System Documentation

(Group Report)

Group Names: Breyton Ernstzen (217203027) Zubair Esau (217100554) Siposethu Feni (217237614) Zaakirah Fakier (220461503) Demi Farquahr (220322104) Edrico Fielies (219447500 Dropped out)
System Name: CPUT Shuttle App
Subject: Project 2
Course: Information and Communication Technology (ICT): Applications Development
Supervisor: Dr. Sheethal Tom
Campus: Cape Peninsula University of Technology
Year: 2021

Contents

1. Introduction 3

2. Document Management 4

3. Data collection methods and findings before the system was designed (graphs and findings) 13

4. System Overview 15

5. Key components of CPUT- Shuttle App 17

6. App Screen Designs 17

7. Tools/Technology used to the develop and debug the application 20

8. Business Rules for the mobile Application 20

9. Entity Relationship Diagram (Explanation) 21

ERD for CPUT Shuttle Booking System 22

10. Diagrams 23

11. Activity Diagram 25

12. Future Updates 27

14. Documentation Sign off 29

15. References 29

1. Introduction

For this project, the project team had to complete a system documentation that will be used as reference in the future. A system documentation is a detailed description of a system or program that has been developed (Evans, 2001). It usually gives an idea of what the system can do and what the system cannot do. It also gave provides information on how the system was planned by the presentation of wireframes, research methods and diagrams. The purpose why this system documentation was developed was to communicate information about the system to its users. Also, it provides the benefit of making the conversation between systems much easier (Sharma, 2021).

This system documentation report of our mobile application discusses different tasks that has been done throughout the year till the final stage or phase of our project. This system documentation outlines document management section, which provides information about the project team roles and responsibilities. Also, it indicates to the user who was responsible for front and back-end development. The second section in the document management shows GitHub commits that has been made from all team members during the development of the application. This logs every single change and configuration of the system that has been made. This also helped us to reverse certain changes that has been made that we were not happy with.

The third point that this documentation contains, is the methodology and the findings before the application was being developed. This survey and findings were done during the beginning of the year as part of our planning phase. The fourth discussion that has been made in the system documentation, is the system's overview. The system overview basically contains information about the applications functionality and what it can and cannot do. It also provides information about what had to be done first, in order for us to design the mobile application. The system components were also discussed in the system overview section. The next section provides information about the business rules that has been used to help us as team to develop a functional database to add the student data and their booking information on it. Then an Entity Relationship Diagram (ERD) is drawn that shows the relation between entities in the database. After the ERD has been discussed, a use case diagram is presented, that shows the different activities that the student can perform with the application. The last diagram that is shown is the activity diagram, which shows how an activity moves from one step to another before reaching the end goal. The last part of the system documentation shows

the document sign off, which provides information on when the project officially came to an end.

2. Document Management

2.1 Contributors to the project

Members	Tasks	Font-end/back-end
Breyton Ernstzen Group Leader	-Assign tasks to members -Design Login page - Functionality Login page -Database for login page - System documentation (System overview, diagrams)	Both- Completed the login layout, the login functionality and database
Demi Farquhar Secretary	- Design Disabled booking page - Functionality of Disabled booking page -Database for disabled booking page - System documentation (Document management) -Keep record of all meetings hold	Both- Completed the disabled booking layout, functionality, and database for disabled booking
Zubair Esau	- Design Registration page - Functionality of registration page -Database for registration page -System documentation (Future system updates)	Both- Completed the registration layout, functionality, and database for registration
Zaakirah Fakier	- Design Booking page - Functionality of booking page -Database for booking page -System documentation (Developers/project team details)	Both- Completed the booking layout, functionality, and database for booking
Siphosethu Feni	- Design about us page - Functionality of about us page -Database for booking page -System documentation (Document sign off)	Both- Completed the about us layout and database for disabled booking
Edrico Fielies (Deregistered in term 4)	- Design the timetable page - Functionality of timetable page -Database for disabled booking page	Front end- completed the timetable layout

2.2 Version control (Commit History)

Team Member Name	GitHub Username
Breyton Ernstzen	breySean
Zubair Esau	ZubairE
Zaakirah Fakier	ZaakirahFakier
Demi Farqhuar	Demifarquhar

129 Commits has been made to the project

Commits on May 1, 2021

- bus icon added
- bus icon added
- cput logo added
- Intent filter added
- login page layout
- This is my first commit to the login oage
- This is my first commit to the login oage
- This is my first commit
- breySean committed on May 1

Commits on May 2, 2021

- some code added in the login class …
- button style changed
- button color added
- button color added
- breySean committed on May 2

Commits on May 8, 2021

- Textfield and password field has been moved.
- breySean committed on May 8

Commits on May 16, 2021

- Login validation has been fixed
- Button functionality has been corrected
- breySean committed on May 16

Commits on May 21, 2021

- Icon set
- Actionbar on top removed
- Default action bar removed
- breySean committed on May 21

Commits on Jun 1, 2021

- Dummy activity added if login is sucess.
- breySean committed on Jun 1

Commits on Jun 2, 2021

- comments added
- Minor change
- Temporary dummy activity created with button
- Name and student number added
- Merge pull request #1 from breytonE/Breyton …
- breytonE committed on Jun 2

Commits on Jun 3, 2021

- Declaring the variables
- Change string of button from cancel to back
- Added Cput image
- Designing registration form for the user to enter their detials
- Creating the registration activity.

