

Entertainment Authority Mobile Application Saudi Arabia: Smart Station

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Abstract—Bus service is considered as one of the major public transportations used by the people. Especially in the areas that have many people such as festivals. Nowadays, there are many events and festivals are going on in Jeddah city. Moreover, there is a huge need to the bus services during the Jeddah season. At the same time, this service has many difficulties faced visitors and bus drivers, such as: lack of information about the bus (location of a bus in real-time, status of a bus: empty or full), and lack of information about the bus stations. Moreover, and based on real experiment during Jeddah’s season waiting in the bus station is a frustrating process. Therefore, this paper proposed a mobile application on google play that facilitates the transportation between the event’s areas by seeing the bus location map and the number of empty passenger seats. The application also serves the bus driver, by clarifying if there is someone at the bus station or not so the driver can decide to move to the next station or stop in the station. A sensor device and LCD screen are used to help in the counting process.

There are many goals of the proposed project the main goal is to make an application that serves a large segment of society during the festival seasons of the Saudi Entertainment Authority especially in transportation: i) organizes and facilitates transportation in the Jeddah season for entertainment, ii) save visitor’s time and reduce traffic by tracking the bus location, knowing distance between the user and bus, and the number of bus passengers, and iii) easy and simple user interface for easy use. To evaluate the proposed application many tests and evaluation tools have been used and prove the effectiveness of the application.

Keywords— Saudi Entertainment Authority, Jeddah season, Bus, transportation.

I. INTRODUCTION

Bus service is one of the major transportation method used by the people. Especially in festivals provided by the Saudi Entertainment Authority, due to that the buses are the easiest and fastest transportation to move between the live shows and activities present at the festival. However, bus transportation service has several problems that people, and bus drivers might face in festivals. Therefore, we build an application that facilitates the communication process between the bus driver and the station observer, by showing the station’s status whether it is full or empty, and visitors can also know the number of seats available on the bus through a sensor located above the bus doors. Sensor reads the numbers of people entering and leaving the bus.

The visitors of festivals and bus drivers faced many difficulties with transportation service, these difficulties are: 1. Lack of information about the bus: passengers do not have a clear view about the exact location of a bus in real-time, or estimated waiting time, or the status of the bus such as number of available seats. 2. Lack of information

about the stations: The bus drivers do not have any information about the situation of a station such as: the next station is it full or empty? As a result, there is no platform for bus service at festivals in Jeddah season to help visitors and bus drivers. The smart station project aims to achieve several essential objectives which are: Organizes and facilitates transportation in the Saudi event especially we are targeting the Saudi Entertainment Authority in Jeddah season for entertainment. Save user’s time and reduce traffic by tracking the bus location, knowing distance between users and the bus, the number of bus passengers, and number of available seats. Easy and simple user interface for easy use.

II. RELATED WORK

A. Mobile Applications in Saudi Arabia

The public users can visit the Unified National Platform’s [1] to access the approved government applications in the Kingdom of Saudi Arabia, according to government sectors. There are seventeen governments sectors that have launched applications for mobile services. Tables I, III, and V show the mobile applications in each governments sector.

As appears in the previous tables there is only a few applications that run under the supervision of the Saudi tourism authority and the entertainment authority, such as Visit Saudi, Experience AIUla, and Riyadh Guide. None of these applications care about the bus services or bus station in recreational seasons in Jeddah, Saudi Arabia.

B. Buses Applications

Northern Territory (NT) Bus Tracker application [2], provides real-time access to information about the bus services. The user can locate nearby bus stops, save the favorite bus stop, and track the bus as it approaches the bus stop on a real-time map.

Singapore (SG) Bus / Mass Rapid Transit (MRT) Tracker application [3] provides many services, such as: predict the most possible next coming bus base on the user current TABLE V location, show nearby bus stop locations on a map, and display all bus schedules and bus arrival times. Moreover, bus arrival time can be accessed via the Android notification bar. Also, the user can click on the map to select a specific stop, then can explore all bus routes via this stop.

Dubai Bus on Demand application [4] is a ride-pooling service. The user selects the destination, and then the application will display the price of the trip, and the direct the passengers to the nearby bus stop within a short walking distance for pick up and drop off.

Double Map bus tracker [5] is a real-time GPS bus tracking system that provides many services such as: allowing the riders to track the exact location of a bus in real-time, viewing the specific routes associated stops, showing the user where the bus stops, and then the expected time for the bus to arrive at that station.

Transit - Bus Subway Times application [6] predictions the location of a bus in real-time, displays bus schedules, the estimated time of arrival, provides audio reminders to start walking to the desire station, and provides a trip planner.

Bus Times London application [7] enables the user to specify the departure date, departure station, and the arrival station, moreover, check the arrival time of the buses.

Next bus Barcelona application [8] provides information about the near bus stations such as: distance, available buses, and the bus route.

London Live Bus Countdown application [9] tells the users when the next bus will arrive at any bus stop in London. Also, the user can search for a station by entering the station name in the search bar and get the details.

However, none of these applications provide services or channel of communication to the bus driver. Moreover, there is no applications that provides information about the available seats inside the bus. And the most important point is each application is built for a specific region or city, as a result there is a need for an application care about Saudi cites or recreational seasons.

