

Cloud Integration with an Android Application

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Abstract

Memory shortage in mobiles has quite become a problem nowadays. Every mobile consumer came across the notification “Not Enough Storage Space”. The aim of this paper is to resolve the mobile memory crisis by establishing a connection between a mobile application and a cloud. This process is not out of the box, most of the new generation mobiles are already providing cloud storage for users; as researchers we are curious to show how those applications work behind. In this paper we developed a simple mobile application that can upload images from local mobiles to cloud storage and can download similar images. This simple application in future can be developed with advanced features that focus on data security and data sharing. Considering features like consumer rate, hands-on experience and services availability related to cloud, in this paper we consider choosing Android Operating System and Amazon Web Services Cloud for demo integration. As a result, in this paper we make use of AWS Cloud services like AWS S3, AWS IAM, and AWS Amplify. Another reason for choosing AWS among other cloud providers is the availability and portability of resources required to implement this paper.

Key Words: Android OS, AWS, Integration, S3

1.Introduction

Cloud Computing is a popular enterprise model in which computing resources are made available on demand. Demand for cloud usage increases rapidly. As resources are available at lower costs (Pay per Use) with more advanced features, the cloud attracts huge customers. Most of the Multinational companies are using the cloud for data storage as well as for developing scalable products. When it comes to

mobiles, they possess limited computing power leveraging cloud could be a huge advantage for mobile application developers as well as for the consumers. On the other hand, Android is based on the Linux kernel developed by google, it represents an ecosystem for developing and maintaining mobile applications. Android includes a software package development kit known as Android SDK which contains a set of development tools that are used for developing mobile applications and also ensures that the process of developing applications was well ordered. To develop mobile applications using SDK which further utilizes Java to develop applications and XML(Extensible Markup Language) to represent data resources. To develop mobile applications using SDK(Software Development Kit), Google offers an IDE(Integrated Development Environment) called Android Studio with features that are capable of making our application portable. Android IDE can also debug, develop and package android applications.

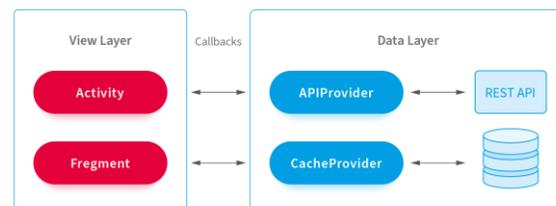


Fig-1 Android Architecture

API is an acronym for Application Programming Interface which is a main ingredient in this paper. Through API, data layer and view layer will talk with each other in android architecture; similarly cloud and android applications can also talk through API.'s. We used AWS TransferUtility Service in this paper where it provides simple API for uploading content to and downloading content from AWS S3(Simple Storage Service)

View is a basic building block of the user interface in Android. When it comes to our Application View we used simple Linear View, apart from that we also used image view to display the image that we choose.

2. Methodology

This paper's objective is to resolve memory crisis issues in mobile devices; as a result we started developing an application with the help of this application mobile users can upload unused images in their mobile to an AWS S3 cloud Storage service. The AWS Cloud Services play a huge role in building this application. This application consists of Major Services like AWS S3, AWS IAM, AWS SDK and AWS TransferUtility.

Below Diagram will explain how an android application can establish connection with the cloud.

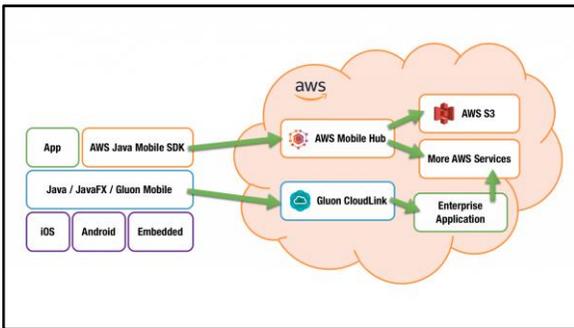


Fig-2 AWS Integration with Android

Process of building an application starts from creating AWS S3(Simple Storage Service) , configuring AWS IAM and ends with developing an android integration using TransferUtility. Connection between Mobile Application and AWS Services can be established using AWS Amplify which is also known as AWS SDK.

