

Jamk University of Applied Sciences  
Course: Android Application Development  
Code: TTOW0625

# Android Game + Firebase

Research assignment  
for the course

## Android Application Development

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## 1. Introduction

For the research assignment in the course “Android Application Development” we want to create an application - game using Kotlin and Firebase. As a topic we chose Fifteen Puzzle. The result of the research assignment will be continued as a course assignment in TTOW0635 Mobile Project course.

## 2. Technology and Programs

### 2.1 Android(Kotlin)

Kotlin is a statically typed programming language that runs on the JVM and is completely interoperable with Java. Kotlin is an officially supported language for developing Android apps, along with Java.

### 2.2 Firebase

Firebase is a mobile and web application development platform, which provides many services for example: Firebase Analytics, Firebase Storage, Firebase Hosting, Firebase Realtime Database, Firebase Cloud Firestore and many more. We used Firebase Realtime Database for our project to save information about user's scores.

### 3. Idea

Our game is come up from the fifteen puzzle wooden game which is physically puzzle game for kids to solve the problem by ordering the number from 1-15. Basically, the game has 16 pieces of puzzle which it needed to remove one last piece before playing the game which is number 16. We got an idea to make this game in application instead of physical one and make it more challenge by collecting the score from user then make a high score or rank feature. On rank feature, we would love to learn new technology which made by google. We use Firebase which is real time database to keep the score.



figure 1

## 4. Library

### 4.1. ReactiveX

ReactiveX is Java VM implementation RxJava of Reactive Extensions. Reactive Extension(ReactiveX) as a library to compose asynchronous and event-based programs using observable sequences.

Our game considering the score by using play time from user. The highest score is the lowest time that can complete the game. So, we use ReactiveX which has observable function and timer.

How observer work in real life be like this example, the situation in Exam room.

**Anna** is a student who is taking an exam in the exam room,

**Michał** also a student who is taking an exam

**Michał** see something wrong about **Anna**, she was doing something bad in exam room which is breaking the condition of exam room.

**Michał** was told to watch and report **Anna** as her state changes, and he's to make a **callback** to whoever is listening to him (the teacher)

