

Smart Office: Development of a Mobile Application for Android with Firebase Services Oriented to GroupMe Messaging

Liliana Enciso^{1,2}, José Guarnizo², Edisson Torres² and Pablo Alejandro Quezada-Sarmiento³

¹*Grupo Investigación IoT - Network Communications on Smart Environment, Universidad Técnica Particular de Loja, San Cayetano Alto, Loja, Ecuador*

²*Departamento de Ciencias de la Computación y Electrónica, Universidad Técnica Particular de Loja, San Cayetano Alto, Loja, Ecuador*

³*Escuela de Informática y Multimedia, Universidad Internacional del Ecuador, Quito, Ecuador*

Keywords: GroupMe Messaging, Firebase, Chat, Android, Smart, Mobile Application.

Abstract: The courier service GroupMe is born for the need to manage instantaneous messages for groups of persons in particular, especially the chat the public enjoys good reputation in general. Nevertheless, it plays a fundamental role in the growth and Internet expansion. The applications of courier service GroupMe have taken big part of the market and have turned into a tool of work more and more used in personal, professional, social ambiances and into emergency situations. The mobile application under the name of the messaging FriendsChats GroupMe: Account with a service provided by Google called Firebase, which allows you to store the information in the cloud quickly and safely. In view of the fact that applications that offer the same service of communication have been developed with primitive tools such as the cloud storage (no security), for this reason it is advisable to implement Firebase, the same that provides read / write rules, avoiding new safety rules. The project was carried out in O.S. Android with the participation of two specialists: a functional development and another one of the interface. Implementing Firebase to Android, any information that is entered in the database is synchronized with different devices with the application.

1 INTRODUCTION

The Messaging GroupMe is one of the ways of communication with friends immediately via the Internet. Cited in the paper (Trigo and Martín, 2006). It must be borne in mind that should not be compared with the Email (EC), as these are very different tools for communication. Published in (A. and G., 2017).

One of the big differences between GroupMe and EC; is that with the GroupMe you can witness to friends, that is to say it is known when you are connected in the instant, in contrast with the EC, it would have to wait for the recipient to go to the mailbox and review the messages. The same thing happens in other applications like (Enciso et al., 2018), (Enciso et al., 2017).

Currently, GroupMe has given a shift toward mobile applications, cross-platform applications or web services that require no application to operate, obtained from the article (Guru, 2016).

GroupMe allows communication with all connected systems, playing exactly in favor of those who

communicate. There are also conferences in group, are instant and can be sent to multiple contacts at the same time. Mentioned in the blog (Apple, 2015)

Based on studies of market, will be used these devices to be able to create the application mentioned above. Today, around 49% are Smartphone devices. Mentioned in the report (Nielsen, 2012), the which allows for greater expansion in the use of the developed application. Published in the article (Vidal, 2012).

We analyzed the services offered Firebase, as it is since it came on the market has been very welcomed by many developers, because that offers reliability, security and speed in the handling of information. Quoted in the blog (Alvarez, 2016).

In the present is proposed to carry out a application of GroupMe (group messages), integrating the services of Firebase and TinyBD. Giving the structure and functioning of the databases in real time. Referente to blog (Anton, 2015).

It is not intended do an application with such magnitude as WhatsApp or Messenger, applications with a large global market; but if, an app that allows com-

munication between a certain group of people, offering optimization in message response time, privacy and security of storage in the cloud. Similar features, mentioned in (KDE, 2012).

The specific objectives are, redacted in (Rodriguez and Lagos, 2016):

- Developing a mobile application which allows the registration of users in the internal database of the movil. the TinyBD.
- Incorporate the services of Firebase, for the synchronization of information between users.
- All information that is sent and received will be stored in the cloud of the Firebase.

The scope of this project is the development of a mobile application, incorporating the services of Firebase (reading and writing), and the application will be developed on Android (functions and the application interface), so that the same is correctly well done and be pleasing to users.

