FACULTY OF COMPUTING
UTM Johor Bahru

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SYSTEM ANALYSIS AND DESIGN

PROJECT PHASE 2

UrbanRide

(ADVANCED PUBLIC TRANSIT SYSTEM)

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1.0 Overview of the project

The administration of the vehicles in and around UTM falls under the purview of UTM Fleet, a vital department. They frequently gave pupils transportation to and from school, the library, and athletic facilities. Not only that, but they also allow outsiders to rent it out in an effort to market UTM and their brand. We'll find out abouttheir unit management practices and any comments made about them. This project undoubtedly ascertains the necessary facts that can support the functioning system.

We are presently interviewing Mr. Afiq, the Legal Officer of UTM Fleet, to get precise information about the current system. He undoubtedly knows a great deal about his team and unit, thus the information he gave us is trustworthy. According toMr. Afiq's claims, we now have a solid command over 5W1H after receiving the essential data. Next, we list the difficulties that UTM students have sent us and describe our experience resolving them. As such, it is our responsibility as analysts to provide a solution.

The process of the system we wish to design may then be visualised and transferred to a high-level Data Flow Diagram (DFD). Nonetheless, we need to figureout the input, process, and output before we can put together the data flow diagram. By performing this action, the Data Flow Diagram will become more organised, transparent, and intelligible to those outside the project. After the context diagram is built, data flows, data storage, and procedures are represented using data flow diagrams, which include parent and child diagrams. A level 0 diagram is a rupture of a context diagram, sometimes referred to as the parent diagram. Each process has an integer allocated to it. The primary data store and all external entities are shown
in the parent diagram. To create a child diagram, every process in the parentdiagram
will be broken apart.

2.0 Problem Statement

1. Accuracy of arrival time of the bus.

   While UTM Fleet publishes a table detailing bus movements and the period oftime it takes for buses to go between locations inside UTM Smart, this information is insufficient for staff, students, and other users to plan their travel schedules. This is because of unanticipated occurrences that occur along the bus route. For example, if there is an accident on the bus route, the movement of the bus will undoubtedly be delayed, and the students are unaware of this. Second, we cannot guarantee that the traffic will remain in the same pattern throughout the day. There may be events near the UTM, which might cause traffic problems and delay the bus's arrival to its destination.

2. Availability seat of the bus

   Passengers often find themselves in a situation where they lack adequate information about seat availability on the bus they intend to board. This lack ofclarity can lead to confusion and inconvenience as they are left unaware of how many seats are still open for their desired journey. Consequently, if all seats are occupied, it significantly impacts the passengers' travel experience, causing delays and forcing them to wait for the next available bus, which could mean a wait of approximately an hour. For students, this waiting time translates into precious minutes lost that could have been utilised more productively for academic pursuits, meals, or completing assignments. Hence,the inefficiency in communication regarding seat availability not only disrupts travel plans but also represents a missed opportunity for passengers, especially students, to allocate their time effectively towards more pressing priorities.

3. Uncertainty factor

   When unforeseen events happen without warning and users are left in the dark regarding the state and progress of their planned bus trip, they frequentlyfind themselves in a frustrated scenario. I can speak from personal experience when I say that there have been times when I was waiting at the bus stop without realising what was going on because of odd occurrences likehigh traffic or flat tires on buses. This lack of knowledge not only makes it difficult for me to plan well, but it also throws off my time management, leadingto needless delays and possible annoyance. I have little option but to put up with the uncertainty and its effects on our schedules if there are no real-time information or notifications regarding these unanticipated conditions.

4. Line changes

   As we know, UTM Fleet has meticulously curated the table of contents of theirbuses within the UTM smart system. This system not only showcases the routes each bus takes for the daily commute of the students but also ensures that the buses adhere strictly to their assigned zones, prioritising efficiency over individual preferences. However, if a situation arises where a bus requires maintenance, passengers face the inconvenience of not receiving timely notifications about the issue. Consequently, this lack of communicationleads to wasted time as students unknowingly await buses that are out of service for a certain period. The importance of transparent communication between the fleet management and passengers cannot be overstated, as it directly impacts the overall transportation experience for the UTM community. Effective notification systems are pivotal in minimising disruptions and enhancing the reliability of the bus service, ultimately contributing to a smoother and more convenient journey for all those reliant on the UTM busesfor their daily commute.

5. Bus do not stop for people at bus stop

   Users occasionally find themselves in scenarios where they have to wait a long time for a bus, just to have their dreams shattered when the bus they are anxiously waiting for doesn't arrive. Feeling discouraged, they attempt to get the driver's attention by frantically waving, but the bus passes by without stopping, leaving them disappointed. Users frequently begin to doubt the dependability of the present bus service as a result of this distressing experience. The same thing usually happens when the bus driver is unsure ofwhether the people waiting at the stop are indeed waiting for that particular bus or for another one entirely. As a result, both parties' misunderstandings and poor communication add to the frustrating cycle of missing buses.

6. Rating and Feedback

   The overall level of satisfaction among consumers is greatly impacted by the inconvenience they encounter while offering feedback and ratings for the existing system. The fact that feedback is only available during office hours and that there is no help available outside of these hours to address problemsis a source of frustration for many customers. Users find it difficult to express their ideas and comments due to this communication channel constraint, which limits the system's ability to be improved based on user feedback. To improve the system's functioning and make sure it meets user expectations, itis essential to interact with users and get their input. As a result, creating easier-to-access feedback channels after hours may significantly enhance customer satisfaction and user experience.

7. Safety factors

Because there isn't a dependable way to notify people in the event of an unexpected collision, the existing system frequently puts users and drivers in risk and threatens their safety. Many people who use public transportation aregreatly discouraged from choosing public buses as their form of transportationdue to this safety problem. In an emergency, not only does the lack of an efficient communication system put passengers at risk, but it also makes themfeel uncomfortable and uneasy. Those who use the current system are plagued by the dread that they won't be able to get help when they need it since there isn't a suitable way to indicate distress.

3.0 Proposed Solution

1. Live Updating Location

   Our live updating location function was thoughtfully crafted to tackle thewidespread issue of imprecise arrival timings. Our smartphone application gives customers a thorough picture of the present state of the roads and the projected time of arrival for buses by utilizing real-time traffic data. With the help of this creative approach, travelers may now proactively plan their trips, giving them the ability to decide what to do and reducing the likelihood of delays. This kind of proactive approach not only expedites the travel process but also helps our consumers make better use of their time. Our technology isinteractive, which means that passengers have more control and assurance on their journeys, which improves their experience in general.

2. Availability seat of the bus

   By incorporating this innovative function into our system, we can assure usersof receiving timely updates regarding the availability of seats on their chosen bus routes. This feature serves as a crucial preventive measure to shield passengers from potential discomfort caused by overcrowded buses, minimizing the inconvenience of having to endure long journeys standing
   without a seat. Our primary motivation behind introducing this functionality isto cater to the needs of individuals requiring special assistance such as the elderly, pregnant women, and passengers with disabilities. Through this enhancement, these individuals can benefit significantly by being informed about the availability of priority seating arrangements or locating seats in close proximity to essential features such as ramps or designated spaces foraccessibility.

3. Announcement and notification about the line change

   This notification is created to instantly pop up on the screen and notify users of any changes made to the transit tracks, along with a detailed explanation ofthe reasons for such changes. This function makes sure that those who are staying close to UTM are always aware of the latest happenings. Our users may adjust their travel arrangements by obtaining timely updates about changes to the lines. This preventive action gives them the ability to look into other routes, account for additional travel time, or modify their plans as needed. Essentially, the app functions as a trustworthy information source, helping users make educated decisions based on the real-time data it provides.

4. Booking system for users

   We created an easy-to-use booking system with our users in mind, so they can enjoy an outstanding experience starting from the time they get to the busstop. When customers arrive at the bus stop, they have access to a detailed display that includes a list of all the buses that are planned to stop there in thenear future, along with an estimate of their arrival time in real time. Users mayeasily book a seat for themselves on a desire bus by clicking on the 'Selectthis bus' icon, which is similar to how easy and familiar it is to buy a ticket in amovie theater. This cutting-edge system not only makes boarding easier, but it also makes sure that every bus that is supposed to stop at the station really does, which improves operational effectiveness and gives passengers peace of mind.

5. Rating and Feedback section

   User feedback is extremely important to us since it gives us important insightsthat we utilize to improve our services over time. Through a detailed analysis of the comments, we are able to identify the precise areas that will need to beimproved in future experiences. These criteria mainly include the entire travel experience, comfort, accessibility, driver conduct, cleanliness, and timeliness.This input also has a dual benefit as it helps pinpoint areas for improvement and makes a significant contribution to the continuous evaluation and development of our system and service quality. By means of this thorough assessment procedure, we are able to precisely identify the essential elements that require improvement, opening the door for a steady
   improvement trajectory across our services.

6. Emergency button

An essential safety component that greatly improves user well-being are emergency buttons. These buttons are important because they provide a direct channel of communication to our company's management and emergency services, such as the police and ambulance, in the event of an emergency that may happen during a bus ride. Furthermore, we have meticulously designed our buses so that all passengers, including those withimpairments or limited mobility, may readily utilize these buttons. This
all-inclusive strategy ensures that everyone on board has the resources necessary to get help quickly in an emergency. These preventative safety measures highlight our steadfast dedication to creating a safe environment forour consumers.

4.0 Information gathering process

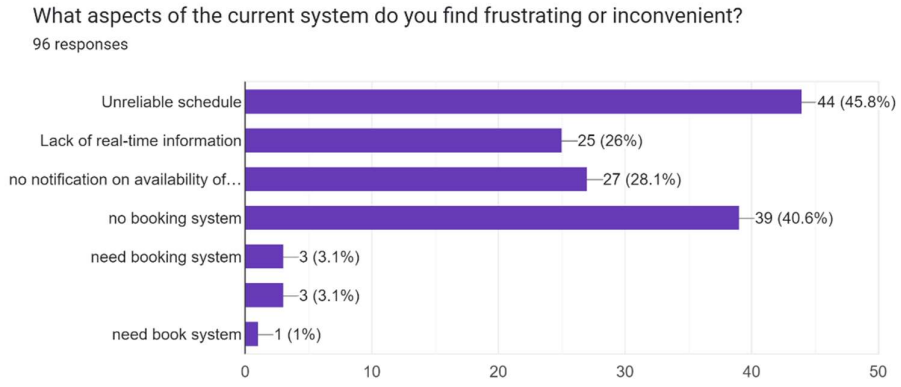
Information collection is necessary to understand users' needs and current system's problems.We collect those information from 104 users who use current public transportation system in UTM and legal officer of UTM Fleet,Mr Afiq.

4.1 Method used

To understand users' needs and analyst problem,we use questionnaire on massive scales of users,and interview with Mr Afiq.In the questionnaire,we employ close-ended questions to increase efficiency and to control big scale of sample.In the interview,we employ open-ended questions to give interviewee freedom to response and to obtain more detail on current system.