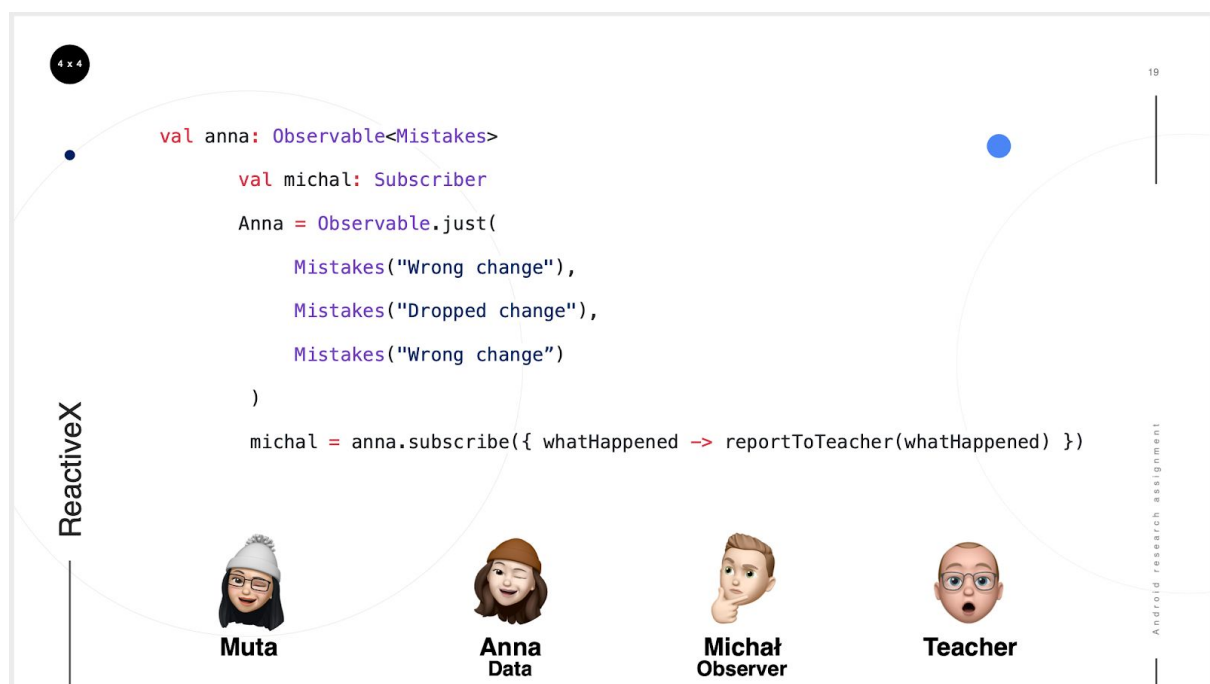


figure 2

## 5. Firebase connection

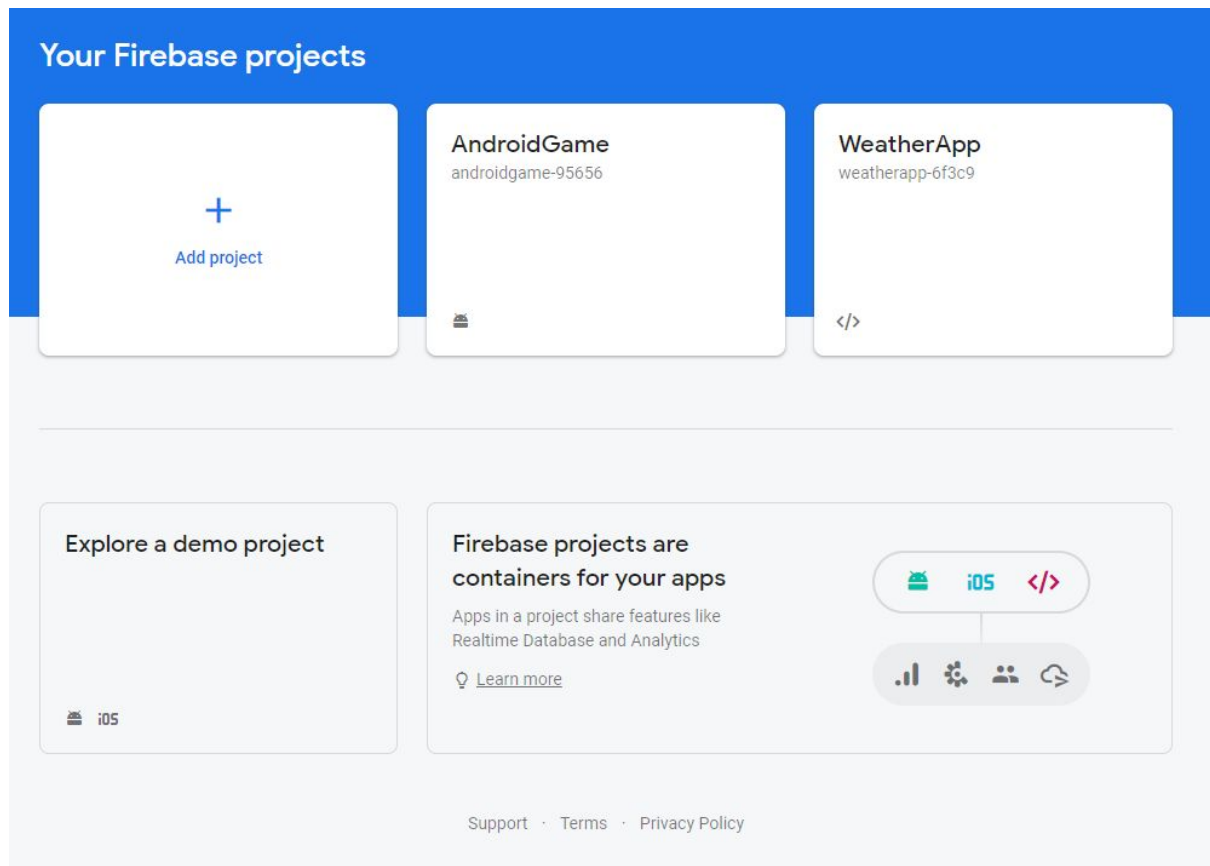



figure 3

We connected our application to Firebase using **Android Studio** and **Firebase website**. Firstly we created a Firebase project on Firebase website then we used Android Studio to connect it to Firebase (**Realtime Database**). There were also other services we could use but they weren't necessary for our project

 **Firebase**

Firebase gives you the tools and infrastructure from Google to help you develop, grow and earn money from your app. [Learn more](#)










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[▶ Save and retrieve data](#)
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Get your app content into Google Search. [More info](#)
- ▶  **Dynamic Links**  
Create web URLs that can be shared to drive app installs and deep-linked into relevant content of your app. [More info](#)

figure 4



# Save and retrieve data

Our cloud database stays synced to all connected clients in realtime and remains available when your app goes offline. Data is stored in a JSON tree structure rather than a table, eliminating the need for complex SQL queries.

[Launch in browser](#)

## 1 Connect your app to Firebase

✓ Connected

## 2 Add the Realtime Database to your app

✓ Dependencies set up correctly

## 3 Configure Firebase Database Rules

The Realtime Database provides a declarative rules language that allows you to define how your data should be structured, how it should be indexed, and when your data can be read from and written to. By default, read and write access to your database is restricted so only authenticated users can read or write data. To get started without setting up [Authentication](#), you can [configure your rules for public access](#). This does make your database open to anyone, even people not using your app, so be sure to restrict your database again when you set up authentication.

## 4 Write to your database

Retrieve an instance of your database using `getInstance()` and reference the location you want to write to.

```
// Write a message to the database
FirebaseDatabase database = FirebaseDatabase.getInstance();
DatabaseReference myRef = database.getReference("message");
```