2 RELATED WORK

Windows Live Messenger: *Enables communication between two or more users, with the arrival of the Messenger it was possible to chat, speak or make video calls between two computers.* (Trigo and Conde, 2006). Using the main idea of Windows, was analyzed tools to help perform the same function, but of a more secure and efficient, which provide Firebase with safety rules.

Once Messenger began to get a great market, Vyrros Andrew development IMessage and describe: *That is a messaging service developed at Apple, supports that users send more than 300 billion messages per day using IMessage.* (Trautschold and Mazo, 2012). The problem I had was that it did not have storage tool information in the cloud, any message that was received, was stored in the device's internal memory. Firebase provides ample storage size for that customer information is always available.

Google launched its long-awaited messaging service called Google talk: *Which seeks to other people the way you choose, you can be: email, instant messaging or voice, is a service similar to that currently offers Skype.* (Mercurio and SAP, 2005). It was one of the first applications that were developed with the service of Firebase, to control the rules of users, enabling encryption when you register the client and the de-encryption when retrieving customer profile information.

DoneSitiOS: *It allows you to give benefits and solutions on the concept that know about (Ecuador)* as for example, education, health, tourist sites, etc. (Bravo and Faican, 2017). There is great similarity with doneSitiOS, since it has an informative "chat". for the development of the application will implement the service of Firebase in order to develop a similar application for the transmission of information of a synchronously with a large group of clients.

2.1 The Unified Modeling Language (UML)

The UML is one of the tools most exciting in the world of systems development.

This allows us to generate designs that capture the ideas for the development of an application. In the figure 1. The Use Case Diagram, in which details the functional structure of the application.

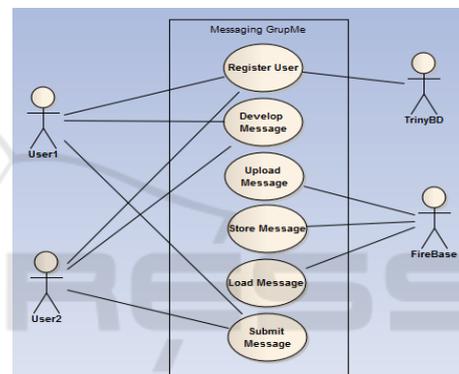
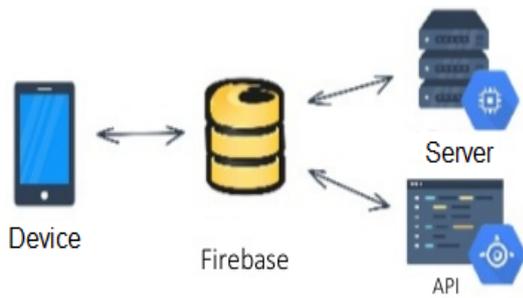


Figure 1: Description of the actions of the system.

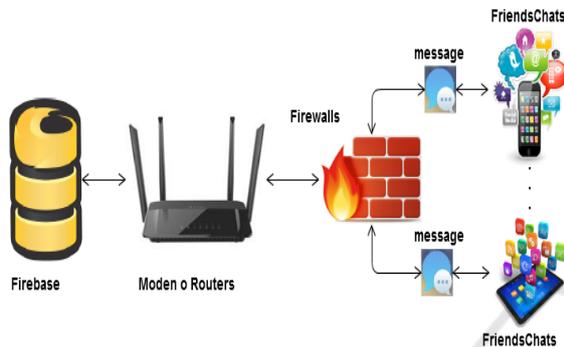
2.2 The GroupMe

The messaging GroupMe, includes messages in real time and allows in group communication between the clients. In the application developed, all persons that are registered will be able to see all messages that have been sent and whether they will be able to answer those messages (Room, 2012). And some important developments during these times, which are detailed in (D. and H.G., 2010):

- It was the implementation in the DISH (Program Logic for Automatic Teaching Operations) used at the beginning of the decade of 1970.
- It appeared on the internet in November 1996.
- The service of GroupMe offers a window where you write the message in plain text, icons or emoticons.
- It differs from the chat and other tools of conversation in which access is immediate and permanent at the click of a button of the navigation of the site.