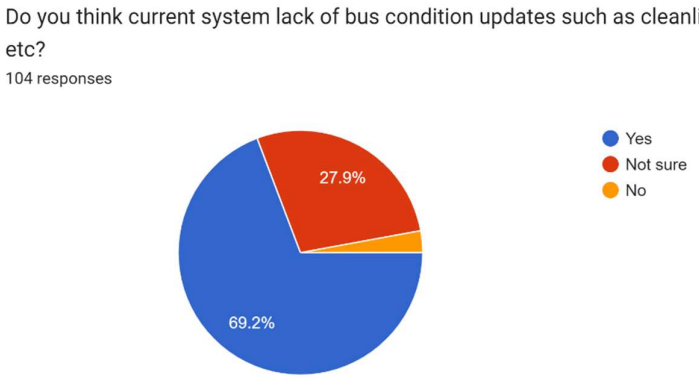
4.1.1 Questionnaire

Question 1:What aspects of the current system do you find frustrating or inconvenient?



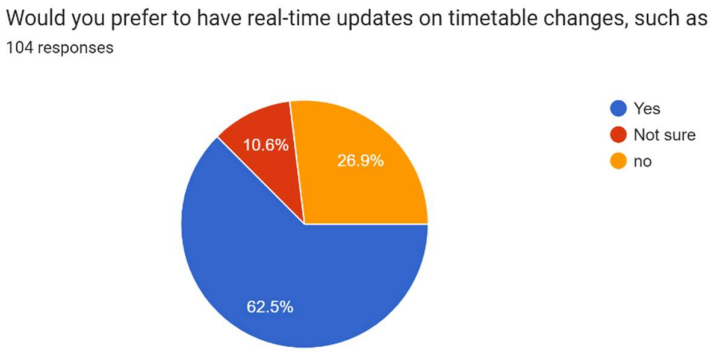
According to the responses from respondents,the majority of respondents think that the schedule feature in current system is unreliable,those responses account for 45.8% of total responses.Besides,there is 26% of respondents think that there is lack of real-time information because in current system the information is fixed and not frequently updated.There is 40.6% of respondents feel inconvenient because there is no reservation system in current system.

Question 2: Do you think current system lack of bus condition updates such as cleanliness, seating availability, etc?



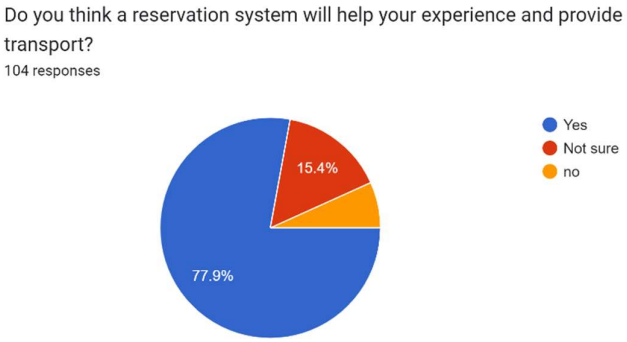
From the data we received,there is 69.2% of respondents think current system lack of condition of the bus update,such as cleanliness,seating availability.It is because bus condition update feature could increase users' convenience and experience on using a public transportation.For example,users is informed in advance that the bus he is about to board is already full. He can plan in advance and use the time waiting for the bus to do other things.

Question 3: Would you prefer to have real-time updates on timetable changes, such as delays or cancellations?



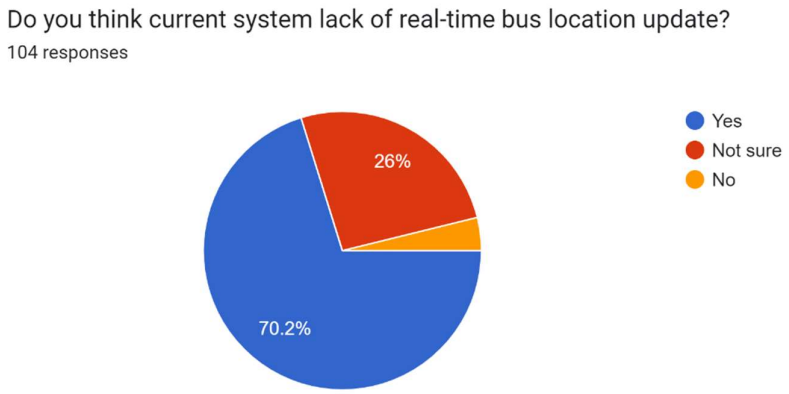
Based on the answer to the 3rd question in the survey form,there is 62.5% of users prefer to have real-time updateson timetable changes,such as delays or cancellations.It is because current system does not update schedule or service gap frequently,this often leads to false information provide to users.

Question 4: Do you think a reservation system will help your experience and provide convenience on public transport?



According to the piechart we received from the questionnaire,77.9% of users think that a reservation system will help improve their experience and convenience.On public transport.Currently there is a lot of complaints about drivers often skip a bus stop without reasons or while a bus stop at a bus stop,there is no users,this could cause users and drivers waste time,but with a reservation system,users can notify drivers that a certain bus stop have users await,this could increase efficiency for everyone.

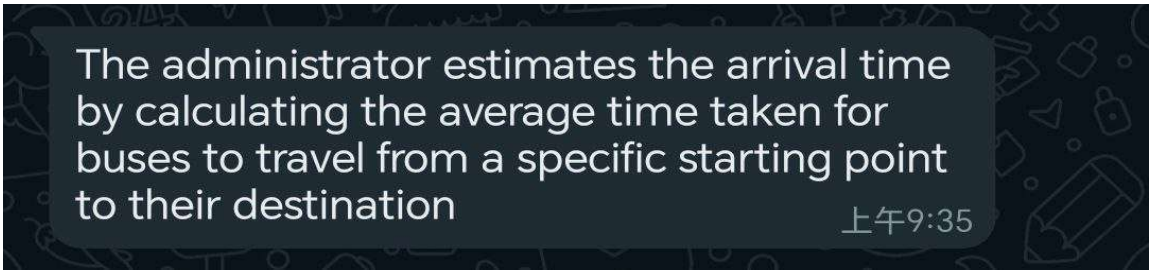
Question 5: Do you think current system lack of real-time bus location update?



From the data obtained,the respondents find it helpful to have a GPS tracking feature that allows users to track the real-time location of the buses,it provide safety and security by knowing the exact location of buses can enhance safety and security for passengers, especially during late-night or low-visibility conditions. It also helps in the event of emergencies or accidents.

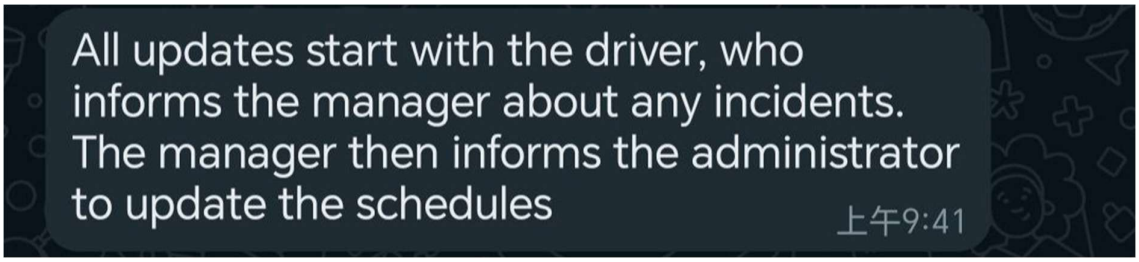
4.1.2 Interview

Question 1: How does the administrator estimate the arrival time of the bus?



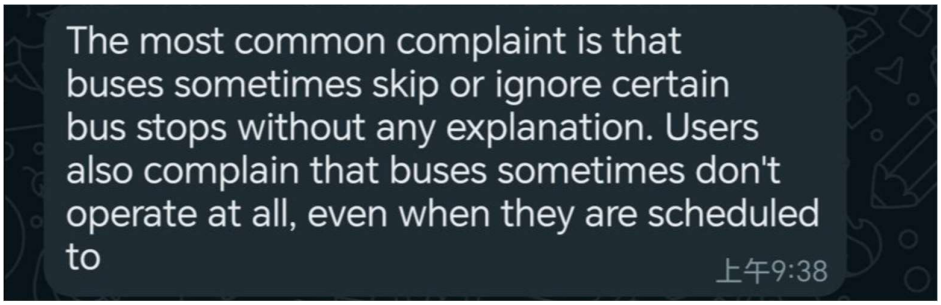
From the interview,Mr Alif state that The administrator estimates the arrival time by measuring the time it takes for the bus to travel from a specific starting point to its destination. However, this method may not provide accurate arrival times in cases of road uncertainties.

Question 2:How do the administrator update the line change and newest schedules?



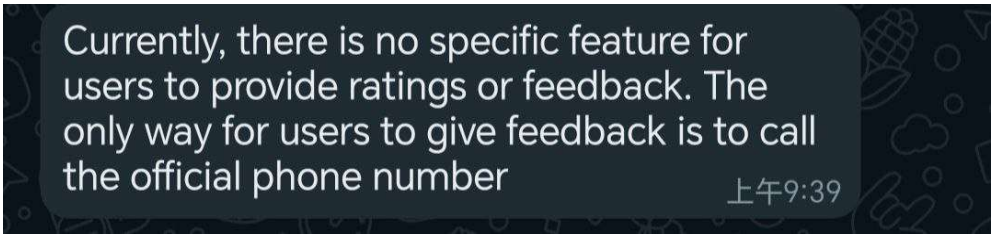
Based on the response in the interview,Mr Alif said that the line changes and schedule updates start with the driver, who informs the manager. The manager then informs the administrator, who logs into the system to make modifications. Finally, announcements are made via email to all users. This complicated procedure for updates leads to infrequent updates and makes it hard for users to access accurate information.

Question 3:What is the most common complain you received from users when they using current system?



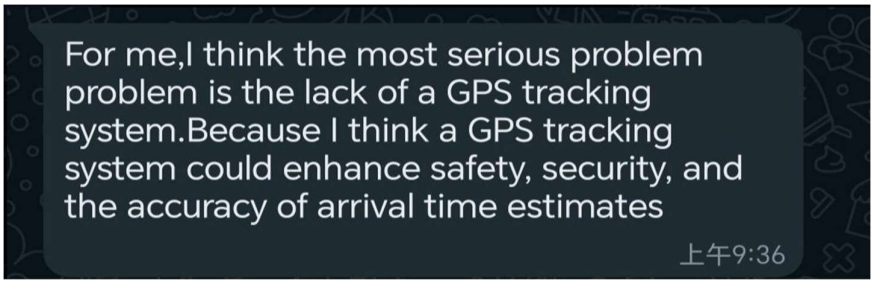
The response show that the most common complaint is that the current system does not notify drivers about passengers waiting at certain bus stops. This leads to unnecessary complaints and wasted time.

Question 4: How do user make rating or feedback?



From the response received,we know that in current system,users can only provide feedback by calling UTM Fleet's official phone number. There is no specific feature in the current system for users to rate or give feedback. This makes it challenging for administrators to analyze and identify problems or make improvements because there is no specific feature for administrator to store and organize feedback.

Question 5: What do you think is the most serious problem with your system?



