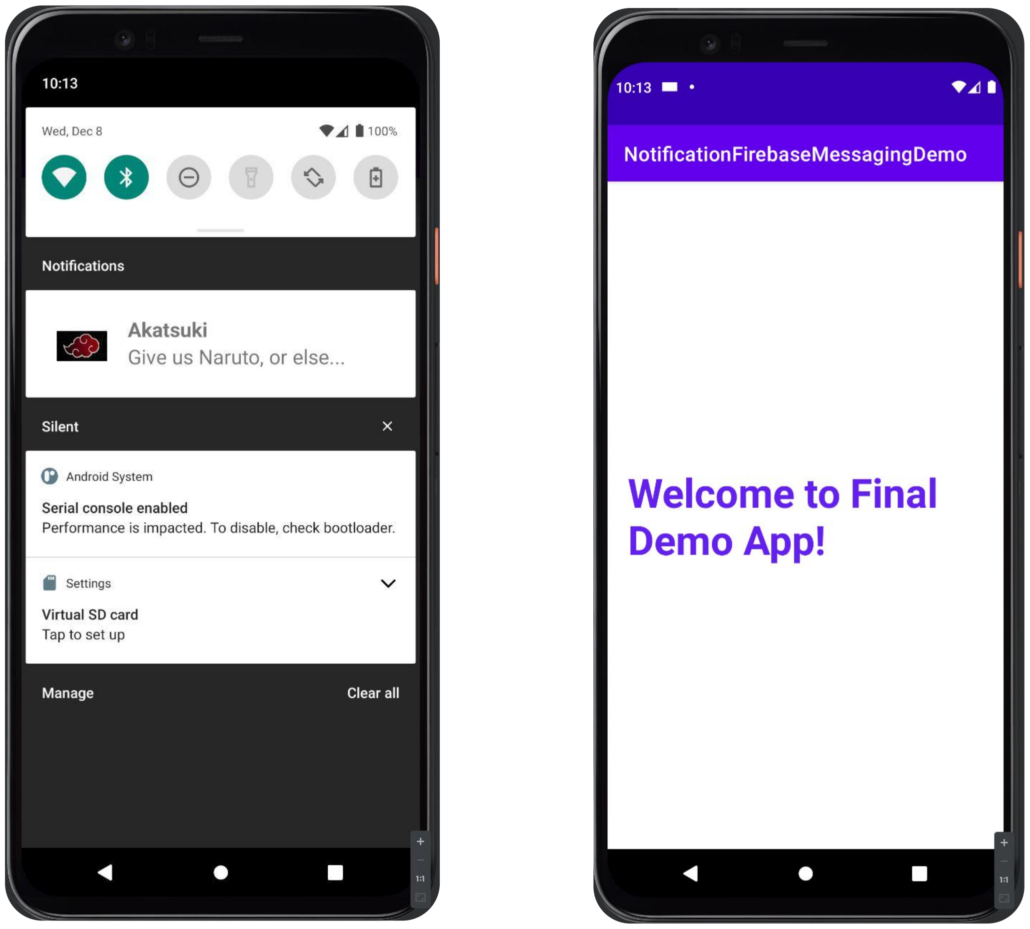
Notifications / Firebase Cloud Messaging – Android

Overview

This tutorial is a simple application that uses the user interface of Notifications from Android, and Cloud Messaging services from Firebase in Kotlin. Firebase – Cloud Messaging (FCM) is a solution for sending messages across devices, and notification across platforms for free. In this project, we will show how to create a notification and send a message using this service.



Akatsuki
Give us Naruto, or else...

Serial console enabled
Performance is impacted. To disable, check bootloader.

Virtual SD card
Tap to set up

Welcome to Final Demo App!

Figure 1. Final product. Notification box on the left, and notification layout on the right.

Getting Started

We will be using Android Studio. To download it, go to this link: https://developer.android.com/studio/

Step 1: Open Android Studio. Create a new project by clicking on *New Project*. Then select *Empty Activity*.