C. Need for the Application

Generally, public transportation is a vital need in any society. More need for this kind of transportation is appears during a crowded events such as Jeddah season. In the recreational seasons, buses are used to transferred people from the parking to the main event gate. Moreover, buses are used to transfer people between the activity's location of the same event. In order to determine the need for such a system, a questionnaire is distributed via Google forms to:

- To find an indicator's of how many people are frequent visit the seasons of the entertainment authority
- To discover the percentage of users that used to use app that helps them to track buses. Moreover, to discover the percentage of users that think having an application that helps them to track buses and provides other services is a useful idea
- To collect suggestions to improve the bus service, and the services at the waiting station for the bus during the entertainment authority season. Also, to collect the most desired features of the required application.
- To determine the problems faced the visitors
- To determine the percentage of the visitors that have used the bus service, and their satisfaction of the provided services

TABLE I
MOBILE APPLICATIONS IN GOVERNMENTS SECTORS IN KSA

1. Healthcare Sector		
App Name	Android Store	Apple Store
Tabaud	✓	✓
Sehhaty	✓	✓
Tawakkalna	✓	✓
Rest Assured "Tataman"	✓	✓
Sehha for Doctors	✓	✓
Sehha	✓	✓
Mawid	✓	✓
MOH Formulary	✓	✓
Daleel KKESH	✓	✓
CCHI KSA	✓	✓
Tamini	✓	✓
Stop It	✓	×
Guide me (Arshidni)	✓	×
Patient Care	✓	✓
Patient Portal	✓	✓
My Visit	✓	✓
My Clinic	✓	✓
Qarceboon	✓	✓
2. Education and Training Sector		
App Name	Android Store	Apple Store
Rawdhatii	✓	✓
Virtual Kindergarten (Rawda)	✓	✓
Madrasati	✓	✓
Madrasati - Results	✓	✓
Safeer	✓	✓
Tawasol	✓	✓
IEN Portal	✓	✓
Tam	✓	×
Your Training	✓	✓
Rayat	✓	✓
Mawhiba	✓	✓
Beneficiary Support	✓	✓
RCJ Education	✓	×
3. Security and Safety Sector		
App Name	Android Store	Apple Store
Absher Individual	✓	✓
Absher Business	✓	✓
My Services- Al Jawazat	✓	✓
Muqcem	✓	✓
Kolluna Amn	✓	✓
Salamati	✓	✓
Faz'aa	✓	✓
Civil Defense 998	✓	✓
Asafny	✓	✓
Al Ghithaa Wal Dawaa	✓	×
4. Business Sector		
App Name	Android Store	Apple Store
Nawafth Monshaat	✓	✓
Consultants Version - Monshaat	✓	✓
Monafasat	✓	✓
Agricultural Development Fund App	✓	✓
Saudi Council Of Engineers App	✓	✓
Tiqan	✓	✓
Federation of Saudi Chambers	✓	✓
My Business Portal	✓	×
Chamber Appointment	✓	×
Asharqia Chamber	✓	✓
Jeddah Chamber	×	✓
5. Trade and Consumer Protection Sector		
App Name	Android Store	Apple Store
Reporting Trade Violations	✓	✓
Tejarati	✓	✓
Bainah	✓	✓
Maroof	✓	✓
Takhfidhat	✓	✓
Al kahraba	✓	✓
Hasibati	✓	✓
Ta'akad	✓	✓
Fatoraty	✓	✓

TABLE III
MOBILE APPLICATIONS IN GOVERNMENTS SECTORS IN KSA

6. Human Resource Sector		
App Name	Android Store	Apple Store
My Job Information	✓	✓
Hisab Al Muwaten	✓	✓
Ma'an	✓	✓
Ta'minati	✓	✓
Labor Education	✓	✓
Ethrai	✓	✓
RCJY Careers	✓	✓
Eshara	✓	✓
7. Municipal Services and Housing Sector		
App Name	Android Store	Apple Store
Balady 940	✓	×
Foras	✓	✓
Balady Al-Riyadh	✓	✓
My reports	✓	✓
Mullak	✓	✓
Sakani	✓	✓
Real Estate Agents	✓	✓
Real estate consultant-beneficiary	✓	✓
Real Estate Consultant-Business	✓	✓
Etmam	✓	✓
8. Environment, Water and Agriculture Sector		
App Name	Android Store	Apple Store
Ministry of Environment, Water	Agriculture App	✓
✓		
Murshadik	✓	✓
Riyadh Plants	✓	✓
Riyadh Air Quality	✓	✓
Arsad	✓	✓
Saudi Irrigation Organization App	✓	×
National Water	✓	✓
9. Industry, Mineral Resources and Local Content Sector		
App Name	Android Store	Apple Store
Ministry of Industry and Mineral Resources App	✓	✓
Saudi Industrial Development Fund App	✓	✓
Modon App	✓	✓
Badir	✓	✓
Saudi Factories	✓	×
10. Justice and Legal Affairs Sector		
App Name	Android Store	Apple Store
Saudi Laws Directory	✓	✓
Ministry of Justice App	✓	✓
Najiz	✓	✓
Taradhi	✓	✓
Mwathiq	✓	✓
E-Marriage Contract-eZawaj	✓	×
e-Mazad	×	✓
Board of Grievances App	✓	✓
Public Prosecution App	✓	×
Guide to Saudi Human Rights Systems	✓	×
Right	✓	×
Mobile Notaries	✓	✓
11. Financial Sector		
App Name	Android Store	Apple Store
MOF Portal	✓	✓
Saudi Currency	✓	✓
Zakati	✓	✓
VAT	✓	✓
Saudi Customs	✓	✓
Simati	✓	✓

Fig. 1, 2, 3, and 4” shows examples of the questions of the distributed questionnaire

