

# **FIREBASE CLOUD MESSAGING (ANDROID)**

Neha Srivastava, Uma Shree, Nupa Ram Chauhan, Dinesh Kumar Tiwari

Department of CSE FGIET, Rae Bareli, Rae Bareli, India

Department of CSE, FGIET, Rae Bareli, Rae Bareli, India

Assistant Professor, Department of CSE, FGIET, Rae Bareli, India

Asso. Professor, Department of CSE, Rae Bareli, India, FGIET, Rae Bareli, India

**ABSTRACT:** In this paper we will be introducing FIREBASE ,which is a realtime database that can communicate directly from the user. When JSON data is saved to firebase, all users immediately received the changes along with web and mobile . Firebase will help us build modern applications faster than ever ,with the use of built-in static file hosting, user management, and security rules. Firebase covers all that mobile developers need to build, maintain and scale a mobile app on all platforms (even on iOS): from Storage and databases to innovative tools like Remote Config and TestLab. FCM inherits GCM's core infrastructure but simplifies the client development. Developer's no longer needs to write their own registration or subscription retry logic. Now, we can integrate FCM in our app with just a few lines of code. Plus, FCM includes a web console called Firebase Notification .However, GCM is not disapproved, Google still support it's all new client-side features will be available on FCM SDK only. The protocol remains the same server-side though. For deployments with more complex messaging requirements, FCM is the right choice.

## **NOMENCLATURE**

FCM-Firebase Cloud Messaging

GCM-Google Cloud Messaging

HTTP-Hypertext Transfer Protocol

JSON-Java Script Object Notation

SDK-Software Development Kit

XMPP-Extensible Messaging and Presence Protocol

## **I.INTRODUCTION**

Firebase is a cloud services supplier and backend as a service company based in San Francisco, California. A special platform is provided by firebase for building mobile and web application. It can build application and update it in real time. Firebase is very easy and it stores data in JSON format. We do not need to configure our server when we use firebase. Every thing will be handled by firebase automatically. So server side coding is not required. It will save time and will make us more productive. In this research paper we will simply explain how to use firebase for our android application. Obviously ,both server side code and client side code is required for building a web-application. It requires a backend that handles a database to store the records, authentication to authenticate the identity of user accessing it, Ajax, an accessible API, and we need to host that backend somewhere. There are many technologies that make backend development an easy task like Ruby on Rails, or services like Heroku but a lot of development time is consumed during building these technologies . Most of the backend concerns are taken into account by the firebase and therefore it is taken as Backend as a Service (BaaS).

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Firestore utilizes web sockets for pushing state to our application. It updates the data in real time and therefore we need not to refresh the browser to get update thereby making it more interactive.

## II. FIREBASE CLOUD MESSAGING

How FCM works?

Firestore Cloud Messaging (FCM) is a cross-platform interactive application which lets you build your application on multiple platforms like android, ios, tablet and many more, that allow you to deliver messages in more reliable manner at no cost. Using FCM, you can notify a client app that new email or other data is available to sync, all this is done in real time. FCM allows multiple parties to send -



An FCM implementation includes an app server that interacts with FCM via HTTP or XMPP protocol, and a client app. You can compose and send messages using the app server or the notification console.

Firestore Cloud Messaging allows us to build notification of firestore that shares the same software development kit for client development. For testing or for sending marketing or engagement messages with powerful built-in targeting and analytics, you can use Notifications. Firestore can update the data within nanoseconds.

## FCM MESSAGES

Firestore Cloud Messaging (FCM) offers wide range of messaging solutions with advance options and newer capabilities. This section focuses on two types of services-Message type and Notification message. The Hypertext Transfer Protocol (HTTP) is an application layer protocol which is used for the secure communication over internet and between sender and receiver. Extensible Messaging and Presence Protocol (XMPP) is the open XML technology as well as protocol for communication between sender and receiver. X refers to extensible means it takes approach in defined way to grow and acquired the changes. M refers to piece of message you see. P refers to presence which is type of indicator use to tell the server that you are available or not. P refers to Protocol means set of rules that enables system to communicate with eachother.

## III. TYPES OF MESSAGES

With FCM, you can send two types of messages to clients:

- Notification messages, sometimes --thought of as "display messages."
- Data messages, which are handled by the client app.

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We can use Firebase Cloud Message for sending instant messages of up to 4KB in size.