- ZubairE committed on Jun 3

Commits on Jun 5, 2021

- Updated the intents.
- ZubairE committed on Jun 5

Commits on Jun 6, 2021

- first commit
- DemiFarquhar committed on Jun 6

Commits on Jun 7, 2021

- Making the edges of the button more rounded
- Removing title and action bar
- ZubairE committed on Jun 7

Commits on Jul 22, 2021

- Merge pull request #3 from ZubairE/Register_217100554 …
- Merge branch 'master' into Register_217100554
- breytonE committed on Jul 22

Commits on Jul 24, 2021

- intent filter added
- register page created
- breySean committed on Jul 24

Commits on Jul 25, 2021

- funtionality code added
- register page button functionality fixed
- methods added on register page

- adjustments added
- landscape variation added
- breySean committed on Jul 25

Commits on Jul 26, 2021

- Code fixed
- Landscape layout added
- Zubair's registration page fixed.Minor errors.
- functionality bug fixed
- breySean committed on Jul 26

Commits on Jul 28, 2021

- database class added
- text colour changed
- unnecessary class removed
- breySean committed on Jul 28

Commits on Jul 29, 2021

- Merge pull request #4 from breytonE/Breyton …
- comment added.full name and student number
- breySean committed on Jul 29

Commits on Jul 30, 2021

- itent filter added
- timetable page added
- else if statement added
- registration activity added
- breySean committed on Jul 30

Commits on Aug 2, 2021

- page link method added
- database edited
- breySean committed on Aug 2

Commits on Aug 4, 2021

- code added on login page
- breySean committed on Aug 4

Commits on Aug 4, 2021

- cursor method added
- breySean committed on Aug 4

Commits on Aug 8, 2021

- changed input type on login page(landscape)
- changed input type on login page
- Restrictions added on registration page(landscape) "EditText" section
- Restrictions added on login page(landscape) "EditText" section
- Restrictions added on login page "EditText" section
- Restrictions added on register page "EditText" section
- EditText input restricted to one line
- breySean committed on Aug 8

Commits on Aug 10, 2021

- edited
- Database Created
- database edited
- Column Name changed
- Unecessary code removed
- Column 6 name replaced with "Cellphone Number"

- "Confirm Password" section changed to Cell Number (landscape)
- "Confirm Password" section changed to Cell Number
- capitalize first letter in surname and name input (landscape)'
- capitalize first letter in surname and name input'
- time schedule page checked
- password visibility set on registration page(landscape)
- password visibility set on login page(landscape)
- password visibility set on login page
- password visibility set on registration page
- breySean committed on Aug 10

Commits on Aug 11, 2021

- Main Activity class removed
- database class configured
- nothing wrong on database helper class
- breySean committed on Aug 11

Commits on Aug 12, 2021

- Comment added
- Primary Key is changed to student number
- Comments added
- Check for user existence code added
- breySean committed on Aug 12

Commits on Aug 13, 2021

- de registration page created
- breySean committed on Aug 13

Commits on Aug 15, 2021

- de registration page created
- breySean committed on Aug 15

Commits on Aug 16, 2021

- landscape variation created for de registration page
- text fixed
- New class added
- breySean committed on Aug 16

Commits on Aug 16, 2021

- method removed
- text link added on landscape page
- breySean committed on Aug 16

Commits on Aug 17, 2021

- Database first commit
- DemiFarquhar committed on Aug 17

Commits on Aug 18, 2021

- button big fixed
- unnecessary comments removed
- comments removed
- breySean committed on Aug 18

Commits on Aug 19, 2021

- Merge pull request #6 from breytonE/Breyton …
- comments added on database helper class
- comments added
- comments added

- comments added
- Merge pull request #5 from breytonE/Breyton …
- landscape variation for timetable page created
- landscape variation for timetable page created
- button bug fixed on de registration page. De registration is function… …
- breySean committed on Aug 19

Commits on Aug 23, 2021

- Database Table
- DemiFarquhar committed on Aug 23

Commits on Aug 24, 2021

- Database
- DemiFarquhar committed on Aug 24

Commits on Aug 29, 2021

- FIXED ERRORS
- DemiFarquhar committed on Aug 29

Commits on Aug 30, 2021

- I have coded my functions and database
- ZaakirahFakier committed 29 days ago

Commits on Sep 9, 2021

- CHANGES MADE
- CHANGES MADE
- DemiFarquhar committed 19 days ago
- adjustments made
- character length set
- counter implemented

- Next button added
- Next button added
- booking link added
- background color changed
- pages re arranged
- touch space adjusted
- Merge pull request #8 from ZaakirahFakier/Booking …
- Merge branch 'master' into Booking
- breytonE committed 19 days ago
- I have coded my functions and database
- ZaakirahFakier committed 19 days ago

Commits on Sep 10, 2021

- Merge pull request #9 from DemiFarquhar/Demi …
- Merge branch 'master' into Demi
- breytonE committed 18 days ago

3. Data collection methods and findings before the system was designed (graphs and findings)

The data collection method that we have used for our research was the use of questionnaires. Zubair Esau and Edrico Fielies (not part of the project team anymore) were responsible to set up the questionnaires. These questionnaires were then sent out to students who stays on the orchard residence to complete it and then send it back to one of the team members who was responsible for setting up the questionnaire. The method how these questionnaires was sent out was through email, because we have to follow COVID-19 restrictions and could not do face-to-face meetings. These questionnaires were then used to see whether the current shuttle service is affecting students in a negative way or not. After the questionnaires was completed and sent back, one group member, Edrico Fielies set up graphs to see the difference between how many students at the residence feels affected by the current shuttle service and how many are not. These graphs are seen below (next page):

A survey was conducted with 10 CPUT Students that lives on the Orchard residence .The first graph below shows how satified students are with the CPUT shuttle, 2 Students are very satified with the Shuttle , 4 Students are Somewhat satisfied with the Shuttle , and 4 Students are not satisfied with the Shuttle at all.