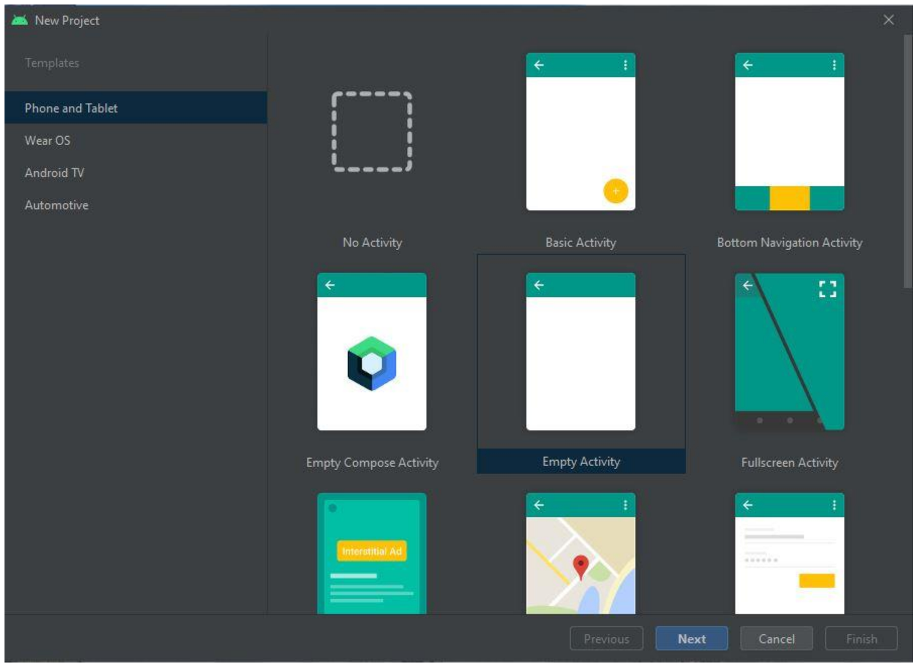


Figure 2. **Select Empty Activity**

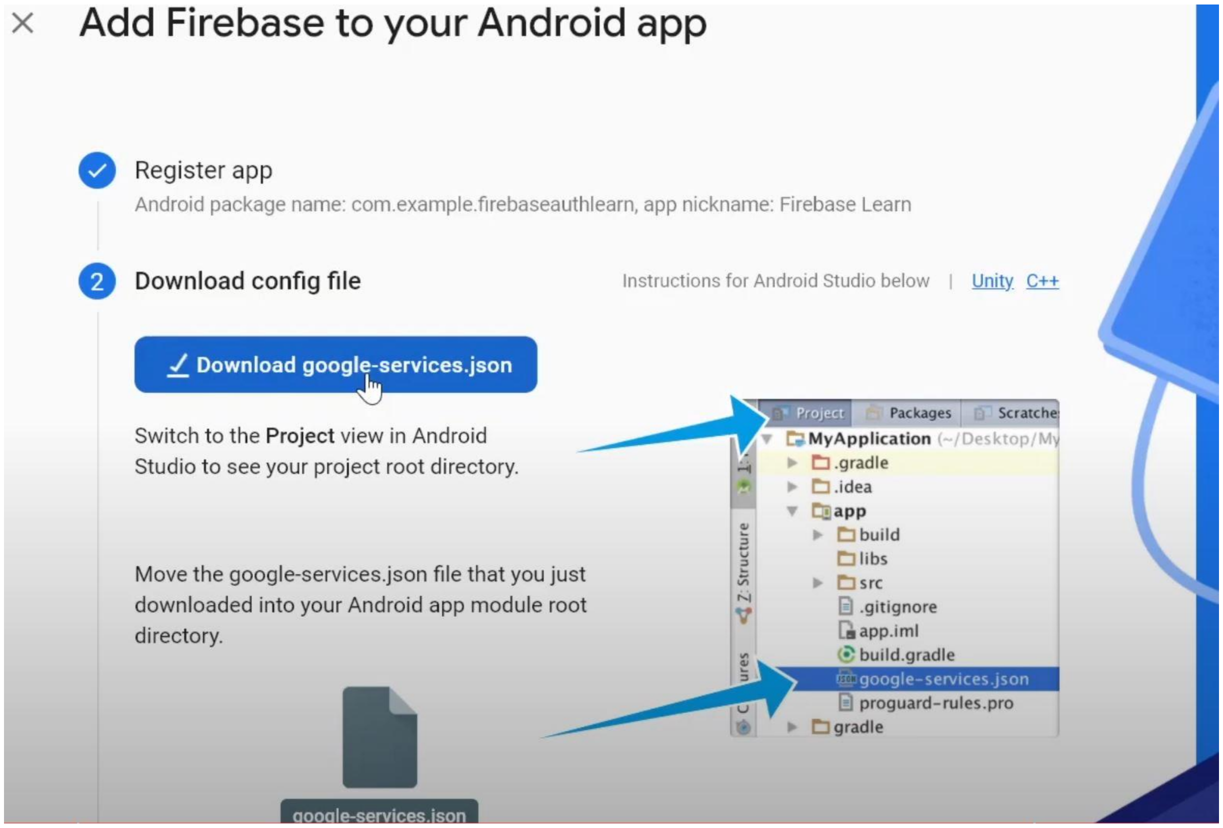
Step 2: Give it a name, which in this case I chose *NotificationFirebaseMessagingDemo*. A desired Package name. Choose Language *Kotlin*, and a Minimum SDK of *API 28: Android 9.0 (Pie)*, and press *Finish.*

Step 3: Connect our app to Firebase. Simply go to https://console.firebase.google.com with your google account and create a new project. Follow the steps until you get a message saying: "Your new project is ready", and press the *Continue* button.

Step 4: Once your project is created click on the Android logo: on the middle level of "Project Overview" page.

Step 5: Now, let's give it a desired package name. I chose "CIS357FinalProject". You can leave empty the fields of *App nickname (optional)*, and *Debug signing certificate SHA-1 (optional)*. Make sure it matches the package identifier in your project's *manifest.xml*. Click on *Register app* button.

Step 6: Download the *google-services.json* file to your gradle build directory (the *app* sub-directory.) as shown in figure 3. Then, click on *Next* button.


Add Firebase to your Android app

Register app

Android package name: com.example.firebaseauthlearn, app nickname: Firebase Learn

2 Download config file

Instructions for Android Studio below | Unity C++

Download google-services.json

Switch to the **Project** view in Android Studio to see your project root directory.

Move the google-services.json file that you just downloaded into your Android app module root directory.

