

SOFTWARE ENGINEERING

IS F341

Report on

MOBILE APPLICATION FOR HOSTEL ALLOTMENT

Author

Danish Mohammad
2018A7PS0103H

Supervisor

Dr. Narasimha Bolloju
Prof, Dept of CS/IS



Birla Institute of Technology & Science, Pilani
Hyderabad Campus

**BIRLA INSTITUTE OF TECHNOLOGY
AND SCIENCE**
Hyderabad

Abstract

This project is concerned with streamlining and automation of the allotment of rooms to students as they change their hostel rooms after the first year. The report is an overview of the mobile application from a Software Engineering Perspective. It goes over the room allotment strategy, the user stories (along with their acceptance criteria), User Interface Wireframes and also gives some additional suggestions for implementation. Using the mobile application the students can form groups with their friends and choose the wing that they would like to occupy. There is also a provision to swap wings and rooms. The Hostel Wardens and Administrators can use the mobile application to monitor the process and collaborate to solve any problems that arise. Implementation suggestions specify databases, architectures and styles that are best suited to the application.

Contents

Acknowledgement	3
1. Problem Overview	4
1.1 Introduction	4
1.2 The Hostel Allotment Process	4
1.2.1 Terms and Definitions	5
1.2.2 Hostel Layout	5
1.2.3 Prerequisites	5
1.2.4 Room Allotment Process Flowchart	6
1.2.5 Round 1	6
1.2.6 Round 2	9
1.2.7 Round 3	9
1.2.8 Other Users	10
2. User Stories	12
3. Mind Map	21
4. User Interface (Wireframes)	22
5. Implementation Strategies	28
5.1 Application Type	28
5.1.1 Requirement	28
5.1.2 Strategy	28
5.2 Application Architecture	30
5.2.1 Requirement	30

	2
5.2.2 Strategy	30
5.3 Database	32
5.3.1 Requirement	32
5.3.2 Strategy	32
6. Conclusion	34

Acknowledgement

I would like to express my sincere respect and gratitude to my Software Engineering Professor, **Dr. Narasimha Bolloju** for providing me the invaluable opportunity of creating this project and for his esteemed support and cooperation.

I extend my thanks to my college, **Birla Institute of Technology and Science, Hyderabad** for giving me this opportunity.

I would also like to acknowledge with gratitude the support and love of my family - my parents and my sister. They all kept me going and this project would not have been possible without them.

1. Problem Overview

1.1 Introduction

The last few decades have seen a massive increase in the number of students attending colleges. Since a vast majority of the colleges have on-site accommodation, the number of hostels being built is steadily on the rise. This means that as new students enter the college older students have to shift hostels.

Hostel Allotment is an event that takes place every year and involves a very large number of students. It is an important part of the students' college stay since it decides the group of people that they will be interacting with on an almost daily basis. As such, this project aims to help the students to ensure that they are satisfied with their choice of wing, wingmates and room and will be comfortable spending their next few years there.

As a mobile application, the project will enable students to interact with it at any place and at any time, thus adding an additional level of comfort.

1.2 The Hostel Allotment Process

The hostel allotment process is divided into three rounds and each round has three segments.

1.2.1 Terms and Definitions

(i) Group Representative:

A group representative is the leader of the group. He/she takes decisions on behalf of the group.

(ii) Group Member:

A group member is simply a part of a group.

(iii) Group Size Requirement:

The size of a wing is the number of students that the wing can accommodate. To be a valid group so as to be considered for allotment, the size of a group must match one of the available wing sizes. This is the group size requirement.

(iv) Freezing a group:

Once a group is frozen no new members can join the group and no current member can leave the group.

(v) User:

A user is any person who uses the application. It includes Students, Administrators and Hostel Wardens.

1.2.2 Hostel Layout

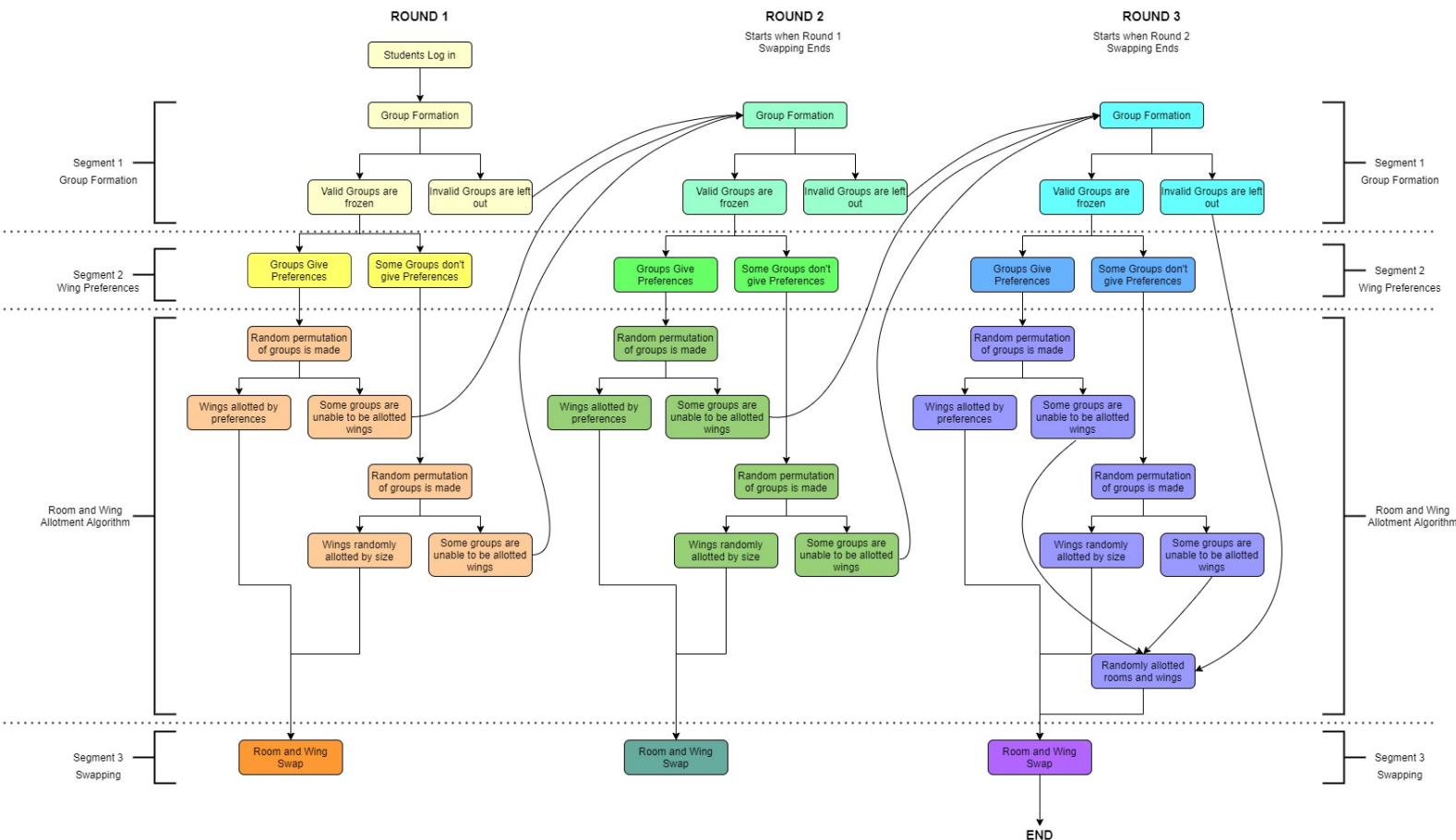
Throughout the hostel allotment process, all the students are able to see layouts of all the hostels that are available to them. The layout of every hostel is divided into floors. Each floor has several wings. The availability and size of each wing (the number of students that it can accommodate) is visible.