The response shows that The lack of a real-time location tracking system for buses is the most serious problem. A real-time tracking system would enhance safety and security for passengers, especially during late-night or low-visibility conditions, and help in emergencies or accidents. Additionally, a GPS system would help administrators identify road situations, such as accidents or roadblocks, allowing them to estimate accurate arrival times by receiving information about the road and route length.

5.0 Requirement Analysis

5.1 Current process (scenarios, workflow)

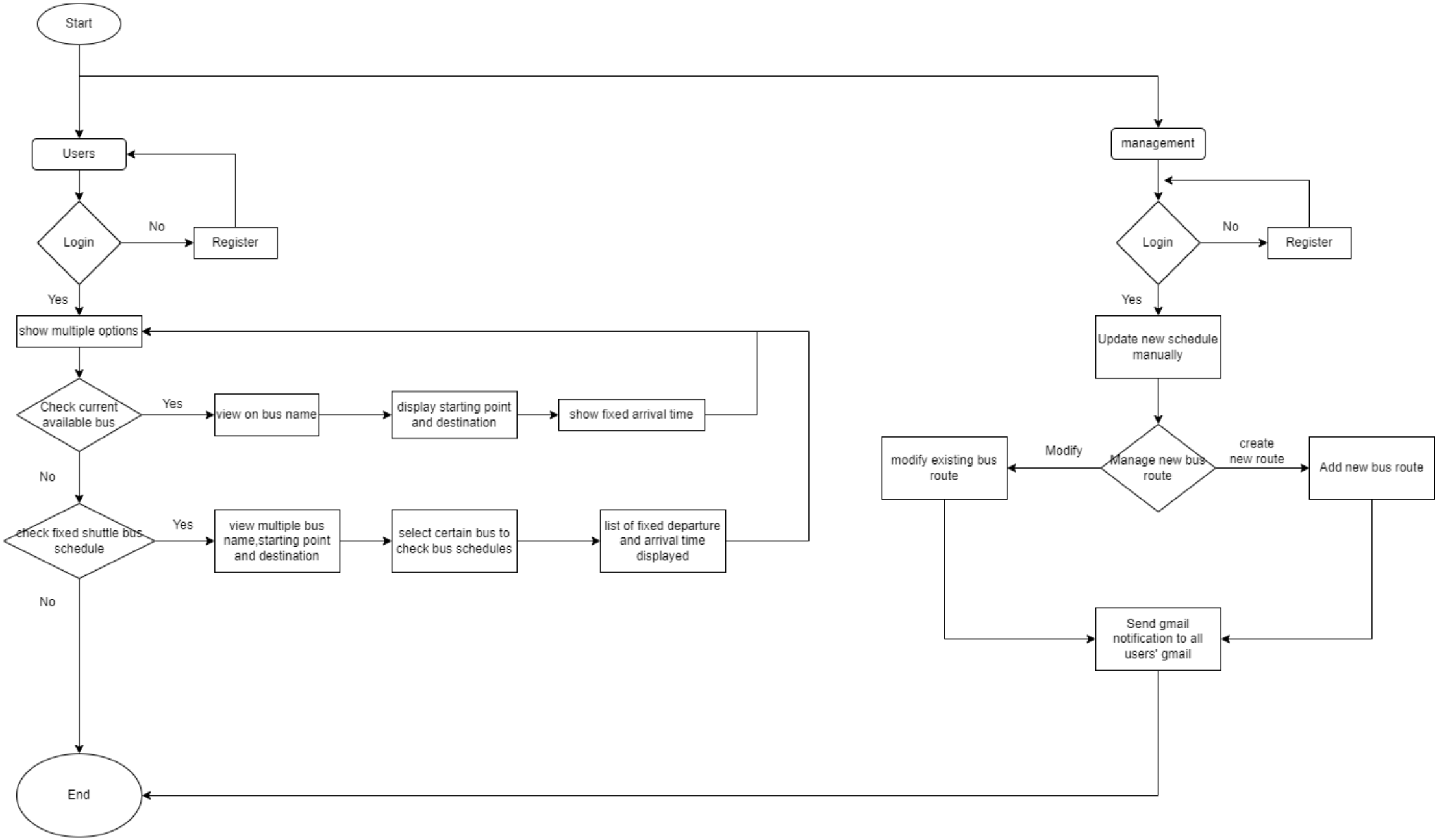
Here are the scenarios and workflow of current process for users on checking UTM bus operation:

1. Login into UTM Smart
2. Multiple option are displayed on the main menu
3. Option for checking current available bus
   3.1 View on bus name(example:A1,A2..)
   3.2 starting point and destination displayed
   3.3 show fixed arrival time

4. Option for checking fixed shuttle bus schedules
   4.1 View multiple bus name,starting point and destination
   4.2 select certain bus to check bus schedules
   4.3 list of fixed departure and arrival time displayed
   4.4 Check the time when there is currently no service or gaps in service

Here are the scenarios and workflow of current process for administrator in UTM Fleet to announce new schedule or any notification to users

1. Login into UTM Smart
2. Update new schedule manually
3. Manage new bus routes by changing starting point and destination
   3.1 Add new bus routes or modify existing ones
4. Send email notification to all users'gmail(ending with @graduate.utm.my) in UTM to announce newest updates launched



AS-IS System Workflow

5.2 Functional Requirement (Input, process output) (AS-IS)

5.2.1 Context Diagram

PROCESS	INPUT	OUTPUT
UTM Bus transportation system	Request to check bus schedules Request to check current available bus Bus's condition or personal issues Bus's newest changes	Newest bus's informations Shuttle bus schedules Bus's newest changes

5.2.2 Level 0 Diagram

PROCESS	INPUT	OUTPUT
Check current available bus	Request to check current available bus Bus's estimated arrival time Currently available bus	Newest bus's informations
Check fixed shuttle bus schedules	Request to check bus schedules Bus's schedules	Shuttle bus schedules
Contact management	Bus's condition or personal issues	Bus's newest changes
Update new schedules and new bus routes	Bus's newest changes	Newest Bus's informations(based on bus or driver's situations

5.2.3 Level 1 Diagram

5.2.3.1 Process 1: Check current available bus

PROCESS	INPUT	OUTPUT
Get information from databases	Request to check bus current available bus Bus's estimated arrival time Currently available bus	bus informations
Show starting point,destination and fixed arrival time	Bus informations	Organized newest bus's informations

5.2.3.2 Process 2: Check fixed shuttle bus schedules

PROCESS	INPUT	OUTPUT
Get newest bus schedules from databases	Request to check bus schedules Bus's schedules	Unorganized bus's schedules
List fixed departure,arrival times and gaps in services	Unorganized bus's schedules	Shuttle bus schedules

5.2.3.3 Process 3: Contact management

PROCESS	INPUT	OUTPUT
Validate informations	Bus's condition or personal issues	Validated informations
Notify management	Validated informations	Bus's newest changes

5.2.3.4 Process 4: Update new schedules or new bus routes

PROCESS	INPUT	OUTPUT
Validate newest change	Bus's newest changes Current bus's informations	Validated newest bus schedules
Modify or add schedules	Validated newest bus schedules	Bus name
Manage bus route	bus name	newest bus's informations(based on bus or driver's situations)

5.3 AS-IS Non-Functional Requirement (performance and control)

- Security
  - Uses @graduate.utm.my account to log in
  - The personal information of the users is secured.
- Availability
  - Will take at least 1 day for the maintenance if anything unexpected things happen to our system.
  - Available on play store and app store.
- Portability
  - Support Android 10 and above and iOS 10 and above.
  - Can use browsers if you don't want to download the app such as Google Chrome and Firefox.
  - Internet connection required.
  - Minimum memory is 3GB.
- Reliability
  - In a week, there will be 1 day of weekly maintenance for the sake of our users to improve our system.
  - If an extreme problem occurs, we will take down the app for maintenance immediately.
- Usability
  - Only few features are understandable and easy to use.
  - User-friendly application interface.

