# Lost and Found

A Software Engineering Lab Project

Software Design Document (SDD)

*Ver 1.0*

Team 3

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## Revision History

| Version | Date | Author | Change Description |
|---|---|---|---|
| 0.1 | 28/02/2016 | Akshay K Patil<br>Arjun Krishnamoorthy<br>Azharullah Shariff<br>Harish Paul Thavisi | Initial release |
| 1.0 | 09/03/2016 | Ahamed P A<br>Simsarul Haq Vengasseri<br>Durge Snehal Pradeep<br>Upasana Bai Asokan<br>Rohit Garlapati | Revised release |

# Contents

## Index of Figures

# 1 Introduction

## 1.1 Purpose

This document will outline the design of the 'Lost and Found' Application. It contains specific information about the actions taken by the user, the corresponding output by the application and other functions. It specifies the details about the interaction between various components to meet the desired requirements. It provides a detailed view of the system's design to understand the working of the system.

## 1.2 Scope

This document is based on the SRS Release 1.0 of the 'Lost and Found' Application. It contains details about how the design will implement the non-functional and functional requirements mentioned in the Software Requirements Specification (SRS) document.

## 1.3 Intended Audience

This document is written to address the team that will perform the implementation task for this application and for the perusal of Dr. Vinod Pathari and the client, Kurian Jacob.

## 1.4 Definitions, Acronyms and Abbreviations

- DBMS - Database Management System. A programmable interface which provides a common layer of abstraction between a physical database and a user or external program.
- LFA - Lost and Found Application.
- NITC - National Institute of Technology, Calicut.

## 1.5 System Overview

The project is a 'Lost and Found' item manager accessible to the students of NITC. It aims to replace the "Lost and Found" desk at NITC. It does so by providing a platform for users to post details of their missing items and browse through posts made by other users who have found some lost property. The app relies primarily on e-mail communication between the two parties through their nitc e-mail IDs and optionally Facebook and/or contact numbers. No third party involvement is present in the whole process of reclaiming the item. All the data is stored in the DBMS associated with the application.
The app allows the users to:

- Post details of lost items

- Post details of found items
- Resolve their posts
- Subscribe to categories of lost articles
- Browse through ”Lost” and ”Found” feeds
- Manage their user profiles
- Report inappropriate posts and users

## 2 Design considerations

This section describes many of the issues which need to be addressed or resolved before attempting to devise a complete design solution.

### 2.1 Assumptions and Dependencies

- The app requires a working internet connection
- The app must be compatible with Android 4.0 and above.
- Users are required to have an NITC Email ID in order to register.
- The App must be able to integrate with the NITC mail system for communication and validation purposes.
- It requires the optional integration of Facebook for contact details.
- The app relies on Google Maps to specify the exact location where the item was found.
- Users can trust this app to claim their missing property without the need of an intermediary, in an ideal scenario.
- The security of the system is based on password-based authentication of the user’s NIT-C e-mail ID.

### 2.2 General Constraints

- An Android mobile device (4.0 or later), preferably with a GPS tracker is required.
- Users can create their accounts only after verifying their identity using their valid NITC Email ID.
- A user can create only one account for his NITC ID.
- The application is meant for reporting items lost or found within the NITC campus only.

### 2.3 Development Methods

The methodology majorly used in the design of this application was the Waterfall Model, in which the software design is organically put together from the Software Requirements Specification created in the previous stage of the software development process. The construction/testing/implementation soon follows according to the model, finally culminating in the maintenance stage.

## 3 System Architecture

This system will follow a three-tier architectural style, i.e. it will be organized into three layers: the interface layer, the application layer and the storage layer. The interface layer will be the graphical user interface that allows the users to interact with the system. It will be implemented using the Android Studio, a Java Media Framework. The application layer will contain the logic and rules for storing data of users and items in the database layer and also retrieving it in accordance with the user's needs and this layer provides logic or algorithms for matching the items and retrieving the recommendations. This is the layer that will contain the data file parsers and will allow controlled access to the data files. Finally, the storage layer will store the metadata required for the system.

The three-tier architecture style shall be used because it not only separates the user interface and the metadata, but also provides an application logic layer. The application layer provides a middle layer that allows the data files and the GUI components to be loosely coupled. The application layer has to be modified if there are any changes to the format of the data files and the interface layer will need little or no modification. This will make it easy for clients of this software to modify the data file format and attributes for further research purposes if they wish to do so. This layer makes the system more maintainable and reusable and also hides the complexity of processing data from the users.

The system architecture for 'Lost and Found' is concerned with how users of the application can view the lost or found items that are in the database and resolving in the case of match. To describe this system architecture the following architectural view.