Figure 3. **Download the JSON file.**

Step 7: Add the following to your Project-level **build.gradle.**

```
classpath 'com.google.gms:google-services:4.3.10'
```

Step 8: Add the following at the bottom of your App-level **build.graddle.**

```
apply plugin: 'com.android.application'
apply plugin: 'com.google.gms.google-services'
```

Step 9: Add the following inside of the d*ependencies* block of your App-level **build.graddle.**

```
implementation 'com.google.firebase:firebase-messaging-ktx'
implementation 'com.google.firebase:firebase-messaging-ktx:23.0.0'
implementation 'com.google.firebase:firebase-analytics-ktx'
```

Step 10: Finally, press "Sync now" at the top right corner in the bar that appears in the IDE. Then, press the *Next* and *Continue to console* buttons. Now we are ready to start coding.

Step-by-step Coding Instructions

Let's begin by modifying the layout file.

Step 11: Open **activity_main.xml**, which can be found within the *layout* folder. Let's customize the default *Text View* with the following values:

```
<TextView
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="Welcome to Final Demo App!"
    android:textSize="40dp"
    android:padding="20dp"
    android:textColor="#6320EE"
    android:textStyle="bold"
    app:layout_constraintBottom_toBottomOf="parent"
    app:layout_constraintLeft_toLeftOf="parent"
    app:layout_constraintRight_toRightOf="parent"
    app:layout_constraintTop_toTopOf="parent" />
```

Of course, customize it with your desired `text` and `textColor`. You will obtain this:

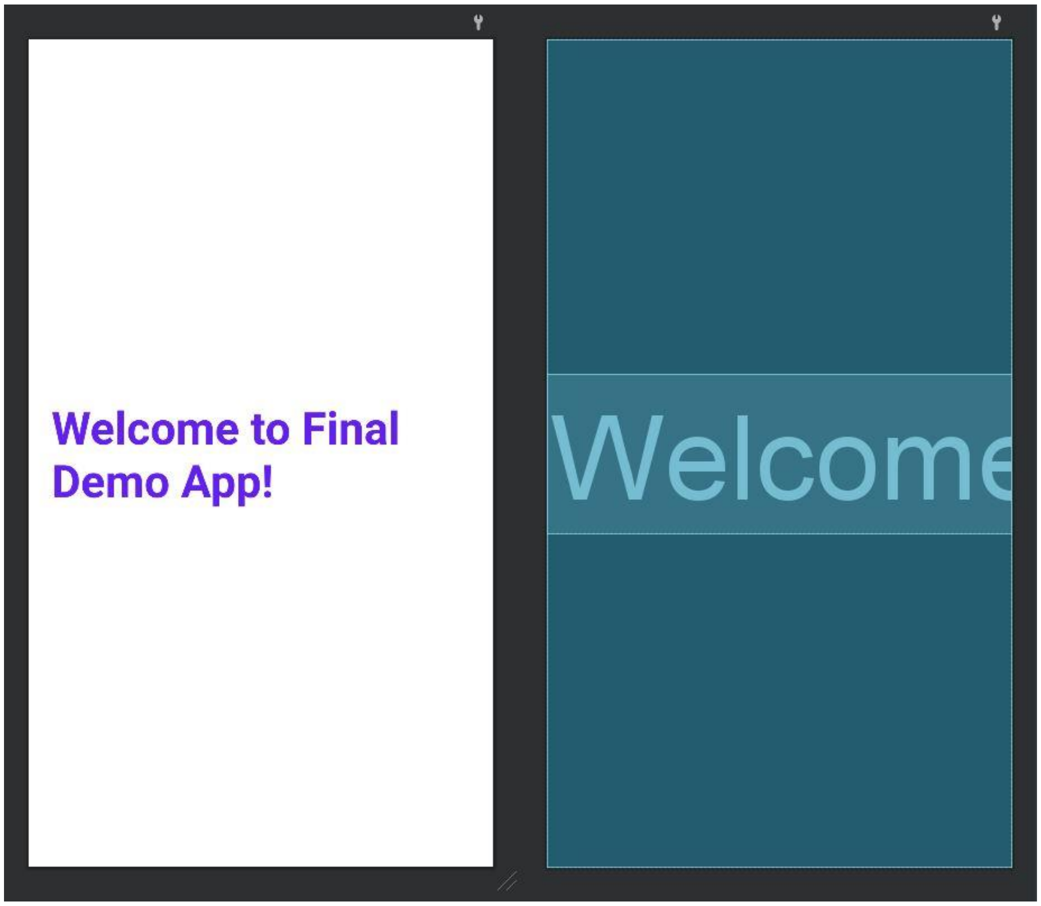


Figure 4. **Layout of activity_main.xml.**

Now, in order to use FCM, we need to do some changes in the manifest file.

Step 12: Open **AndroidManifest.xml,** which can be found under the *manifests* folder, and paste the following code inside the application block, but outside of the activity block:

```
<service
    android:name=".MyFirebaseMessagingService"
    android:exported="false"
    tools:ignore="Instantiatable">
    <intent-filter>
        <action android:name="com.google.firebase.MESSAGING_EVENT" />
    </intent-filter>
</service>
```

Upon pasting the above code, you will see an error because we have yet to create a class called **MyFirebaseMessagingService**.

Step 13: Let's create it by selecting your package name folder, right click and go to *New>Kotlin Class/File*. Name it **MyFirebaseMessagingService,** and double click on *Class*.

Step 14: Next, add the following code in your **AndroidManifest.xml** within the application block, and before the activity block:

```
<meta-data
    android:name="com.google.firebase.messaging.default_notification_icon"
    android:resource="@drawable/image_name" />
<meta-data
    android:name="com.google.firebase.messaging.default_notification_color"
    android:resource="@color/colorAccent" />
```

You will notice 2 errors. We need to add an image to use as the notification logo, and choose a color.