AS-IS Context Diagram

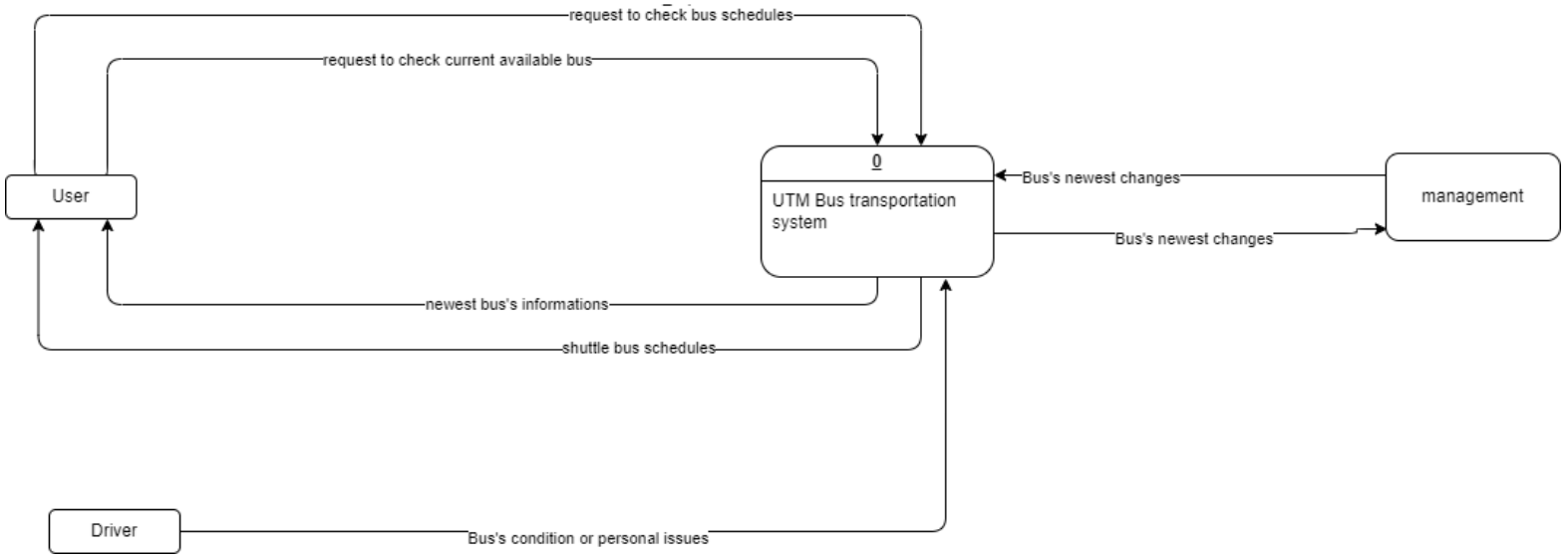
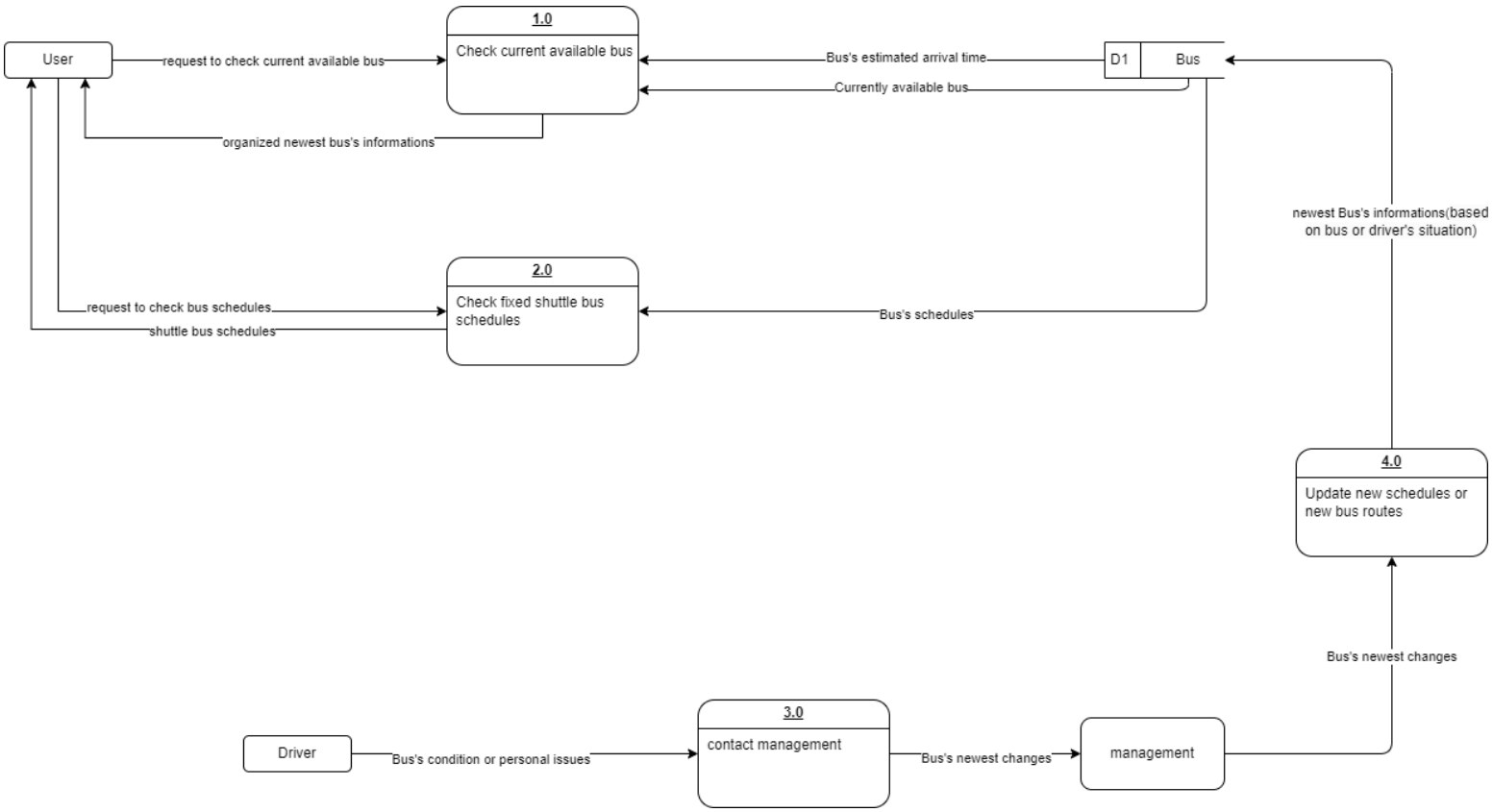
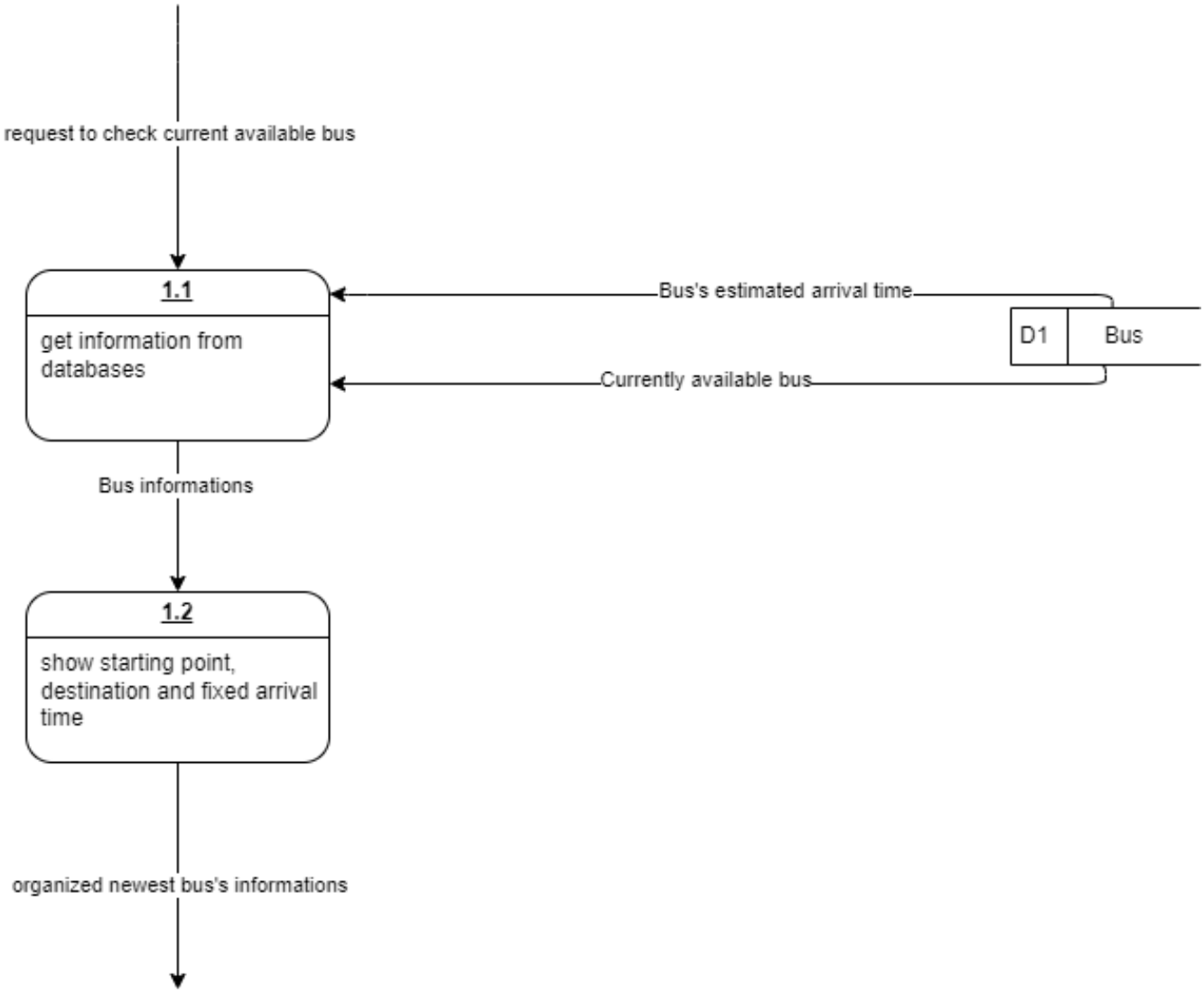


Diagram 0


User
request to check current available bus
1.0
Check current available bus
Bus's estimated arrival time
Currently available bus
D1
Bus
organized newest bus's informations
newest Bus's informations(based on bus or driver's situation)
request to check bus schedules
shuttle bus schedules
2.0
Check fixed shuttle bus schedules
Bus's schedules
4.0
Update new schedules or new bus routes
Bus's newest changes
Driver
Bus's condition or personal issues
3.0
contact management
Bus's newest changes
management

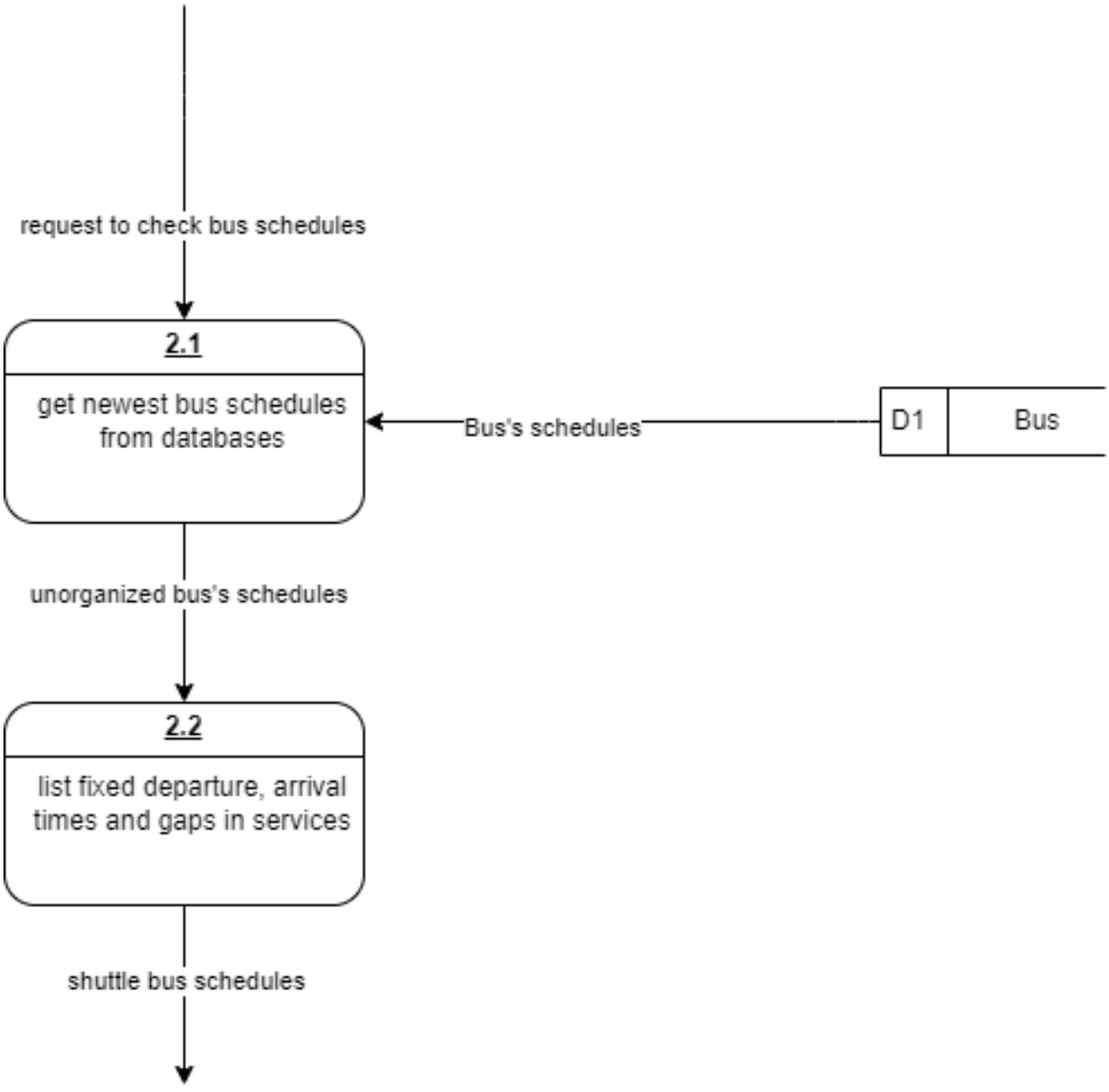
Level 1 Diagram:

Process 1: Check Current Available Bus



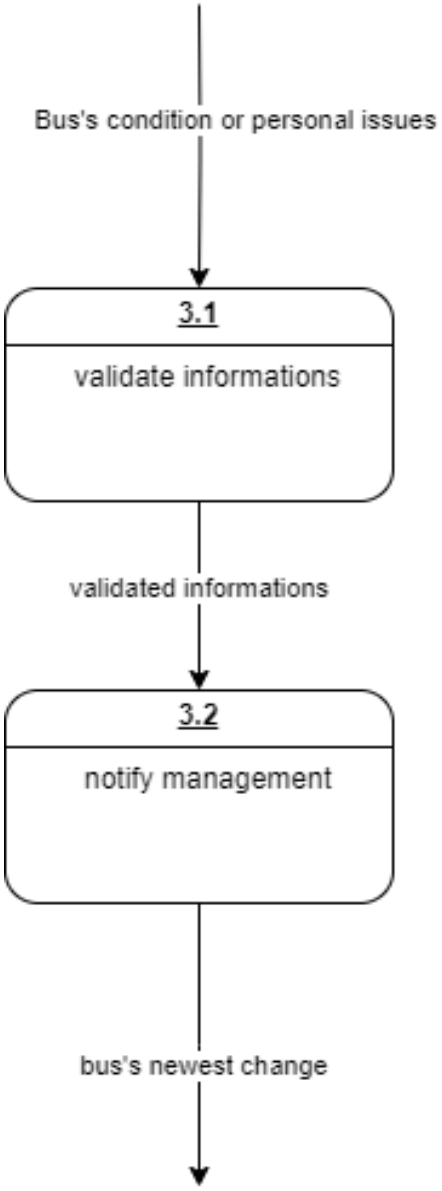
Level 1 Diagram:

Process 2: Check Fixed Shuttle Bus Schedules



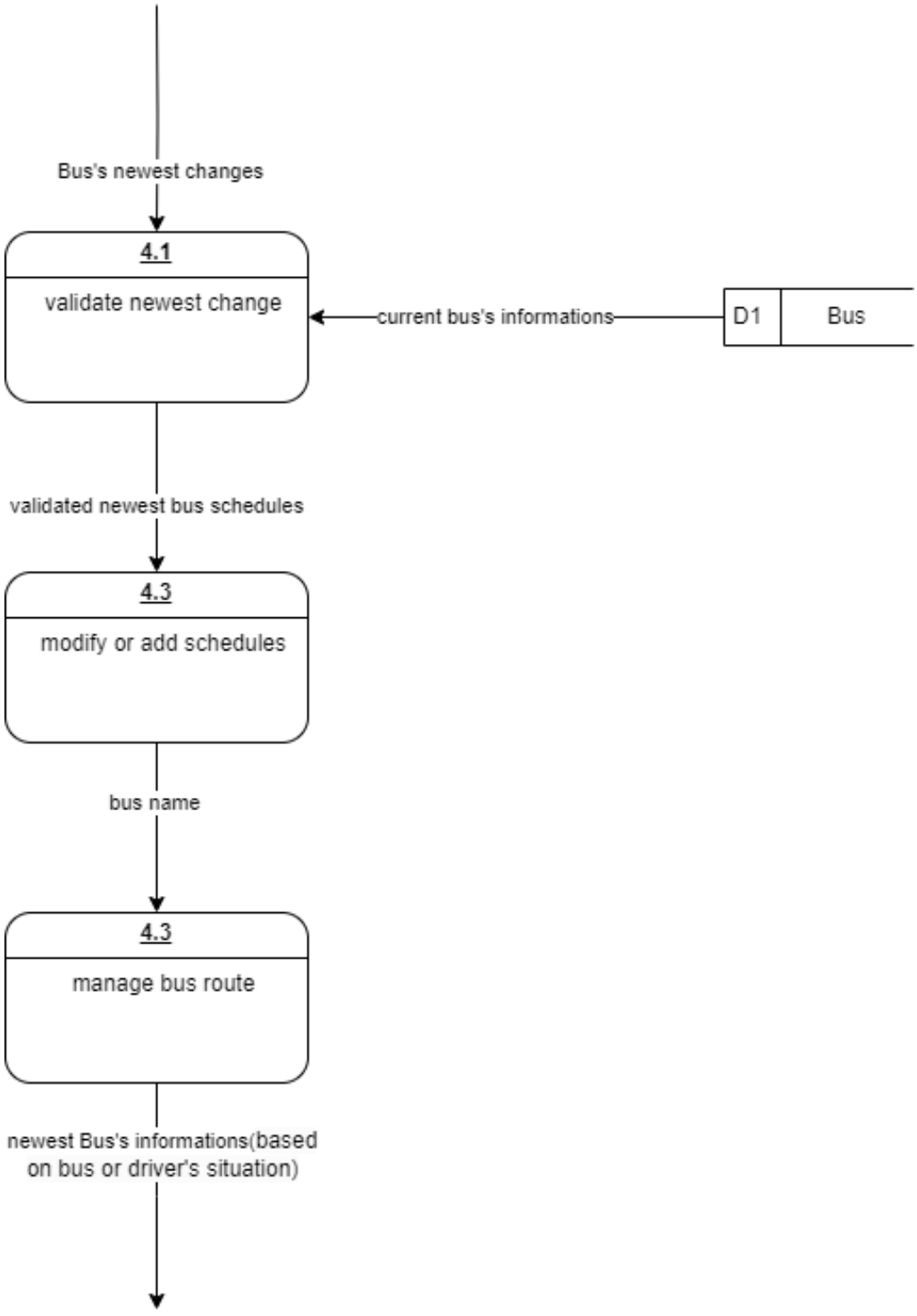
Level 1 Diagram:

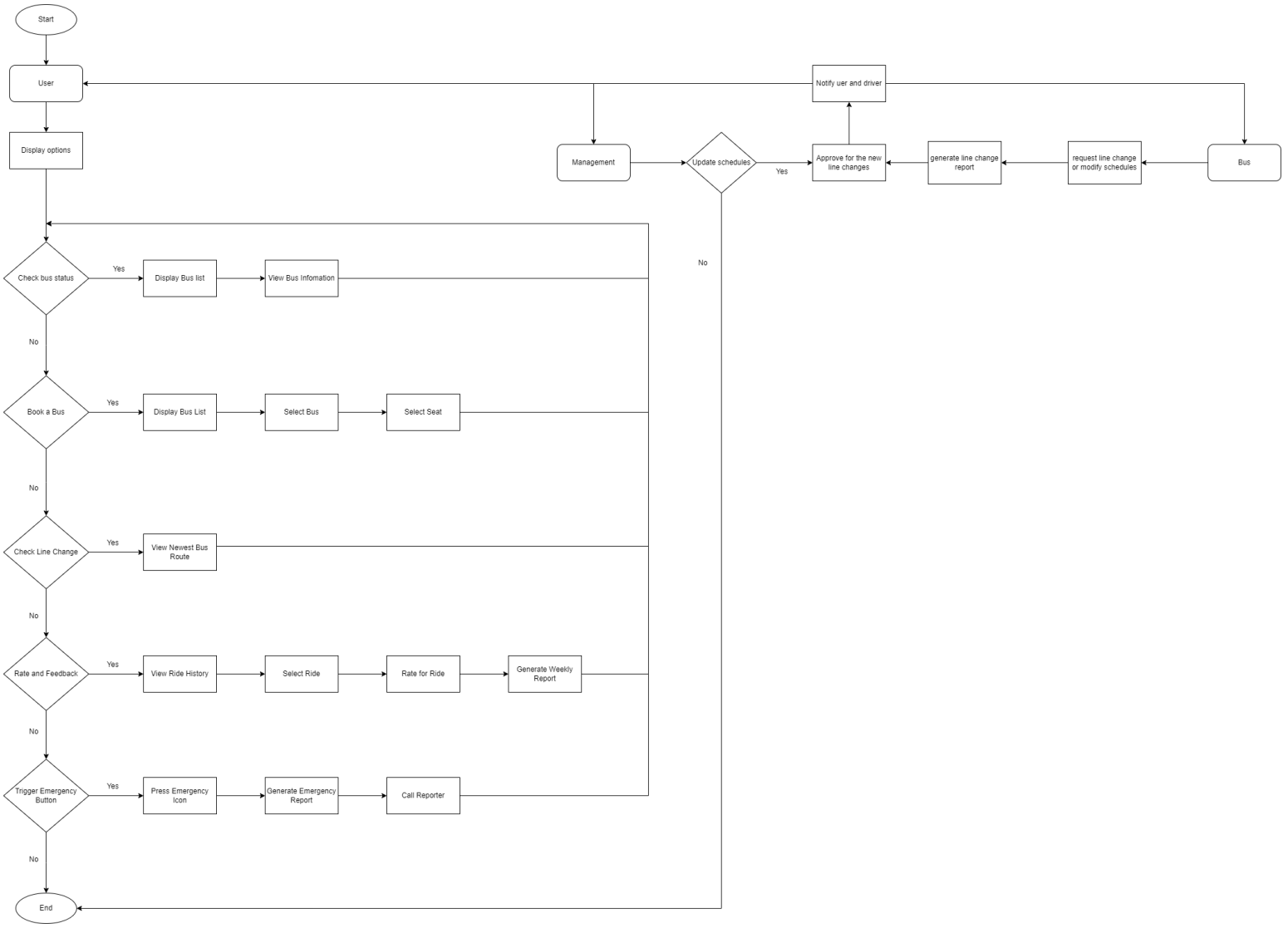
Process 3: Contact Management



Level 1 Diagram:

Process 4: Update New Schedule or New Bus Route





TO-BE System Workflow

5.2 Functional Requirement (Input, process output)

5.2.1 Context Diagram

PROCESS	INPUT	OUTPUT
UrbanRide System	User's information Bus's information Booking request User's rating Line change request	Booking information Bus's information Bus's updated information Bus's rating Ride history Emergency call Emergency report Weekly report Line change report New bus route

5.2.2 Level 0 Diagram

PROCESS	INPUT	OUTPUT
Check Bus Status	Bus's information	Bus's location Bus's estimated arrival time Bus's available seat
Book a Bus	Bus's information User's information Booking request	Booking information Bus's location Bus's estimated arrival time Bus's available seat Ride history
Check Line Changes	User's location	Bus's updated information (line changed affected buses)
Rate and Feedback	User's information Bus's information User's rating	Bus's rating Weekly report
Trigger Emergency Button	User's information Bus's information Bus's location Bus's status	Emergency call Emergency report

5.2.3 Level 1 Diagram

5.2.3.1 Process 1: Check Bus Status

PROCESS	INPUT	OUTPUT
Search Bus	Bus's information	Bus's list
Select bus	Bus's code	Bus's location Bus's estimated arrival time Bus's available Seat