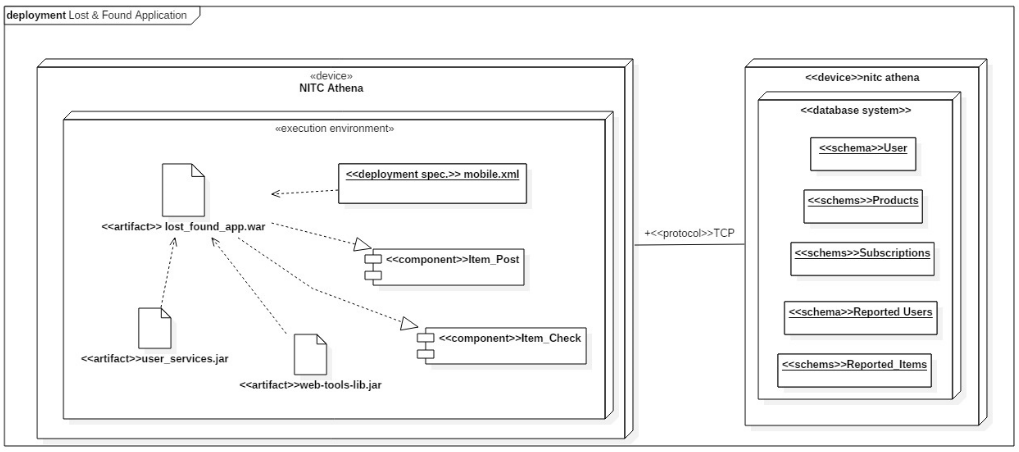


Figure 1: Deployment Diagram

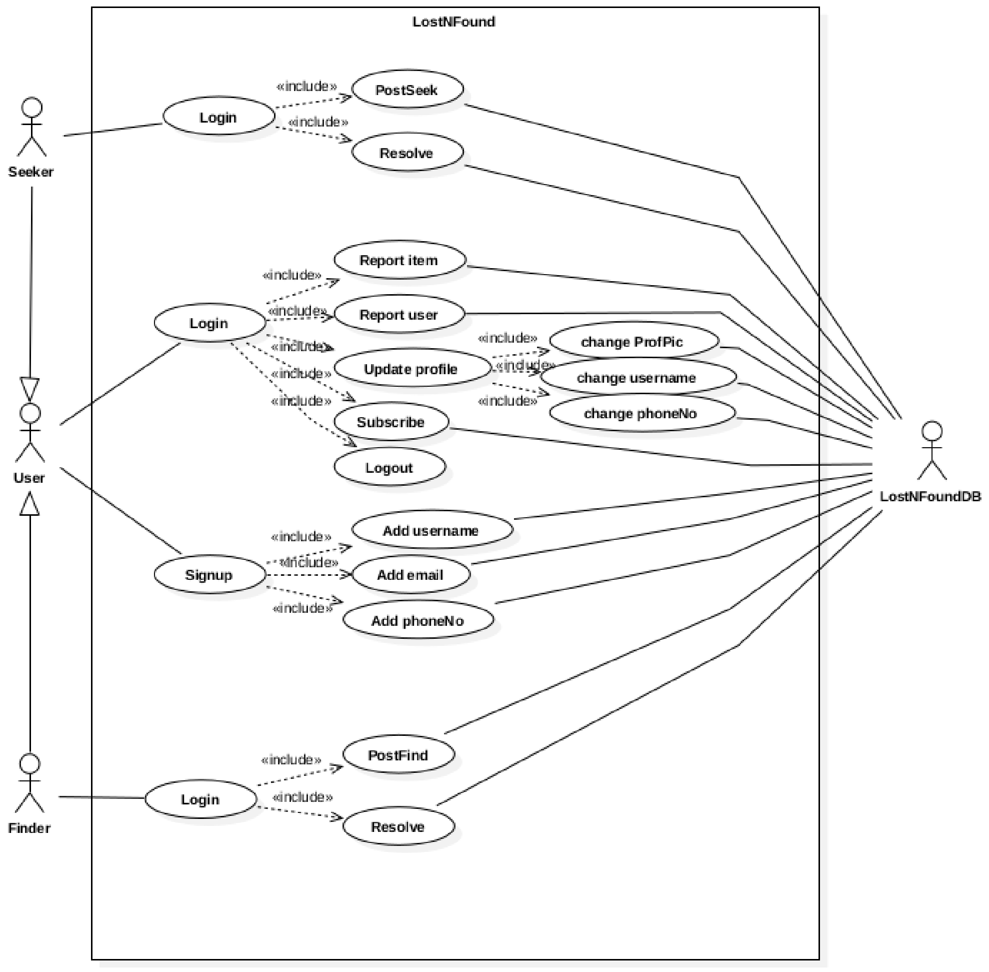


Figure 2: UseCase Diagram

# 4 Detailed System Design

## 4.1 View of Product Classes

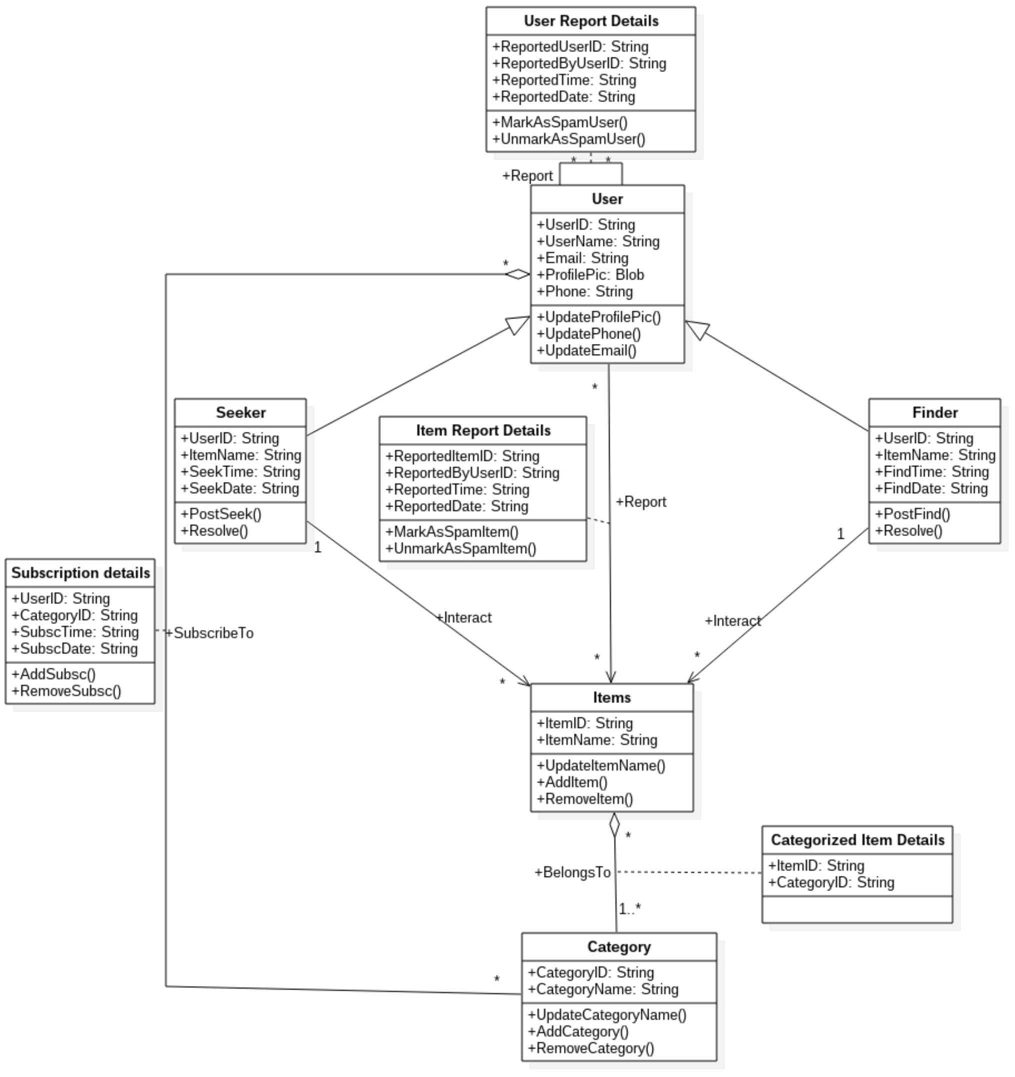


Figure 3: Class Diagram

## 4.2 Classification

- Subsystem: The subsystems in our application are the Application Interface, the Database and the relevant Actions.
- Function: The functions in our application are 'Posting an item', 'Resolving a post', 'Reporting a user/item', 'Subscribing to or Unsubscribing from a category' and 'Authentication'.
- Class - The classes in our application are user and items.
- Module - The module in our application is the items feed.