TABLE V
MOBILE APPLICATIONS IN GOVERNMENTS SECTORS IN KSA

12. Tourism and Travel Sector		
App Name	Android Store	Apple Store
Visit Saudi	✓	✓
Experience AIUla	✓	✓
Riyadh Guide	✓	×
Tourism Complaints And Reports	✓	✓
Ministry of Foreign Affairs - MOFA	×	✓
Saudi Airports	✓	✓
SAUDIA	✓	✓
SAR Saudi Railway	✓	✓
13. Islamic Affairs Sector		
App Name	Android Store	Apple Store
Eatmarna	✓	✓
Eatmarna Business	✓	✓
Shaaer Smart Card	✓	✓
Hajj Smart Id	✓	✓
Manasikana	✓	✓
Ershad	✓	✓
Smart Hajj App	✓	×
Tarwiah	✓	✓
Luma' Al-Adhkar	✓	×
General Presidency App	✓	✓
Mushaf Al Madina Al Monawarah App	✓	✓
14. Telecom Sector		
App Name	Android Store	Apple Store
CITC App	✓	✓
Saudi Post — SPL	✓	✓
SP Cloud	✓	✓
Locator Map	✓	✓
15. Media and Culture Sector		
App Name	Android Store	Apple Store
Ministry of Media App	✓	×
Rasd Now	✓	✓
Saudi Press Agency App	✓	✓
SPA News Search	✓	×
King Fahd National Library App	✓	✓
Media Center - Royal Commission in Jubail	×	✓
Alula FM	✓	×
16. Sports and Entertainment Sector		
App Name	Android Store	Apple Store
King Fahd National Library App	✓	✓
King Fahd National Library App	✓	✓
King Fahd National Library App	✓	✓
King Fahd National Library App	✓	✓
King Fahd National Library App	✓	✓
King Fahd National Library App	✓	✓
17. Charitable and Voluntary Sector		
App Name	Android Store	Apple Store
National Volunteer Work Platform	✓	✓
Health Volunteering	✓	✓
Wateenp	✓	✓
Al Mostajeeb	✓	✓
Volunteer	✓	✓
Wesal	✓	✓
Donate	✓	✓
Ehsan	✓	✓

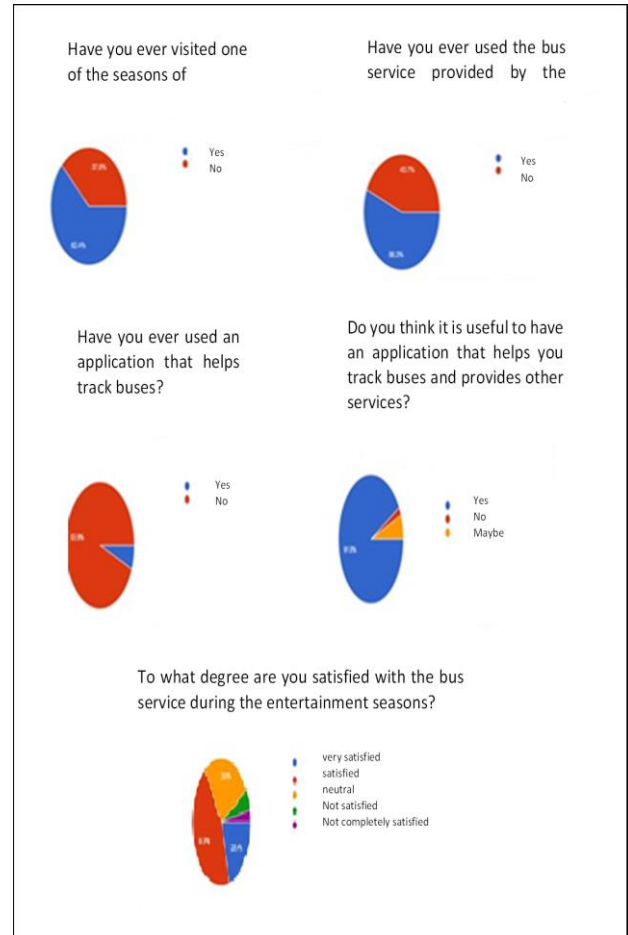


Fig. 1. Sample of the Questionnaire's Questions

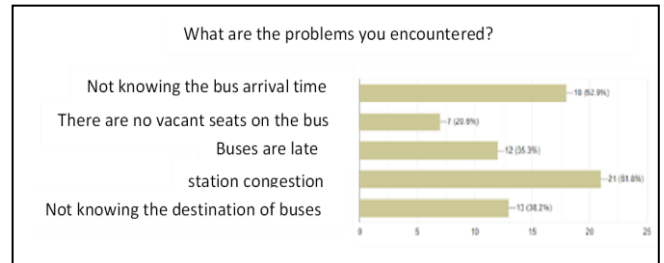


Fig. 2. Sample of the Questionnaire's Questions

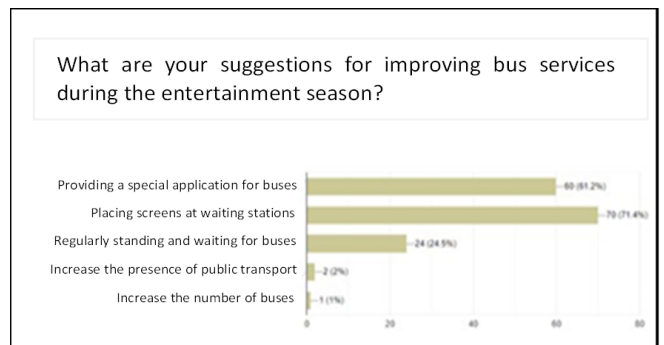


Fig. 3. Sample of the Questionnaire's Questions.

What is the most desirable feature in this application?

- More regular
- Clear and easy and benefits the deaf and dumb
- Provide more buses
- See the location of the bus
- Advance reservation
- Precision

Fig. 4. Sample of the Questionnaire's Questions

III. SYSTEM MODEL

The proposed solution includes software and hardware components. As a software, we proposed a mobile application called smart station that contains:

- Admin account that manages the buses and the stations details. Moreover, admin account manages all other users accounts.

