Ministry Category: Ministry of Railways **Problem Code:** #IR11

Team Leader Name: Shraddha Makwana **College Code:** 4318

<u>Problem statement</u> : Tracking of Individual Package booked in Parcel and Luggage

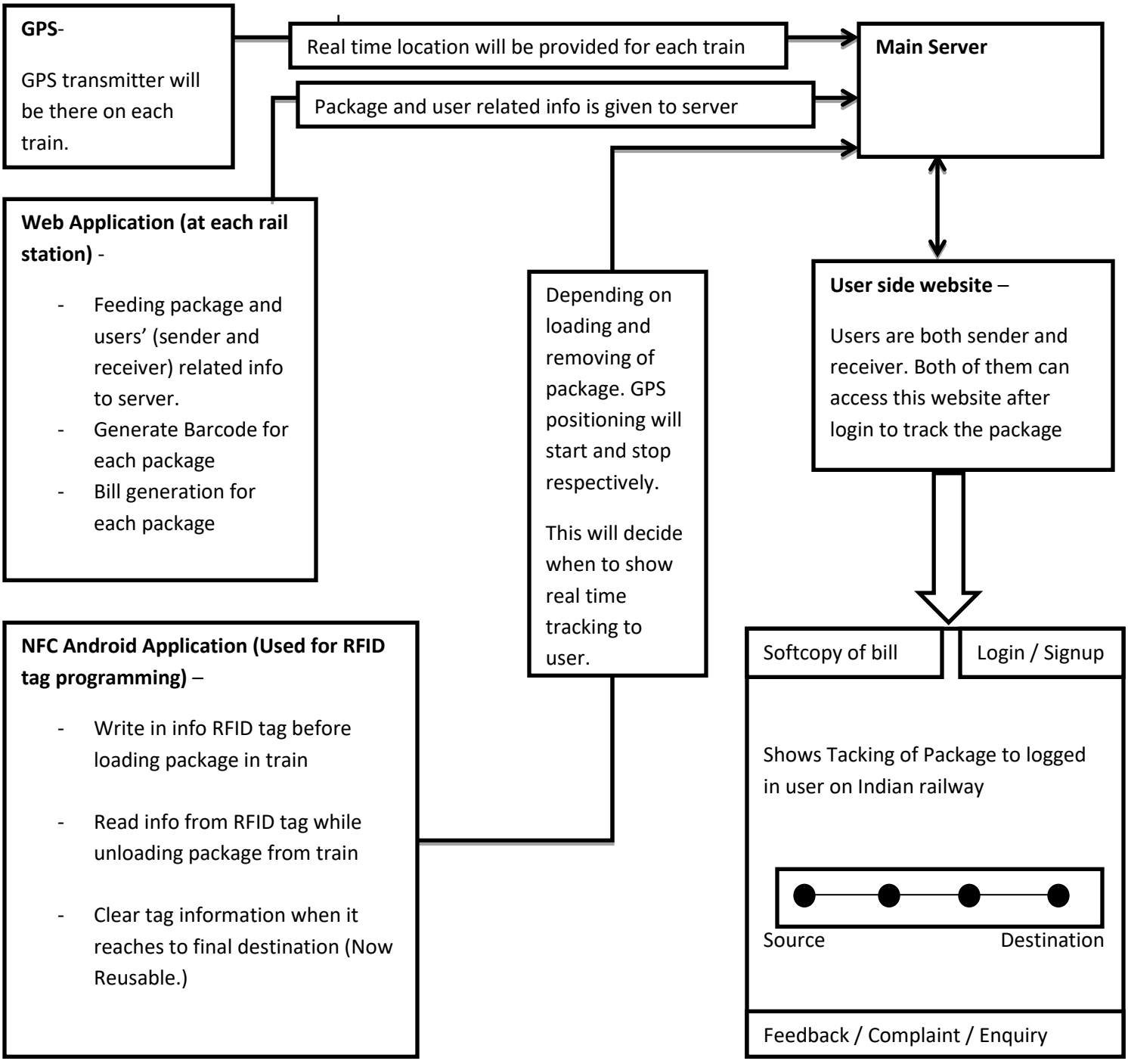
Parcel and luggage packages are booked for transport from one station to another. A receipt is issued to the consigner on depositing the package at parcel/luggage office. At some stations where computerization of parcel office has been implemented, Barcode tags are pasted on package.

- At present, the mechanism of tracking of individual package is not available.
- Customer wants the information about current location of the package on Indian Railways system.