Step 15: To do this, you need to have a desired image file in your computer. Copy it, and paste it under *res/drawable* folder in Android Studio. Then replace the above `image_name` with the name of the image that we recently added to the *drawable* folder.

Step 16: Then, choose a desired color to replace `colorAccent`. I chose the default color `purple_700.`

We are now ready to work with the notification.

Step 17: Open **MyFirebaseMessagingService.kt** and extend it like this:

```
class MyFirebaseMessagingService : FirebaseMessagingService() {
}
```

Step 18: Create the custom layout for the notification. Go to *res/layout* and right click on *layout* folder. Go to *New>Layout Resource File* and name it notification. Press the *OK* button.

Step 19: In the **notification.xml** file, go to *Code* (on the top right corner), and replace all the code with the following:

```
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="wrap_content">

</RelativeLayout>
```

Step 20: Add another `RelativeLayout` within the existing `RelativeLayout` with the following code:

```
<RelativeLayout
      android:layout_width="wrap_content"
      android:padding="10dp"
      android:layout_height="match_parent">

</RelativeLayout>
```

Step 21: Next, we will add the logo for our app. Add the following code within the second `RelativeLayout`:

```
<ImageView
    android:id="@+id/app_logo"
    android:layout_width="70dp"
    android:layout_height="70dp"
    android:layout_marginLeft="10dp"
    android:layout_marginTop="10dp"
    android:padding="10dp"
    android:src="@drawable/akatzuki1" />
```

Step 22: Let's add the title and the message. Add the following code after `ImageView` within the second `RelativeLayout`:

```
<TextView
    android:id="@+id/title"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_marginLeft="10dp"
    android:layout_marginTop="15dp"
    android:layout_toRightOf="@+id/app_logo"
    android:text="Title"
    android:textSize="20sp"
    android:textStyle="bold" />

<TextView
    android:id="@+id/message"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:layout_below="@+id/title"
    android:layout_marginLeft="10dp"
    android:layout_toRightOf="@+id/app_logo"
    android:text="This is the message"
    android:textSize="20sp" />
```

Your notification will look similar to this:

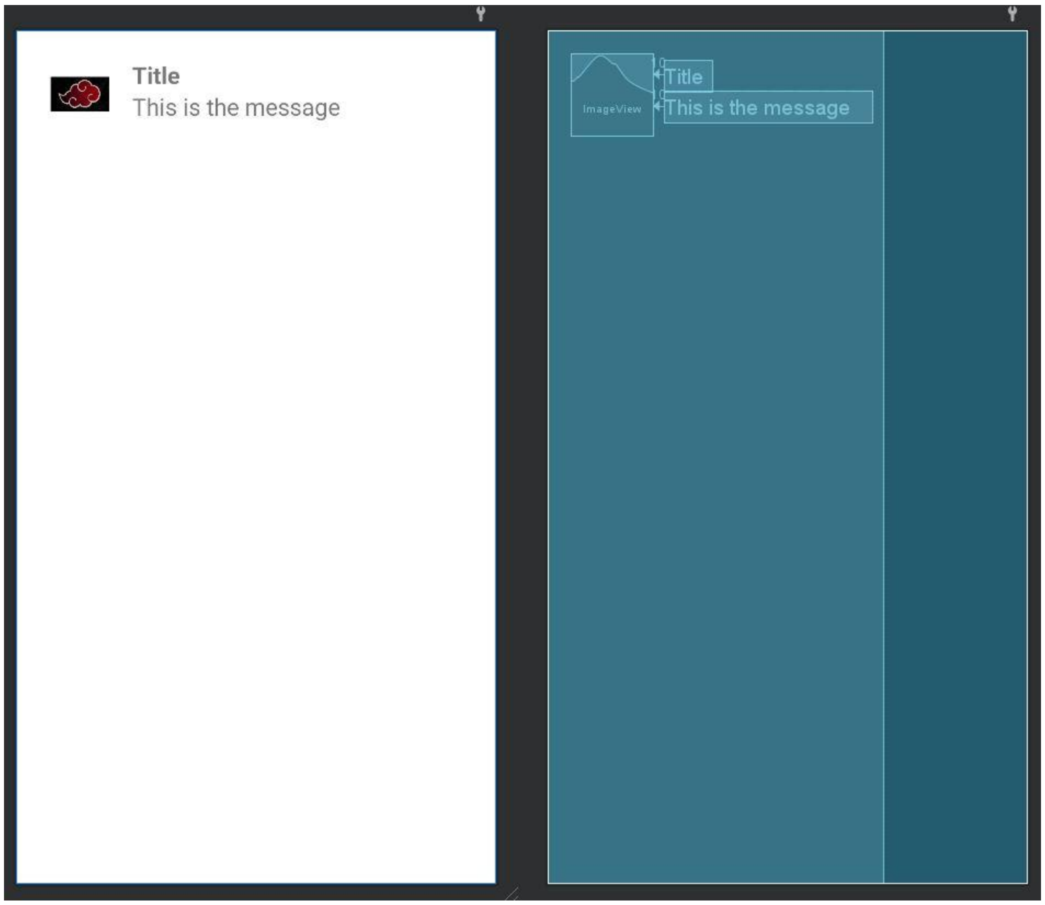


Figure 5. Layout of notification.xml.