## 4.3 Definition

- Post Details: A user can post details of the articles that they have found/lost.
- Resolving a post: Once the user has successfully reclaimed/returned his lost/found property, he can resolve the post.
- Reporting a user/item: If a user has found that a post/item is invalid/spam content, he can flag that specific post/user as inappropriate.
- Subscribing/Unsubscribing: A user can manage his subscriptions by subscribing/unsubscribing a category to receive/stop receiving notifications about items in that category.
- Authentication: A user has to do a one-time authentication using his NITC Gmail ID on accessing the application for the first time.
- User: The class 'user' is a collection of information about all the users who have logged in to the application.
- Items: The class 'items' is a collection of information about all the items that have been posted as lost or found in the application.
- Items feed: The items feed is a view (available to the users) of all the items that have been posted as lost or found in the application.
- Application interface: The subsystem 'application interface' is the GUI for the user to access the application.
- Database : The subsystem 'Database' is the collection of information of all the users and items in the application
- Actions: The subsystem 'Actions' is a set of all the functionalities a user of the application can have.

## 4.4 Responsibilities

- Post Details : This component will get the lost/found item details from the user and store it into the database
- Resolving a post: This component will remove the resolved item entry from the database.
- Reporting a user/item: This component will flag each spam item/user.
- Subscribing/unsubscribing a category: This component ensures that the user is notified about all the item updates in a particular category he has subscribed to.
- Authentication: This component will ensure that only people with valid NITC Email ID are able to access the application.
- Items feed: The items feed gets all the unresolved items from the database.

## 4.5 Constraints

For all the component interactions, authenticating with a valid NITC email id is a precondition. Constraints specific to these components are:

- Post Details: The system stores this information and the user is redirected to the 'Lost' Feed. There should be a character limit on the product description provided.
- Resolving a post: The system stores this information and the user's homepage is refreshed.
- Reporting a user/item: A red dot appears next to the post/user profile which serves as a spam indicator.
- Subscribing/Unsubscribing a category: The system updates this information and refreshes the Homepage.
- User: The class 'user' is a collection of information about all the users who have logged in to the application.
- Items: The class 'items' is a collection of information about all the items that have been posted as lost or found in the application.
- Items feed: Users are able to view the feed.

There should be synchronization between the database and items feed (whenever there is an item resolve or an item report, the item feed should update immediately).

## 4.6 Composition

Most of the components in the application are functions and the others are atomic. Hence, they cannot be further decomposed. So, there are no subcomponents.

## 4.7 Uses/Interactions

All the components will use the authentication component.

- Post Details: This component uses the 'application interface' to get the lost/found item and its details from the user. This component is used by the 'database' (both user and items).
- Resolving a post: This component uses the 'item feed' to resolve the post. It is used by the 'database' to remove the resolved item.
- Reporting a user/item: This component uses the 'items feed' to flag the user/item. It is used by the 'database' to flag that user/item.

- Subscribing/unsubscribing a category: This component uses the 'application interface' (manage subscriptions button) for the user to subscribe/unsubscribe a category. It is used by the 'database' to keep track of a user's subscriptions.
- User: This component is used by the 'report user' component.
- Items: This component uses the 'post details' component to update the items collection. This component is used by the 'report user' and 'resolve post' components.
- Items feed: This component uses the 'database' to display all the unresolved items in the application. This component is used by 'resolve item' and 'report item components'.
- Application interface : This component is used by 'post details', 'subscribing/unsubscribing a category', 'reporting a user/item', 'authentication' and 'resolving' components.
- Database: This component is used by all the functions to make the necessary updates.
- Actions: This component uses the 'database'.

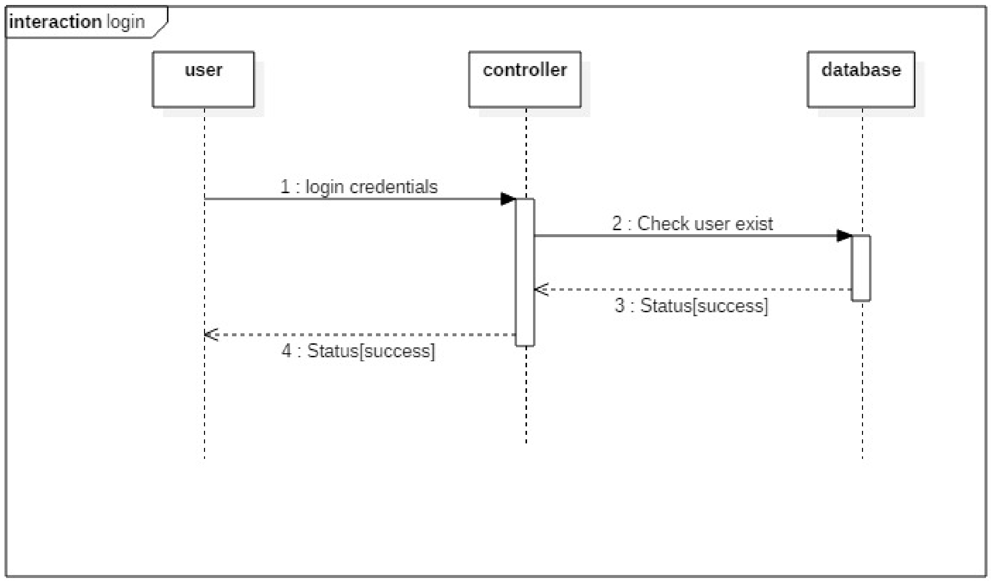


Figure 4: Sequence Diagram for Login

## 4.8 Resources

All the functions manage the database and all the components need the database. There are no deadlock/race conditions that can occur at any point.