1.2.3 Prerequisites

(i) All users must download the Hostel Allotment Application.

(ii) All students must register on the mobile application.

1.2.4 Room Allotment Process Flowchart



1.2.5 Round 1

Segment 1: Group Formation

- (i) Each student has the freedom to be either a group member or a group representative. This choice can be changed until the end of the first segment.
- (ii) Group representatives can send membership requests to students who have chosen to be group members, but are not yet part of any group. The student joins the group as soon as the request is accepted.

- (iii) Students who have chosen to be group members, but are not yet part of any group, can send membership requests to group representatives to be a member of their group. They become members of that group as soon as the request is accepted.
- (iv) If the group size requirement is met, then the group representative can initiate a request to freeze the group. The group is frozen if all members accept the group representative's request. All the groups that satisfy the group size requirement, but are not yet frozen, will be automatically frozen at the end of segment 1.
- (v) Before a group is frozen, a group member can leave the group by sending a request to the group representative. If the request is accepted, the student is no longer a member of the group.

After the end of segment 1, those groups that do not satisfy the group size requirement (and hence, are not frozen) are not considered for subsequent segments of the current round. The members of these groups must participate in group formation in the next round.

Segment 2: Wing Preferences

- (i) Each group representative whose group has been frozen can submit up to 3 different wings that their group would like to occupy in order of preference. The size of every wing that is given as a preference must be equal to the size of the group.
- (ii) After the deadline for segment 2, the following algorithm (Wing and Room Allotment) is executed.

Wing and Room Allotment Algorithm

- (i) A random permutation of all the groups that have submitted a valid wing preference is created. For example, let the groups that have submitted a valid wing preference be - $g_1, g_2, g_3, \dots, g_{20}$. Then a random permutation could be - $g_{16}, g_4, g_8, \dots, g_{13}$.

- (ii) Sequentially, the groups in the random permutation are assigned their highest available preference. If none of their preferences are available, then they are randomly assigned a wing of the correct size. If there is no unoccupied wing whose size matches the size of their group, they are not assigned a wing. Members of such groups must try again in the next round.
- (iii) Now, the groups that have not submitted a valid wing preference are considered. A similar random permutation is created and they are randomly assigned a wing of the correct size. If there is no unoccupied wing whose size matches the size of their group, they are not assigned a wing. Members of such groups must try again in the next round.
- (iv) The members of the groups that have been assigned a wing are randomly assigned a room within the wing.

Segment 3: Room and Wing Swap

- (i) All members (group members and group representatives) of a group which has been assigned a wing after segment 2 can submit requests to other students in the same wing to exchange rooms with them. If the request is accepted, their rooms are swapped.
- (ii) A group representative can submit wing swap requests to other group representatives who have been assigned a wing in this round if they both have the same wing sizes. If the request is accepted, the wings are swapped.
- (iii) A group cannot now make a request to swap their current wing with a wing that is unoccupied, regardless of whether the wing sizes are the same or not. This is because the group could easily have obtained that wing by giving it as their highest preference.

All the groups that have been assigned wings will not be considered for the second and third rounds.

1.2.6 Round 2

- (i) All the students who have not been assigned a room in round 1 can participate in round 2. Participating students can choose whether they want to be group members or group representatives, irrespective of their choice in round 1.
- (ii) All the steps of round 1 are repeated again.
- (iii) Wing swapping in this round is allowed only amongst those groups that were assigned a wing in this round. Room swapping (within the same wing) in this round is allowed only amongst those students who were assigned a room in this round.

1.2.7 Round 3

All the students who have not been assigned a room in round 2 can participate in round 3. Participating students can choose whether they want to be group members or group representatives, irrespective of their choice in round 2 and round 1.

Group Formation (segment 1) and wing preferences (segment 2) of round 3 are the same as that of round 1. The Wing and Room Allotment Algorithm used for round 3 is different from that used in rounds 1 and 2 to ensure that all students are assigned a room.

Wing and Room Allotment Algorithm for round 3:

- (i) After the random permutation and wing allotment, some groups might still not have been assigned a wing. These students, along with those who have not yet been assigned a room (for any reason), are considered here.
- (ii) All these students will now be randomly assigned wings and rooms out of those that are still unoccupied. After this, all students have been assigned rooms and wings.

- (iii) Each wing assigned in this manner is considered a new group and a randomly selected student is assigned as the group representative while the rest are group members. After this step, every student is part of some group and every group has a group representative.

Segment 3: Wing and Room Swapping

- (i) All students, regardless of the round in which they were assigned a room, can issue room swap requests for rooms within their own wings.
- (ii) All group representatives can send wing swap requests to all other group representatives, regardless of the round in which they were assigned a wing.

