# IMPLEMENTATION OF GEOFENCING TECHNOLOGY TO OBJECT TOURISTS AND CUSTOMER SERVICE BASED ANDROID

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## ABSTRACT

Hotel Golden Flower Bandung merupakan salah satu hotel di bawah Manajemen KAGUM Group yang terus mengalami perkembangan dan berupaya dalam meningkatkan layanan standar kualitas hotel dari berbagai sisi, antara lain dari sisi informasi. Selama ini segala proses pelayanan tamu dan promosi di Hotel Golden Flower masih dilakukan secara konvensional.

*Geofencing* menganalisa dan melacak posisi objek wisata secara otomatis dan memberikan laporan kapan pun dan dimana pun ketika objek keluar atau masuk ke area yang sebelumnya sudah ditentukan oleh pemantau. *Geofencing* sebagai media pencarian objek wisata yang terletak di sekitar lokasi hotel Golden Flower Bandung. Android menawarkan sebuah lingkungan yang berbeda untuk pengembang seperti API (*Application Programming Interface*) yang disediakan akses ke Objek Wisata.

Aplikasi yang dibangun pada smartphone berbasis Android ini menerapkan teknologi geofencing untuk menunjukkan lokasi objek wisata, membantu pihak hotel dalam memberikan pelayanan kepada pengunjung serta memudahkan pengunjung dalam menggunakan fasilitas ataupun memperoleh informasi mengenai Hotel Golden Flower.

**Keywords**: *Geofencing*, *Android*, Objek Wisata, Aplikasi Mobile, Hotel

## 1. INTRODUCTION

The increasing number of tourists visiting Indonesia influences the development of the hospitality industry. The turn of the mobile technology and the use of android in recent years has created tremendous new opportunities for them in the hospitality industry. The hotel can now interact with hotel guests in a simple way that was not done before. Hoteliers can engage with tourists in almost every phase of their journey to achieve a number of goals.

Golden Flower Hotel Bandung is one of the hotels under the Management of KAGUM Group which is constantly developing and strives to improve the service and quality standard of hotel from various side, among others from information technology side. During this process for guest services at the Golden Flower Hotel often experience some obstacles, one of the obstacles that occurs is to obtain information that still uses the phone as a medium of liaison between hotel guests and the hotel, but the availability of information submitted by the hotel is not always well channeled And quickly to hotel guests such as hotel guests check-in must come to the reception desk, inquire to upgrade and upsell room, food or beverage menu, room service, meeting room, karaoke, other hotel facilities (swimming pool, fitness, sauna) and objects Tour nearby. Hotel guests need a long time to get information about the facilities as well as information of nearby attractions. Therefore the hotel is in desperate need of a medium that uses android-based mobile devices to provide information to hotel guests in order to know information about the hotel and various facilities to be offered so that guests of the hotel or visitors feel attracted by the facilities that have been Offered by the hotel.

Based on the results of questionnaires given to guests of Golden Flower Hotel Bandung, the result of 30 guest correspondents found that 40% of guests experience obstacles in getting information about check in, room service and hotel facilities and 60% of guests experience some constraints when searching for nearby attractions on When staying. Nowadays tourist places and culinary places are the most popular, many guests are looking for tourist attractions or culinary places in their respective areas or looking out of town. But not all are realized because of their lack of a place to be addressed. Sometimes to find the closest needs, guests have little difficulty getting information because of the availability that can not be published publicly to the public. Lack of media to provide such information makes the guest a little difficult to get the information they want to get.

Needed a system that can assist in making information the nearest tourist attraction and service to guests Hotel Golden Flower Bandung using geofencing system by utilizing GPS contained in the smartphone. The coordinates captured by the GPS are sent to the server, then the server displays the location of the guest's presence on the map that can be accessed through the website by the hotel. [1] [2] Geofencing is a virtual parameter in a geographic

area that uses location-based services used for restrictions on hotel guest areas. If hotel guests pass the geofencing limit set will appear notification to hotel guests in the form of messages via smartphone.

Based on the description of the problem at Golden Flower Hotel Bandung then it takes an application of geofencing as a media search for tourist attractions and guest services based on android.