As a hardware, there are two components:

- A sensor: senses any passenger movements such as entering and leaving the bus and count the numbers and kind movements. These numbers then used by the mobile application to calculate the number of the available seats inside the bus.
- LCD screen in the bus that shows the number of passengers for bus drivers and passengers

The architecture of the proposed solution is divided into two sub-architecture diagrams. Fig. 5 illustrates the architecture diagram for passengers, bus driver, and station observer as:

1. Passengers' scenario: the passengers have an ability to check the buses that near to their location, knowing the number of the passengers inside the selected bus, and the number of the available seats inside the selected bus. Moreover, passengers can track the buses near to them and checking the distance between them and the selected bus and expected arriving time. Also, the Passengers can check the statues of selected station.

2. Station observer scenario: At each station, there is an observer he/she can manage and change the station state, by send up-to-date information about the station, to enable bus drivers' interface and passengers' interface to know the status of the selected station. For example, if no one waiting at the station the station observer can change the station status to empty. As a result, the bus driver will not stop at this station and save the time by keep deriving to the next station. Also, station observer can track a selected bus and check the number of availabilities in the selected bus.
3. Bus driver scenario: The driver can check the status of the station, then the driver can decide to stop by or to keep driving to the next station. Also, the bus driver monitor the numbers of the passengers in the bus through the LCD screen.

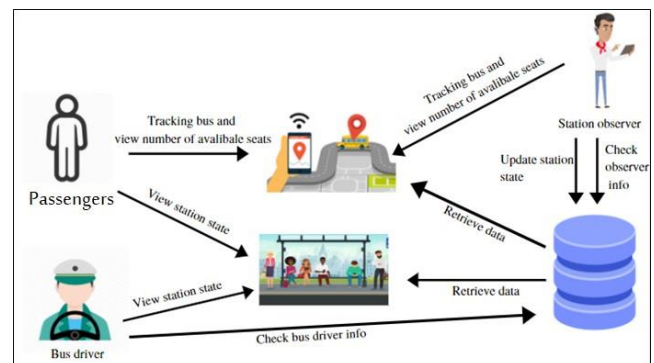


Fig. 5. Architecture diagram for passengers, bus driver, and station observer

Fig. 6 illustrates the architecture diagram for the Sensor scenario. At each bus, there are two sensors, the sensor is allocated above each door. The sensor senses the number of the entering and exiting passengers from the bus. These numbers are used by the application to calculate the number of available seats = the total number of seats – the current number of passengers. The current number of passengers must consider the entering and exiting passengers. Also, there is an LCD screen at each bus that linked to the sensors, this screen displays the current number of passengers.

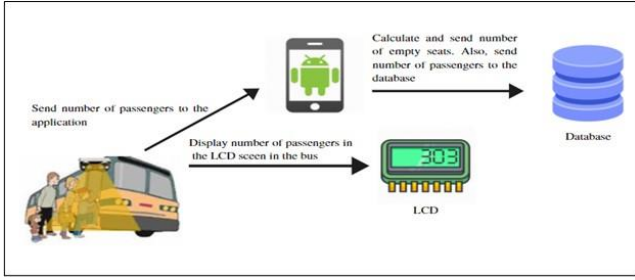


Fig. 6. Architecture diagram for hardware components

The main users of the smart station application are the visitors, the bus driver, the station observer, and the admin. Figure 7 illustrates the application use case. The figure shows the sequence of processes between the users and the system.

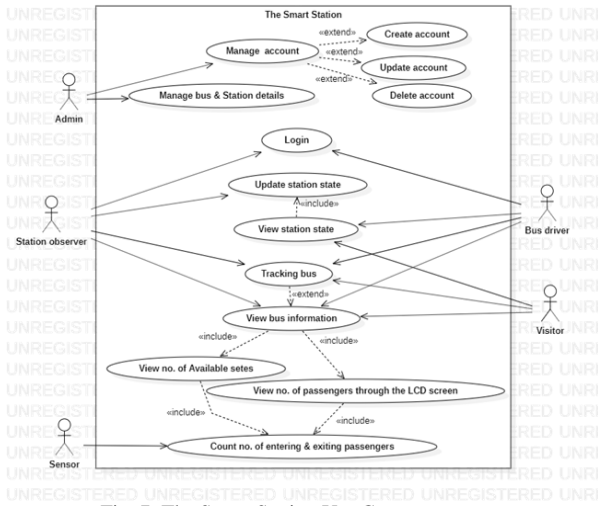


Fig. 7. The Smart Station Use Cases

The admin creates, deletes and updates the accounts for the bus drivers and station observers. Also, the admin can manage the station and bus details such as: number of seats inside the bus, number of available buses, and location of stations. The station observer starts by accessing his/her account through login. The station observer can update station state by changing the number of waiting people in the station, see the bus information and check number of available seats. Moreover, Also, the station observer can track the bus on the map.

The bus driver starts by accessing his/her account through login. The bus driver can check the station state, can view the number of currents passengers inside the bus through the LCD screen. Also, the bus driver can see the bus information

and check number of available seats and track the bus on the map.

The visitors can check the station state, see the bus information such as: The current number of passengers through the LCD screen, number of available seats and track the bus on the map.

The sensor counts the number of entering and exiting passengers from the bus. Then use this information to calculate the number of available seats and the current number of passengers.

IV. IMPLEMENTATION

The application system is an object-oriented programming language implemented using Android Studio (Java language), with need seven classes as shown in figure 8.

1. EmployeeLogin class: for observer and the driver login.
2. Station: to store station state information.
3. BusMap: to store bus information and display map.
4. Visitor: to view station state and bus information.
5. LocationShareService: to request the service from google API.
6. Driver: to display her/his own interface.
7. Observer: to display her/his own interface.