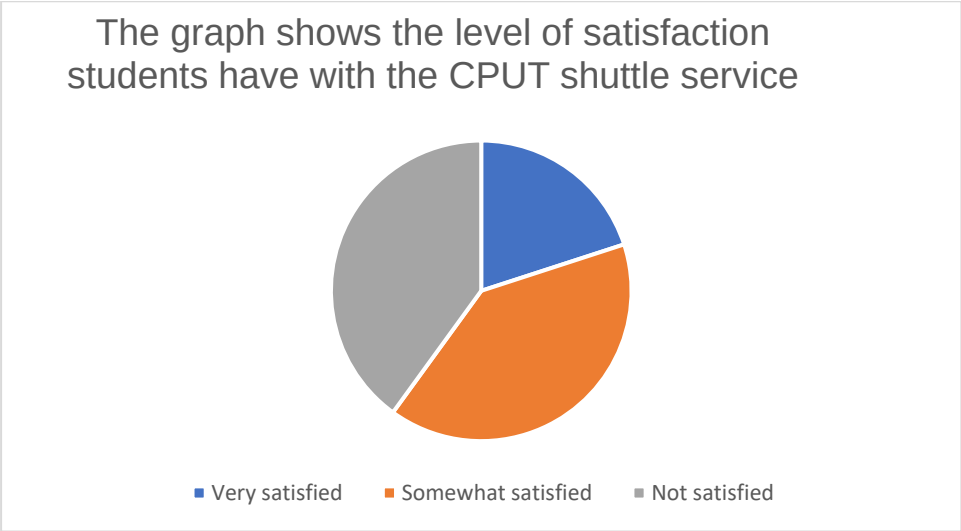


Figure 1: Level of satisfaction graph of students

The seconds graph below shows the response by students, whether the shuttle bus is on time ,3 Students responded that the shuttle is always on time, 7 students had a response of no which means that the shuttle was never on time. None of the students responded that sometimes the bus was late.

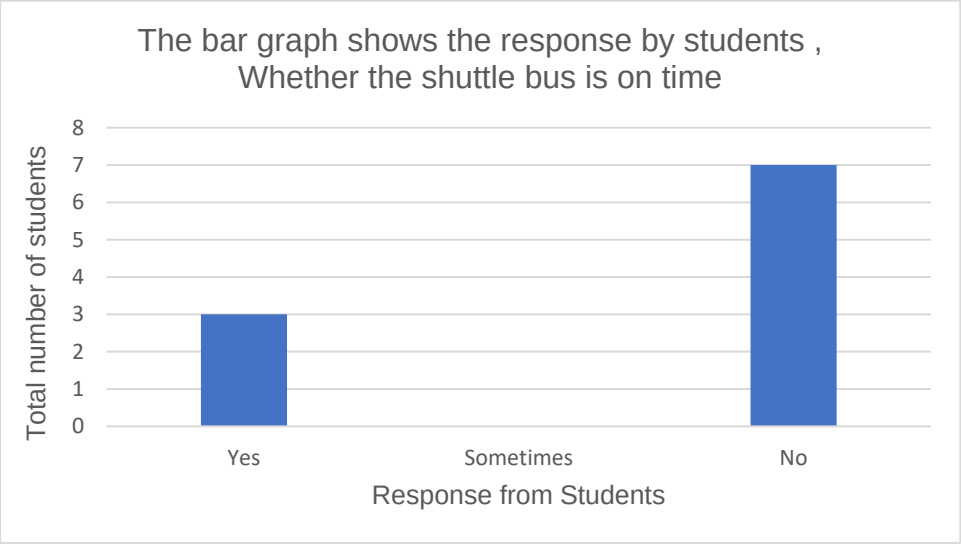


Figure 2: Number of students who agree that their bus is on time or not

The last graph below shows how long students has to wait for a CPUT Shuttle when it arrives late. 2 students responded that the bus arrives at least 5 minutes late. 1 student responded that the bus arrives 10 minutes late. 3 students responded that the bus arrives 15 minutes late. 1 student responded that the bus arrives 20 minutes late. 3 Student (other) responded that the bus is always on time.

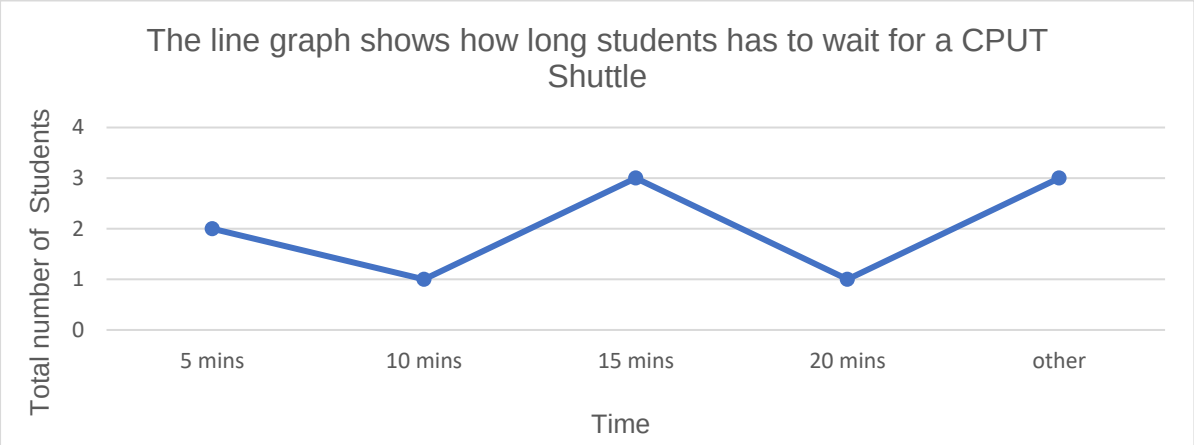


Figure 3: How long students had to wait for this bus

4. System Overview

In the beginning of the year, the project group has decided on designing a bus booking application for the CPUT students. This was decided after we have done some research on how the current bus transport works from residence to campus and vice versa. The data collection method that was used, was the use of a surveys that was done from our team member, Edrico. From the data that was collected from the survey, this helped us to find out how what to include in our mobile application, that will help satisfy the user's(student) needs when he or she makes use of the mobile application.

As mentioned in the beginning, CPUT Shuttle App is a mobile application (only available on Android devices), that enables students at the Cape Peninsula University of Technology who stays on residence, to make seat bookings for a bus. This mobile application is also designed for students so they can keep track of bus times and when they will be at campus and at residence. Also, this will prevent those busses gets overloaded, especially now with the current COVID-19 pandemic where social distancing must be applied. This mobile application is also designed for disabled students, but those with visual disability still have to

wait for additional features (text-to-speech etc.), in order to make the application fully functional for them.