1.2.8 Other Users

Apart from the students, the Hostel Wardens and the members of the administration also have access to the hostel allotment process.

Hostel Wardens

After each round the Hostel Warden can see which students have been assigned which rooms. They can send requests to the administration to reserve certain rooms/wings for various purposes.

Administrators

They can see the current state of the rounds (the groups that have been formed, the preferences of various groups, the rooms and wings that are occupied and empty) and also have the power to restrict certain rooms/wings from being available. This means that the selected room or wing will appear as unavailable to the students. In case there were already students occupying the wing/room, the assignment will be cancelled and they will once again be eligible for the next round. (In case

this happens in the third round the students will randomly be assigned available rooms).

2. User Stories

User stories are informal descriptions of software system features, often written from the perspective of end-users. Below are 18 user stories, encompassing a variety of features and users.

- (i) **As** a first time user
I want to be able to register my account
so that use the mobile application

Acceptance Criteria

Scenario: New user is able to successfully register an account with the application.

Given that I am a first time user
When I open the application, there is an option to register my account.
Then I can click the 'register' button, give my details, set up a password and register my account.

- (ii) **As a registered user**
I want to be able to sign-in to my account
so that use the mobile application

Acceptance Criteria

Scenario: Registered user is able successfully log into his/her account.

Given that I am a registered user who remembers his/her password
When I open the application, and fill in the correct details
Then I can click the 'sign-in' button, and I will be able to log into my account.

Given that I am a registered user who has forgotten his/her password
When I open the application there is an option for those who have forgotten their password
Then I can click the 'forgot password' button, and I will be directed to a page where I have to fill in my email and I will be able to reset my password through the link there, and thus log into my account.

- (iii) **As a student**
I want to be able to send messages to Administrators and Hostel Wardens
so that I can clarify any doubts that I might have.

Acceptance Criteria

Scenario: Students can send messages to Administrators and Hostel Wardens.

Given that I am a registered user who has logged into his/her account
When I open the application, and navigate to the 'Users' section on the Dashboard
Then I can select the message icon beside the name of the administrator or hostel wardens who I want to contact and send them a message.

(iv) **As a student**

I want to be able to see which groups have which members
so that I can decide which group I want to be in.

Acceptance Criteria

Scenario: Students can view members of all groups.

Given that I am a registered user who has logged into his/her account
When I open the application, and navigate to the 'Groups' section on the Dashboard
Then I can click the respective group button and I will be able to see the names of all the students in that group.

Given that I am a registered user who has logged into his/her account
When I open the application, and navigate to the 'Groups' section on the Dashboard
Then I can click the respective group button and if the group has not submitted any wing preferences, I will see 'No wing preferences' under the preferences section for that group.

(v) **As a student**

I want to be able to see the wing preferences of all the groups
so that I can contribute to the wing preferences of my group.

Acceptance Criteria

Scenario: Students can view wing preferences of all groups.

Given that I am a registered user who has logged into his/her account
When I open the application, and navigate to the 'Groups' section on the Dashboard
Then I can click the respective group button and I will be able to see all the wing preferences for that group if the group has submitted any wing preferences.

Given that I am a registered user who has logged into his/her account
When I open the application, and navigate to the 'Groups' section on the Dashboard
Then I can click the respective group button and if the group has not submitted any wing preferences, I will be able to see 'No wing preferences' under the preferences section for that group.

(vi) **As a user**

I want to be able to see the schedule of rounds and segments
so that I do not miss any deadlines.

Acceptance Criteria

Scenario: Users can see the schedule of rounds and segments.

Given that I am a registered user who has logged into his/her account
When I open the application, and navigate to the 'Schedule' section on the Dashboard
Then I will be able to see the exact date and time for the start and end of each segment of each round.

(vii) **As a user**

I want to be able to see the details of how each segment and round is conducted
so that I can better understand the hostel allotment process.

Acceptance Criteria

Scenario: Users can see details of rounds and segments.

Given that I am a registered user who has logged into his/her account
When I open the application, and navigate to the 'Schedule' section on the Dashboard
Then by clicking on the information icon beside a given segment or round I will be directed to the 'Information Page' where I will be able to see the details of how every round and segment is conducted.

(viii) **As a student**

I want to be able to see the layouts of the hostels and wings
so that I can contribute to deciding the wing preferences of my group.

Acceptance Criteria

Scenario: Students can see the layouts of hostels and the sizes and arrangement of wings within the hostel.

Given that I am a registered user who has logged into his/her account
When I open up the application and navigate to the 'Hostel Layout' section on the Dashboard
Then I can see the various hostels which are available to me and if I click on the hostel, then I can see it's floor wise division and the locations and sizes of wings on those floors.

(ix) **As a student**

I want to be able to see the status of my room allotment (whether I have been allotted a room and if yes, then the details of the room - Hostel name, floor number, wing number, room number)

so that I know whether I need to participate in further rounds or not and also know what room I have been allotted.

Acceptance Criteria

Scenario: Student checks status of room allotment.

Given that I am a registered student who has logged into his/her account and I have been allotted a room

When I open the application, navigate to the 'Allotment' section on the Dashboard

Then I will be able to see the details of the room that I have been allotted including hostel name, floor number, wing number and room number.

Given that I am a registered student who has logged into his/her account and I have not been allotted a room

When I open the application, navigate to the 'Allotment' section on the Dashboard

Then the page will display a message saying, "Room not allotted yet".

(x) **As a group member**

I want to be able to send membership requests to group representatives **so that** I can become part of their groups.

Acceptance Criteria

Scenario: Group members can send membership requests to group representatives

Given that I am a registered user who has logged into his/her account and has chosen to be a group member

When I open up the application and navigate to the 'Groups' section on the Dashboard

Then I can click the respective group button and I will be able to send a message to the group representative by clicking on the message icon beside his name.

(xi) **As a group representative**

I want to be able to send membership requests to students
so that they can become part of my group.

Acceptance Criteria

Scenario: Group representatives can send membership requests to group members

Given that I am a registered user who has logged into his/her account and has chosen to be a group representative

When I open the application, and navigate to the 'Students' portal on the 'Users' section on the Dashboard

Then I will be able to see a list of all the students colour coded to show whether they are already part of a group or not (whether as a group member or as a group representative) and can click the message icon beside their names to send a message to that student.