figure 5

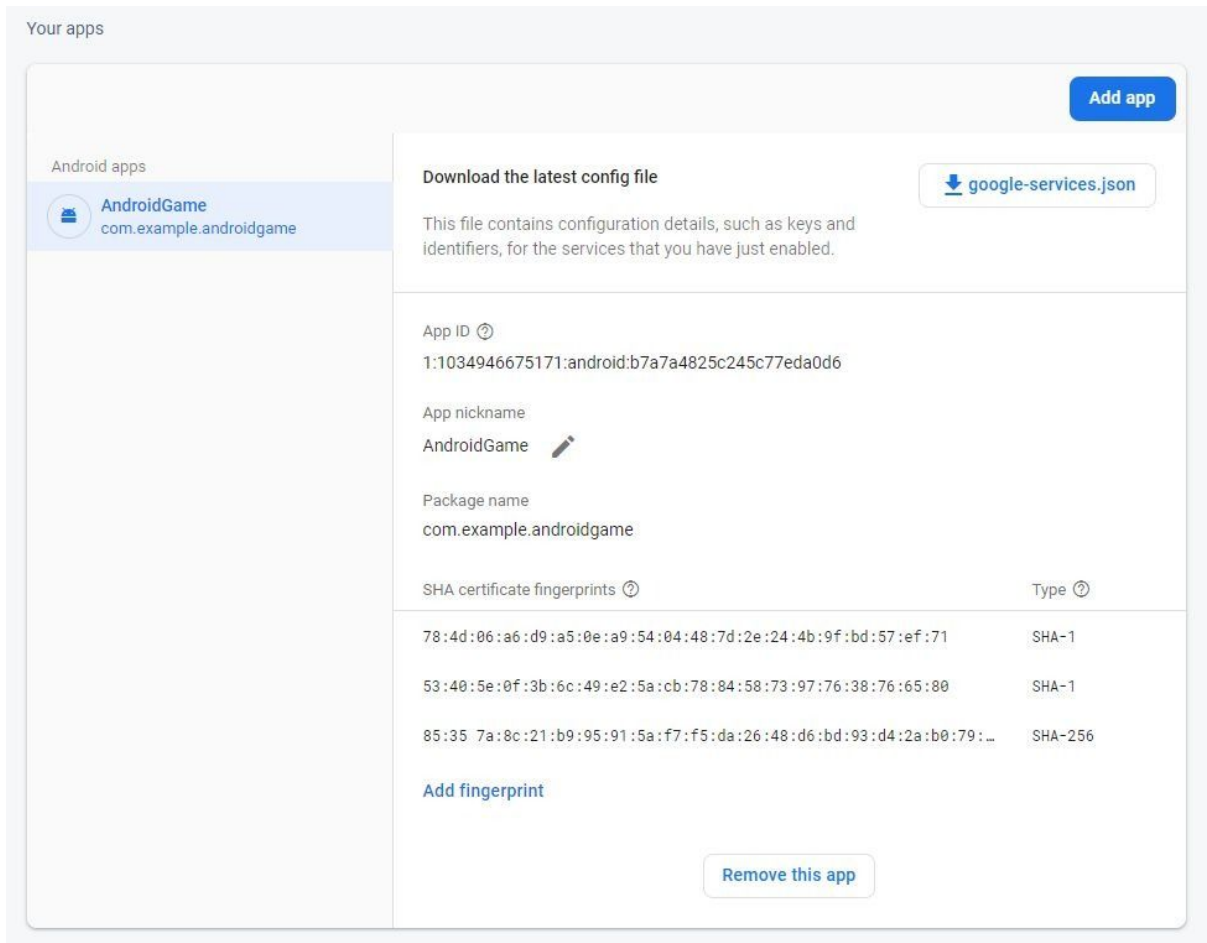


figure 6

After connecting to Firebase we downloaded **google-services.json** file and we put it into the application's folder.

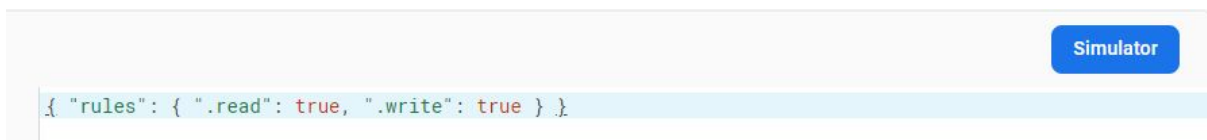


figure 7

The last thing to do was to set **Rules** for the Database on Firebase Website as **'true'** to enable saving to database and reading from it. After changing Rules, we synced our project in Android Studio and Firebase Realtime Database was ready to be used.