The mobile application that we designed has three types of functionalities for the student to use. This functionality includes Register (Create), Deregister (Delete) and update of student details. What the mobile application cannot do is, the displaying details such as the student password as this information should be kept private from unauthorized people. In order for the student to use the mobile application, he or she must register first if not registered previously. This registered data will then be added or stored on the database of the application. If the same user who is registered on the database already, logs in the next time, the application will recognize the user by searching through the database and see if the user already registered. If the user exists than the login is a success. This will allow the student to make a booking and also look at bus arriving and departure times from campus and residence. If the user makes a booking, it will store this data on to the Booking table and a message will display at the bottom that indicates that the booking was made and how many seats is still available in the bus.

For the Deregister part, which is the deletion of student data from the database. This function allows a student who is registered on the database to remove(deregister) his or her data from the database. For this, it only requires the student's student number and the press of the De register button to perform this action. If the same user that deregistered from the database attempts to log in to the application the next time, access will be denied because the student data has been removed from the database. In order for the same student to use the application, he or she have to re-register again and then log in. If the student de register from the application, the booking data of that student will also be lost.

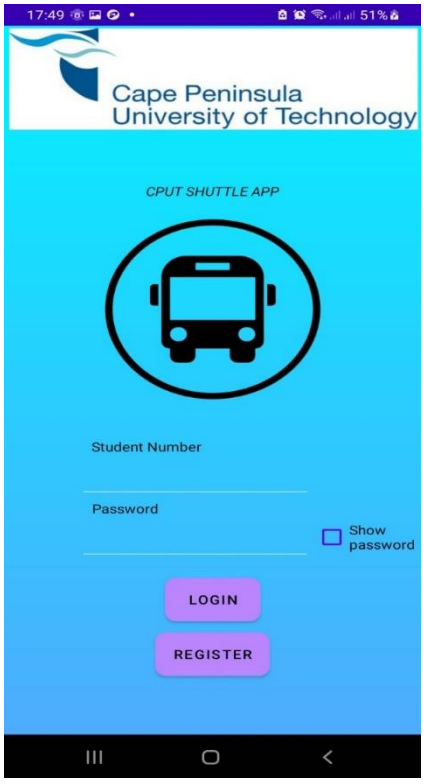
In this application there is also an update functionality available for the student where he or she can update its student details such as passwords, names or mobile number. This feature can be used only if the student is registered on the database. For this to perform the update, the student number of the student is required since it is the primary key of the of the table, which means it identifies each student details and perform an update on the student details by which the student number belongs to. If the student is not registered on the database, he or she can't perform updates and an error message will pop-up that says the student does not exist.

5. Key components of CPUT- Shuttle App

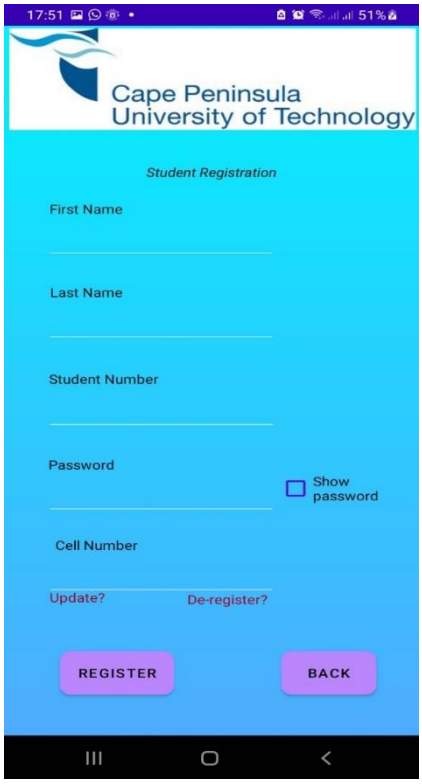
- Log in
- Register
- Update
- Deregister
- View bus times as well as pick up points
- Book a seat for student from residence to campus and vice versa
- Book a seat for disabled students from residence to campus and vice versa
- Show booking has been made