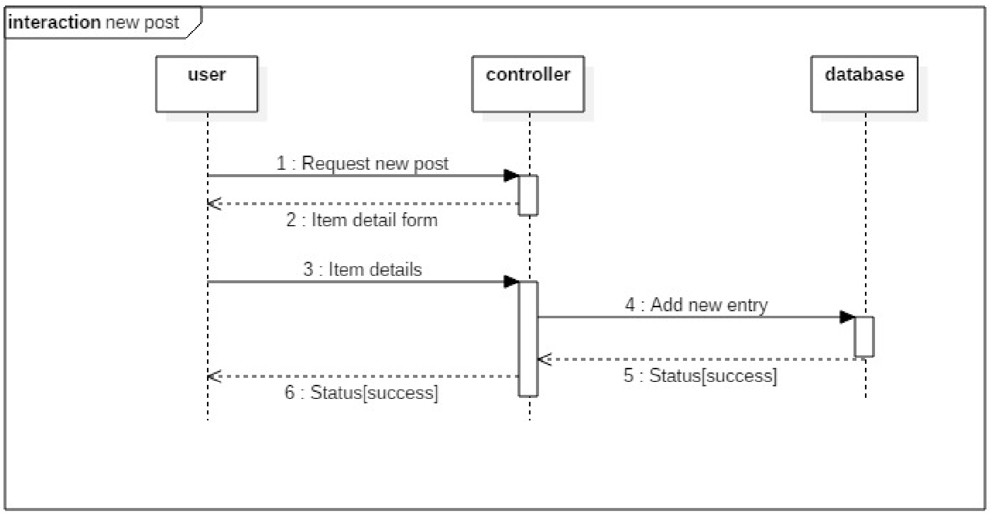


Figure 5: Sequence Diagram for a New Post

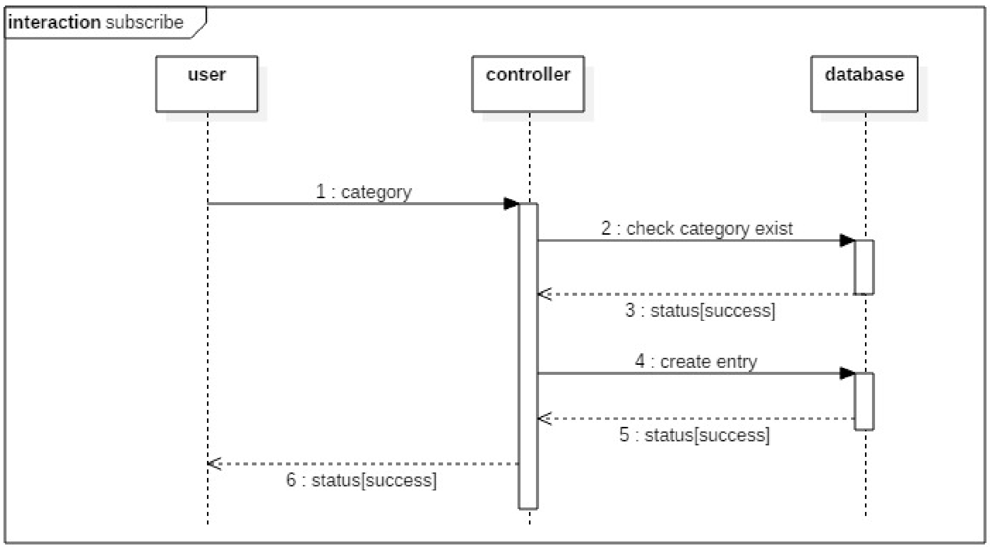


Figure 6: Sequence Diagram for Subscribe

## 4.9 Processing

- Post Details: When a user clicks the 'post details' button, the 'post details' component gets the 'item details' and stores it in the 'database'.
- Resolving a post: This component deletes the 'resolved item' from the 'database'.
- Reporting a user/item: This component flags the 'reported user/item' and toggles a flag counter corresponding to that particular item/user in the 'database'.

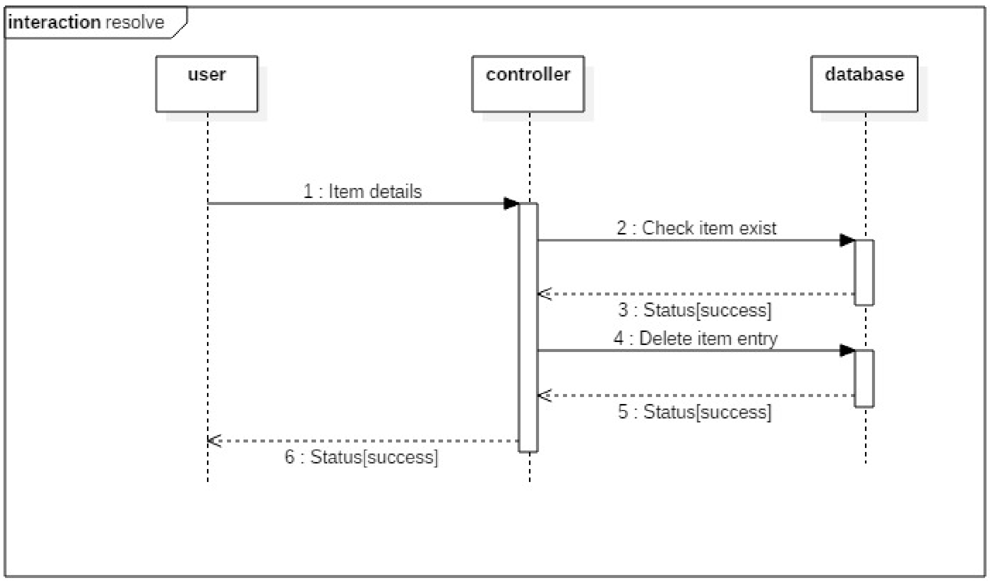


Figure 7: Sequence Diagram for Resolve

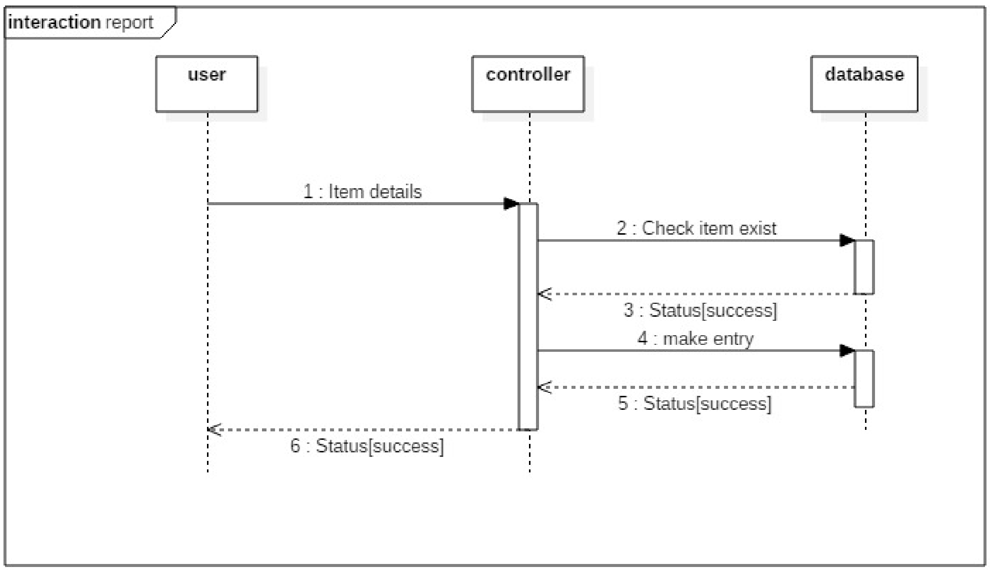


Figure 8: Sequence Diagram for Report

- Subscribing/unsubscribing a category: This component manages the user's notifications about the item updates in the subscribed categories.
- Authentication: A user has to do a one-time authentication using his NITC Gmail ID on accessing the application for the first time.
- Items feed: It uses the 'database' to display all the unresolved items.
- Application interface: It provides a GUI for all the application functionalities so that necessary actions can be performed and information can

be sent to the 'database'.