(a) Architecture two layers of Firebase



(b) The organizational structure of FriendsChats

Figure 2: Technologies implemented.

2.3 Firebase

Firebase was founded in 2011 by Andrew Lee and James Tamplin, is the new and improved Mobile development platform in the cloud. It was acquired by Google in October 2014, and from there has given new features. Information retrieved from the article (A.B., 2011).

In the Figure 2.a. The functional architecture of the Firebase, has a architecture two layers (client/server) starting from a customer to transmit information to the server, which transmission is made in bi-directional lines. Borja summarized, That the same requires a client GroupMe that performs the service, also is different from the email. There are messaging programs that serve as a great help for your shipment arrives instantly. the main features of the GroupMe, the mentioned in the article (Bravo, 2016).

Figure 2.b. Presents the basic structure and organization of GroupMe, implementing in Firebase. It can be seen that the data go in bi-directional and that all message passes through the firewall to be filtered.

2.4 Add Firebase to Android

2.4.1 Add the SDK

If you want to integrate libraries of Firebase to one of your projects, you must perform some basic tasks

that help in the preparation of the project of Android Studio(Studio, 2008).

Code 1: Complement google-services.

```

1  buildscript {
2      dependencies {
3          classpath 'com.google.gms:
4              google-services:3.0.0'
5      }
6  }
```

In the code 1. We describe how to include add-ons to Android, obtained from the manual (Developers, 2016):

Line 1: Contains the main package the all of code, which allows you to add rules to file *build.gradle*.

Line 2: We incorporate the dependency package to the file.

Line 3: We include the add-in google-services.

Code 2: Complement Gradle.

```

1  apply plugin: 'com.android.
2      application'
3  android { }
4  dependencies {
5      compile 'com.google.firebase:
6          firebase-core:9.6.1'
7          // ADD THIS AT THE BOTTOM
8      apply plugin: 'com.google.gms.
9          google-services'
10 }
```

In the code 2. It is described how to include dependencies that will be used in Android, obtained from the manual (Developers, 2016):

Line 1: Corresponds to the file *app/build.gradle*.

Line 2: It is incorporated the packages of Android.

Line 3: It is incorporated the dependency package to the file.

Line 4: Compile the service of Firebase.

Line 6: You add the line *apply plugin* to enable the add-in GRADLE.

2.4.2 Safety Rules in Firebase

The rules of security are used to protect the data of the application developed; Firebase has three types for verification of the security, found in the channel (DesarrolloWeb.com., 2016b).

We must remember that these security levels must have the same data model you are working on the project.

For the purpose of the application developed will need the rules of writing and reading for users; these

rules are organized in the form of a tree. Adapted from the virtual manual of (DesarrolloWeb.com., 2016a).

Code 3: Rules of reading and writing.

```

1  {
2    "rules": {
3      ".read": true
4      ".write": true
5    }
6  }
    
```

The editions of the rules will have to be done manually from the official page of Firebase <https://firebase.google.com/?hl=es-419> go to console, once inside we will modify the rules of Firebase, giving them true values for editing by the user, in the code 3, It describes the activation of the rules of reading and writing that will own the users:

Línea 2: Pack of rule.

Línea 3: Reading rules are given a true value.

Línea 4: Reading rules are given a true value.

Once these simple steps are completed, it will no longer be needed to return to the Firebase page. Now we will focus on the project that was developed in Android Studio and App Inventor. Explained in the video (DesarrolloWeb.com., 2016a).

2.5 APP Inventor

APP Inventor is an application of Google Labs, for the creation of applications for Android devices (Net, 2015). This application has been one of the great innovations of the last years on the part of Google, because it has allowed the newest programmers to make their own applications with different objectives.

It is necessary to have an account that the application would not serve to the creation of application that contains a great magnitude since for reasons that only supports a limited number of services. Retrieved from comments by (TuAppInventor, 2016).

Some characteristics that can be exploited in the course of their use are:

- The creation of simple applications, suitable for any Android operating system.
- Easy importation of add-ons that we want to implement.
- Dynamic blocks holding the Android code.