### Notification messages

Notification messages are handled by firebase SDK itself. Typically the notification message contains title, message, icon etc., this message can be sent from firebase console UI. By sending this kind of messages, you won't get much control over the notification. The notification will be shown automatically when the app is in background.

For example, here is a JSON-formatted notification message in an IM app. The user can expect to see a message with the title "Portugal vs. Denmark" and text "great match!" on the device:

```
{
  "to" : "bk3RNwTe3H0:CI2k_HHwgIpoDKCIZvvDMExUdFQ3P1...",
  "notification" : {
    "body" : "great match!",
    "title" : "Portugal vs. Denmark",
    "icon" : "my icon"
  }
}
```

When the app is running in the background and user is not currently using the app at that moment Notification messages are stored in the notification tray. And messages are handled by these callbacks:

- `didReceiveRemoteNotification`: on iOS
- `onMessageReceived()` on Android.

### Data messages

Set the data key with your custom key-value pairs to send a data payload to the client app. Data messages can have a 4KB maximum payload.

For example, here is a JSON-formatted message in the same IM app as above, where the information is encapsulated in the data key and the client app is expected to interpret the content:

```
{
  "To" : "bk3RNwTe3H0:CI2k_HHwgIpoDKCIZvvDMExUdFQ3P1...", "data" : { "Nick" : "Mario", "body" : "great match!", "Room" : "PortugalVSDenmark"
}
}
```

NOTE: We can't send Data messages using the firebase console. We need to use the REST Client or Server.

- On Android, a client app receives a data message in `onMessageReceived()` and can handle the key-value pairs accordingly.
- On Android, the data payload can be retrieved in the Intent used to launch your activity.

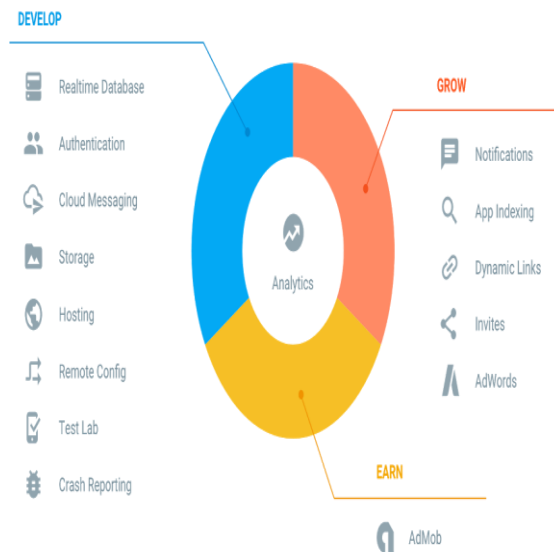
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## IV. FEATURES

- Real time Database: A schema less and cloud hosted database that is structured in Java Script Object Notation format.
- Authentication: Authentication in firebase provides a very good service of authenticating all the users without even using any client side coding.
- Cloud messaging: Firebase cloud messaging allows messages to be delivered from any platform other than the one on which it is developed in a reliable manner.
- Storage: Files can be uploaded and downloaded in a secure manner without being affected by network quality
- Hosting: Firebase web applications can be statically hosted in a secure manner in a very fast and quick manner.
- Remote config: This feature allows to update the user application without the need of deploying the current updated app.
- Test lab: It involves testing of applications with different configurations and with variety of devices.
- Crash reporting: This feature is used to prepare a report of all the app crashes and errors in application.



### Real time database

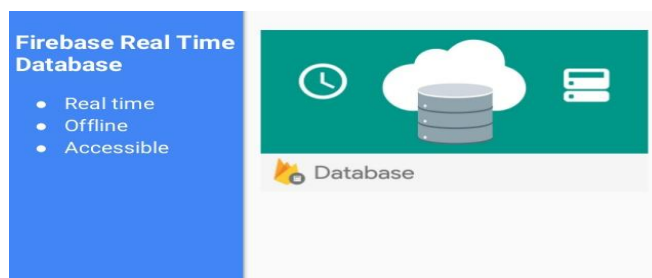
Firebase Real-time database is a cloud hosted database that supports multiple platforms Android, iOS and Web. All the data is stored in JSON format and any changes in data, reflects immediately by performing sync across all the platforms & devices.

How the Data is Stored – JSON Structured: Firebase real-time database is a schema less database in which the data is stored in JSON format. Basically the entire database is a big JSON tree with multiple nodes. So when you plan your database, you need to prepare the json structure in way that the data is accessible in easier way by avoiding nesting of child nodes.