- Database: Information received from the application interface is updated/added.

## 4.10 Interface/Exports

- Post Details: This component takes the 'item details' and sends it to the database. Exception: if the user abandons this operation before clicking 'Submit', the entry will not be updated in the 'database'.
- Resolving a post: This component takes the item id and deletes the entry corresponding to the item in the 'database'.
- Reporting a user/item: This component takes the item id/user id and flags the entry corresponding to the item/user in the 'database'. Exception: if the user abandons this operation before confirming, no change is reflected in the system.
- Subscribing/unsubscribing a category: This component takes the category id and the user id and updates it in the 'database' so that items feed can be updated accordingly.
- Authentication: It takes a Gmail ID and checks if it is present in the database. If founds, it starts a session which allows a user to access all the functionalities.
- Database: This component updates/adds information to the 'database' corresponding to that particular user id or item id.

## 4.11 Detailed Subsystem Design

As mentioned, the 3 Subsystems in this application are the Application Interface, the Database and the Actions available to the user. All Actions can be processed only with a working Internet Connection, i.e., no data/information is stored locally on the device (other than the session cookies).

# 5 Data Design

## 5.1 Database Description

The Entity Relation diagram given in **Figure 16** has the following entities:
1) User
2) Subscriptions
3) Items
4) Category
The attributes of each entities and relationships among entities are shown in the diagram.

### 5.2 Global Data Structures

There are no specific data structures to be used in particular. Arrays could be used for storing the items while matching the Lost and Found products.

## 6 Glossary

- Database: A structured set of data held in a computer, especially one that is accessible in various ways.
- User: A person who uses or operates something (in this case, the user is using the application)
- Report: Make a formal statement or complaint about (someone or something) to the necessary authority.
- Item: An object of value that has been found by a user, or one that has been lost by someone.
- Post: Contains details about an item like the appearance, the location it was found/lost (last seen) and the time-frame when it was found/lost
- Subscribe: To ensure that you are notified about all posts pertaining to an item category of interest, you use this option to receive the relevant feed.

## 7 Details of Review Session

- Comments: Figures were not numbered.
  Action taken: All the figures were numbered and an appendix given at the end of the page.
- Comments: General constraints were incorrect.
  Decision: Some of the constraints were supposed to be in assumptions and dependency section and some were trivial.
  Action taken: They were correctly placed under assumptions and dependencies or were deleted.
- Comments: Development method should have described an SDLC model which is more appropriate for the project.
  Decision: It was discussed with the mentor and decided to explain an SDLC model under this section, preferably waterfall model.
  Action taken: Waterfall model has been used for the description.
- Comments: Class diagram is wrong.
  Action taken: Modified class diagram has been given in Page
- Comments: Sequence diagrams have to be modified.
  Action taken: Modified sequence diagram has been given in Page

- Comments: Activity diagram is wrong.
  Action taken: New activity diagram has been given in Page
- Comments: Use case diagram is wrong.
  Action taken: New use case diagram has been given in Page
- Comments: ER diagram is wrong
  Action taken: New ER diagram has been given in Page
- Comments: State diagram and component diagram is not required.
  Action taken: They have been removed from the document.