## 2. RESEARCH CONTENT

### 2.1 *Geofencing*

Geofencing is a virtual parameter for geographic regions in the real world. The specified Virtual Parameters can be either dynamic or status. An example of dynamic geofence is the surrounding radius or location point. Static geofene can be set from predetermined limits, such as school attendance zones or environmental boundaries. Digital geofencing costumes can also be used, if the device provides location-based services (LBS) users enter or exit geofencing, the device receives a notification message. This notification may contain information about the location of the device. Geo-fence notifications may be sent to the phone as an example of increasing every other form of action

Geo-fencing can be described as proactive LBS. In many cases the proactive system is much more convenient than the reactive, where the user must explicitly request data for the location. There are different types of tourism locations to improve the position of GPS that can be tested. For example, whether the user is near the destination (POI) or to other users. [1]




**Figure 1**. *Geofencing*

Here's how Geofencing works:

1. Transition Dwell, indicating that the user enters the area already marked.
2. Transition Enter, indicates when the user enters the monitored area.
3. Transition Exit, indicates when the user exits the area
4. Geofencing Request, giving notice.
5. Geofencing API, the point of entry of all interactions with google API.

#### 2.1.1 Geofencing Area

For the size of the area in geofence ranges from several tens of meters to several kilometers but for this application is limited to 5 kilometers from the hotel golden flower. Shapes of regions in irregular geofence can be circular, geometric figures, such as square or rectangular, or more complicated, such as complex polygons. The following is the source code for taking the area in geofencing.

```
package com.example.android.wearable.geofencing;

import com.google.android.gms.location.Geofence;

/**
 * A single Geofence object, defined by its center and radius.
 */
public class SimpleGeofence {

    // Instance variables
    private final String mId;
    private final double mLatitude;
    private final double mLongitude;
    private final float mRadius;
    private long mExpirationDuration;
    private int mTransitionType;

    /**
     * @param geofenceId The Geofence's request ID.
     * @param latitude Latitude of the Geofence's center in degrees.
     * @param longitude Longitude of the Geofence's center in degrees.
     * @param radius Radius of the geofence circle in meters.
     * @param expiration Geofence expiration duration.
     * @param transition Type of Geofence transition.
     */
    public SimpleGeofence(String geofenceId, double latitude, double longitude
            long expiration, int transition) {
        // Set the instance fields from the constructor.
        this.mId = geofenceId;
        this.mLatitude = latitude;
        this.mLongitude = longitude;
```

**Figure 2.** Source Code Geofencing Area

The description on the picture above is:

1. package com.example.android.wearable.geofencing: The package name of the program.
2. import com.google.android.gms.location.geofencing: Inserting the library package (the contents of the library are classes), if using the syntax library must be imported first.
3. public class SimpleGeofence {: The class name, one class consists of several functions depending on needs.
4. private final string mID: No Identity with string variable
   Private final double mLatitude: Position Coordinate Mapping with variable double.
   Private final double mLongtitude: Position koorinat mapping with variable double.
   Private final float mRadius: Radius with float variable.
   Private long mExpirationDuration: The length of time ends with variable long.
   Private int mTransitionType: Intermediate type with integer variable.
5. public simpleGeofence (string geofenceId, double latitude, double longtitude, float radius, long expiration, int transition) {: variable type used in geofencing program in each class.
6. This.mID = geofenceId: assigns the ID data by calling the geofenceId class
   This.mLatitude = latitude: fills the mLatitude

data by calling the latitude.This.mLongtitude = longtitude class: fills the mLongtitude data by calling the longtitude class.

### 2.2 *GPS (Global Positioning System)*

GPS stands for Global Positioning System, which is a navigation system using satellite technology that can receive signals and satellites. This system uses 24 satellites that transmit microwave signals to the earth. This signal is received by the receiver on the surface, where the GPS receiver will collect information from GPS satellites, such as:

A. Time

The GPS receiver receives time information from atomic clocks that have very high accuracy.

B. Location

GPS provides location information in three dimensions:

1. Latitude
2. Longitude
3. Elevation

C. Speed

When switching, GPS can indicate the speed of the switching information.

D. Direction of Travel, GPS can indicate the direction of destination.

E. Save Location

Places that have been or wish to be visited can be stored by a GPS receiver.