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### Authentication

To know the identity of a user is ultimate requirement of most of the application. Authenticated user is provided with the customized experience and identity of the user should be known in order to grant them permission to access the data. The process of authentication verifies the identity of user . Firebase provides a full set of authentication options out-of-the-box.

Three things are carried out when a user authenticates to a Firebase app:

- User's Information is returned in callbacks on the client device. The user's experience can be customized for that specific user whenever a user authenticates to a firebase app.
- The returned user information contains a `uid` (a unique ID), which is definitely different and unique across all providers, and it never changes its value for any specific user that is authenticated.
- The `auth` variable's value gets defined in our app's Security and firebase rules. This variable holds a `null` value for all those users that are unauthenticated , but for authenticated users it contains the user's unique (`auth.uid`) in the form of object and potentially other data about the user. Data access on a per-user basis can therefore be controlled in secure manner.



### Cloud messaging

It involves versatile message targeting. Data is synced in real-time and remains available even when the application goes offline.

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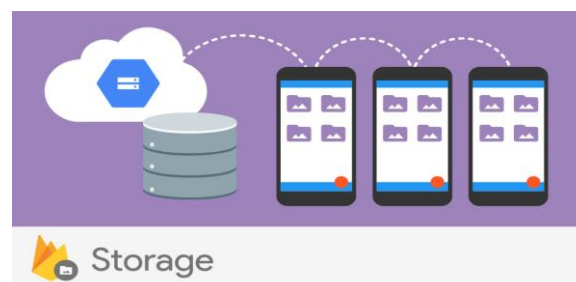
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### Storage

User-generated content including photos or videos can be stored and served in an effective manner by the app developers using the firebase storage feature of Firebase . File can be uploaded and downloaded in a secure manner using firebase storage feature of Firebase and it is not affected by the quality of network .It can also be used to stored photos, files, audio, video, or other type of content generated by user from communication . Storage feature is highly supported by Google cloud storage, services which is powerful, simple to use, and cost-efficient ,consistent service used for storing objects in a simple manner.



### Hosting

The Firebase Hosting feature of FCM is used to provide fast and secure static hosting for your web application .Firebase Hosting is production-grade web content hosting for developers. With Hosting, web apps and static content can be very quickly and easily deploy to a content-delivery network (CDN) which is global and uses command.

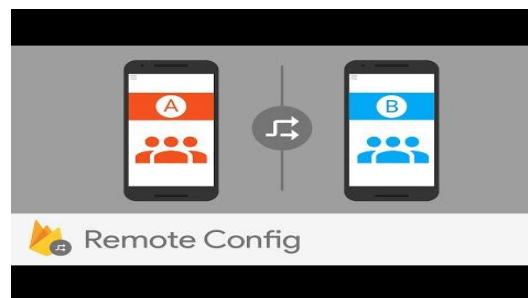
### Remote Config

Remote Config is a FCM service using which the behavior and appearance of our application can be changed and updated without the requirement to get the app downloaded first. When using Remote Config, the behavior and appearance of our app can be controlled using the created in-app default values that Then, Firebase console can later on be used the override in-app default values for all app users or for segments of our user base.

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### Test Lab

All the consequences can be tested in the lab not on user's application

- To identify bugs, tester need to generate detailed reports and screenshots
- Custom test scripts should be tested .

### Crash Reporting



Crash reporting feature of FCM is used to identify errors in application. When errors are occurred in the application then those are collected into slots of similar properties in the form of stack and sorted by the rapidity of effect on users .For identify those reports that are generated automatically, we can log custom events to find the steps that are generated crash.

## V.CONCLUSION AND FUTURE SCOPE

Firebase is a platform and a tool that is known for its speed and reliability in terms of the time it takes for building applications that are real-time with a highly simpler platform, many of the Google features are carried forward along with other advanced features like crash reporting and thereby allowing the developers to create critical and more functional applications providing a wide variety of services.

It has a great scope in future because of the variety of advanced features that are added in firebase that provide variety of services.

All of the above can now be implemented when using Firebase that is quite similar and involves no complicated configuration that means it saves a lot of time because data is updated in real time which means all the changes are updated to all connected clients automatically thereby it make our apps/sites unique. It offers a simple and controllable

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dashboard. Security in firebase can be enabled by setting the Java Script Object Notation (JSON) like objects inside security rules and changing their default values to some unique values.

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