2.5.1 Supporting Features of App Inventor

When building applications for Android; Works with two tools, detailed in the official page l (Riego, 2017):

1. App Inventor
2. App Inventor Blocks Editor

2.5.2 Operation of an Application in App Inventor

The Android program is based on events, that is, an action has to occur for the corresponding reaction to take place. Recovered from (Díaz, 2016).

Figure 3. The diagram for the execution of the events carried out by Android is explained.

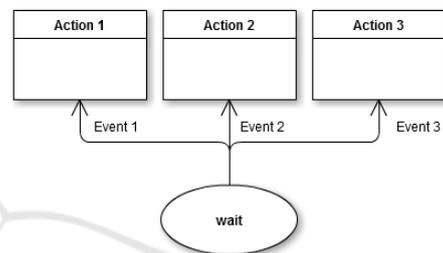


Figure 3: Execution Diagram on Android.

In the case of programming in other languages, such as Arduino, programming is based on a cycle in which the code is executed in a linear fashion. Within the cycle it is checked if the action has occurred, thus executing what corresponds. Recovered from (Díaz, 2016).

Figure 4. The diagram for the execution of the actions in Arduino is explained.

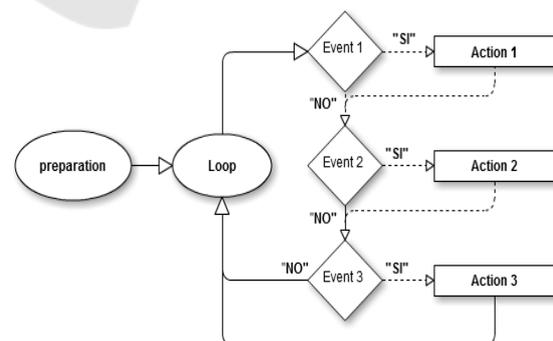


Figure 4: Execution Diagram on Arduino.

2.5.3 In the Translation of Android Studio to App Inventor

In the App Inventor tutorial proposed by Luis Díaz explains that in the development of the interface that

will own the application for the user, the developer can make use of the Various elements of **App Inventor tool**, from buttons and text boxes to elements that allow modifying the way the elements are displayed and displayed. Detail in the instructive (Díaz, 2016).

Figura 7.a. It details the process for developing the application with the App Inventor tool, which compiles the code from the Android server, previously loaded.

3 RESULTS

During the execution of the present project, an adequate application has been developed to identify the main operation of GroupMe with the services of Firebase.

However, the respective investigations of the tools and services that would be used in the present project have been carried out, which were detailed previously.

The GroupMe application was initially developed in the Android Studio IDE, it developed the source code, in which it was implemented and activated the dependencies and the rules that will allow the adequate use of in the compiler.

Figure 7.b. Some of the registered users are presented in the respective tests made to the prototype of the application. *Pepe* and *toni*, users are appreciated, and at the same time the encrypted information of each user is presented.

Figure 5. The results of the compilation are appreciated with one of the users entered, once it is obtained information of the user it is said that the user rules are activated.

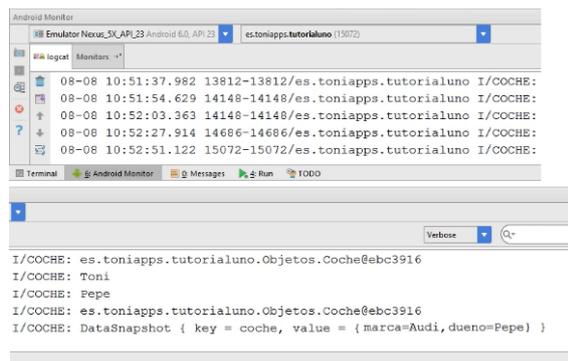


Figure 5: Firebase compilation results for the import.