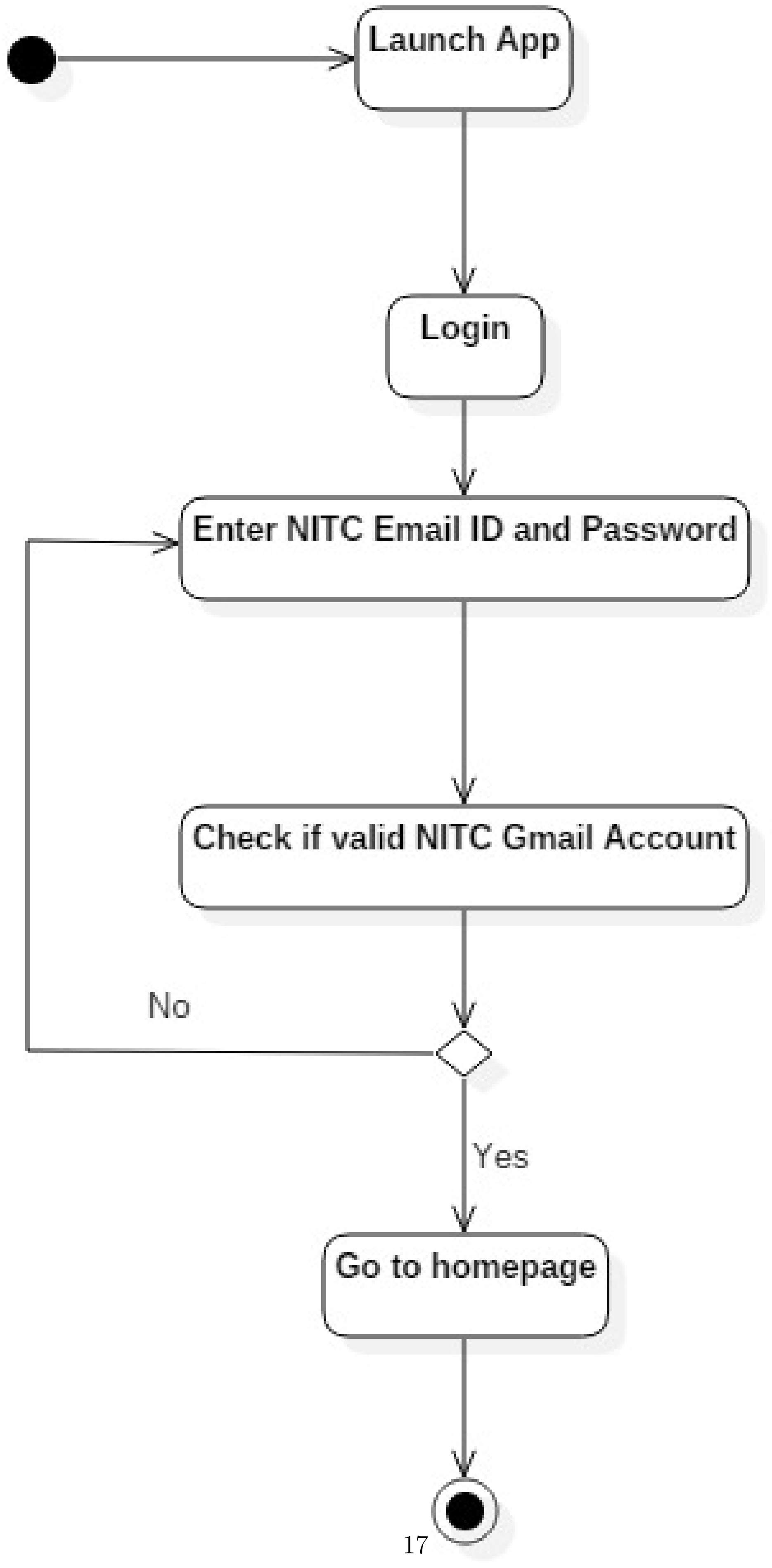
## References

[1] Brad Appleton. *A Software Design Specification Template*, (brad@bradapp.net) http://www.bradapp.net.

[2] Buxbuddy SRS *version 1.1*

[3] Design Doc Template *www.se.rit.edu/ vdkrit/design/VDK-RIT_SDS.doc*

[4] UML Reference *http://www.uml-diagrams.org/uml-25-diagrams.html*


Launch App
Login
Enter NITC Email ID and Password
Check if valid NITC Gmail Account
No
Yes
Go to homepage