(xii) **As a group representative**

I want to be able to send a request to freeze my group
so that I can restrict people from joining and leaving my group.

Acceptance Criteria

Scenario: Group representatives can send freeze requests to their own group members

Given that I am a registered user who has logged into his/her account and has chosen to be a group representative and my group satisfies the group size requirement

When I open the application, and click on the 'Your Group' button on the Dashboard

Then I will be able to click the 'Send Freeze Request' button and send out a freeze request to all members of my group.

Given that I am a registered user who has logged into his/her account and has chosen to be a group representative and my group does not satisfy the group size requirement

When I open the application, and click on the 'Your Group' button on the Dashboard and then click the 'Send Freeze Request' button

Then I will be shown a message saying, "Cannot send Freeze Request - Group Size Requirement not satisfied"

(xiii) **As a student**

I want to be able to send messages to other students
so that I can collaborate with them

Acceptance Criteria

Scenario: Students can send messages to other students

Given that I am a registered user who has logged into his/her account
When I open the application, and navigate to the 'Students' portal on the 'Users' section on the Dashboard
Then I will be able to see a list of all the students and can click the message icon beside their names to send a message to that student.

(xiv) **As a student**

I want to be able to change my status from group member to group representative and vice versa
so that I can adapt to the changing requirements of the group formation process.

Acceptance Criteria

Scenario: Student can change his/her status.

Given that I am a registered user who has logged into his/her account and has not yet chosen whether I want to be a group member or a group representative
When I open the application, and navigate to my profile by clicking the profile icon on the Dashboard
Then I will be able to see an option to choose whether I want to be a group member or a group representative.

Given that I am a registered user who has logged into his/her account and has already chosen whether I want to be a group member or a group representative
When I open the application, and navigate to my profile by clicking the profile icon on the Dashboard
Then I will be able to see an option to change my status. If I am a group member, clicking the button will change my status to group representative and if I am a group representative, clicking the button will change my status to group member.

- (xv) **As** a hostel warden or administrator
I want to be able to see the progress of the rounds
so that I can collaborate with other Administrators and Hostel Wardens to quickly resolve any problems.

Acceptance Criteria

Scenario: Administrators and Hostel Wardens can see progress of rounds

Given that I am a registered warden or admin who has logged into his/her account
When I open the application, and navigate to the 'Progress' section on the Dashboard
Then I will be able to see the percentage of occupied wings, percentage of assigned groups, percentage of students without groups and other relevant data on the progress of the rounds and segments.

- (xvi) **As** a hostel warden or administrator
I want to be able to send messages to students
so that I can clarify their doubts or give them updates regarding any changes to the process.

Acceptance Criteria

Scenario: Administrators and Hostel Wardens send messages to students

Given that I am a registered administrator or hostel wardens who has logged into his/her account
When I open the application, and navigate to the 'Students' portal on the 'Users' section on the Dashboard
Then I will be able to see a list of all the students and can click the message icon beside their names to send a message to that student or click the Announcement icon to send the same message to all users.

- (xvii) **As** hostel wardens and administrators
We want to be able to send messages to each other
so that we can collaborate.

Acceptance Criteria

Scenario: Administrators and Hostel Wardens send messages to each other

Given that I am a registered warden or administrator who has logged into his/her account

When I open the application, and navigate to the 'Admin' or 'Hostel Warden' portals on the 'Users' section on the Dashboard

Then I will be able to see a list of all the people in that category (Admin or Hostel Warden) and can click the message icon beside their names to send them a message.

- (xviii) **As** an administrator
I want to be able to restrict certain rooms or wings from being part of the hostel allotment process
so that I can reserve them for other purposes like for guests and parents or for storage.

Acceptance Criteria

Scenario: Administrators restrict a room or wing.

Given that I am a registered administrator who has logged into his/her account

When I open the application, navigate to the 'Hostel Layout' section on the Dashboard, and select the hostel, the floor and wing

Then I will be able to see a list of all the rooms in that wing, and I can click the minus icon beside the room to restrict it from being available for student occupancy.