3.1 Translation of the Source Code

In the translation of **IDE Android Studio a App Inventor**, 3 simple steps were taken:

1. We pack the Android studio project.
2. Load into App Inventor.
3. Initialize the App Inventor server.

3.1.1 Components

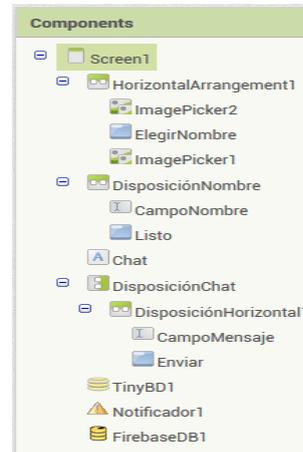


Figure 6: Components retrieved from the Android server.

In figure 6, the components loaded automatically when you create the project coupled with the packaging that was previously translated from the Android studio IDE, the image shows that the entire application will be enclosed in a *Screen*, for the reason that only work in a window.

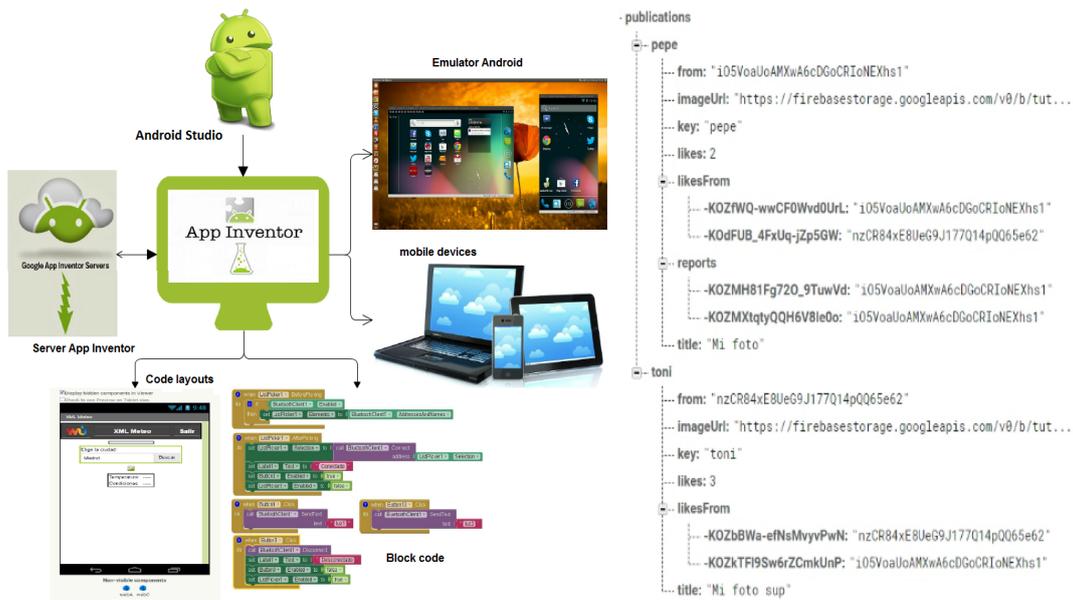
3.1.2 Interface

For the case of the division of the sections we will use the layouts, which are identified with the icon with two white circles and a green strip, which can be seen in figure 8. These are used to give styles Presented by sections as shown in the figure. 9. In which the field with the label **USUARIO**, has two *icons* and a *label*, which forms a single section, and this will facilitate for the manipulation in the modeling of the application.

3.1.3 Code for App Inventor

For the presentation of the code that has our application we will make it in three parts and explain the use of the services that were used for the execution of the project:

1. TinyBD Code. - Used for storing and registering users.
2. Firebase Code. - Used for the storage of the information sent.



(a) Functional structure of App Inventor incorporating Android Studio (Java). (b) Default users in the creation of the data

Figure 7: App Inventor structure and default users.



Figure 8: Final interface of the application.

3. Notificación Code. - Used for synchronization with Firebase, which will notify when there is movement in the base of Firebase.

TinyBD Code: figure 10, it presented the structure Testing on mobile devices and in the same ways Of the code, with which the application could stock and register new users

Firestore Code: figure 11, the connection with the Firestore service is appreciated, which will send the data obtained from the cloud each time the notifier has a positive value.