Every notification needs to respond with an intent after a tap. To do this, we will use `PendingIntent` and `setContentIntent()`

Step 23: Go to **MyFirebaseMessagingService.kt** and create a *generateNotification* function with the following parameters:

```
fun generateNotification(title: String, message: String) {
}
```

Now, let’s create an intent for the user notification.

Step 24: Add the following code within the function we recently created:

```
1 val intent = Intent(this, MainActivity::class.java)
2 intent.addFlags(Intent.FLAG_ACTIVITY_CLEAR_TOP)
3
4 val pendingIntent =
PendingIntent.getActivity(this,0,intent,PendingIntent.FLAG_ONE_SHOT)
```

On line 1, intent will jump from `this` to the `MainActivity`. Line 2 will add a flag that will clear all activities on the activity stack, and it will put this activity at the top. Line 4 will let us use a coming intent in the future, and `FLAG_ONE_SHOT` indicates to use this activity only once after user taps on the notification, and the activity gets destroyed.

Next, we need to create the channel id, and channel name.

Step 25: Create the constant values before the beginning of class *MyFirebaseMessagingService*. Give it a name, and your package name.

```
const val channelId = "notification_channel"
const val channelName = "edu.gvsu.cis.notificationfirebasemessagingdemo"
```

Do not forget to change the `channelName` with the name of your package.

Step 26: Use `NotificationCompat.Builder` object to set the notification's content and channel by adding the following in the *generateNotification* function:

```
var builder: NotificationCompat.Builder =
NotificationCompat.Builder(applicationContext, channelId)
    .setSmallIcon(R.drawable.image_name)
    .setAutoCancel(true)
    .setVibrate(longArrayOf(1000,1000,1000,1000))
    .setOnlyAlertOnce(true)
    .setContentIntent(pendingIntent)
```

Change `image_name` with the name of the image that we added earlier. `setAutoCancel` automatically removes the notification when the user taps it. `setVibrate` will set the device vibration, which in this case the device will vibrate for 1 second, relax for 1 second, vibrate again for 1 second, and finally relax for 1 second. `setOnlyAlertOnce` will alert the notification only once. `setContentIntent` will pass the pending activity created above.

Now, we need to attach it with the notification's layout that we previously built (Figure 5).

Step 27: Add the following after the above code:

```
builder = builder.setContent(getRemoteView(title,message))
```

You will see an error because we have yet to create the `getRemoteView` function.

Step 28: Create the `getRemoteView` as the following:

```
@SuppressLint("RemoteViewLayout")
fun getRemoteView(title: String, message: String): RemoteViews {
    val remoteView =
RemoteViews("edu.gvsu.cis.notificationfirebasemessagingdemo",
R.layout.notification)
    remoteView.setTextViewText(R.id.title,title)
    remoteView.setTextViewText(R.id.message,message)
    remoteView.setImageViewResource(R.id.app_logo,R.drawable.akatzuki1)

    return remoteView
}
```

This will map the layout to the title and message of the notification, and will return the remote view.

Afterwards, we need to create the notification manager.

Step 29: Add the following line of code within the *generateNotification* function:

```
val notificationManager = getSystemService(Context.NOTIFICATION_SERVICE) as
NotificationManager
```

Step 30: Check if the client's Android version is greater than or equal to Android Pie and show the notification within *generateNotification* function with the following:

```
if(Build.VERSION.SDK_INT >= Build.VERSION_CODES.O) {
    val notificationChannel = NotificationChannel(channelId, channelName,
NotificationManager.IMPORTANCE_HIGH)
    notificationManager.createNotificationChannel(notificationChannel)
}

notificationManager.notify(0,builder.build())
```

If true, it will create a notification `channelId` and a `channelName` with importance priority high. Then, it make the notification appear using the `notificationManager.notify()` object.

Thereafter, we will show the notification by creating a new function.

Step 31: Create another function called `onMessageReceived` with the following:

```
override fun onMessageReceived(remoteMessage: RemoteMessage) {
    if (remoteMessage.getNotification() != null) {
        generateNotification(remoteMessage.notification!!.title!!,
remoteMessage.notification!!.body!!)
    }
}
```

This will receive the notification and call the respective functions. At this point, go ahead and run the app.

After successfully running the app, the only thing left to do is to send a notification from the Firebase console.

Step 32: Switch over to the Firebase project we previously created, and click on *Cloud Messaging* under *Engage* as shown in figure 6.