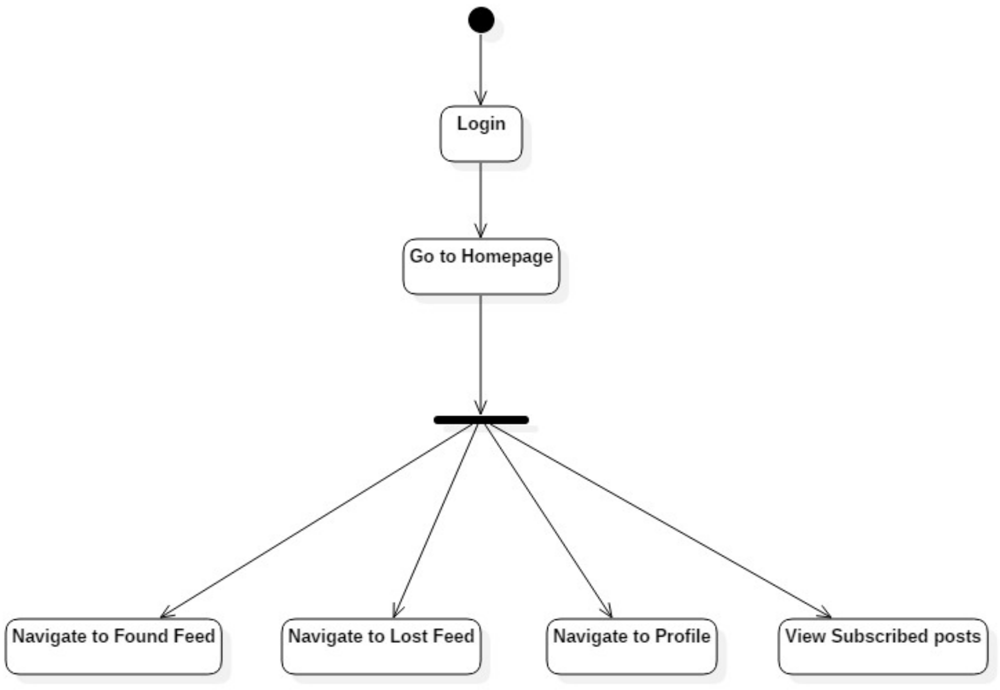


Figure 10: Activity diagram for Homepage

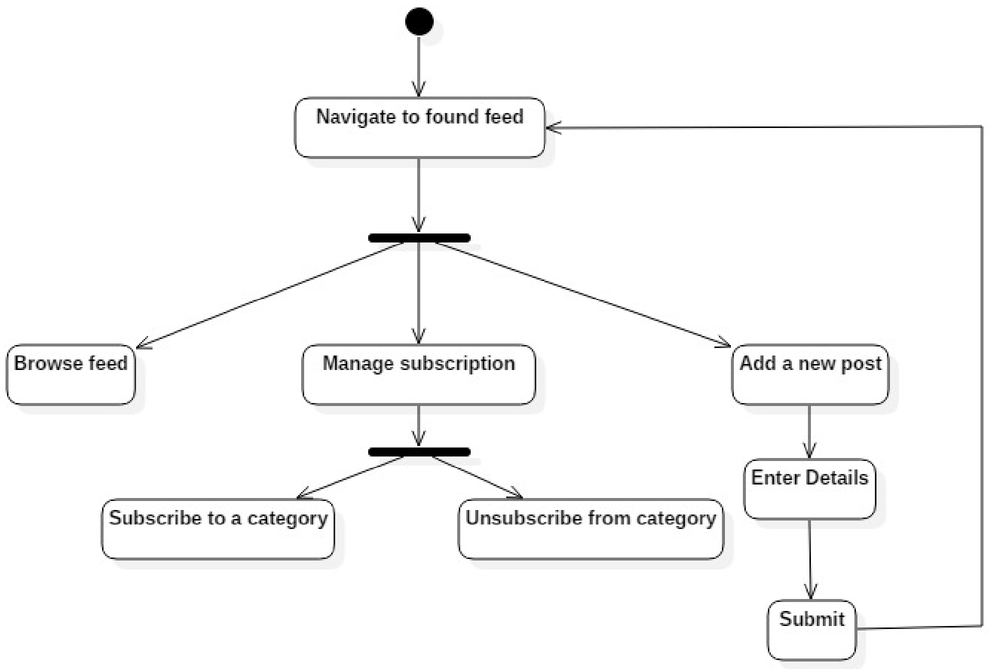


Figure 11: Activity diagram for Navigation to Found feed

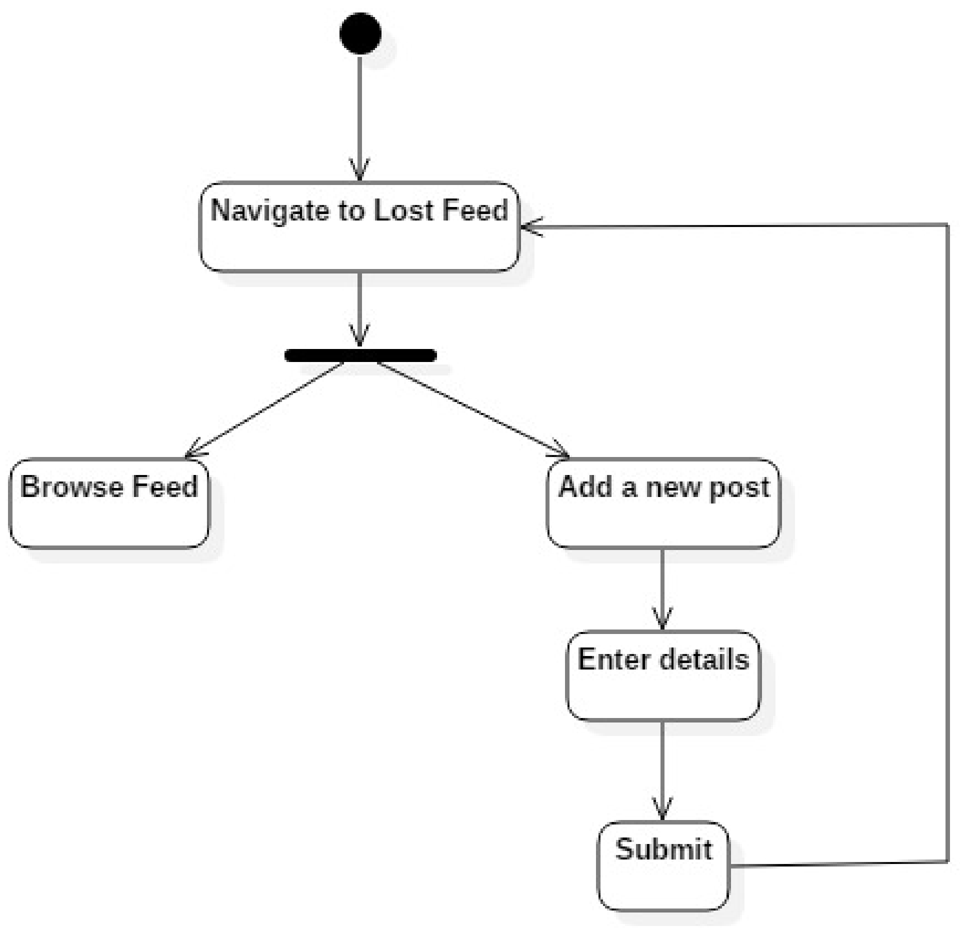


Figure 12: Activity Diagram for Navigation to lost feed

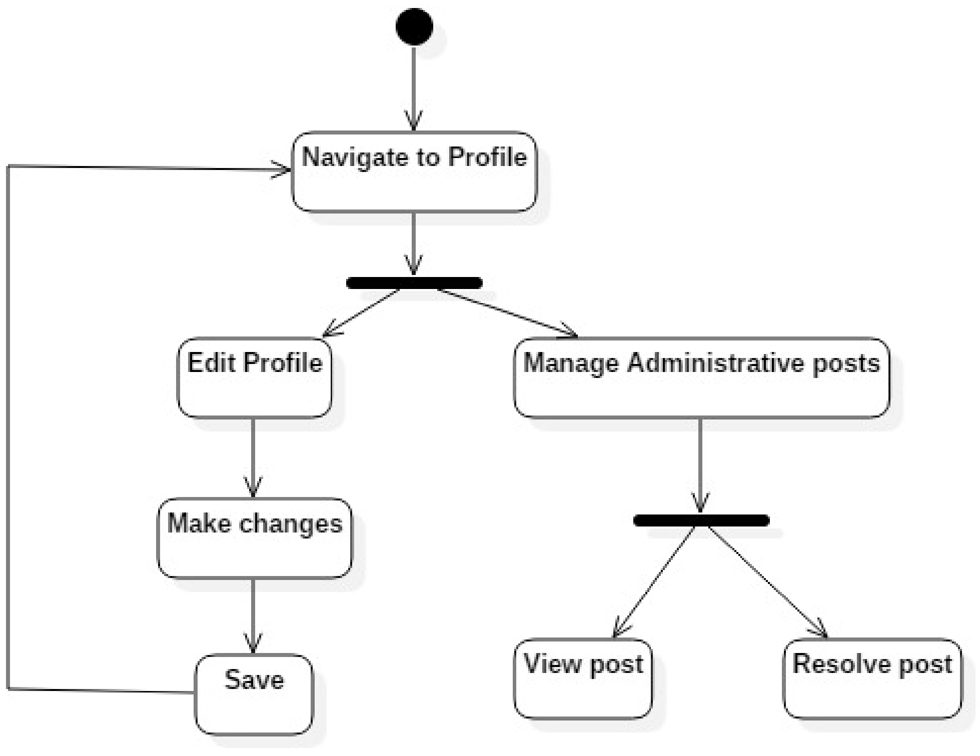


Figure 13: Activity diagram for Navigation to Profile