5.2.3.2 Process 2: Book a Bus

PROCESS	INPUT	OUTPUT
Search Bus	Bus's information	Bus's list
Select bus	Bus's code	Bus's available seat
Select seat	Bus's available seat Selected seat Booking request User's information	Booking information Bus's location Bus's estimated arrival time Bus's available seat Ride history

5.2.3.3 Process 3: Check Line Changes

PROCESS	INPUT	OUTPUT
Search Bus	User's location	Bus's list
Select Bus	Bus's code	Bus's updated information (line changed affected buses)

5.2.3.4 Process 4: Rate and Feedback

PROCESS	INPUT	OUTPUT
View Ride History	User's information	Ride History
Select Ride	Ride history Ride code	Bus's current rating
Rate for Ride	Bus's current rating User's rating and feedback	Bus's updated rating and feedback
Generate Weekly Report	User's information Bus's previous rating Bus's updated rating and feedback	Weekly Report

5.2.3.5 Process 5: Trigger Emergency Button

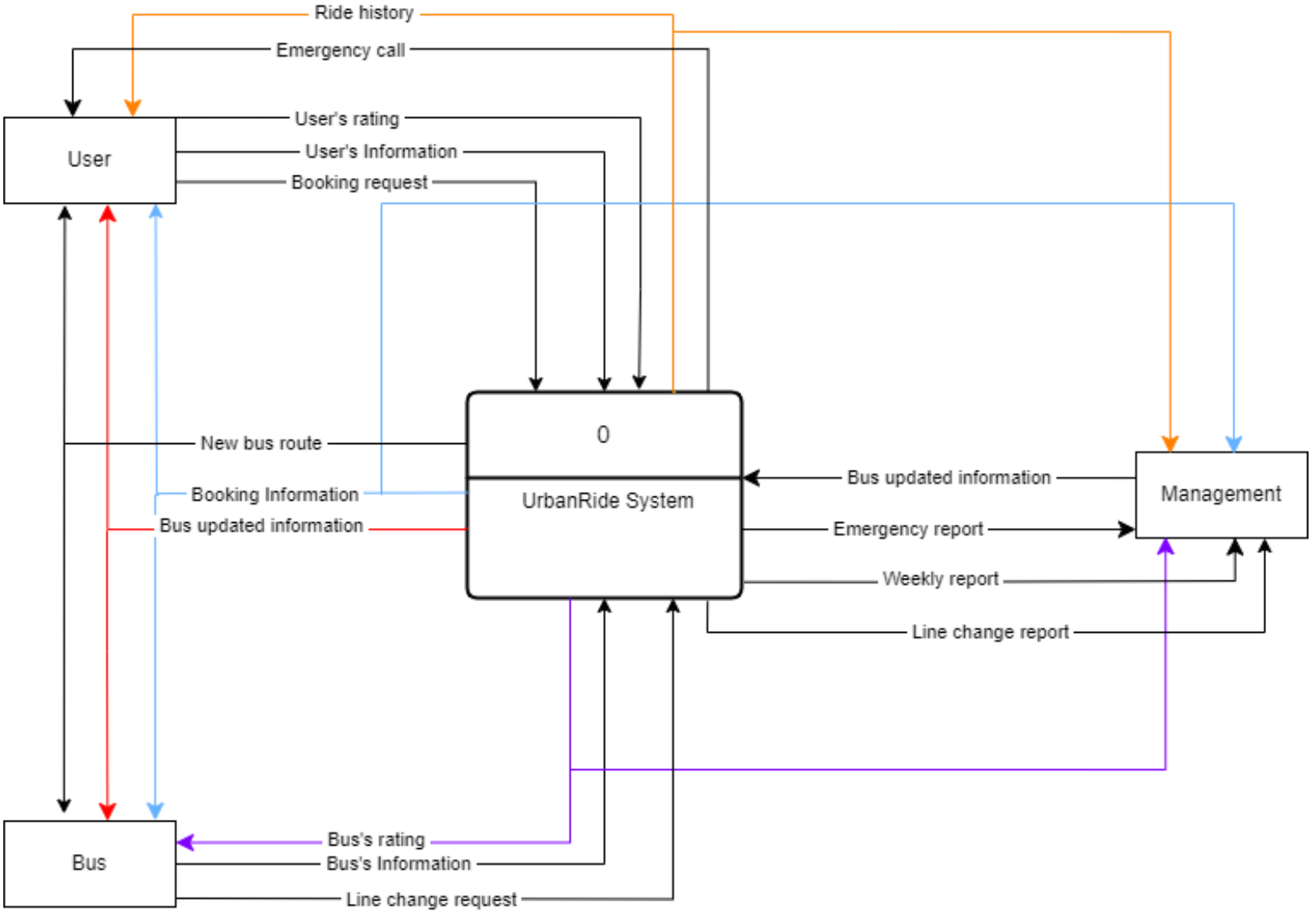
PROCESS	INPUT	OUTPUT
Press Emergency Icon	User's information Ride code	Bus's code
Generate Emergency Report	Bus's code Bus's location Bus's passenger information	Emergency report
Call Reporter	User's phone number (from user's information) Emergency call	User's phone number Emergency call

5.2.3.6 Process 6: Update Schedule

PROCESS	**INPUT**	**OUTPUT**
Request Line Change or Modify Schedule	Leave reason Leave certificate Bus issue	Line changed request and reason
Generate Line Changed Report	Line changed request and reason	Line changed report New bus route
Approve for the new line changes	Line changed report New bus route	Approval status Notification to driver
Notify user and driver	Approved bus route	New bus route (assign with another driver)

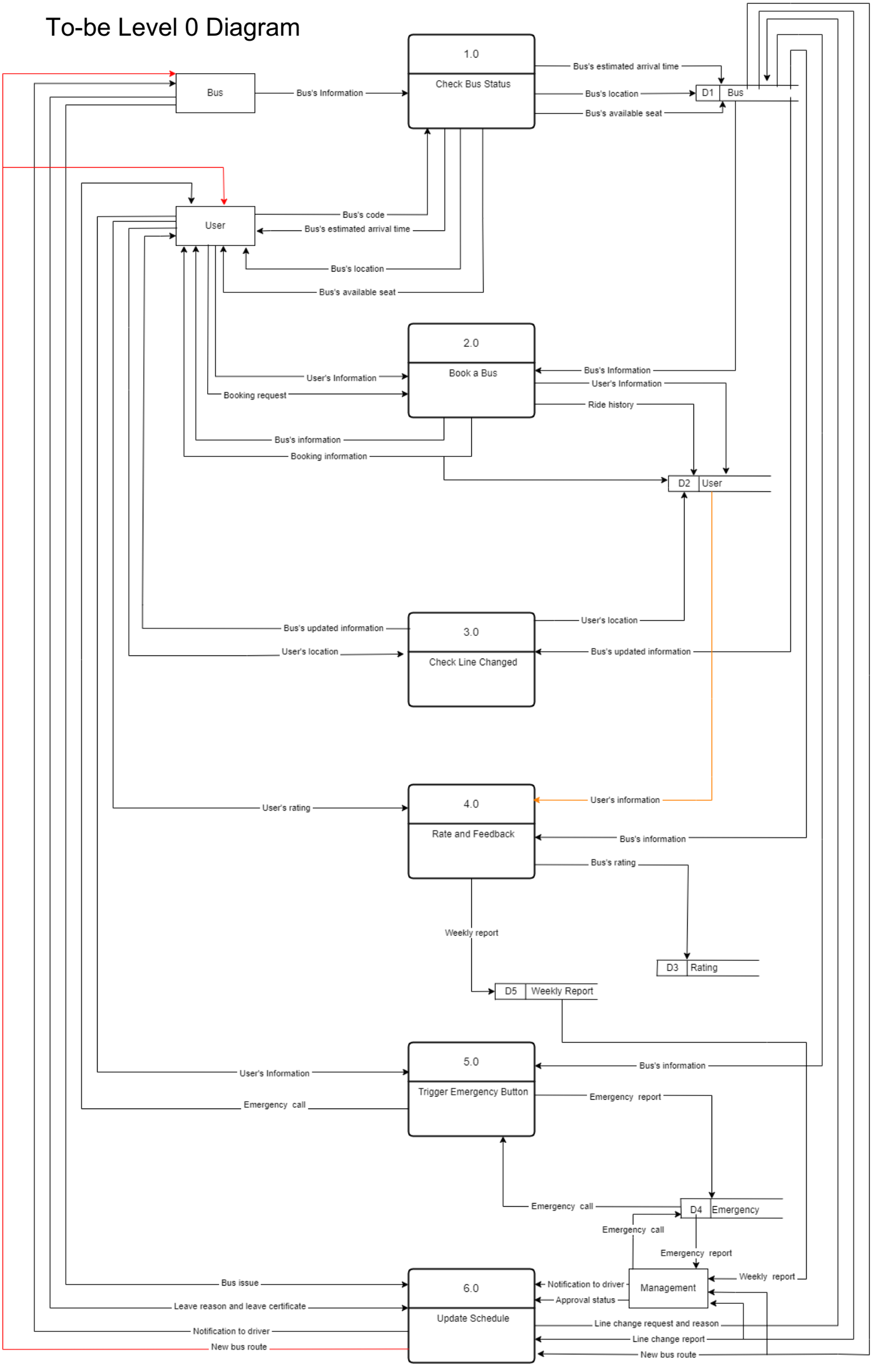
5.3 TO-BE Non-Functional Requirement (performance and control)