F. Data Commuting

The GPS receiver can store track information, such as total trips already made, average speed, highest speed, lowest speed, time / hour to destination, and so on. [3]

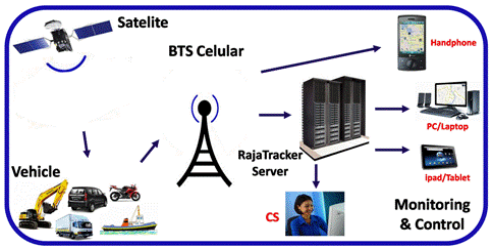



**Figure 3.** How GPS Work

### 2.3 *Google Maps*

Google Maps is an online map or open a map online, easily done via Google's free service. In fact, this service provides API (Appliction Programming Interface) which allows other developers to take advantage of this application in a homemade application. The Google Maps view can also be selected, based on the original photo or the route image map only. The Google Maps API is a JavaScript-shaped library.

Using the Google Maps API, we can save time and money on building a powerful digital map app, so we can focus on the data to be displayed. [3]

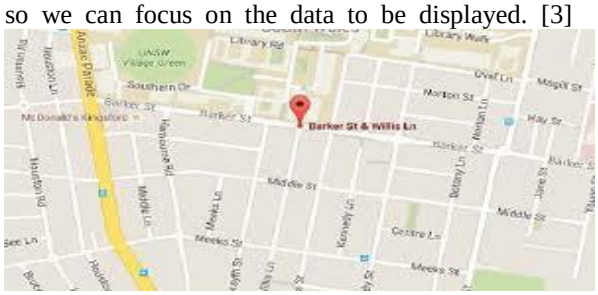



**Figure 4**. Google Maps

### 2.4 *Web Sevice*

Web Service is a software system designed to support interoperability and interaction between systems on a network. Web services are used as a facility provided by a web site to provide services (in the form of information) to other systems, so that other systems can interact with the system through the services provided by a system that provides web services. Web services store data information in XML format so that this data can be accessed by other systems although different platforms, operating systems, and compiler languages.

Web services aim to enhance collaboration between programmers and companies, enabling a function in Web Service to be borrowed by other applications without the need to know the programming details contained therein [4]

### 2.5 System Architecture Analysis

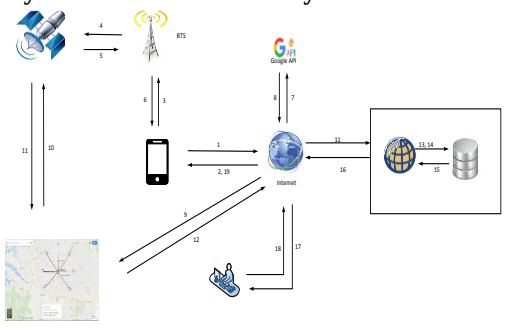


**Figure 5.** System Architecture Analysis

Berikut adalah dekripsi dari Gambar 5 Arsitektur Perangkat Lunak pada Platform *Mobile*:

1. Smartphone mengaktifkan GPS melalui internet.
2. Internet menerima kordinat GPS.
3. Smartphone meminta data posisi ke BTS.
4. BTS mengirimkan titik koordinat longtitude dan latitude ke satelit.
5. Satelit mengirimkan data longtitude, latitude ke BTS.
6. BTS mengirimkan data posisi ke smartophone.

7. Smartphone meminta data lokasi area geofencing melalui google api.
8. Google api mengirimkan data area termasuk longitude, latitude dan radius geofencing.
9. Internet meneruskan data geofencing ke pengguna smartphone.
10. Area geofencing memberikan data titik koordinat longtitude, latitude dan radius ke satelit.
11. Satelit mengirimkan data koordinat longtitude, latitude dan radius area geofencing ke pengguna smartphone melalui internet.
12. Area geofencing mengirimkan data koordinat longtitude, latitude dan radius ke internet yang diteruskan ke smartphone.
13. Pengguna smartphone melakukan request ke server melalui internet ke server.
14. Server menerima request data dari perangkat pengguna smartphone melalui internet.
15. Server menerima request dan mengambil data yang ada di database.
16. Database menyimpan request dan mengirimkan data yang diminta ke server.
17. Internet menerima data permintaan dari server.
18. Server menerima data permintaan dari pengguna smartphone melalui internet.
19. Server mengirimkan data permintaan pengguna smartphone ke resepsionis hotel untuk diolah.