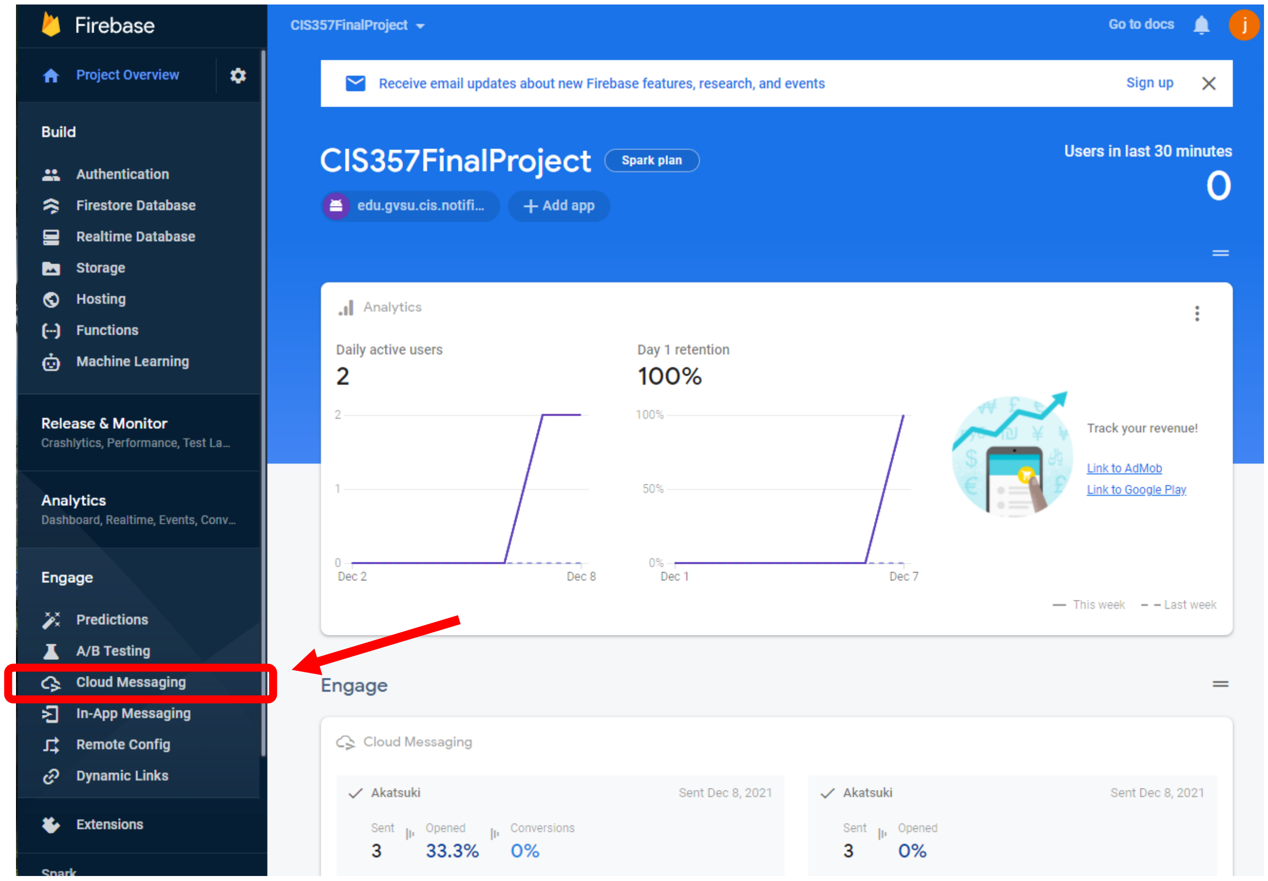
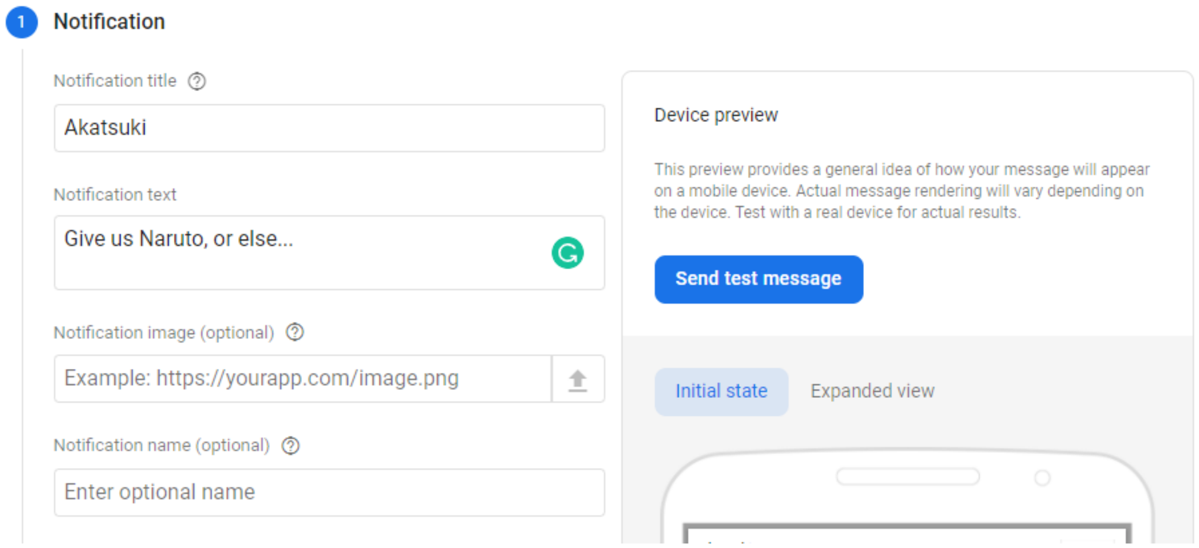


Figure 6. **Firebase Console.**

Step 33: Click on the *Send your first message* button and follow the instructions.



Notification title: Akatsuki

Notification text: Give us Naruto, or else...