3. Mind Map

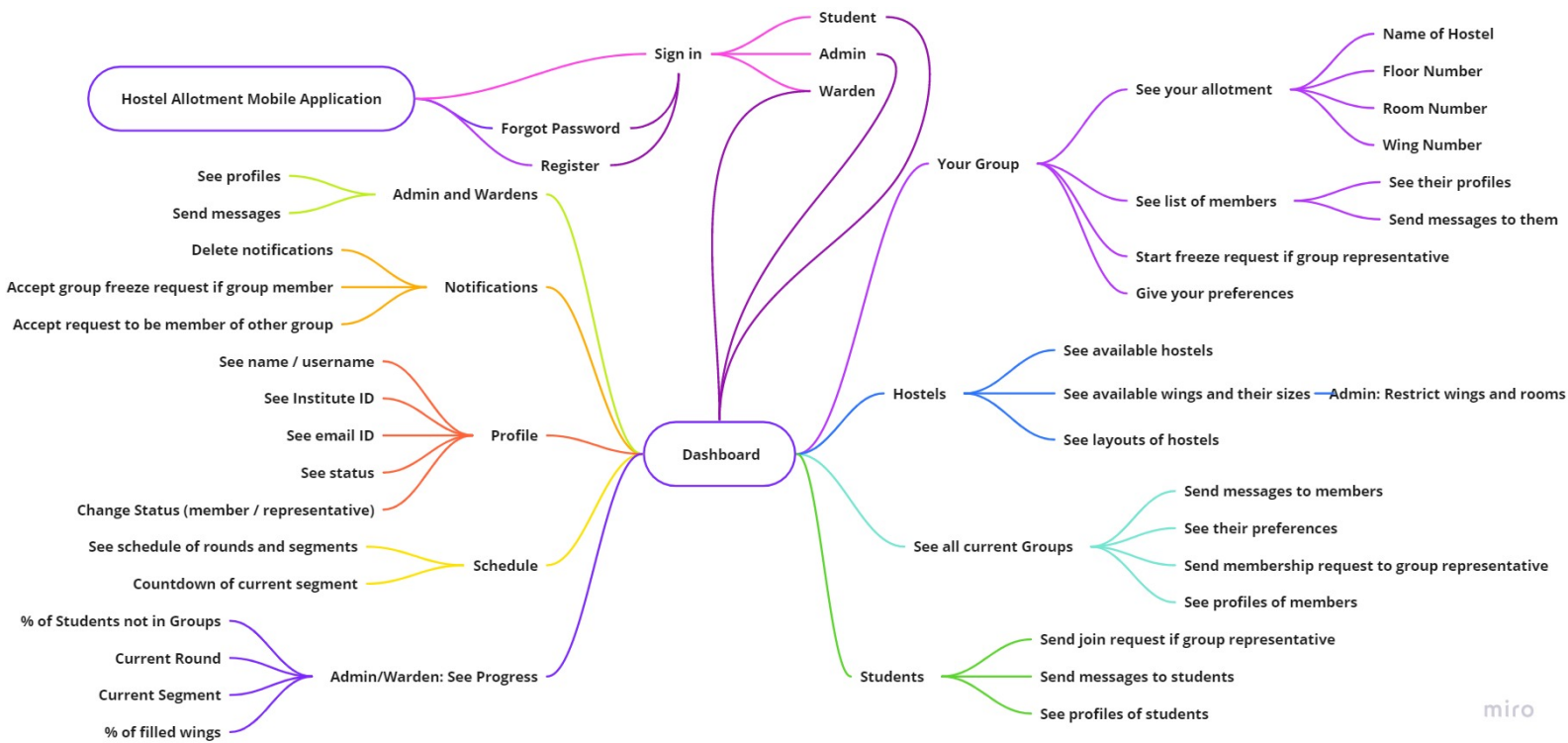
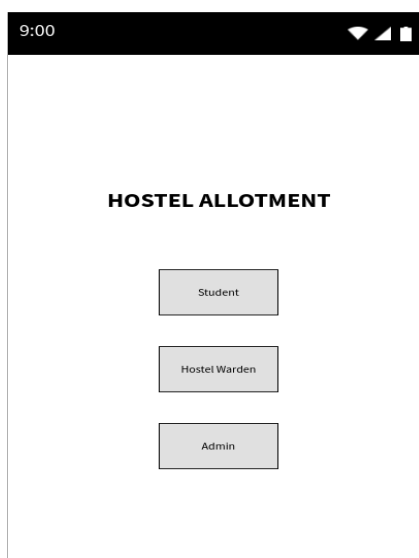


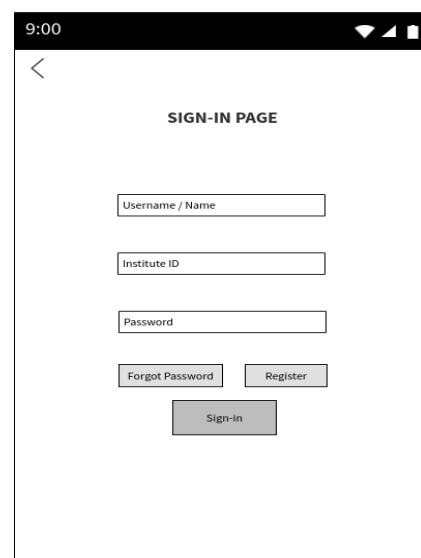
Figure 3.1: The Mind Map is a visual organization of information. It depicts the access flow for all users of the mobile application.

4. User Interface (Wireframes)

Wireframe is a screen blueprint which acts as a visual guide that represents the application framework. Below are wireframes for the Hostel Allotment Mobile Application.



(i) **Opening Page** - This is the first Page seen when application is opened. From here all users are directed to the Sign-in Page



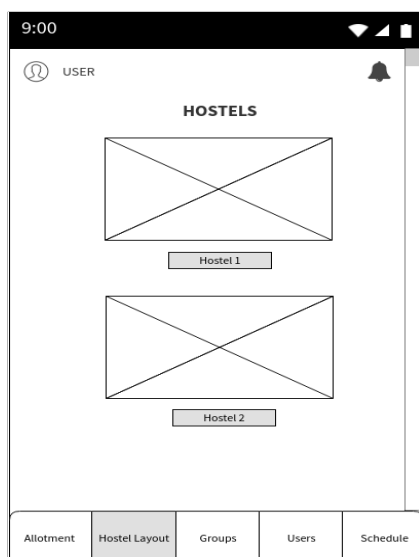
(ii) **The Sign-in Page** - If users have forgotten the password they can use the "Forgot Password" Button. If users are first time users, they have to register. Signing in takes the user to the Dashboard.

(iii) **The Forgot Password Page** - This is used to reset password by sending a mail to the registered email ID in case a user has forgotten the password. The Back Symbol takes users back to the Sign-in Page.

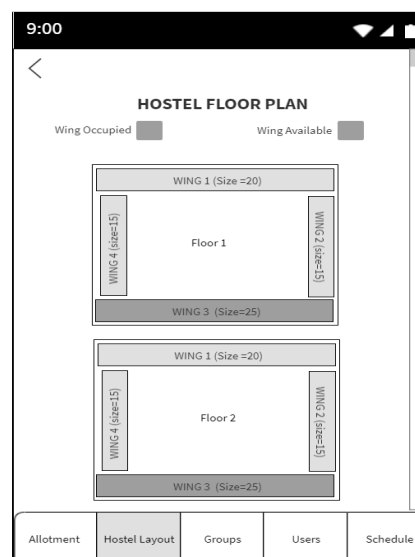
(iv) **The Registration Page** - First time users will use this page to register an account on the application. The Back Symbol takes users back to the Sign-in Page.

(v) **Allotments Section of the Student Dashboard** - This is the page that Students will see once they have signed in. It gives details of Room Allotments.