## 2.6 Analysis Of JSON Data

JSON data analysis is a description of the application built to explain the input and output data. In Figure 6 explains json's data for room service:

```
<?php

require_once __DIR__ . '/db_connect.php';
$db = new DB_CONNECT();
$response = array();

$json = json_decode($_POST['data'], true);

if(isset($_POST['data'])){
    foreach($json as $key => $value)
    {
    $nama = $value['nama'];
    $jumlah = $value['jumlah'];
    $id_tamu = $value['id_tamu'];
    $waktu = $value['waktu'];
    $tanggal = $value['tanggal'];
    $status = 'request';

    $result = mysqli_query($db->connect(),"INSERT INTO t_layanankamar(permintaan, jumlah,tanggal,waktu,status,id_tamu)
              VALUES('$nama', '$jumlah','$tanggal','$waktu','$status','$id_tamu')");
```

**Figure 6.** JSON Analysis Of Room Service

Pada gambar 7 berikut menjelaskan request data Json untuk layanan kamar:

```
<?php

namespace App\Http\Controllers;
use Illuminate\Http\Request;
use App\Http\Requests;
use Illuminate\Support\Facades\Input;
use Illuminate\Support\Facades\DB;

class Layanan_KamarController extends Controller
{
public function Show()
{
  return view('/layanan_kamar',['layanan_kamarMdl'=>DB::table('t_layanankamar')
  ->join('t_tamu','t_layanankamar.id_tamu','=','t_tamu.id_tamu')
  ->select('t_layanankamar.id_tamu','t_layanankamar.id_layanankamar',
           't_tamu.nama_depan','t_tamu.nama_belakang','t_tamu.id_kamar',
           DB::raw('group_concat(t_layanankamar.permintaan) as permintaan'),
           DB::raw('group_concat(t_layanankamar.jumlah) as jumlah'),
           DB::raw('group_concat(t_layanankamar.tanggal) as tanggal'),
           DB::raw('group_concat(t_layanankamar.waktu) as waktu'),'t_layanankamar.status')
  ->groupBy('t_tamu.id_tamu')
  ->get()])
  ->with('number',1);
}
```

**Figure 7.** Analysis Of Room Service Request

Pada gambar 8 menjelaskan output data json yang sudah diinput sebelumnya:


```
[{"id_layanankamar":"1","nama":"Sendal","gambar":"sendal.jpg"},
{"id_layanankamar":"2","nama":"Sabun Mandi","gambar":"sabun_mandi.jpg"},
{"id_layanankamar":"3","nama":"Shampoo","gambar":"shampoo.jpg"},
{"id_layanankamar":"4","nama":"Body Lotion","gambar":"body_lotion.jpg"},
{"id_layanankamar":"5","nama":"Handuk","gambar":"handuk.jpg"},
{"id_layanankamar":"6","nama":"Selimut","gambar":"selimut.jpg"}]
```


**Figure 8.** Analysis Of Room Service Output

## 2.7 *Use Case Diagram*

The use case diagram of the built mobile app consists of thirteen functional, ie booking code, check in, check out, meeting room, appointment service, food and beverage, wellness, entertiment, tourist attraction, criticism and suggestions, talking to the front office, Upgrades and upsell, history.

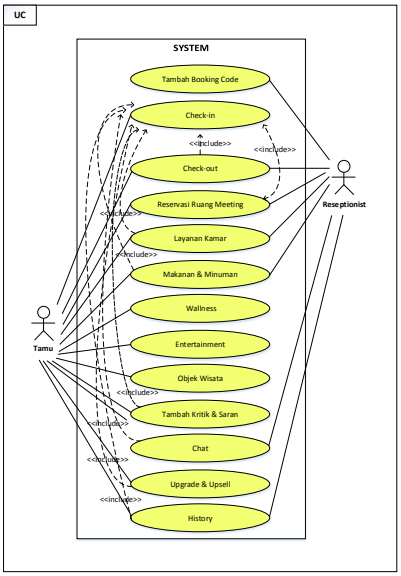



**Figure 9**. *Use Case* Diagram

There are 13 use cases in this application development. Each use case describes different functionality. The following identifies use cases that exist in the system in the following table:

**Table 1.** Identification *Use Case Diagram*

| ***Use Case*** | | |
|---|---|---|
| **No** | ***Use Case*** | **Deskripsi** |
| UC-01 | *Booking Code* | Fungsionalitas untuk melakukan check in pihak |

| *Use Case* | | |
|---|---|---|
| **No** | ***Use Case*** | **Deskripsi** |
| | | ketiga |
| UC-02 | *Check-in* | Fungsionalitas untuk melakukan *check-in*. |
| UC-03 | *Check-out* | Fungsionalitas untuk melakukan *check-out*. |
| UC-04 | Ruang Meeting | Fungsionalitas untuk melihat dan memesan ruang meeting. |
| UC-05 | Layanan Kamar | Fungsionalitas untuk melihat dan memesan pelayanan kamar hotel. |
| UC-06 | Makanan dan Minuman | Fungsionalitas untuk melihat dan memesan menu makanan dan minuman. |
| UC-07 | *Wellness* | Fungsionalitas untuk melihat detail informasi tempat *wellness*. |
| UC-08 | *Entertiment* | Fungsionalitas untuk meilihat detail informasi tempat karaoke |
| UC-09 | Lihat Informasi Objek Wisata | Fungsionalitas untuk melihat detail informasi objek wisata. |
| UC-10 | Beri Kritik dan Saran | Fungsionalitas untuk memberikan kritik dan saran |
| UC-11 | Berbicara dengan Front Office | Fungsionalitas untuk dapat berbicara dengan staf Front Office Hotel |
| UC-12 | Upgrade & Upsell | Fungsuionalitas untuk melakukan Upgrade & Upsell |
| UC-13 | History | Fungsionalitas untuk menampilkan riwayat aktifitas terakhir pemesanan |

### 2.8 *Class Diagram*

Class diagram dari aplikasi mobile android yang dibangun dapat dilihat pada gambar .

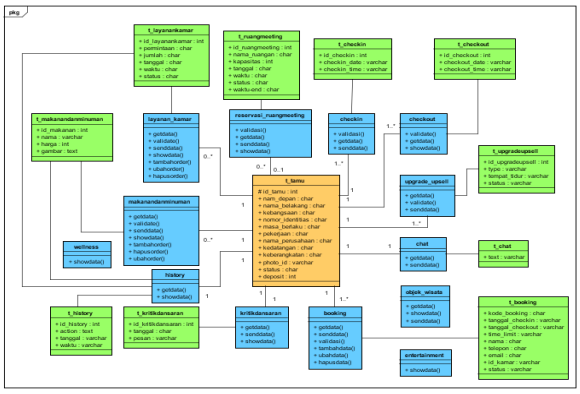


**Figure 10**. *Class* Diagram

### 2.9 System Implementation

Implementation is a continuation stage of application design. Furthermore, feasibility testing of applications that have been built so as to provide input for the development of applications that have been built. This stage is the stage where the application is ready to be operated.

### 2.12 Interface Implementation

Application of tourism object attraction and customer service with geo-based technology android dihotel golden flower requires a process to enable GPS on android device that will be used to run the application. And the app is installed on the mobile device.

1. Main Menu Interface

The interface is the view of an already built application.