Notification image (optional): Example: https://yourapp.com/image.png

Notification name (optional): Enter optional name

Device preview

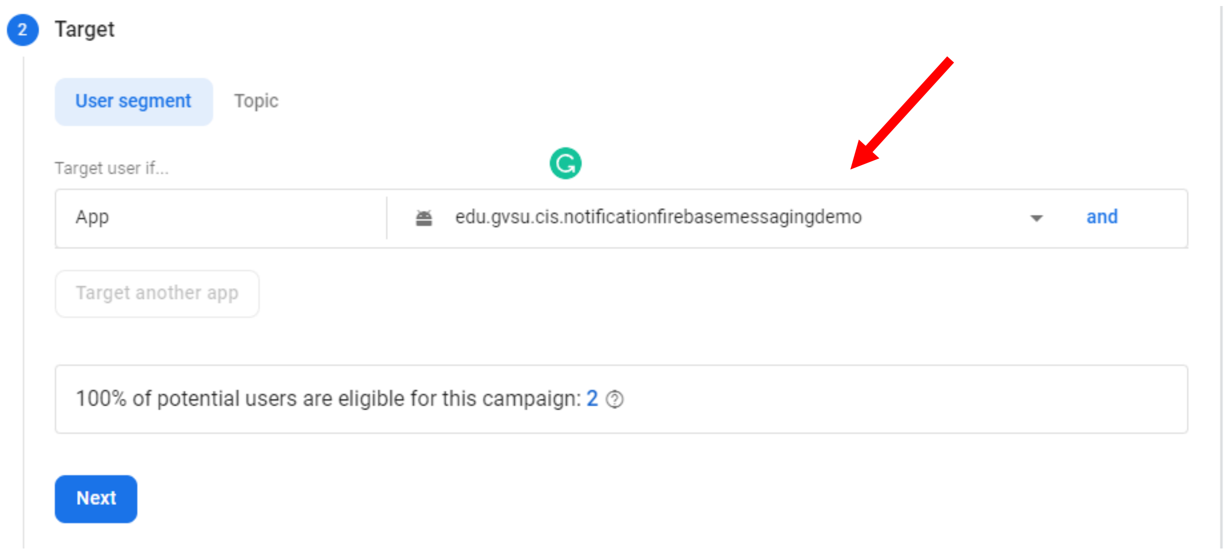
This preview provides a general idea of how your message will appear on a mobile device. Actual message rendering will vary depending on the device. Test with a real device for actual results.

Send test message

Figure 7. **Compose notification - Notification.**

You can skip the optional fields, and press the *Next* button.

Step 34: Select your package name as shown below and click on *Next*.

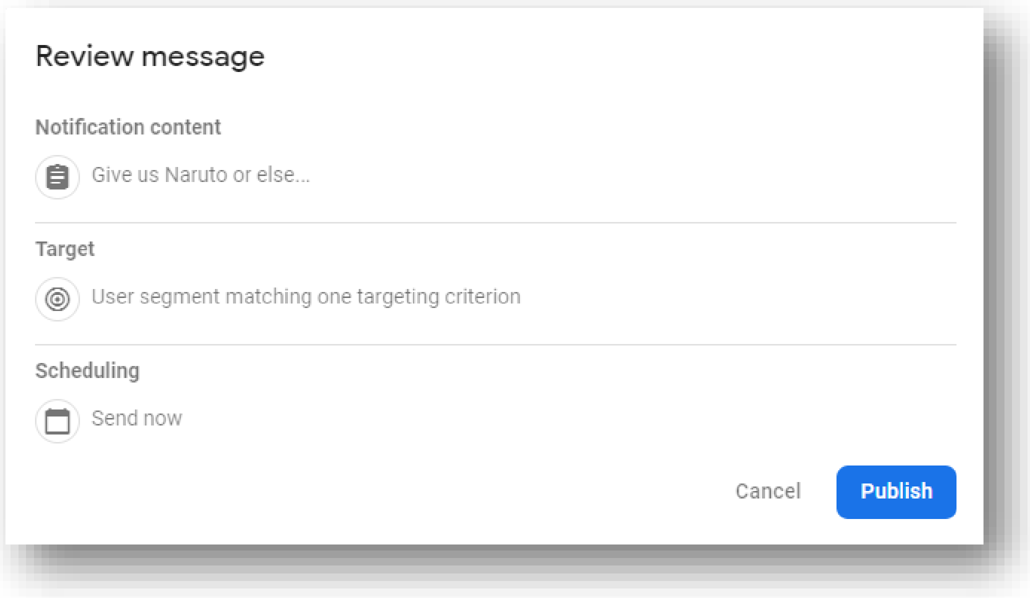


100% of potential users are eligible for this campaign: 2

Figure 8. **Compose notification - Target.**

Step 35: Click on *Next* for *Scheduling*, and *Conversion events*. Then, press the *Review* button under *Additional options*.

Step 36: Click on the publish button as shown in figure 9, and switch over to your Android app.



Review message

Notification content

Give us Naruto or else...

Target

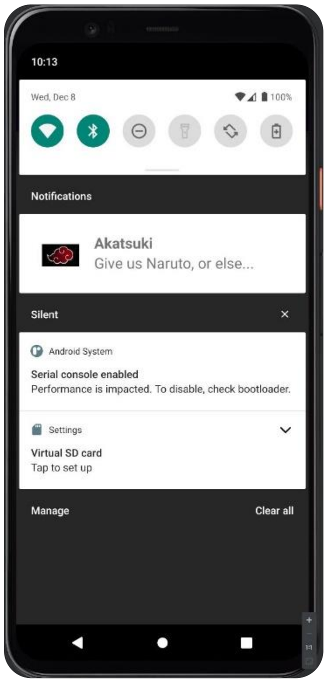
User segment matching one targeting criterion

Scheduling

Send now

Figure 9. **Compose notification – Review message.**

Right after that, your app will receive the notification, and it will look similar to figure 10.