Description of Idea / Solution:

The tracking system allows us to define the current position of the particular object. User can view the status of the consignment by using the track consignment service. The mechanism of tracking individual package on Indian railway system has to be there to provide convenience to user.

To implement this idea following approach can be used. The solution is explained with the following **block diagram**.



As shown in the above block diagram the solution would contain Main server application which will communicate with other components to provide services to them and it will fetch various data from different components.

First when consigner (sender) will come to Railway Parcel Department then he has to provide package, sender (his own) and receiver related information to the office. At each railway parcel office there will be one web application which will take this mentioned information provided by sender and send it to server which will be helpful for tracking mechanism. This web application will also generate barcode which we can stick on respective package and it will generate bill/receipt which will be given to consigner.

Now, it is time to load that package in particular train. We have to stick one **RFID tag**(Radio frequency identification) on each package. Now this tag has to be programmed i.e. package, source and destination related info has to be written in this tag. In order to write this information we need one NFC (Near Field Communication) phone. We have to build one Android NFC application for programming of tags. The loader or remover (i.e. NFC app user) first has to select the train number, by this we are actually mapping each package in that train with train number and sending the information at server side. After selecting train number he has following basic options which he can perform on RFID tags –

- Write information into tag – The package and user related info will be taken by scanning barcode on package this will reduce the work of typing. At this moment, we will start showing track of package (i.e. location) to user. (Note : Barcode and tag both will have same information)

- Read information from tag – When package is removed from train we will tap our NFC phone to tag. At this moment, we are just reading data about package without modifying or clearing data in tag. And during this time we will show user that package is removed from that train and is in hub of that station.

- Clear information from tag – When package is reached at final destination we will clear tag information and this tag is now reusable.

The above functions will also take care of such scenario, if we are moving package from one train to another, in between, to reach final destination. In this case NFC user will first select train number and will read tag information.

Using RFID Tag rather than barcode would save too much of time since it doesn't need direct line of site to scan we can just tap our NFC device with tag to achieve this. And they are reusable and durable so it is safe to use this RFID tags rather than barcode. Still permanent barcode has to be there on each package incase if we need more information or we lost tags on that package.

Now, In order to get the location of each train we can use Indian Railway API or If that is not possible then as mentioned above we will fit GPS transmitter in each train. Location of the train will be sent to server, server will have information about how many packages are still present in the train. Server will now update location information in database of all the packages present in train.

In order to show this tracking to user we need some website/Application where in user can log in and get the location of package. Here, user can also get soft copy of his bill. Feedback or any contact can be done by user to the respective railway department for their queries.

Note :

1. This entire solution can be implemented without need of any barcode, but still we are using it as safety option. RFID tags will make work much faster than barcode scanning that is the reason why we would prefer RFID since no extra hardware is needed only NFC phone is needed where as if we use barcode then we would need barcode scanner device and it would be time consuming also. So, it is preferable not to use barcode but still if it is compulsory to use it than we can use it that is why we have used both in our solution description

Another very important point to be noted is that the entire solution can also be implemented by only barcode or only RFID mechanism.

2. The alternate and optimize solution for this problem is use of active chip (i.e. chip that contains power sources) on each package and each coaches of train would have router that will detect this chips. So, actually we are detecting each package which is in close proximity of that router and if we remove that package from that coach then it will be disconnected from that router so here there is no need to manually scan each package.

Description of technology stack :