6. App Screen Designs

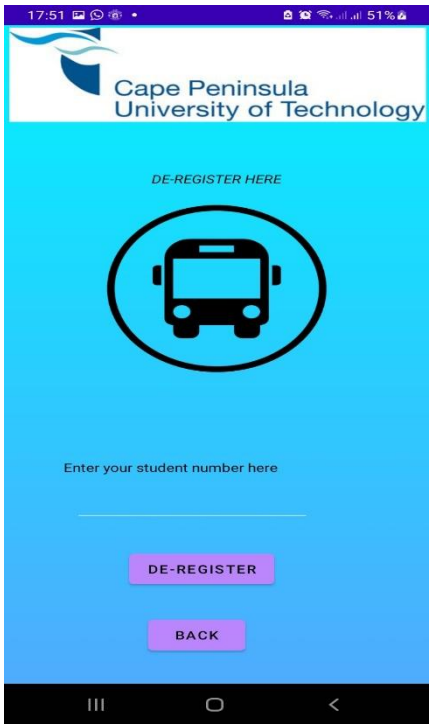
Login Screen



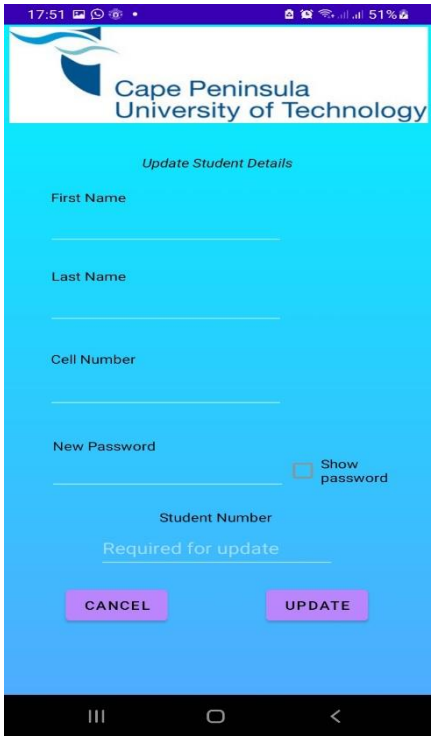
Registration Screen



De-Register Screen



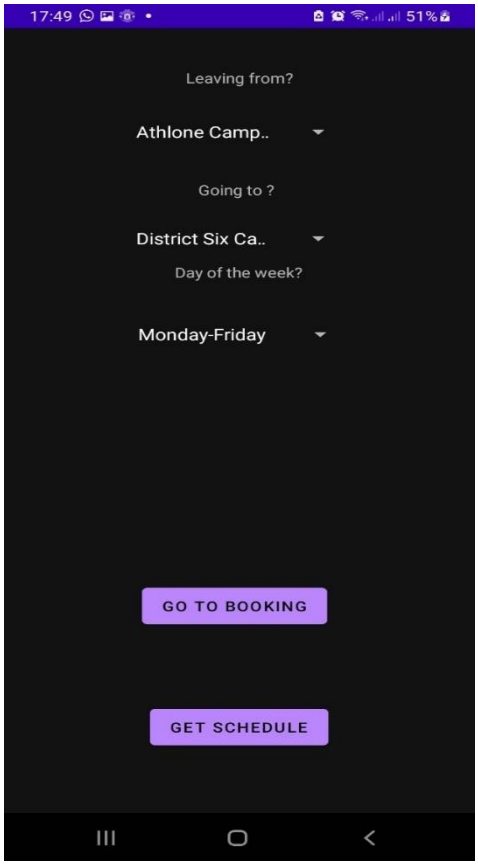
Update Screen



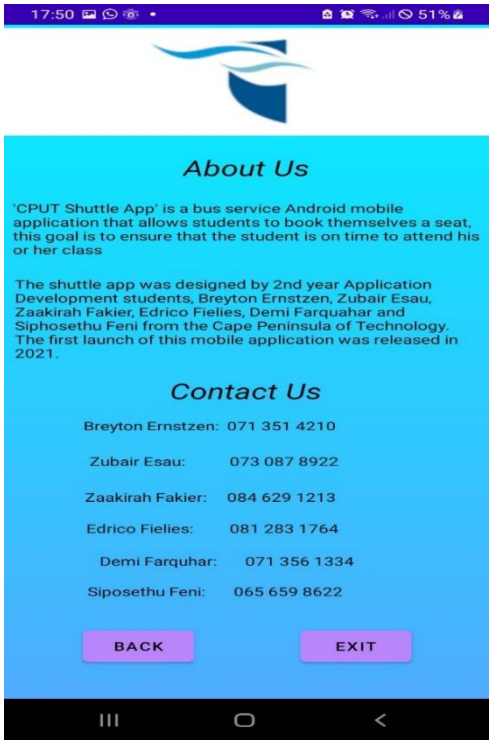
Booking Screen(non-disabled)

Booking Screen(disabled)

Schedule Screens



About-Us Screen



7. Tools/Technology used to the develop and debug the application

For the mobile application we designed, the team made use of Android Studio IDE (Integrated Development Environment) which is empowered by IntelliJ Platform. The versions that were used during the design of this project was started at version 4.2 which was released in May 2021. The next version which was used during the development of the application was the Arctic Fox (2020.3.1) which provided improved performance to the program, and the team was able to use newly added features that was available with the new update. What this update includes was the add of new virtual devices (emulator), new design, better flexible workflow and live edits could be done. The virtual device that was used throughout the entire application was the *Pixel 4a API 30* along with a *Samsung Galaxy A12.* The android version by which this device was setup was android 6, which means the application will run on android devices that supports version 6 up to android version 11. The programming language that was used for developing the mobile application, was Java.

8. Business Rules for the mobile Application

For the mobile application, the team had to find out the business rules, that helped with the database. A business rule is a brief description of an organization policy. In this case, we needed to find the business rule for both CPUT and the shuttle service application. This was to identify the different relationships or associations among the stakeholders that involved here. The different stakeholders that were identified was the bus driver(s), students, busses, ticket, campus and residences.

- A bus can transport zero or more students, each student can only be transported in one and only bus at a time.
- A bus driver can drive one or more busses, each bus is driven by one and only one bus driver.
- A residence can have zero or more students, each student can stay at one and only one residence.
- A bus ticket is reserved for zero or more students, each student receives can receive one and only one bus ticket.
- A booking is made by one or more student, each student can make one and only one booking.

- A campus can include one or more busses, each bus can travel to one and only one campus at a time.

9. Entity Relationship Diagram (Explanation)

For *CPUT Shuttle App* an ERD (Entity relationship diagram) was developed to give a graphical representation of the mobile application's database. What this means it shows the logical structure of a database (Peterson, 2021). The ERD shown below (on the next page), consist of seven entities. These entities are *Student, Booking, Campus, Residence, Driver, Bus* and *Bus Ticket (bridging entity).* There are also attributes that exists among these entities. These attributes refer to the characteristics of these entities, which means it describes each entity in the ERD. The third component to mention of the ERD on the next page is the association (also known as relationship) between these entities. In the ERD, there exists a one-to-many relationship between *Booking* and *Student*. The second association identified, is the *Campus*, who is in as one-to-many relationship with both *Student* and *Bus*. The Student entity are in one to many relationship with *Residence* and the bridging entity *Bus Ticket.* The last association identified is the relationship between *Driver* and *Bus.*