10:13

Wed, Dec 8 100%

Notifications

Akatsuki
Give us Naruto, or else...

Silent

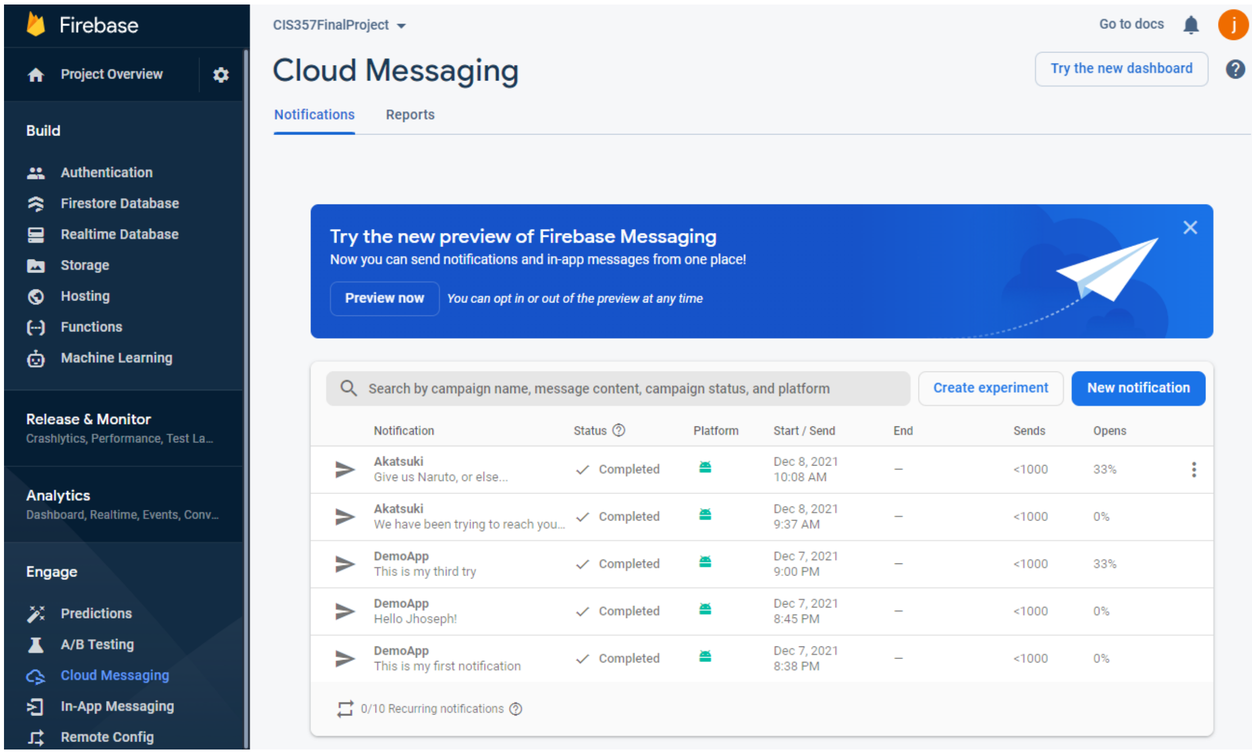
Android System
Serial console enabled
Performance is impacted. To disable, check bootloader.

Settings
Virtual SD card
Tap to set up

Manage Clear all

Figure 10. A message from Akatsuki is shown as a new notification.

Since we are using a free tool as FCM, sometimes it might take a while for the notification to arrive. You can also track your sent messages by clicking again on *Cloud Messaging* as shown in figure 11.



Cloud Messaging

Try the new preview of Firebase Messaging
Now you can send notifications and in-app messages from one place!
You can opt in or out of the preview at any time

Search by campaign name, message content, campaign status, and platform

Notification	Status	Platform	Start / Send	End	Sends	Opens
Akatsuki Give us Naruto, or else...	✓ Completed		Dec 8, 2021 10:08 AM	–	<1000	33%
Akatsuki We have been trying to reach you...	✓ Completed		Dec 8, 2021 9:37 AM	–	<1000	0%
DemoApp This is my third try	✓ Completed		Dec 7, 2021 9:00 PM	–	<1000	33%
DemoApp Hello Jhoseph!	✓ Completed		Dec 7, 2021 8:45 PM	–	<1000	0%
DemoApp This is my first notification	✓ Completed		Dec 7, 2021 8:38 PM	–	<1000	0%

0/10 Recurring notifications

Figure 11. Cloud Messaging.

This tutorial is based on “*Create a Notification*” from https://developer.android.com/training/notify-user/build-notification, “*Set up an Android client*” and “*Send a test message*” from https://firebase.google.com/docs/cloud-messaging/android/client

Further Discussion/Conclusions

Finally, once you tap on the received notification, you will be directed to the home page of your app. Notice that before sending a message through Firebase, you need to have your app up and running. Otherwise, you will not receive a notification until the next time you run/open your app. Also, this tutorial was created with a targeting audience of Android 9.0 Pie or greater.

Lastly, this is how we use Android Studio, and Firebase Cloud Messaging to create, send and receive notifications.

You can watch the short video here: https://www.youtube.com/watch?v=ui_DVMYJw6s