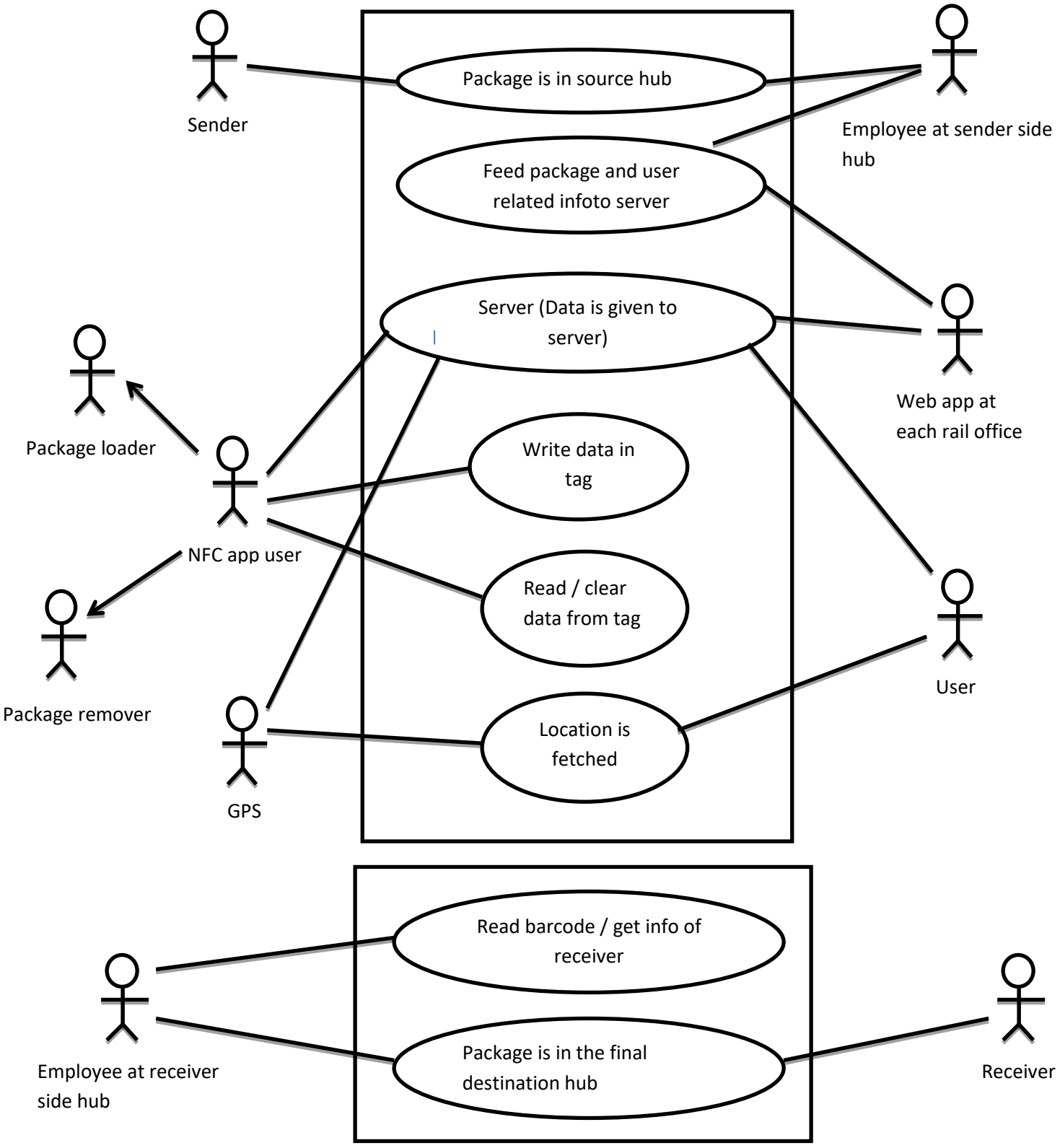
- **Web application at each rail department –** This web module can be developed by Java/JSP servlet
- **NFC Android Application –** Android app (Development tool would be Android Studio which is bundle comprises everything to develop android app).
- **RFID (Radio Frequency Identification) Tags -** These tags will contain limited memory to store information.
- **User Side Website –** To show tracking of package to user made by JSP/ Java
- To implement Location of train **Indian Railway API** or **GPS transmitter** can be used.

Aspects to be considered –

- Notifying and sending data from Android app to server we would be using **web services** while sending data from desktop app to Android app concept of **push notification** would be used.
- **User Interface** of Android would be done using XML. While Server app would be done using HTML, CSS, JavaScript, JQuery, Bootstrap etc.

Description of Use Case of project:

The model comprises of following main modules and scenarios which is demonstrated using use case diagram:



The mentioned actors would be using this application as described in the above section of description of idea.

The list of actors/modules is as follows with their respective role:

- Sender – Consigner who wants to send package
- Receiver – To whom package has to be delivered.
- Employee at sender side hub – They will gather needed information, give this info to server, bill generate, barcode generate, stick this barcode on package, make package ready to ship with the help of web app
- Employee at receiver side hub – They will be responsible for delivering package to receiver.
- NFC application user – The one who loads and remove packages from train will use this NFC application
- GPS – It is provider of location of each train.

Description of dependencies / Stoppers:

- In order to make this system efficient, firstly we need NFC enabled phone and if we have one then NFC Application phone needs internet to update information on server.
- The cost of RFID tags and NFC device might be high, but since it is one time cost it can be affordable since the tags are reusable.
- In order to track each train Indian railway API is needed or else as mentioned above GPS transmitter has to be there in each train.