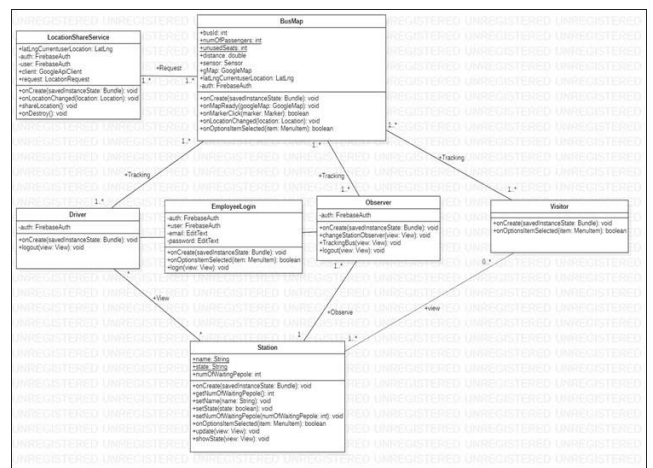


Fig. 8. Class Diagram

Tracing the bus is one of the most important features in the application. In order to do tracking function, a specialist's module is needed. The most

famous modules are Google Maps Platform and GPS module, Google Maps Platform has been chosen to use in the application based on the comparison that appears in the tables VII

TABLE VII
GOOGLE MAPS PLATFORM AND GPS MODULE COMPARISON

	Google Maps Platform	GPS module
Definition	The Google Maps Platform is a set of APIs and SDKs that allows developers to embed Google Maps into mobile apps and web pages, or to retrieve data from Google Maps	It is a hardware that must be connected to the Arduino board using a power source, and data between it and the Android Studio can be sent and received via a Bluetooth module
Interact with users	✓	✓
Connection with android studio	API Key must be generated first then imported the Google Maps library	Arduino code must be programmed in addition to the Java code. Moreover, the Bluetooth Module (Hardware) need to be coded in order to send the data from the Arduino platform to the Android Studio
Cost	It is free but if the application generates 25,000 or more map daily for more than 90 consecutive days, the API must be ungraded and the cost is 4\$ per 1000 page	Buying a GPS module for each bus is required. Also, these components is required: Arduino UNO, NEO-6M Module, Male - Male Wire, Mail Board, USB cord, Power supply 9 volts, and Bluetooth Module. Approximate the total cost is around price 133\$

The application required a database. Firebase is a database that stores and synchronizes data in real-time in a mobile and web application. Also, MySQL can provide same services. To choose the suitable tools for the application a comparison has been done as shown in table IX.

Response time is an important feature for any application works with database. Figure 9, figure 10, and figure 11 present a comparison of performance between the Firebase real-time and MySQL database. Y-axis shows the response time in milliseconds and the X-axis shows the

experiments. And all experiments proved that Firebase is faster than MySQL databases [10].

TABLE IX: FIREBASE AND MYSQL COMPARISON

	MySQL	Firebase
Used for	Mostly used for relational data and transactions	Firebase is suitable for real-time applications
Flexibility	Not flexible in terms of design	Very flexible in terms of design.
Store data in	All MySQL databases are stored inside a MySQL DATADIR directory	Data stored and processed in a cloud
Languages	Java, C++, C#, Payton, C, PHP	Java, JavaScript
API	Java Database, Connectivity (JDBC), Open Database, Connectivity (OBDC)	Android, iOS, JavaScript

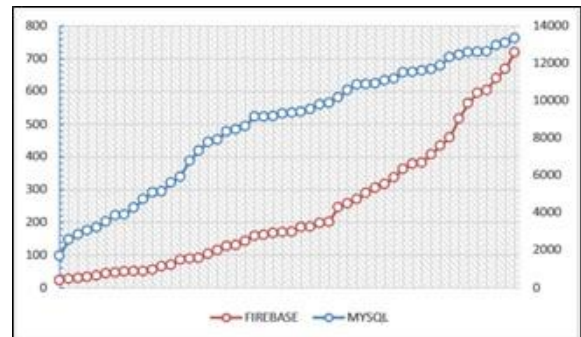


Fig. 9. Performance time in millisecond for create operation

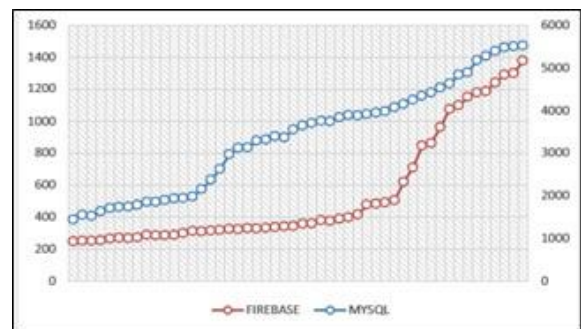


Fig. 10. Performance time in millisecond for update operation

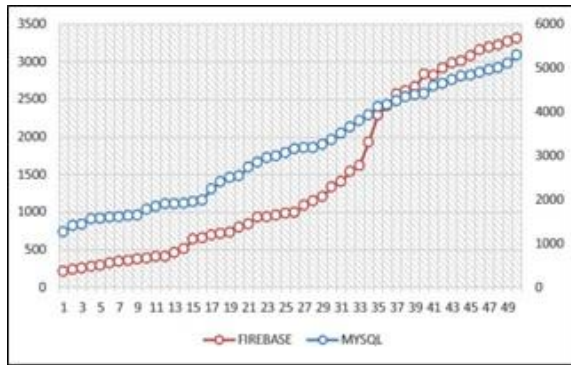


Fig. 11. Performance time in millisecond for read operation

As a result, firebase has been chosen to use in the system. Figure 10 shows an example of the database table using firebase.