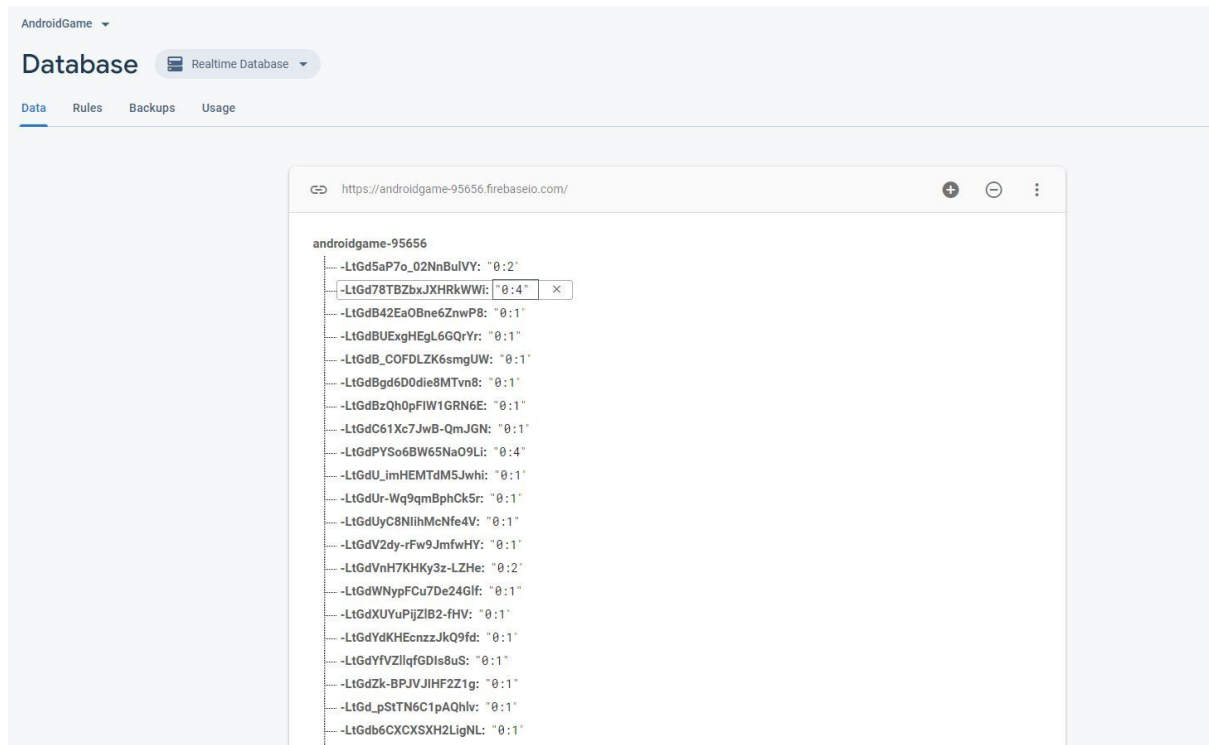


figure 8

Our application works with Firebase Realtime Database and it saves information about user's achieved scores. We also read from the database to find the best achieved score and show it on the screen.

## 6. Android Project

The main screen shows the highest achieved score, blocks with numbers on it (game board) and two buttons: START and STOP. After you click START button, one of the blocks (with number 16) will disappear from the screen and other blocks will be randomly placed on the board. You can stop and reset your game by clicking STOP button. Player's goal in this game is to put all blocks in the correct order (from 1 to 15). After it is achieved, the game stops and saves achieved score to Firebase Realtime Database. If the score is better than the best score it will be replaced by better score (shorter achieved time).

Our main goal for this game was achieved, but we are also thinking about adding more options for example: playing on boards 3x3, 5x5.

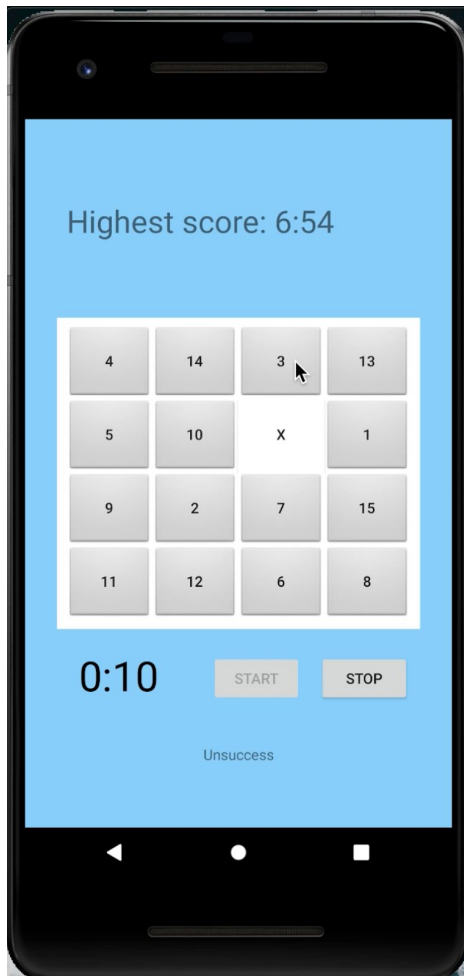


figure 9



figure 10