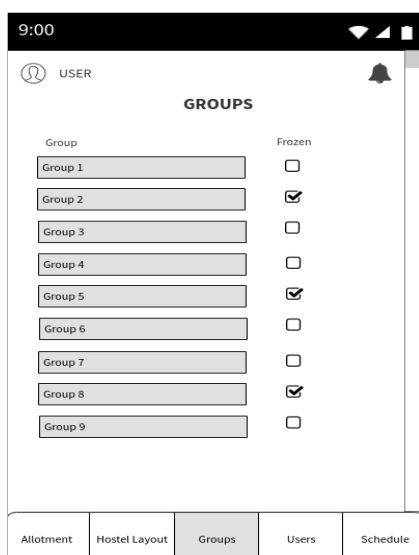
(vi) **The Your Groups Page** - This page contains a list of all members of your group. You can see their profiles and send messages and requests to them from here. It also contains the wing preferences with the group representative can change.



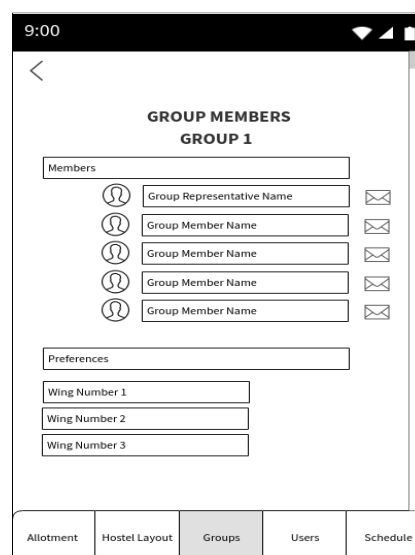
(vii) **The Hostel Layout Section of the Dashboard** - This page lets users see all the Hostels (with their images) that they have access to. By clicking a specific hostel, its floor-wise layout will open up.



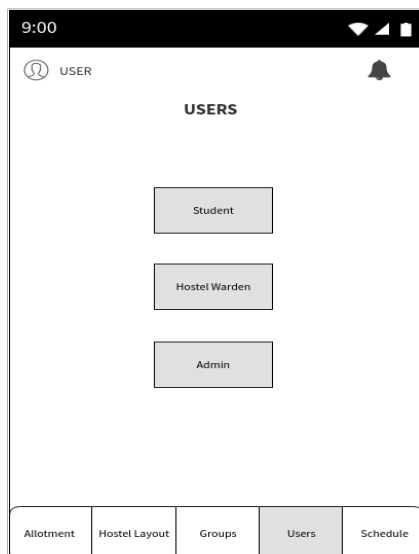
(viii) **The Hostel Floor Plan Page** - This page contains the floor plan, wings and wing sizes of the hostel that was selected in the Hostel Layout Page. The wings are colour coded to show if they are available or not. The Administrator can click on a wing to restrict rooms in that wing.



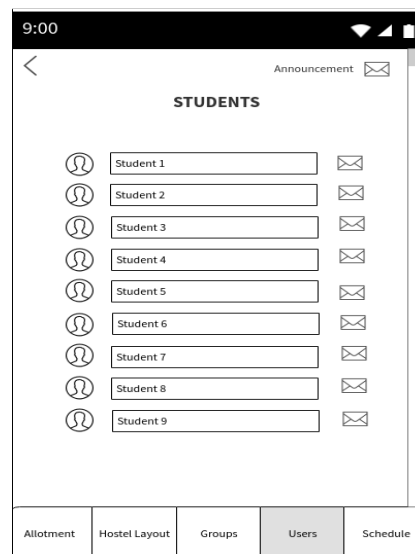
(ix) **The Groups Section of the Dashboard** - This page gives a list of all current groups and whether or not they have been frozen. By clicking the Group whose details you want to see, a new page showing that groups membership and preferences (if any) will open up.



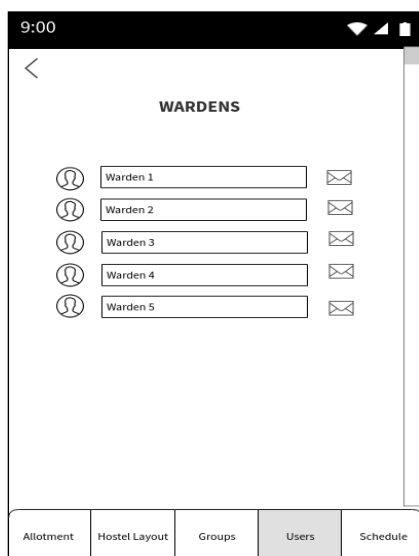
(x) **The Group Details Page** - This page is accessed by clicking on a specific Group in the Groups Section of the Dashboard. This page shows the members of the group and the preferences that they have submitted (if any). From this page the user can also send them messages and see their profile.



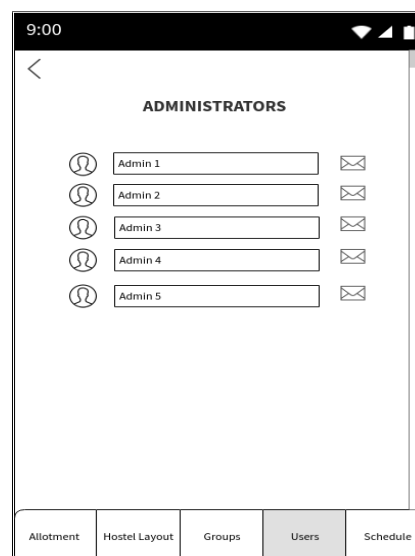
(xi) **The Users Section of the Dashboard** - This page allows a user to navigate to the list of all users of a given type.



(xii) **The Students' Page** - This page can be accessed by clicking the "Students" button on the Users Section on the Dashboard. It contains a list of all students. It is possible to view their profile and send them messages from here. Admins and Wardens can simultaneously message all students by clicking the Announcement button.



(xiii) **The Hostel Wardens' Page** - This page can be accessed by clicking the "Hostel Warden" button on the Users Section on the Dashboard. It contains a list of all Hostel Wardens. It is possible to view their profile and send them messages from here.



(xiv) **The Administrators' Page** - This page can be accessed by clicking the "Admin" button on the Users Section on the Dashboard. It contains a list of all Administrators. It is possible to view their profile and send them messages from here.