ERD for CPUT Shuttle Booking System

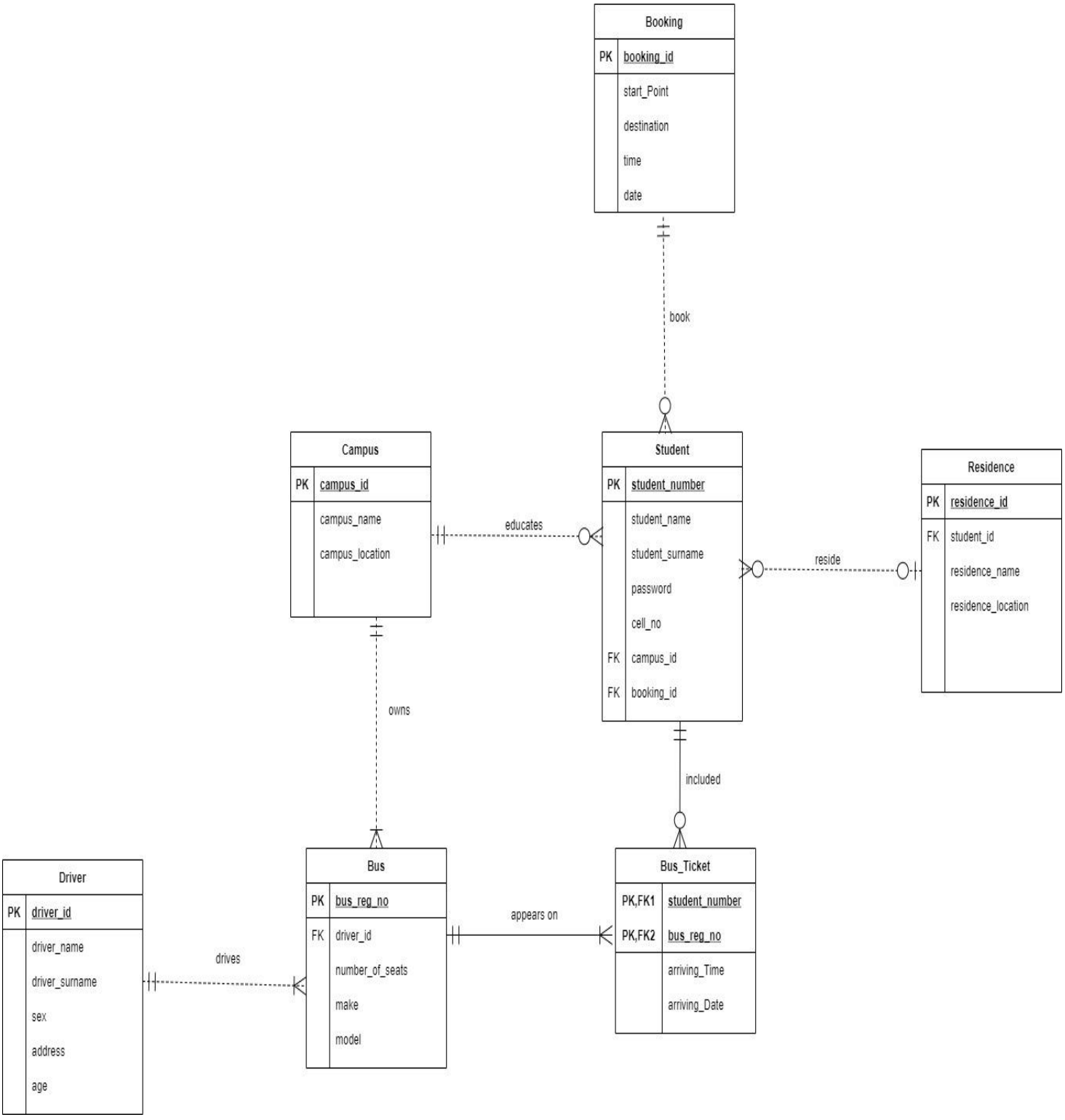


Figure 4: ERD for CPUT Shuttle-App

10. Diagrams

Before the development of our system, we also had to do some diagrams, which helped us to decide on the application should work and who uses it. Me and my group did two types of diagrams for this during planning. The first diagram was a use case diagram and the second diagram(s) we used was activity diagram. A use case diagram is a representation that shows the activities the system performs from a user request (Satzinger, et al., 2016). In this case the user will be the student (represented as a stick figure on the diagram), as he or she makes use of the bus shuttle service. On the other hand, an activity diagram. An activity diagram is a flowchart that shows how an activity flows from one activity to another. What it basically means, is that it illustrates the activity flow within a system (Athuraliya, 2021).

Use Case Diagram

The use case diagram shown on the next page shows how the student (including disabled students) interacts with the mobile application. They can perform actions such as Register, log in, De-register, View schedule, make bookings, view developer information (project member details) and also sign out when they done with using the mobile application.