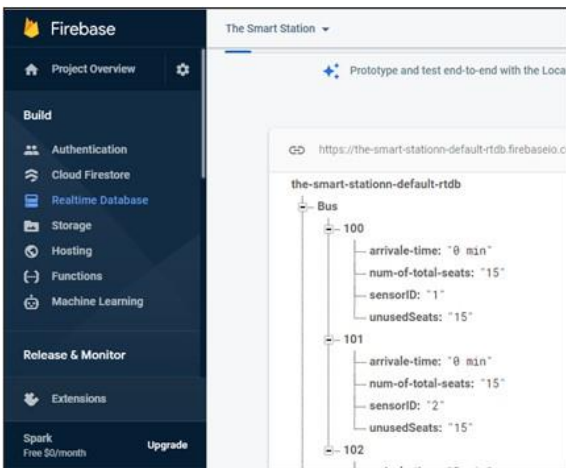


Fig. 12. Example of database table in firebase

For the hardware the arduino is used to counting the number of entering and exiting passengers from the bus, then using his number to calculate the total number of passengers and the number of available seats in the bus. The following hardware are needed:

1. Two IR sensors to detect the IR radiation emitted from an object as shown in figure 13
2. 16×2 LCD to display the number of passengers, as shown in figure 14
3. Arduino board to read the inputs and the light from the sensors
4. NodeMCU (WIFI) which is a hardware of Internet connectivity,

that allows the programmers to transfer data from the Arduino to firebase as shown in figure 15

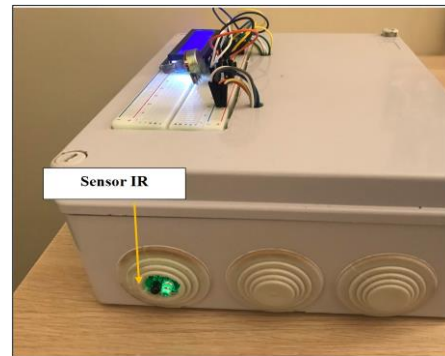


Fig. 13. The Sensor

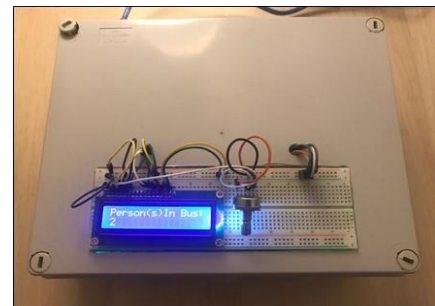


Fig. 14. LCD screen shown the number of the passengers

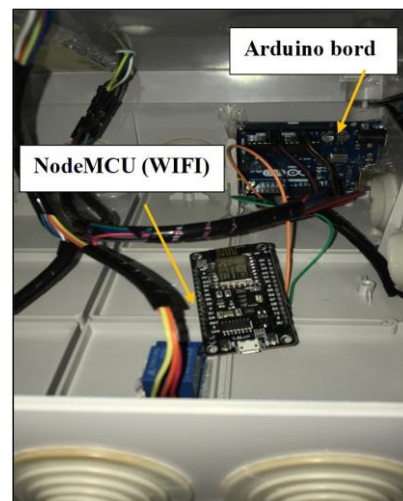


Fig. 15. Arduino board and NodeMCU

V. RESULTS AND EVALUATION

Android studio is used to develop the proposed system. The main interface or welcome page is appeared as a user download and open the application as figure 16: [a]. The welcome page, that contains two main buttons: i) Start as a visitor that takes the user to the main menu services without need to log in process, ii)Employee log in. figure 16:[b] shows the log in screens for the employees only. Employees might be a driver or a station observer. Log in done through the email and password, if one of the entries either email or password are wrong the "wrong email or password" message will appear to the user. The main menu interface is appeared to all users as shown in figure 16:[c].

Furthermore, the bus information such as bus id, driver name, and number of available seats are appeared when the user clicks on the bus icon as figure 17: [b].

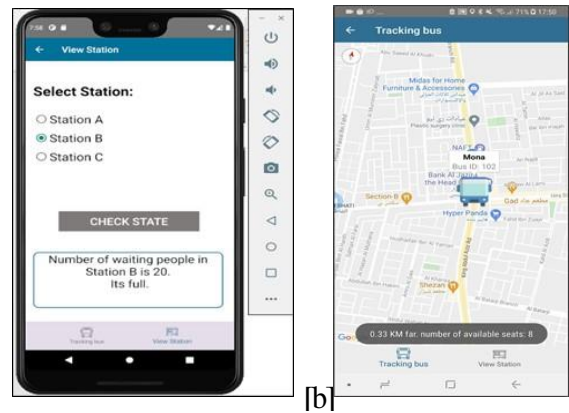


Fig. 17. Interfaces for All Users



Fig. 16. Main Interfaces

All kind of users can view the station state as shown in figure 17: [a] by selecting any station then click on check state. Moreover, all users can track the buses from the tracking bus buttons.

The observer can check the station state by select any station then the observer can see the information. Also, the observer can change the station state by select the station and enter the number of waiting people then update the status, as shown in figure 18.



Fig. 18. Changing Station State Interface

An arduino sensor to calculate number of entering and exiting passengers. Then the application will calculate the number of available seats based on that numbers. The SoftwareSerial library for nodeMCU wifi and LiquidCrystal library to allows an Arduino board to control LiquidCrystal displays (LCDs). The pins of each LCD screen and NodeMCU are defined, figure 19 shows the results of calculation available sates in the LCD screen.