**Figure 11.** Main Menu Interface

2. Customer Service Menu Interface

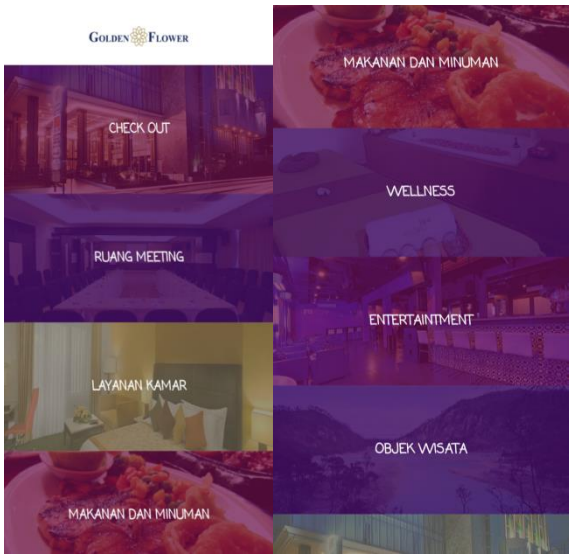



**Figure 12.** Hotel Facilites Menu Interface

3. Interface Tourist Attraction

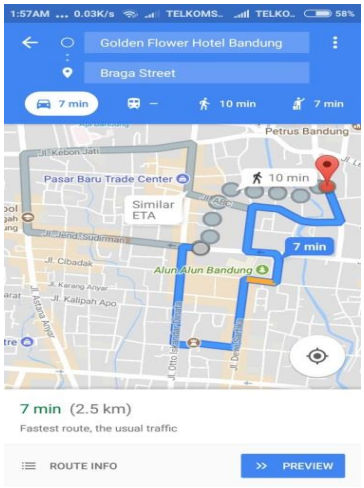



**Figure 13.** Menu View Of Tourist Attraction

### 2.13 Testing System

System testing is the process of examining the system with the intent to find errors on the system, before the system is given to the user. Testing said to be good and successful if it has a chance to bring up and get an unknown error. Not to make sure there are no errors but to find as many errors as possible in the system.

### 2.14 Scenario Testing

The test scenario explains testing of existing systems in applications Application Geofencing as Media Search Objects and Customer Service Based on Android case study Hotel Golden Flower Bandung. The test scenarios can be seen in table 2.

**Table 2.** Table Test Scenario

| No | Komponen yang Diuji | Detail Pengujian | Jenis Pengujian |
|---|---|---|---|
| 1 | Kode Booking | Verifikasi data kode booking. Tanggal check in, tanggal check out, batas waktu, nama, telephone, email, kamar | *Black Box* |
| 2 | Check In | Verifikasi data nama depan, nama belakang, kebangsaan, no KTP, masa berlaku KTP, pekerjaan, perusahaan, tanggal kedatangan, tanggal keberangkatan, kode booking, upload foto KTP | *Black Box* |
| 3 | Check Out | Verifikasi rincian pembayaran selama menginap dihotel. | *Black Box* |
| 4 | Ruang Meeting | Pilih menu type ruangan meeting, tanggal reservasi, waktu saat mulai meeting, dan waktu selesai meeting | *Black Box* |
| 5 | Layanan Kamar | Tambah jumlah pesanan | *Black Box* |
| | | Kurang jumlah pesanan | *Black Box* |
| 6 | Makanan dan Minuman | Tambah jumlah pesanan | *Black Box* |
| | | Kurang jumlah pesanan | *Black Box* |
| 7 | Upgrade & Upsell | Verifikasi type kamar, tempat tidur dan nama tamu | *Black Box* |
| 8 | Objek Wisata | Memperlihatkan lokasi | *Black Box* |
| 9 | Entertiment | Menampilkan informasi mengenai hiburan dihotel | *Black Box* |
| 10 | Wellnes | Menampilkan informasi | *Black Box* |

| No | Komponen yang Diuji | Detail Pengujian | Jenis Pengujian |
|---|---|---|---|
| | | kebugaran (Olahraga dan Spa) | |
| 11 | Kritik dan Saran | Menulis Kritik dan saraan | *Black Box* |
| 12 | History | Menampilkan riwayat pemesanan tamu selama dihotel | *Black Box* |
| 13 | Chat | Menulis pesan untuk resepsionis | *Black Box* |

In addition, testing is done by giving questionnaires to 20 hotel guest customers and 5 to receptions. The results of the kusioner test can be seen in table 3 and table 4.