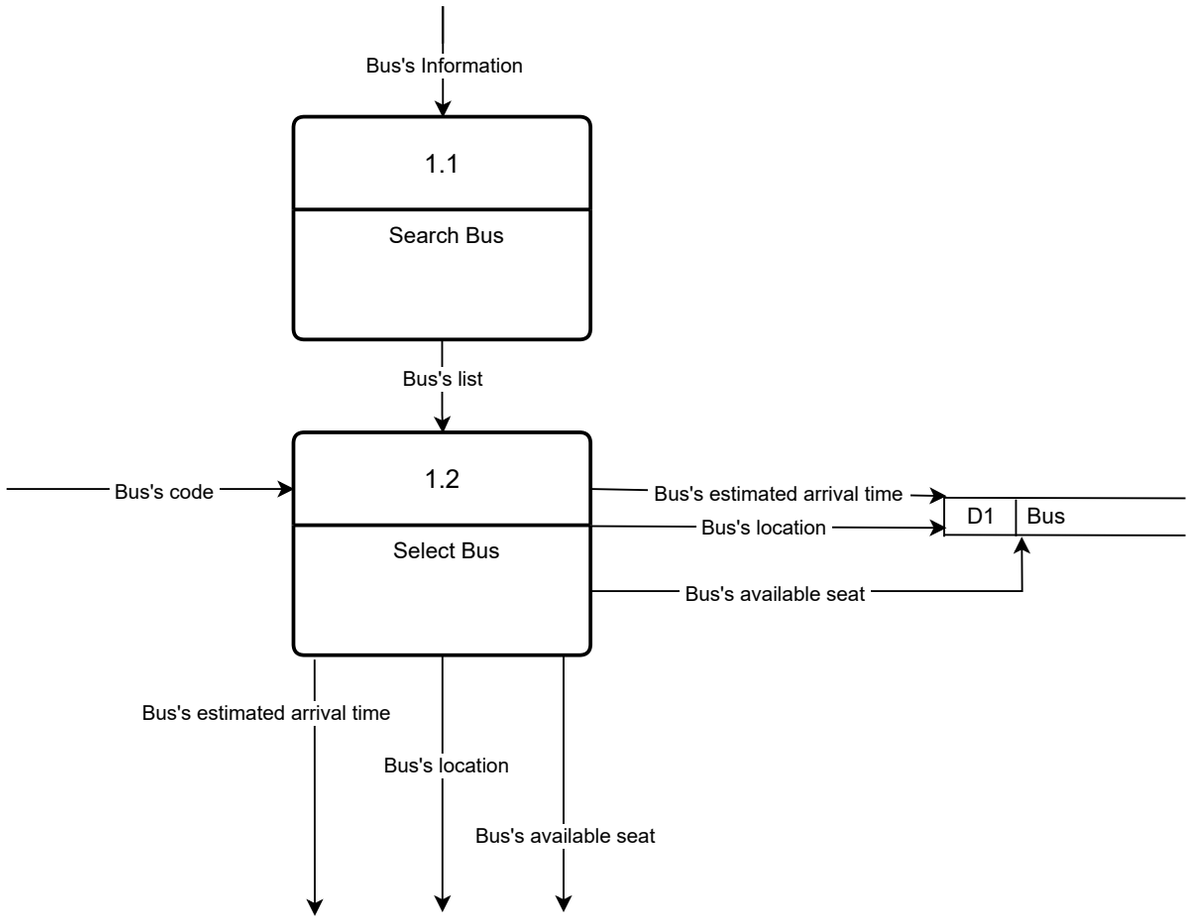
- Security
  - Uses two-verification ways to log in into the page.
  - The personal information of the users is secured.
- Availability
  - Will take around 5 hours for the maintenance if anything unexpected things happen to our system.
  - Available on play store and app store.
- Portability
  - Support Android 12 and above and iOS 11 and above.
  - Can use browsers if you don't want to download the app such as Google Chrome and Firefox.
  - Internet connection required.
  - Minimum memory is 2GB.
- Reliability
  - In a week, there will be 8 hours of maintenance for the sake of our users to improve our system.
  - If an extreme problem occurs, we will take down the app for maintenance immediately.
- Usability
  - Many features are understandable and easy to use.
  - User-friendly application interface.
  - Many graphics and visuals that will attract the user.