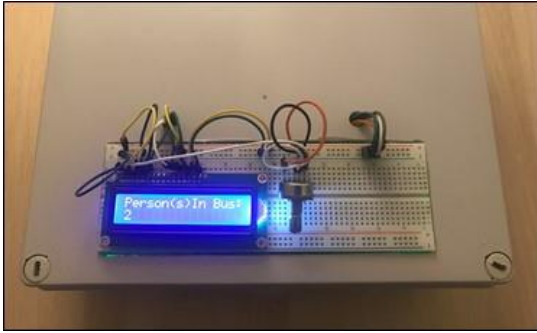


Fig. 19. Bus Sensor Showing Numbers

1) *Testing:* The testing phase detects errors, measures the quality, ensures that the project runs correctly, and makes sure it satisfies the requirements. Three kinds of testing methods are used to ensure that the system works as expected: i) system testing, ii) integration testing, and iii) Unit Testing. System testing is testing the behavior of the whole system where there is no need to know the structure and details of the code to make sure that the functional requirements are met. Table XI shows the system testing steps and results.

TABLE XI
SYSTEM TESTING

Functions	Steps	Results
Login employee	<ol style="list-style-type: none"> 1) Select " Login employee" from welcome page 2) Enter email and password 3) Press " Login" button 	The bus driver/station observer login into the system successfully
Change station state function	<ol style="list-style-type: none"> 1) Select " View station" from menu 2) Select station name 3) Enter the number of current waiting people 4) Press "Update" button 	Station state is updated in the station table in the firebase successfully
View station state	<ol style="list-style-type: none"> 1) Select " View station" from menu 2) Select station name 3) Press " Check state" button 	The station state appears to the user
View all bus information	<ol style="list-style-type: none"> 1) Select " Tracking bus" from menu 2) Press the bus icon 	The bus information appears for the user
Tracking bus on the map	<ol style="list-style-type: none"> 1) Select "Tracking bus" from the main menu 	The user can track the bus movement on the map

Integration testing is done between the sensors, firebase, and android studio to make sure that they communicate to each other without failure or any damage. Figure 20 illustrates interaction between the components, and the steps for the integration testing are:

- 1) The bus sensor senses the passengers' movements, and it shows the number of passengers on the screen
- 2) The number of passengers sends to firebase by using NodeMCU wi-fi
- 3) The sensor table in the firebase is updated
- 4) The application calculates the available seats using the previous equation
- 5) The number of available seats is updated in the bus table in firebase
- 6) When the user clicks on bus icon the number of available seats will appear

Unit testing is a testing method by which individual units of code can be logically isolated in a system to determine whether they are fit for use. and the system is passed the unit testing successfully.

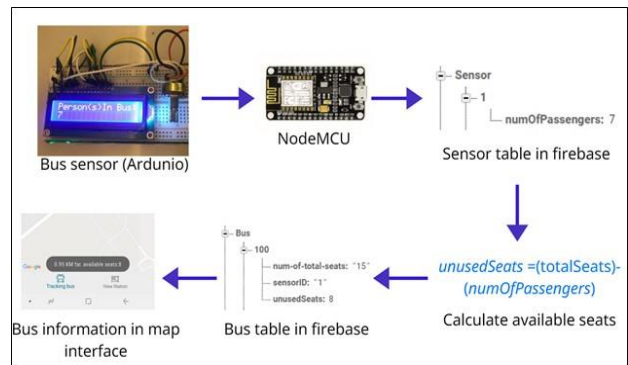


Fig. 20. Interaction between components

2) *Performance Evaluation:* To evaluate the performance of the proposed system and how it will perform in the real life, the performance of the CPU, the memory and the network are tested.

CPU performance is a metric that tells how much of the CPU is being used by the running

application. The more of the CPU consumption, the more of the battery consumption. The results of the CPU performance testing is shown in figure 21, the highest percentage of using CPU is 38.68% and it happened at the beginning when lunch the application. And the lowest percent is 2.19% while clicking on the button.

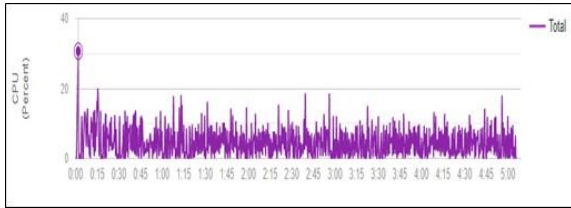


Fig. 21. CPU Performance

Memory performance is a metric that tells how much of the memory is being used by the running application. As shown in figure 22, at the most memory consuming function when the user opens the map to the tracking bus, it consumes 299,39 K of the memory.

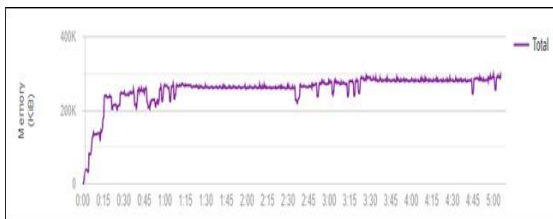


Fig. 22. Memory Performance

Network performance is a metric that focus on the network requests being made by the application. This test showing data sent and received, as well as the current number of connections. The application send request when the user open the map to tracking the bus by 9.9 K. and received 33K at 19 sec as shown in figure 23.