9:00

USER

SCHEDULE

Round 1

Start	End	dd : mm : yyyy	hrs : min : sec
Segment 1			
Start	End	dd : mm : yyyy	hrs : min : sec
Segment 2			
Start	End	dd : mm : yyyy	hrs : min : sec
Segment 3			
Start	End	dd : mm : yyyy	hrs : min : sec

Round 2

Start	End	dd : mm : yyyy	hrs : min : sec
To Start / End :			
Round	Segment	days : hrs : min : sec	

Allotment Hostel Layout Groups Users Schedule

(xv) **The Schedule Section of the Dashboard** - This page allows a user to see the start and end times of all segments and rounds. By clicking the information icon, a user can see the details of the workings of all rounds.

9:00

INFORMATION PAGE

Round 1

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nunc maximus, nulla ut commodo sagittis, sapien dui mattis dui, non pulvinar lorem felis nec erat. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nunc maximus, nulla ut commodo sagittis, sapien dui mattis dui, non pulvinar lorem felis nec erat.

Segment 1

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nunc maximus, nulla ut commodo sagittis, sapien dui mattis dui, non pulvinar lorem felis nec erat. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nunc maximus, nulla ut commodo sagittis, sapien dui mattis dui, non pulvinar lorem felis nec erat.

Segment 2

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nunc maximus, nulla ut commodo sagittis, sapien dui mattis dui, non pulvinar lorem felis nec erat. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nunc maximus, nulla ut commodo sagittis, sapien dui mattis dui, non pulvinar lorem felis nec erat.

Segment 3

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nunc maximus, nulla ut commodo sagittis, sapien dui mattis dui, non pulvinar lorem felis nec erat. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nunc maximus, nulla ut commodo sagittis, sapien dui mattis dui, non pulvinar lorem felis nec erat.

Round 2

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nunc maximus, nulla ut commodo sagittis, sapien dui mattis dui, non pulvinar lorem felis nec erat. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nunc maximus, nulla ut commodo sagittis, sapien dui mattis dui, non pulvinar lorem felis nec erat.

Segment 1

Allotment Hostel Layout Groups Users Schedule

(xvi) **The Information Page** - This page can be accessed by clicking the information icon on the Schedule Section of the Dashboard. It contains all the details of every round and Segment in the Hostel Allotment Process.

9:00

ADMIN / WARDEN

ALLOTMENTS

Wings Occupied: ☐

Students without Groups: ☐

Current Round: ☐

Current Segment: ☐

Progress Hostel Layout Groups Users Schedule

(xvii) **The Progress Page on the Admin/Warden Dashboard** - This is the page the Admins and Wardens will see when they sign in. This contains progress data regarding the hostel allotment process, so they can easily monitor it.

9:00

ROOMS

Hostel Name:

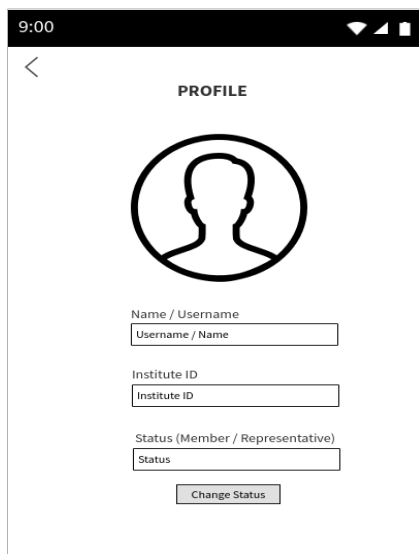
Floor Number:

Wing Number:

Room	Restricted	By
Room 1	<input checked="" type="checkbox"/>	<input type="text" value="Admin Name"/>
Room 2	<input type="checkbox"/>	
Room 3	<input type="checkbox"/>	
Room 4	<input checked="" type="checkbox"/>	<input type="text" value="Admin Name"/>
Room 5	<input type="checkbox"/>	
Room 6	<input type="checkbox"/>	
Room 7	<input checked="" type="checkbox"/>	<input type="text" value="Admin Name"/>
Room 8	<input type="checkbox"/>	

Allotment Hostel Layout Groups Users Schedule


(xviii) **The Room Restriction Page** - This page accessible only to Administrators by clicking on a specific wing on the Hostel Floor Plan Page. By clicking the checkbox beside a given room, that room can be made unavailable.



9:00

<

PROFILE



Name / Username
Username / Name

Institute ID
Institute ID

Status (Member / Representative)
Status

Change Status

(xix) **Profile Page** - This page is accessed by clicking the Profile Icon at the top right corner of the Dashboard. It contains an image of the user, along with his name, email and status. The status can be changed by clicking the "Change Status" Button. The Back Button will take a user back to the Dashboard.



9:00

<

SEND MESSAGE

 Recipient Name

Send Leave Group Request ☐

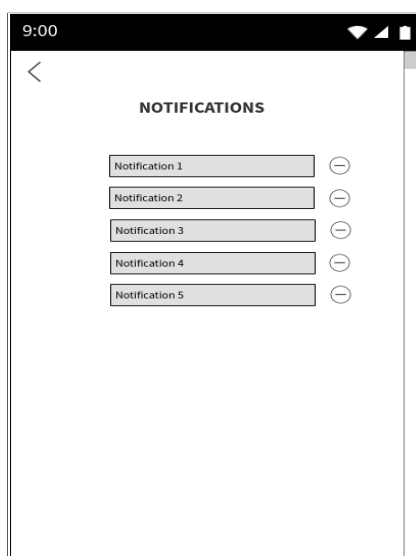
Send Membership Request ☐

Send Room Swap Request ☒

Send Wing Swap Request ☐

Enter Text message here


(xx) **The Messages Page** - From this page users can send text messages to various users and also all the different kinds of requests.





9:00


<


NOTIFICATIONS

Notification 1 

Notification 2 

Notification 3 

Notification 4 

Notification 5 

(xxi) **The Notifications Page** - This page can be accessed by clicking on the bell icon on the Dashboard. It contains all notifications that the user has received. Notifications include regular messages, announcements and requests. Notifications can be deleted by clicking the minus sign beside them.

5. Implementation Strategies

There are several possible implementations and a large number of technologies that can be used in the implementation of any process model. However, only a few implementations achieve optimal performance for a specific model. Below I have outlined well-performing strategies for the hostel allotment mobile application in the categories of Application Type, Application Architecture, and Database.

