SOFTWARE ENGINEERING

Hostel Allotment

Build a mobile application for the Hostel Allotment problem:
1. Problem overview
2. User stories (for the student app)
3. Mindmap
4. UI design (wire frames showing the sequence of steps)
5. Suggests for implementation

PROBLEM OVERVIEW

The Hostel Allotment Project is an attempt to streamline and automate the process of room assignment for college students. 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.

Method

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

Group Representative: A group representative is the leader of the group. He/she has powers/responsibilities that the group member does not have.
Group Member: A group member is simply a part of a group. He/she does not have the powers of the group representative.
Wing Size Requirement: 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 wing size requirement.
Freezing a group: This means that no new members can join the group and no current member can leave the group.

Segment 1: Group Formation

1. Every student who is not part of a group that has already been assigned a wing can choose to be either a group representative or a group member (regardless of the student's choice in the previous round).
2. 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 if the request is accepted.

3. 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 if the request is accepted.
4. If the group representative is satisfied with the current state of the group and the group satisfies the wing size requirement, 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.
5. 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.

At the end of segment 1 all the groups that satisfy the wing size requirement, but are not yet frozen, will be automatically frozen.

Segment 2: Wing Preferences

1. All students will be 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) will be displayed.
2. 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.

Wing Allotment (Rounds 1, 2 and 3):

1. A random permutation of all the groups that have submitted a wing preference is created. For example, let the groups that have submitted a wing preference be - $g_1, g_2, g_3, \ldots, g_{20}$. Then a random permutation could be - $g_{16}, g_4, g_8, \ldots, g_{13}$.
2. 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.
3. Now, the groups that have not submitted a 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.

Wing Allotment (Round 3):

1. All those students who still remain to be assigned rooms (which is possible only if they failed to form groups that satisfied the wing requirement in both round 1 and round 2) and wings will now be randomly assigned wings and rooms out of those that are still unoccupied. In this step - the third segment of the third round - all students have been assigned rooms and wings.
2. Each wing assigned in the previous step 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: Room and Wing Swap

1. 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.
2. A group representative can submit wing swap requests to other group representatives who have been assigned a wing if they both have the same wing sizes. If the request is accepted, the wings are swapped.
3. 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 subsequent rounds.

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