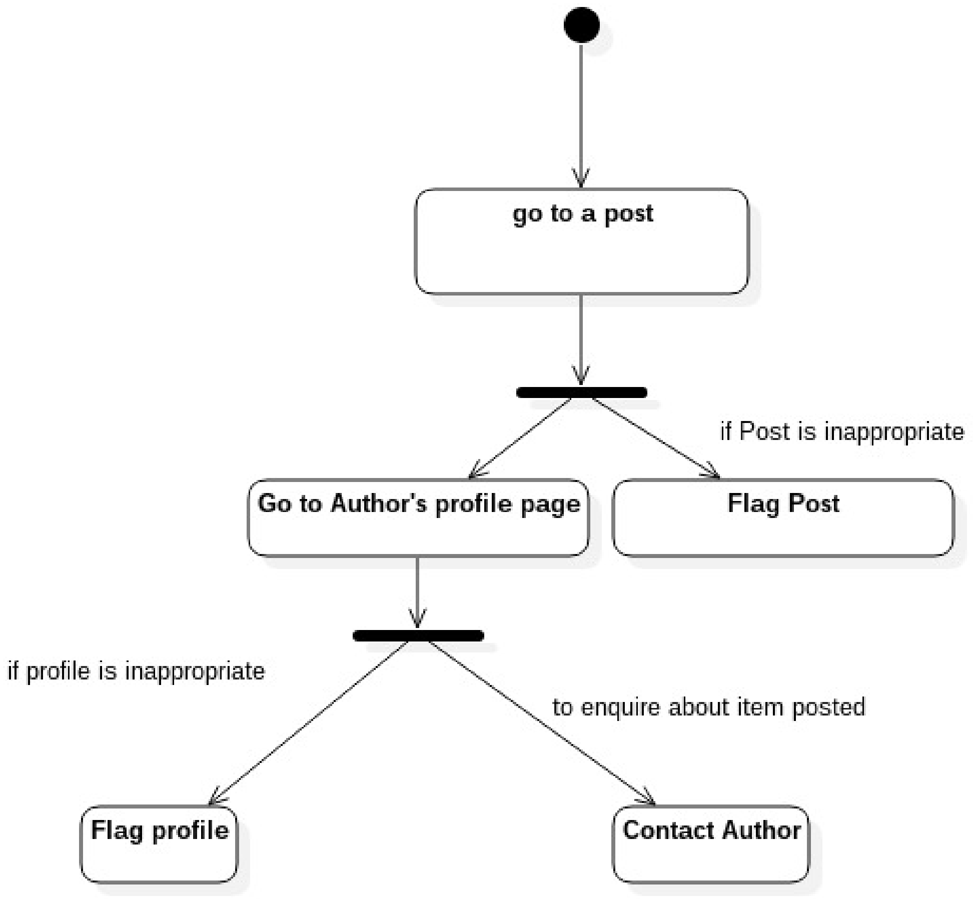

go to a post
if Post is inappropriate
Go to Author's profile page
Flag Post
if profile is inappropriate
to enquire about item posted
Flag profile
Contact Author

Figure 14: Activity Diagram for Reporting

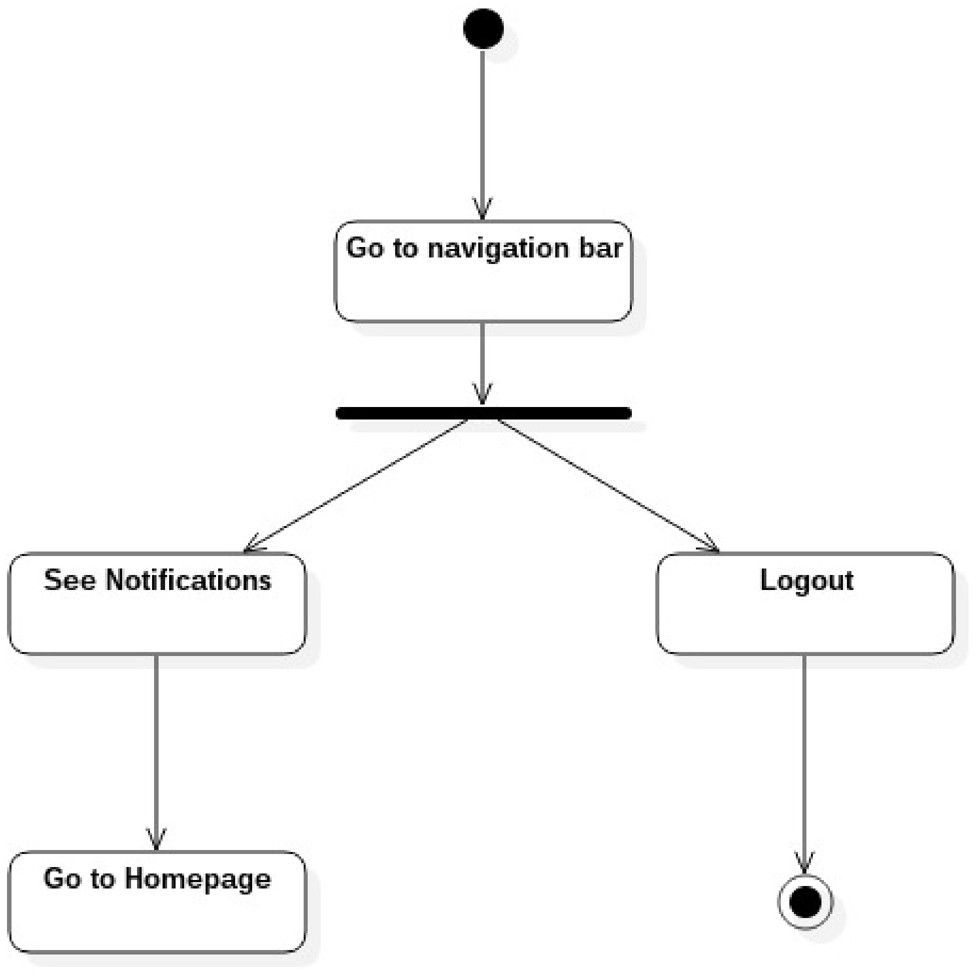


Figure 15: Activity diagram for Logout and Notification

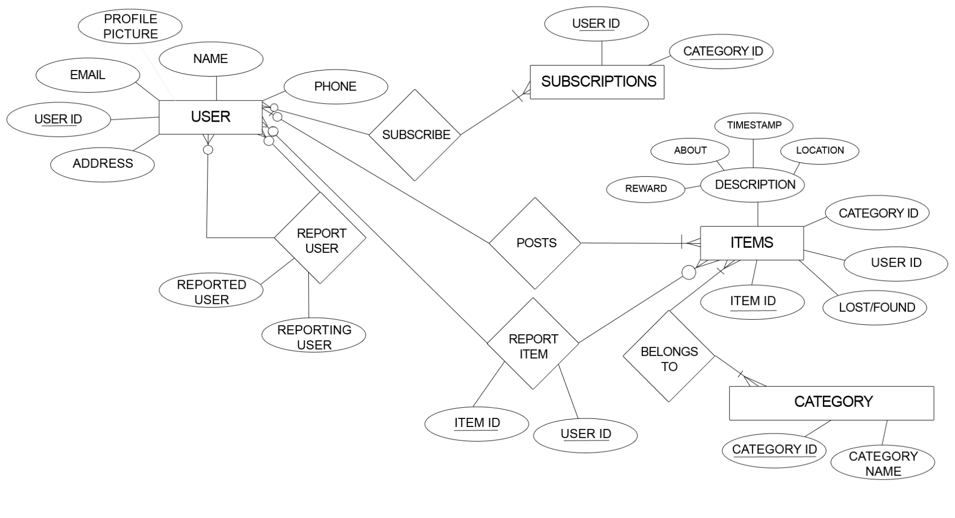


Figure 16: ER Diagram for LFA