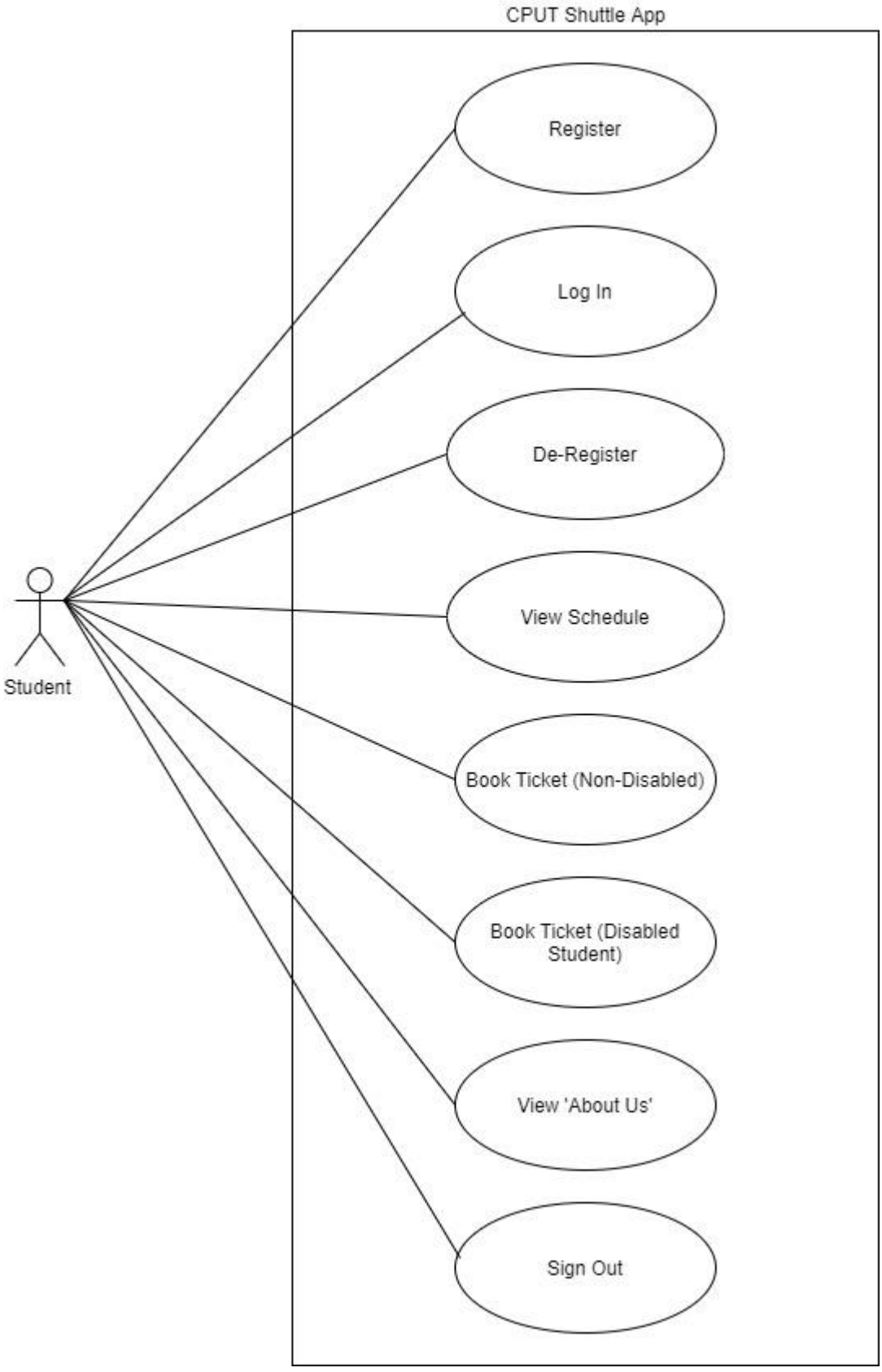


Figure 5: Use Case Diagram for CPUT Shuttle App

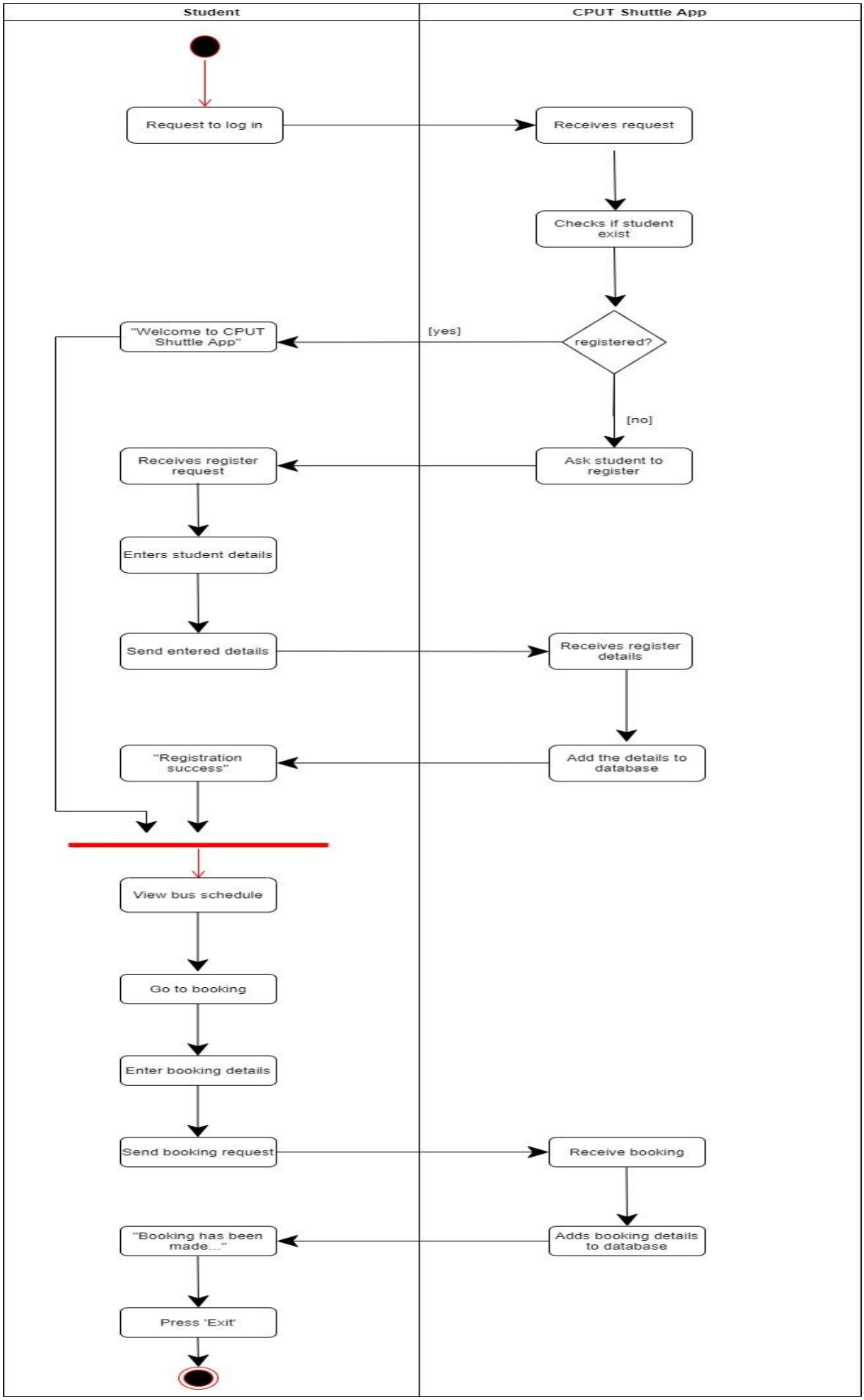
11. Activity Diagram

The activity diagrams shown below shows how the student interacts with the app, and how they got to the desired end result after using the application. So, to explain what an activity diagram is, it is a representation or description of the various user activities, the user who use the system (In this case the user is the student) and also how the activities move from one to another (Satzinger, et al., 2016).