**Table 3.** Result of Customer Guest Hotel Questionnaire

| Pertanyaan Pertama : Apakah aplikasi ini dapat membantu keperluan Anda selama menginap dihotel? | | | | |
|---|---|---|---|---|
| SS | S | RG | TS | STS |
| 6 | 13 | 1 | 0 | 0 |
| Rata-rata=(30+52+3+0+0)/20=4,2 | | | | |
| Pertanyaan Kedua : Apakah tampilan aplikasi ini cukup memudahkan Anda pada saat digunakan? | | | | |
| SS | S | RG | TS | STS |
| 25 | 60 | 0 | 0 | 0 |
| Rata-rata=(25+60+0+0+0)/20=4,2 | | | | |
| Pertanyaan Ketiga : Apakah aplikasi ini membantu Anda untuk memperoleh informasi mengenai Hotel Golden Flower dan sekaligus Objek Wisata di sekitar kawasan Hotel Golden Flower? | | | | |
| SS | S | RG | TS | STS |
| 40 | 44 | 3 | 0 | 0 |
| Rata-rata=(40+44+3+0+0)/20=4,3 | | | | |
| Pertanyaan Keempat : Apakah dalam penyampaian informasinya sesuai dengan kebutuhan Anda? | | | | |
| SS | S | RG | TS | STS |
| 25 | 60 | 0 | 0 | 0 |
| Rata-rata=(25+60+0+0+0)/20=4,2 | | | | |
| Pertanyaan Kelima : Apakah aplikasi ini menggunakan bahasa yang mudah dipahami? | | | | |
| SS | S | RG | TS | STS |
| 35 | 52 | 0 | 0 | 0 |
| Rata-rata=(35+52+0+0+0)/20=4,3 | | | | |

**Tabel 4.** Hasil Kuisioner Pelanggan Tamu Hotel

| Pertanyaan Pertama : Apakah aplikasi ini dapat membantu pihak hotel untuk mempromosikan hotel? | | | | |
|---|---|---|---|---|
| SS | S | RG | TS | STS |
| 0 | 20 | 0 | 0 | 0 |
| Rata-rata=(0+20+0+0+0)/5=4 | | | | |
| Pertanyaan Kedua : Apakah aplikasi ini dapat membantu atau memudahkan tamu untuk mendapatkan informasi mengenai Hotel Golden Flower? | | | | |
| SS | S | RG | TS | STS |
| 10 | 12 | 0 | 0 | 0 |
| Rata-rata=(10+12+0+0+0)/5=4,4 | | | | |
| Pertanyaan Ketiga : Apakah tampilan aplikasi ini cukup menarik? | | | | |
| SS | S | RG | TS | STS |
| 0 | 20 | 0 | 0 | 0 |
| Rata-rata=(0+20+0+0+0)/5=4 | | | | |
| Pertanyaan Keempat : Apakah aplikasi ini mudah dipahami dan digunakan? | | | | |
| SS | S | RG | TS | STS |
| 0 | 20 | 0 | 0 | 0 |
| Rata-rata=(0+20+0+0+0)5=4 | | | | |
| Pertanyaan Kelima : Apakah aplikasi ini menggunakan bahasa yang mudah dipahami? | | | | |
| SS | S | RG | TS | STS |
| 0 | 20 | 0 | 0 | 0 |
| Rata-rata=(0+20+0+0+0)/5=4 | | | | |

### 2.15 Tetsing Room Service

The following test room service delivery tested as much as 20x and produce data in Figure 14 as follows.

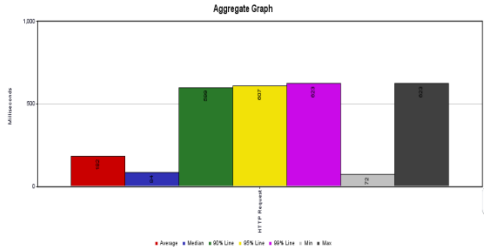



**Figure 14.** Testing Room Service

In the picture above shows that the response speed on the test room service average 128ms, minimum 72ms, and maximum 623ms. And it can be concluded that the test delivery of data to the web service that is built quite well.

# 3 CLOSING

## 3.1 Conclusion

Based on the results of research, system design analysis and implementation and testing conducted, then obtained the following conclusions:

1. Applications built to facilitate the hotel in providing services to guests and promotion at the Golden Flower Hotel Bandung
2. The built application can facilitate hotel guests in doing Check-in, Check-out, Upgrading and Upsell Room, ordering Room Service, ordering food and beverage, reservation meeting room, karaoke, and other Hotel facilities (swimming pool, fitness , Sauna) in meeting the needs during a Guest Hotel stay.

## 3.2 Suggestion

Based on the results of implementation and testing, this information system can still be developed again so that the proposed system can work and function optimally. Some suggestions that can be done, among others:

1. Development of geopencing applications bebasis android at Golden Flower Hotel is to be used as material for further system development
2. Further research is expected that the built system can include payment transactions.

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