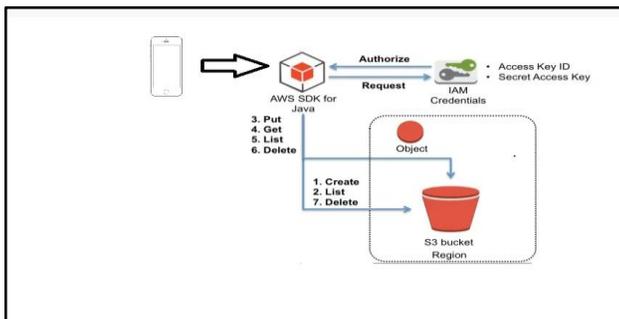


Fig -3 Application Architecture

3. Overview of Technologies and Services

1. **AWS Cloud** : Amazon Web Services is a most used cloud platform. It offers around 200 featured services from data centers globally. It is a cloud computing platform that includes IaaS (Infrastructure as a Service) and PaaS (Platform as a service). It offers solutions for compute, storage, database and many more. AWS is also cost effective as it follows a Pay as you go method. Where consumers can pay for individual services as long as they use them. Along with AWS service we will receive a virtual environment where we can load the software and services our applications require.
2. **AWS S3** : S3 acronym for Simple Storage Service is one of the services provided by Amazon Web Services Cloud. It is a key - value store, one of the categories of NO-SQL database for storing unstructured and semi structured data. Uploaded objects are referred to by a unique key, which can be any string. We can store an unlimited number of objects in a bucket.
3. **AWS IAM** : IAM is an acronym for Identity Management, one of the services provided by Amazon Web Service Cloud. Through IAM we can create an aws account that has specific permissions. It enables certain individuals to access the right resources at the right time. In general, we can specify who can access AWS Services and resources under which conditions. Using IAM policies we can manage permissions. Through IAM we will grant permissions to our application.
4. **AWS S3 TransferUtility** : It provides a simple API (Application Programming Interface) through which we can upload to and download from AWS S3(Simple Storage Service).
5. **Android OS** : Android is a mobile Operating System developed by Google. It is based on a modified version of Linux Kernel. Using Android Studio, we can develop mobile applications that can work on Android OS. Android Studio comes with all packages that are required for building android applications.

4. Implementation

The building of these application can be done using following steps

- 1] Creating S3 Bucket (Simple Storage Service)
- 2] Creating an Identity Pool
- 3] Configure Identity and Access Management Role
- 4] Getting started with Integration

Working with AWS Cloud services includes creating a S3 bucket and configuring IAM roles using policies. During the creation of S3 bucket we will be asked to choose permissions, like block all public access, check this option so the bucket cannot be accessed by the public. We can also enable versioning; versioning means keeping multiple variants of a single object in the bucket. It will be used for recovering and restoring the objects. After creating a bucket, we need to create identity pools and configure AWS IAM. The Use of Identity pool is to provide credentials for users who are guests. Using AWS Cognito, we can create Identity pools. During creation of Identity pool, we need to make sure that both authenticated and unauthenticated roles are present. After creating the pool, we need to configure the IAM role.

Integrating cloud with android is the major part of this paper. For integration we need follow below steps

- Get the AWS SDK for android.
- Add transfer service to Sdk.
- Initialize Credential provider.
- Set amazon S3 as client
- Configure AWS keys.
- Set file upload.

We implemented this integration on Android Studio. Getting SDK for android is done by configuring Gradle Dependencies. After completing the process of creating identity pool through Cognito console, AWS provides us a code to attach with our android application. Paste that code in Gradle Package within the section named dependencies. As we upload the image from our internal memory, we need to ask the user to give our application external memory access permission. Those permissions are added to the AndroidManifest.xml file. Add these permissions just after the package name.

Amazon has a built-in feature known as transfer utility. That provides to develop and track files to

upload and download from or to amazon s3. Develop a separate Java Package importing TransferUtility.

Credential Providers are the primary mechanism for user authentication. AWS can perform with two environmental variables `AWS_ACCESS_KEY_ID` and `AWS_SECRET_ACCESS_KEY` since they are recognized by all AWS SDK. But in this application we managed authentication using `MY_REGION` and `COGNITO_POOL_ID`. We can get the code from our COGNITO Dashboard.

The API that we created using S3TransferUtility needs to have an end gateway that is S3 Bucket we have created. We have built a function that can return S3 client instances.

Application needs certain keys like MY Region, Bucket name, Cognito Pool id in-order to know the destination. We create Class within the package that can take these variables like `My_REGION` and `BUCKET_NAME`.

We implement a code to upload images from external memory to S3 Bucket, which we have created by importing packages provided by Amazon TransferUtility.

5. Results and Discussion

The Application can successfully upload and download images that were stored in the internal storage of a mobile. Throughout the entire research process, I found out about amazing resources and SDK's AWS can provide. I also learned how services like S3, IAM, and SDK work with real time applications. Along with Cloud Computing I researched even more about Android OS. There are quite a few studies that have been conducted to improve data storage in mobiles. However, most of them are not applicable to mobile devices since mobile devices have limited computing resources and power. Leveraging cloud on mobile can be a great solution to solve the data storage crisis within mobiles.

6. Conclusion and Future Scope

Our Paper aims to resolve the problem related to memory crisis on mobile devices with the help of integrating cloud services with android applications. In the future we want to research how Data Security and Data Sharing work within these kinds of applications. We can make use of Cryptography algorithms like Digital Signature, Advanced Encryption Standard Algorithm (AES) and Diffie Hellman Key Exchange to provide data security within these applications.

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