes instead of pre-purchased processing power, is that not the right structure for the project you have been preparing for a long time now? Okay, go ahead with it.

    Cloud services mainly spent in serverless. It takes a lot of money, with the huge promotion offered and practical pricing you can confidently expect that serverless is one of the most commonly deployed cloud services in future years. Due to all the unthinkable errors that disrupted your development, your applications could run on servers for several years that you had to patch, repair, and constantly look after late nights and early mornings. The full responsibility for their proper functioning was on you as long as you managed them. Serverless appears to be unlike the latter, you don't have to care about the underlying servers because they are no longer operated by you and the burden falls to the cloud vendors with management out of the picture.

III. SERVICES REQUIRED FOR SERVERLESS ARCHITECTURE

Most important AWS services to build the video delivery solution are:

A. AWS lambda

AWS Lambda is one of the Cloud-based computing services. It is a service managed by AWS. Lambda will help us to develop serverless serverless video delivery solution. We assume that csp can use server, we don't need to start them or handle them. It is Cloud's responsibility for everything. In lambda, we just need to deploy our code, and define an action or event that will be executed by lambda. In simple terms, a trigger that will execute on the basis of predefined event can be said to be lambda.

1) Functions:
1) A lambda function can be made which is invoked by api gateway request to store data in S3.
2) A lambda function can be made which is invoked by api gatewat request to reterive a video that is stored in S3.
3) A lambda function can also be implemented which will verify the registered user with aws cognito.

4) If a database is made for user than it can be used to store and reterive data in database.

B. AWS S3

One of the main features of a cloud is storage. AWS cloud has multiple storage options, EBS for the storage of blocks, EFS for files and S3 for objects. S3 is one those the most cost-effective storage. It has infinite space. It is best available alternative. This has buckets which are unique in the entire AWS environment and there will be no two buckets of the same name. It is also AWS managed service which is scalable and has global availability.

1) Functions:
1) AWS S3 is a flat file storage , so it can be used for storage of videos uploaded on the platform.
2) AWS S3 provide static website hosting service so it can be used to serve the website directly through an s3 bucket.

C. AWS API gateway

APIs are an excellent way of sharing information. With the support we can build, manage and deploy API easily. This will deal with huge amounts of requests. The lambda functions can be invoked using the API gateway.
Functions:
API gateway can be used to create api that can be used to trigger lambda function
An API that acts as a single point of integration for external application while you implement business logic and other required functionality at the backend using other aws service

D. AWS Cloudfront-
It is AWS private content-deliver network. We can deliver our complete web site with the help of it. With low latency and fast data transfer speed, the video content can be delivered. With the support of edge locations the content is served to the customer. AWS cloud front supports applications which can be served over http or https.

1) Functions:
1) With the help of aws cloudfront content can be delivered with low latency
2) Dynamic website can also be served with the help of cloudfront

D. AWS IAM

AWS identity and access management is a great way to protect AWS account and resources in it. With the help of principal, users can interact with AWS resources. Root user, iam user and iam roles are the type of principal. Not every user can be granted permission to access aws account. So with the help of iam, users are provided permission to access aws services.

1) Functions:
1) It protect aws resources from unauthorized access
2) With the help of IAM roles , different services can access each other
3) With IAM built in policies different aws service can access each other according to the policy, they can perform actions

E. AWS Cognito

Authentication and authorization are important for a web solution that involves user data with the help of aws cognito user pools we don't need to maintain a seperate database for user, instead we can make userpool that will help our user authenticate by registering themselves and get authorization for performing task like video upload etc.

1) Functions:
1) Amazon cognito hosted ui can be used to implement the login module
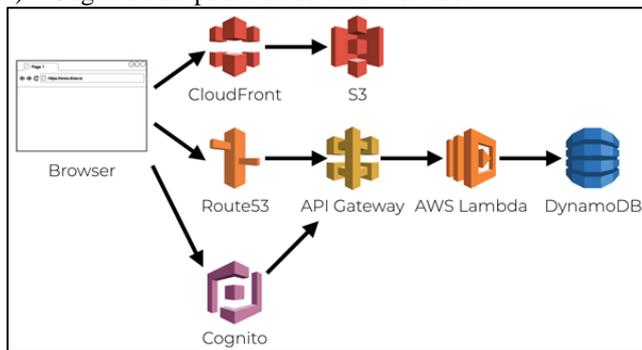2) Cognito user pool can be made for user.

Fig. 1: Flow of server-less web application

IV. ADVANTAGES OF SERVERLESS

1) Very cost efficient.
2) Server doesn't remains idle.
3) As the server doesn't remains idle they are used when required so power is saved.
4) You don't have to launch server in every region, CSP will handle it.
5) The cost of a serverless application is dependent on the number of function executions, which are calculated in milliseconds rather than hours.
6) Scalable, there's no need to think about how many simultaneous requests.

V. DISADVANTAGES OF SERVERLESS

1) Reduced overall control.
2) Architectural complexity.
3) Additional risk allows a third party vendor to be more trustworthy.
4) Security risk.
5) Disaster recovery risk
6) Price is uncertain, since there is no predefined number of executions.
7) App may provide poor user experience as a result of increased latency of requests, unless architectured correctly.

VI. CONCLUSION

Serverless architecture is definitely really exciting, but it still comes with a bunch of limitations. As the validity and performance of architectures depends on the requirements of the market and by no means on technology alone. In the same way, when used in the proper place, serverless will shine. So, if you've thought about switching to serverless, you can first check your FaaS apps to make sure it works perfectly. Function as a Service is a big cloud technology innovation, which will mature in the years to come.

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