5.2.1 To-Be Context Diagram

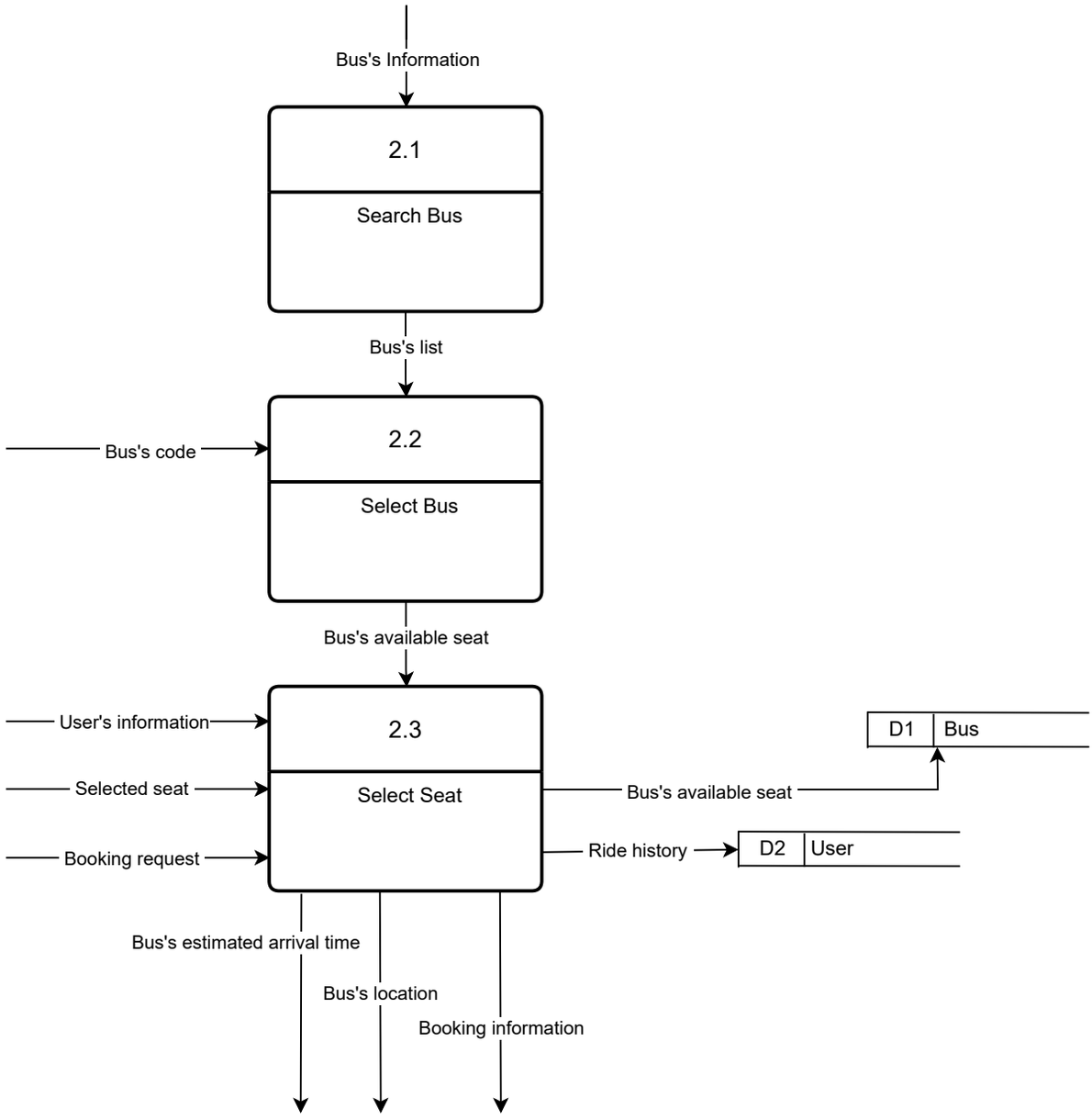
To-be Level 0 Diagram





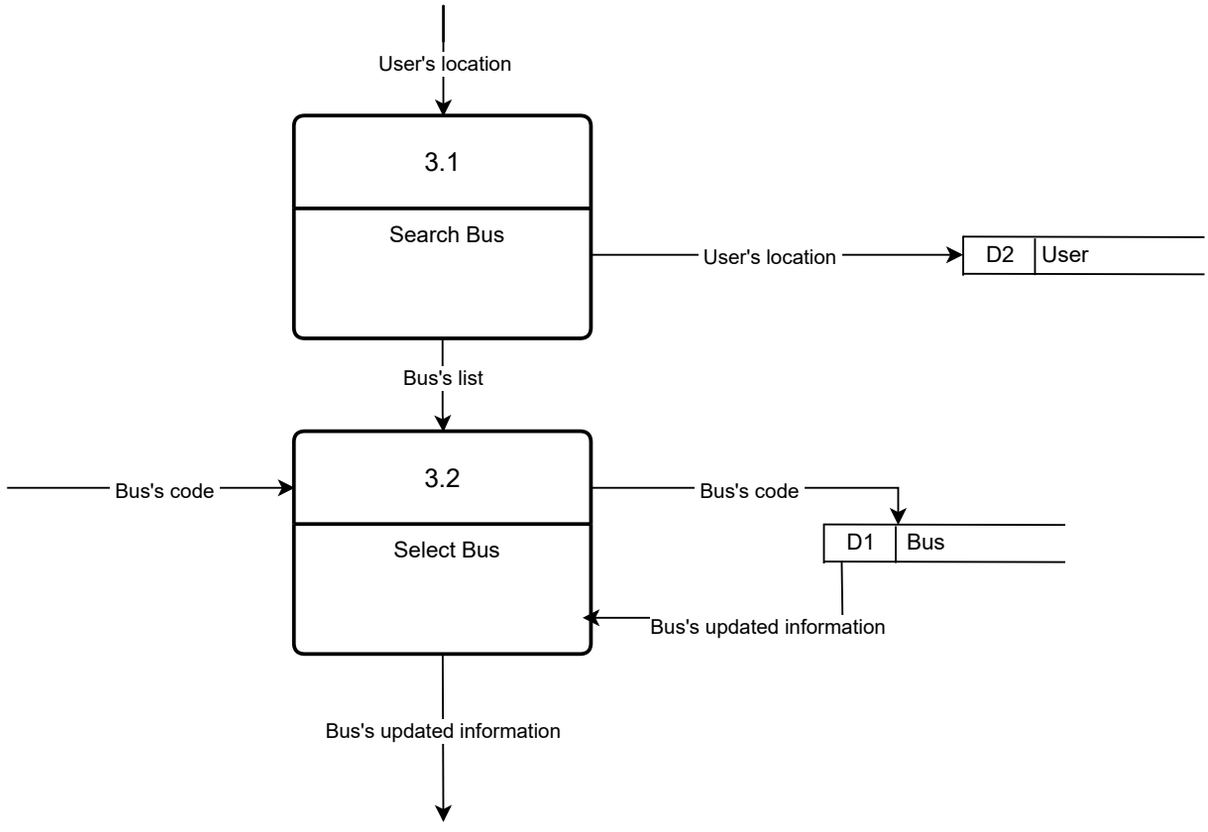
Level 1 diagram

5.2.3.1 Process 1: Check Bus Status



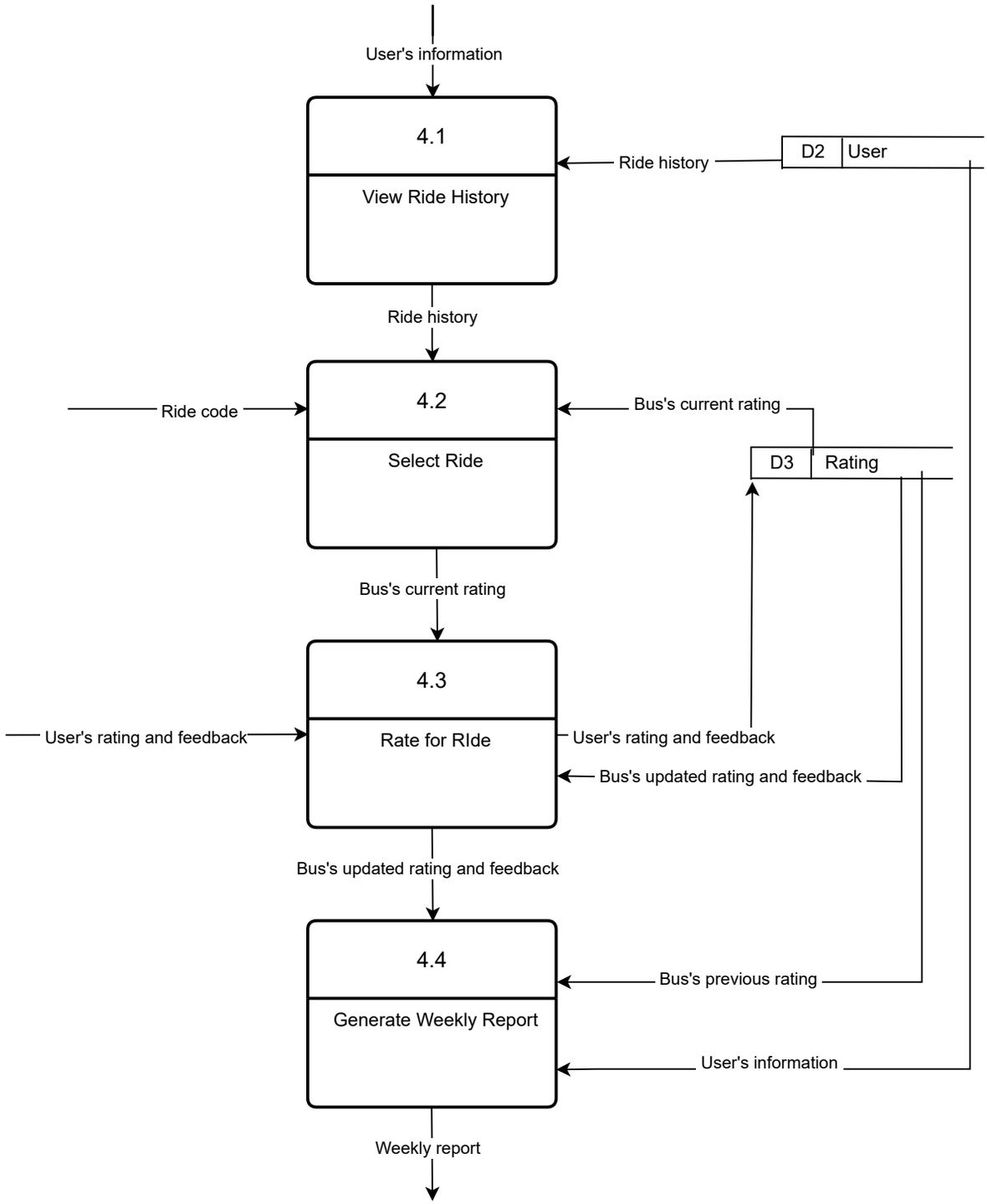
Level 1 diagram

5.2.3.2 Process 2: Book a Bus



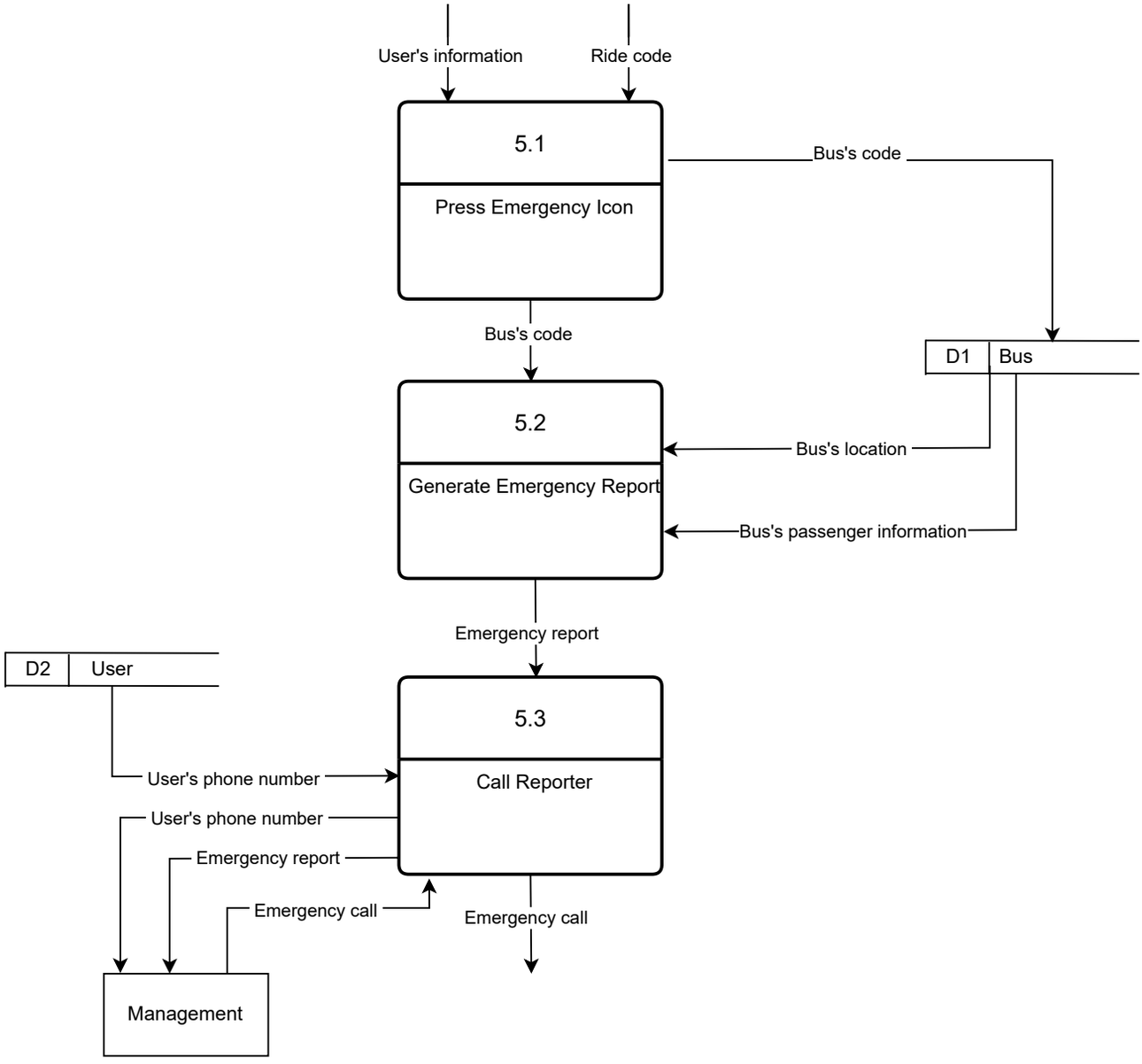
Level 1 diagram

5.2.3.3 Process 3: Check Line Change



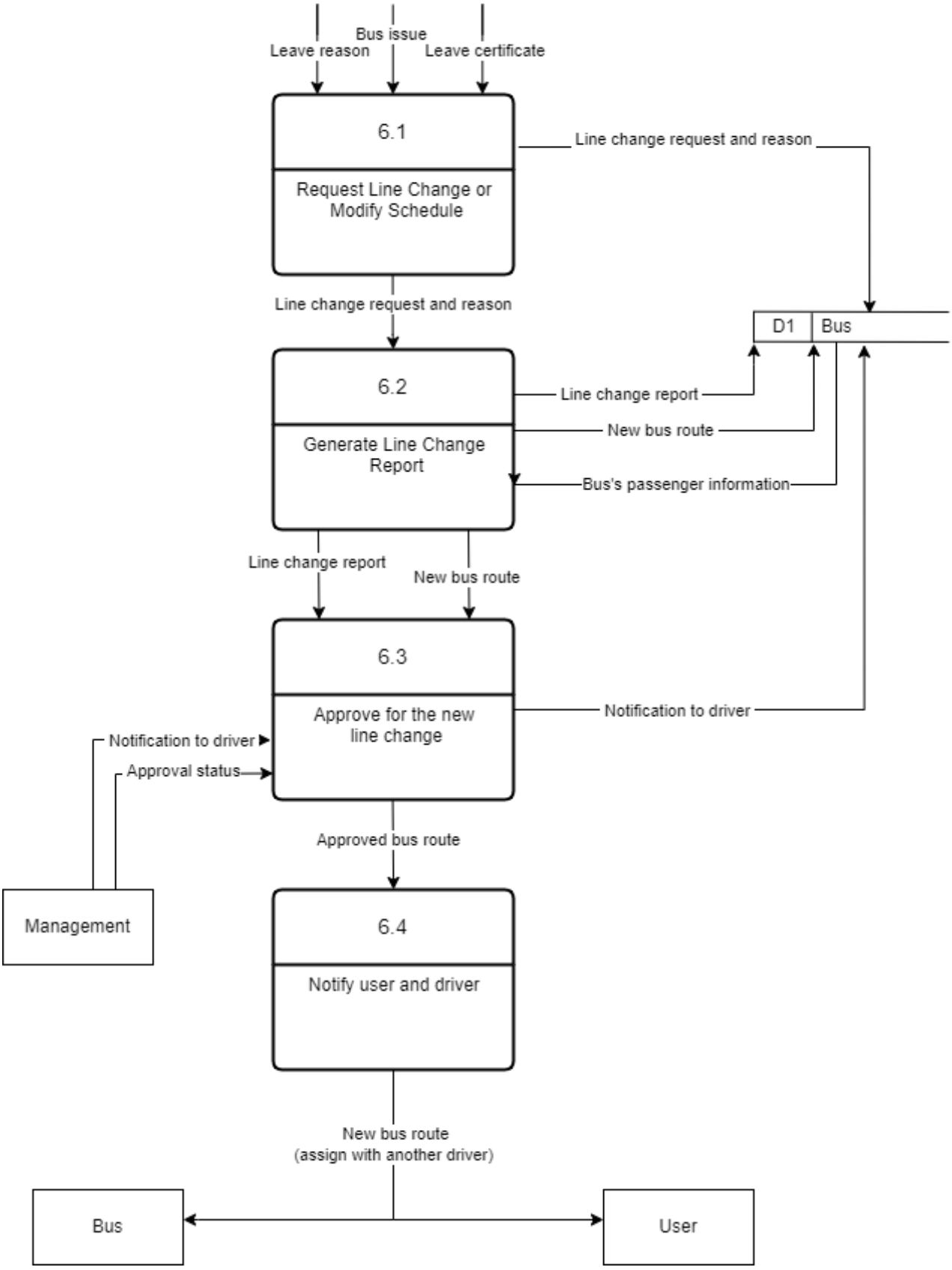
Level 1 diagram

5.2.3.4 Process 4: Rate and Feedback



Level 1 diagram

5.2.3.5 Process 5: Trigger Emergency Button



Level 1 Diagram

5.2.3.6 Process 6: Update Schedule

6.0 Summary of Requirement Analysis Process

The current system is commonly used by manual and it is very inconvenient for both parties, drivers and users. They have their own website which is called Vehicle Reservation Management System, however there are some comments about them and mostly from students who are regular customers inthis situation. Therefore, some features can be added to improve the quality ofthe system:

- Live tracking and updating current location.
- Notification about something unanticipated happening.
- Database to store personal information of users and drivers.
- Sortation of the buses according to their zone (zone 1 - zone 8).
- Automated update the availability of the seat of all buses.
- Rating and Feedback section.
- Booking system for users inside UTM.
- Emergency button.
- Display the driver's name and contact information according to the buses.