The diagram below shows how the sequence of activities is taking place in specific order. The first thing that happens is the student (user) attempts to log in at first, then after the student entered his or her details, it will search through the database and checks if the student is already exists or not. If the student is already registered on the database, he or she gets access and the log in is a success, else the application will respond back and ask the student to register first, in order to use the booking application. After the new student has registered his or her details, that details will be added on the database, and he or she will receive a message that indicates that the register was a success and will be given access once the same user logs in, the next time.

The join bar (red horizontal bar) shows how both the login and register activity moves to one point after registration and login was a success. After the join, the student is finally in the application and scroll through the application such as view bus schedules, which is the very first page after the log in. This is where the student can view bus times, pick up points of where the bus will pick students up, and the destination of the transport. The next activity that that the students scroll to, is the core of the mobile application, which is the booking section, where the student can make the actual bookings. The student can either decide to leave the application directly after he or she view schedules or can make the booking. There are two booking pages, one for disabled students, and the other one for non-disabled students but these data are saved on one database since it serves the same function.

These two pages requires that all fields must be completed in order for the booking data to be saved on the database. The database receives this data then and saves it in the table. After the booking has been made the student receives a message that says the booking has been made. Also, the same student won't be able to make another and the confirm buttons will be disabled, this is to prevent the same student to make multiple bookings and take unnecessary seat space in the bus. The student is then allowed to exit the application or can view the about page and can exit the application from there also. The activity is then terminated.


Student
CPUT Shuttle App
Request to log in
Receives request
Checks if student exist
registered?
[yes]
"Welcome to CPUT Shuttle App"
[no]
Ask student to register
Receives register request
Enters student details
Send entered details
Receives register details
Add the details to database
"Registration success"
View bus schedule
Go to booking
Enter booking details
Send booking request
Receive booking
Adds booking details to database
"Booking has been made..."
Press 'Exit'

12. Future Updates

Updating systems has always been an important part of any application development process because it makes sure that the application is always at high performance and speed and does not get outdated and branch out to unwanted problems.

The update that will most likely be made first to our current application in the future is the expansion to different campuses. Our current application only runs from the CPUT district six campus and the reason for that being because the application is still in the prototype phase meaning outside surveys and data collection first needs to be done to deem the application liable and only then can all the other CPUT campuses be added. The application will function the same for all campuses and give all users a comforting and easy to use experience.

Sometimes waiting for a bus to arrive is not the most fun experience especially if the bus is delayed, therefore the next update is something that will take the horrible feeling of waiting for a bus away and having the disabled students look forward to it. And that will be done by adding a small basic chat room to the application. So, students can communicate with each other, and this also allows students to tell the bus driver to wait for a student who is delayed by a few seconds because that particular student sent a message in the particular chat that he booked a ticket but is a few seconds late. This chat room feature will create many bonds and increase the good experiences of travelling for disabled students.

The next feature is probably one of the biggest future goal updates of this application and that is to have this application run without any data or wifi connections. This update would make sure that even through load shedding and student data expiring it will not put any disabled student to a disadvantage when it comes to travelling to their place of residence.

More advanced updates can be added in the future as well like an emergency contact button. So, if anything significant happens where the disable student needs to be rushed to hospital because something happened on their way to catch the bus they can use this button and one of the bus drivers for that particular campus can respond to the emergency call and transport the student to the necessary destination. But keeping in mind that there can also be smaller future updates like students being able to give the bus drivers ratings

and these ratings will indicate to CPUT who specifically is doing a good job transporting the disabled students and who of them are not.

As we all know updates need to be unique and creative so that it not only keeps up with modern technology but will make the application stand out more compared to potential competitors. Therefore, one of our future updates to this application would be a buddy system whereby non disable students can apply to pair up with disabled students living in the same residence and they will be a helping hand towards the person they are paired with. The reason for this update is that sometimes we do not really know how tough it can be for disabled students living the student life so to have someone there not only helping them on and off the bus but to lighten their load by helping them carry textbooks and lunch meals. The most amazing thing about this feature is that it can branch out to so much more like the forming of study groups and disable students feeling like they are not fighting their battles alone.

Many future updates to this application were mentioned and many more creative ideas will come up along the way, but the most important function of this application remains the same and that is making things easier for the life of a disabled student.

13. Contact Details of Developers

Application user (students) can use these contact details to contact one of the developers if they experience any problems with the mobile applications, or if they want toe get more informed about our mobile application.

Developer Names	**Contact information**
Breyton Ernstzen	Cell No: 071 351 4210 Email: breytonseanernstzen1224@gmail.com
Zubair Esau	Cell No: 073 087 8922 Email: esau.zubair98@gmail.com
Zaakirah Fakier	Cell No: 084 629 1213 Email: zaakirahfakier207@gmail.com
Siphosethu Feni	Cell No: 065 659 8622 Email: siphosethufeni21@gmail.com
Demi Farquhar	Cell No: 071 356 1334 Email: DemiFarquhar01@gmail.com

14. Documentation Sign off

Roles	Name	Student Number	Dates of Sign-off
Group Leader	Breyton	217203027	10/10/2021
Group Member	Zubair	217100554	10/10/2021
Monitor	Zaakirah	220461503	10/10/2021
Scribe	Demi	220322104	10/10/2021
Group Member	Siphosethu	217237614	10/10/2021

15. References

Evans, T., 2001. *TimothyDEvans.* [Online]
Available at: http://www.timothydevans.me.uk/sysdoc.html
[Accessed 10 October 2021].

Peterson, R., 2021. *Guru99.* [Online]
Available at: https://www.guru99.com/er-diagram-tutorial-dbms.html
[Accessed 30 September 2021].

Satzinger, J., Jackson, R. & Burd, S., 2016. *System Analysis and Design - In a changing world.* 7th ed. Boston: Cengage Learning.

Sharma, P., 2021. *Your Article Library.* [Online]
Available at: https://www.yourarticlelibrary.com/management/mis-management/system-documentation-features-purpose-and-contents-mis/70408
[Accessed 10 October 2021].