Notificación Code: figure 12, the code that is presented runs constantly until it receives a positive value, the positive value occurs when it receives infor-

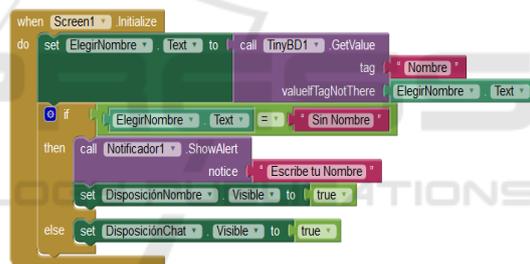


Figure 9: TinyBD Code.

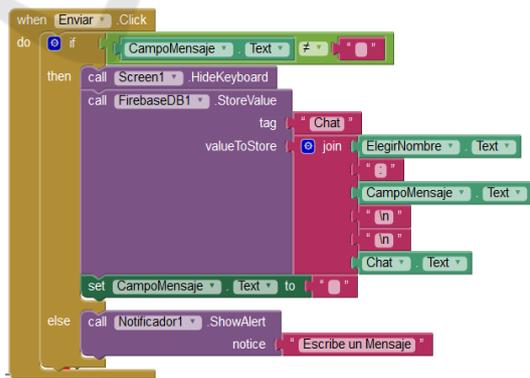


Figure 10: Firestore Code.

mation in the database of Firestore and will proceed to execute the code of Firestore to proceed the synchronization of the presented messages.



Figure 11: Code which notifies the Firebase service that there is activity to synchronize.

3.2 Application Execution and Testing

Once the development process is completed, the compilation and construction of the application proceeded testing on mobile devices and in the same ways in emulators for S.O. Android.

Final application icon: The icon was appreciated in Figure 13. Icon created and retrieved from the page <http://iconion.com/es/>.

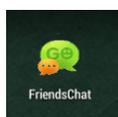


Figure 12: Application Icon.

3.2.1 Application Testing

For application testing, it was performed on the following devices:

- Mobile device - Samsung Ace Lite 4.
- Device virtual machine (emulator) - BlueStacks 2.

Figure 14. The implementation of the application is presented in the virtual machine, with the username 'Diana'.

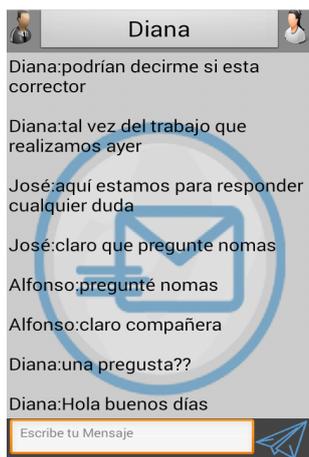


Figure 13: Try number 1.

Figure 15. Corresponds to the user with the mobile device, with the username. 'Alfonso'.

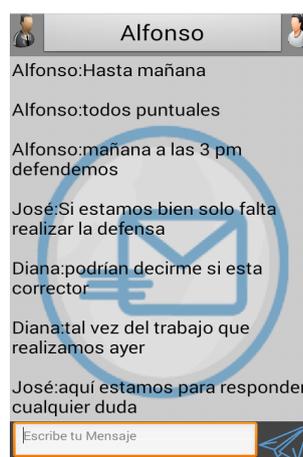


Figure 14: Try number 2.

4 CONCLUSIONS

All the objectives and requirements established throughout the development of the project have been fulfilled. The main one was to create a mobile application for Android capable of offering the group communication service.

The developed application allows the sending and reception of flat texts that allows the communication between the users. For the storage of the information it will do with the Google Serves tool called Firebase.

In addition, the application has been validated with the device Samsung Ace Lite 4 and console emulator BlueStacks. You need a connection to mobile data or a wifi connection for the synchronization between the device and the Firebase BD. All this demonstrates the use of new technologies that arise in this generation. Since Google distributes some free services for developers in a way that can be used for studies, hobbies, or for monetary reasons.