5.1 Application Type

5.1.1 Requirement

The Hostel Allotment Application is going to be used by a large variety of users and, despite hostel allotment being a major part of a student's campus life, will be used only once. This means that the application must run smoothly, be highly intuitive to use and must have as small of a learning curve as possible. Since different institutes might implement their own versions of the apps (which will generally be carried out by the students), cost effectiveness is also a factor in deciding the application type.

5.1.2 Strategy

There are three major ways of developing mobile applications:

- (i) Web Apps

(ii) Native Apps

(iii) Hybrid Apps

Web Apps

Web apps are applications that are rendered by Web Browsers like Chrome and Firefox, and so do not need to be downloaded. This helps them reach a wider demographic since users use a large variety of web apps.

Due to the additional layer of web browsers between the mobile application and the mobile operating system, web apps suffer from slow speeds, high load times, and cannot utilize the full gamut of latest features that the user might already be familiar with.

Additionally, web apps do not have very reliable API's and so contribute to the difficulty of developing the application.

Since the hostel allotment mobile application does not have "wide reach" as a goal (all students, wardens and admins of an institute will use the same application) but would benefit from more intuitive features and ease-of-development (which web apps cannot provide), the web application type is not well suited to the hostel allotment application.

Native Apps

Native Apps are built for specific platforms, using the languages that the platform accepts (like Kotlin for Android and Swift for iOS). Though these languages are not the most widely used, they are high-level, easy to use and have the support of large companies like Google and Apple.

These are the apps that can provide the best performance and user experience since they directly interact with the mobile operating system. However, there are cost based issues associated with native apps. The requirement of multiple code bases for the application, drives up costs and development time. Thus, if cost and development time are not severely constrained, native apps are the best strategy.

Hybrid Apps

Hybrid Apps use a combination of the strategies of web apps and native apps. They can be installed and run on mobile devices like native apps but use web views to render content.

Since they need only one codebase, they have cheaper implementation (though long term costs might be higher than native apps) costs and smaller development time. With the burden of rendering content as web views while still interacting with the mobile operating system, hybrid apps display a noticeable performance drop when compared to native apps. Customization is difficult and costly.

However, if little customization is required and there are severe constraints in terms of costs and time, Hybrid Apps might provide a suitable compromise.

Conclusion

Overall, though native apps might cost more in some cases and require a longer development time, the performance benefit and ease of maintenance make it the right choice of application type.

5.2 Application Architecture

5.2.1 Requirement

The Hostel Allotment Application relies heavily on the messaging system between users - It uses it to form groups, to communicate and solve problems, to freeze groups and to swap wings and rooms. This means that the architecture used must efficiently handle messages.

5.2.2 Strategy

One of the ways of handling extensive messaging reliance is to use an Event Driven Architecture (used by several messaging applications) com-

bined with a Service Oriented Architecture (SOA).

Service Oriented Architecture

A service oriented architecture provides modular development, which enables several independent systems to interact efficiently with one another. This also enables faster development since it is possible to have multiple teams working on independent components. SOA also offers the flexibility of easy modification, if the hotel allotment algorithm is altered.

Event Driven Architecture

Event driven architectures react to events, which can be thought of as changes in state. The acceptance of group membership by students and assignments and swapping of rooms can all be thought of as events. With a large proliferation of such events, event driven architecture is well suited to the hostel allotment process.

Event Driven Service Oriented Architecture

Event driven service oriented architecture is a combination of the principles of both paradigms. Event Driven Architecture complements Service Oriented Architecture because services can be initiated, terminated or halted upon the occurrence of events. The modularity and development speed afforded by Service Oriented Architecture and the ease-of-development of Event Driven Architecture provide a highly desirable development environment for the Hostel Allotment Application.

Conclusion

Event Driven SOA is an optimal implementation architecture for the Hostel Allotment Application.

5.3 Database

5.3.1 Requirement

The Hostel Allotment application must store a large amount of (large number of students sending lots of messages), rapidly generated (heavy usage for short periods of time), frequently changing (room assignments change rapidly with swaps) messages and data. Additionally data integrity is also important.

5.3.2 Strategy

There are 2 major types of Databases - SQL and NoSQL databases.

SQL Database

(i) **Structured Data:**

An SQL database is useful when the data you have is structured since the database works on queries. This makes it easy to query, update and delete data from the database. In the hostel allotment mobile application, the data relating to assignment of rooms and group formation is structured. Additionally, since the number of students, wardens and admins is essentially fixed and there is a maximum possible number of groups (equal to the number of students), it makes sense to use an SQL database to store such data.

(ii) **Complex Queries:**

Using an SQL database for room and group data also enables us to generate a wide variety of data (maybe about students who are frequently changing their status from representative to member and vice versa in an attempt to destabilize the system) since SQL can handle complex queries.

(iii) **Data Integrity:**

SQL databases also provide ACID (Atomicity, Consistency, Isolation

and Durability) properties that ensure that data is not erroneously overwritten, erased or lost in case of power failure or other potential errors. Since, integrity of room allotment data is a factor of prime concern, SQL databases are best suited for the task.

NoSQL Database

(i) Unstructured Data and Simple Queries:

A NoSQL database is well suited to store unstructured data which will not have to be queried frequently and will generally require simpler queries. Since it might be unwieldy to store text messages (which will not be queried frequently and are unstructured) between students, admins and wardens in an SQL database, a NoSQL database is the way to go.

(ii) Eventual Consistency:

Without a very stringent constraint on instantaneous message data integrity (NoSQL databases guarantee eventual consistency), NoSQL databases can be leveraged to accommodate the potentially large volume and volume rate of data generation.

Conclusion

Using SQL databases for room allotment and group formation while using NoSQL databases for messages, will give optimal performance.

6. Conclusion

Implementing the application as a Native App, using Event Driven Service Oriented Architecture and using the right combination of SQL and NoSQL databases the app development process can be fast tracked, while still ensuring optimal performance and best user experience.

An intuitive and user friendly implementation ensures that users of all ages and backgrounds can use the application with ease. The user stories enumerated in the report capture a very large variety of requirements thus ensuring that the product delivered satisfies all users.

The mobile application is an easy and transparent solution to the hostel allotment problem. It is an important step towards ensuring ease-of-living for students who might be venturing out of their homes and away from their families.