- 69.6% of the end users find it easy to use, while 30.4% find it within normal range
- 60.9% of the end users find the colours and design of the application are very nice, while 21.7% find them nice, and 4.3% find them bad
- The answers about the clarity of the application functions are as: 43.5% of end users answered that the functions are very clear, 21.7% find it just clear, 17.4% said neither clear nor not clear, 13% said not clear, and 4.3% said application are not vary clear
- 60.9% of the end users find transitions between the interfaces are very easy, 13% said find them easy, 17.4% said neither easy nor difficult, 4.3% said difficult, and 4.3% said was very difficult
- The end users opinions about the display and tracking the bus on the map are: 60.9% said they are very satisfied, 39.1% are satisfied, 13% are neutral, and 8.7% said they are dissatisfied.
- 82.6% of the end users find that the information about bus station status is sufficient and 17.4% said is not sufficient.
- 100% of the end users find the application is worked as their expectation

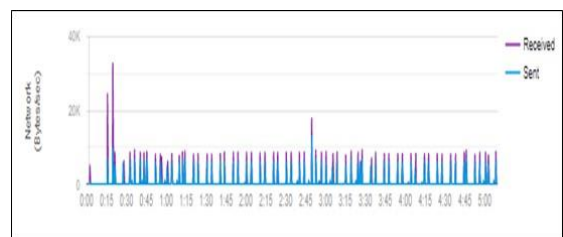


Fig. 23. Network Performance

3) *Usability Testing*: Usability testing is a technique used to evaluate how easy an application is to use. The tests are done with real users to measure how 'usable' or 'intuitive' an application is and how easy for the users to reach their goals. The usability test done through asking people to use the system then fill up a questionnaire. The questionnaire consists of a closed-end and open-end questions. The results of the questionnaire conducted the following:

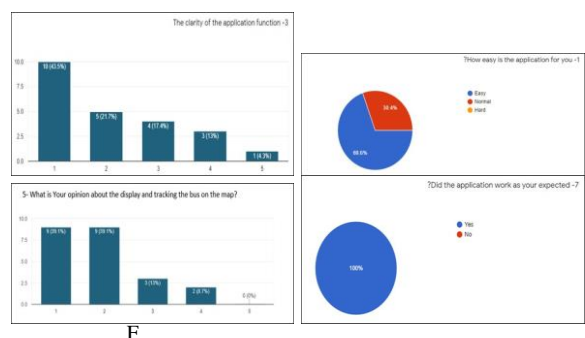


Fig. 24. Sample of the the Usability Test Questionnaire's Questions

VI. . LIMITATIONS

[10] As any project going on, might face some limitations and challenges such as in case of no internet the end users can't check the near station or the status or location of the bus. Moreover, the application only available and work with the Android operating system. On the other hand, the challenges in the hardware area are connecting the Arduino board and IR sensor, and it solved by putting a wire on the power pin on the monitor. During the implementations transferring the data from Arduino to firebase was not an easy task and solved by using a NodeMCU.

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CONCLUSION

Many people face problems while navigating by buses during the Jeddah seasons such as: no information about the number of the available seats on the bus, the distance between the user and bus, or even if the station of the bus is full of people or empty. For the bus drivers, the proposed application gives them the ability to know the number of people standing at the next stop. Thus, the driver can decide to stop in the next station or not to. Moreover, the bus driver can know the current number of passengers by check the LCD screen. For the station observer, the proposed application gives them the ability to enter the number of people waiting at the station to the firebase. Also, they can check the bus information such as the current number of passengers, the distance between him and the bus, and number of available seats. For the visitor, the proposed application gives them the ability to check the bus information and track the bus and check the station information. All these services make the entertainment experiment in Jeddah season much netter based on the questionnaire's results.

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تطبيق جوال هيئة الترفيه السعودية: المحطة الذكية

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المستخلص. تعتبر خدمة الحافلات من وسائل النقل العام الرئيسية التي يستخدمها الناس. خاصة في المناطق التي يوجد بها الكثير من الناس مثل المهرجانات. في الوقت الحاضر، هناك العديد من الفعاليات والمهرجانات التي تقام في مدينة جدة. علاوة على ذلك، هناك حاجة كبيرة لخدمات الحافلات خلال موسم جدة. في الوقت نفسه تواجه هذه الخدمة العديد من الصعوبات التي يواجهها الزوار وسائقو الحافلات، مثل: نقص المعلومات حول الحافلة (موقع الحافلة في الوقت الفعلي، حالة الحافلة: فارغة أو ممتلئة) ، ونقص المعلومات حول محطات الحافلات. علاوة على ذلك، وبناءً على تجربة حقيقية خلال موسم جدة، فإن الانتظار في محطة الحافلات عملية محبطة. لذلك، اقترحت هذه الورقة تطبيقًا للجوال على google play يسهل التنقل بين مناطق الحدث من خلال رؤية خريطة موقع الحافلة وعدد مقاعد الركاب الفارغة. يخدم التطبيق أيضًا سائق الحافلة، من خلال توضيح ما إذا كان هناك شخص ما في محطة الحافلات أم لا بحيث يمكن للسائق أن يقرر الانتقال إلى المحطة التالية أو التوقف في المحطة. يتم استخدام جهاز استشعار وشاشة LCD للمساعدة في عملية العد.

هناك العديد من أهداف المشروع المقترح الهدف الرئيسي منها هو تقديم تطبيق يخدم شريحة كبيرة من المجتمع خلال مواسم المهرجانات بالهيئة السعودية للترفيه خاصة في مجال النقل: (١) ينظم ويسهل النقل في موسم جدة للترفيه، (٢) توفير وقت الزائر وتقليل حركة المرور من خلال تتبع موقع الحافلة ، ومعرفة المسافة بين المستخدم والحافلة ، وعدد ركاب الحافلة ، و (٣) واجهة مستخدم سهلة وبسيطة لسهولة الاستخدام. لتقييم التطبيق المقترح تم استخدام العديد من الاختبارات وأدوات التقييم وإثبات فاعلية التطبيق.

الكلمات المفتاحية- الهيئة السعودية للترفيه، موسم جدة، حافله، مواصلات