It is important to note that FriendsChat allows people to be in contact with each other. It also helps us to work, work, ideas, form a meeting, and it is a very economical and effective way.

Finally, with the culmination of the project we learned to develop a project from beginning to end, going through all its phases, acquired new knowledge, or expanded many of them on Java, Android, model client-server, SQL, and other necessary skills that have been required during all phases.

REFERENCES

A., F. and G., S.-T. (2017). *Analysis of Android Intent Effectiveness in Malware Detection*. Computers and Se-

- curity. AndroDialysis.
- A.B., F. (2011). Firebase. Master's thesis, General Technical Report. General Technical Report - US Department of Agriculture, Forest Service, (INT-182) , pp.270-271.
- Alvarez, M. A. (2016). Introducción a firebase. <http://www.desarrolloweb.com/articulos/introduccion-firebase-backend-nube.html>.
- Anton, C. (2015). Manejo de datos en tiempo real con polymer y firebase. *Platzi*.
- Apple, R. (2015). Groupme, la nueva mensajería instantánea que le hace competencia a what's app. *rinconapple*.
- Bravo, B. (2016). Firebase auth en android. *DISQUS*.
- Bravo, D. and Faican, A. (2017). Donesitios es una aplicación en dar soluciones creativas a problemas cotidianos a través de herramientas eficientes y vanguardistas.
- D., B. and H.G., K. (2010). *A methodology for empirical analysis of permission-based security models and its application to android*. Communications Security. Proceedings of the 17th ACM conference on computer and communications security, Chicago, Illinois, USA, pp. 73–84.
- DesarrolloWeb.com. (2016a). Autenticación de usuarios en firebase. *DesarrolloWeb.com*.
- DesarrolloWeb.com. (2016b). Reglas de seguridad en firebase. *DesarrolloWeb.com*.
- Developers, G. (2016). *Firebase en Android*. Number 1. Google Developers.
- Díaz, L. (2016). *Como funciona una aplicación en App Inventor Creando la interfaz de usuario*.
- Enciso, L., Baez, R., Maldonado, A., Zelaya-Policarpo, E., and Quezada-Sarmiento, P. A. (2018). E-mail client multiplatform for the transfer of information using the smtp java protocol without access to a browser. In Rocha, Á., Adeli, H., Reis, L. P., and Costanzo, S., editors, *Trends and Advances in Information Systems and Technologies*, pages 1124–1130, Cham. Springer International Publishing.
- Enciso, L., Pachar, J., Palacios, C., Zelaya, E., and Pablo, Q.-S. (2017). Instant messaging application (mi-utpl). pages 762–766. cited By 3.
- Guru, S. (2016). Desarrollando aplicaciones ios con datos en tiempo real con firebase y swift. *slideshare*.
- KDE (2012). Introducción a la mensajería instantánea. *KDE Documentation Sitio*, page 4.
- Mercurio, E. and SAP (2005). *Google lanza su esperado servicio de mensajería instantánea*.
- Net, A. (2015). Que es el app inventor para que sirve. *App Moviles*.
- Nielsen (2012). Un 49% de los teléfonos en españa son smartphones.
- Riego, A. R. (2017). Primeros pasos app inventor. <https://sites.google.com/site/appinventormegusta/primeros-pasos>.
- Rodriguez, D. and Lagos, A. (2016). 7 consejos para planear objetivos. *Entrepreneu*, page 1.
- Room, G. (2012). La historia de la mensajería instantánea. *geek'sroom*.
- Studio, A. (2008). Conoce android studio. *develope*.
- Trautschold, M. and Mazo, R. (2012). *Using iMessage*. Springer.
- Trigo and Martín (2006). *Menciona la mensajería de Messenger*. 2006 ed.
- Trigo, V. and Conde, M. (2006). *Windows Live Messenger*. TuAppInventor (2016). Dudas sobre app inventor.
- Vidal, H. M. (2012). *Aplicación para dispositivos móviles*. UPC.