

Mobile Computing

Practical Assignment #1 / Design and Development

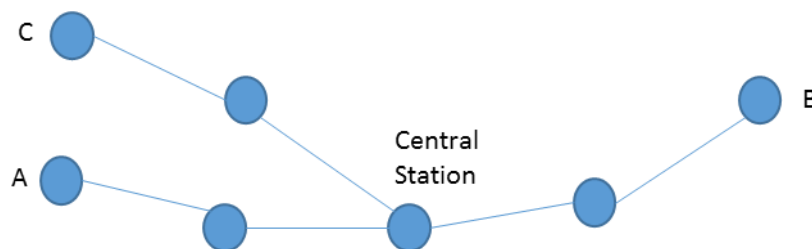
Android system for train tickets

1. Scenario

A railway company needs to develop and offer to its clients an Android application where they can consult some information (timetables, ticket prices) and buy tickets. The company ticket inspectors should also be in possession of an Android device with an application capable of validating the emitted tickets for that trip.

When the final users run the application for the first time (and only once) they should register with the company, supplying some personal data (name, user name, password ...) and their credit card data (type, number, validity). This information should be kept in the company data base.

Electronic tickets are offered between any two stations in the company railways, which have a map like the following:



There are a total of 3 daily trains in each direction from A to B and from C to the Central station. The duration of these voyages are 210 minutes and 60 minutes respectively. The train timetables are the same in each day. The distances between stations are also known.

Tickets can be sold for trips between any two stations, needing to change trains in the central station when the trip is between any station in the C portion and any other station besides the Central. In this case the traveler can be supplied with two tickets, one for each train. Ticket prices are proportional to the trip total distance.

2. Application use

Any user should be capable of consulting the daily timetables of trains going between any two stations. The application should indicate the passage times in all stations, the need to change trains in the central station, the arrival and departure time from that station (in the case a change is needed), and the waiting time in that station. Prices should also be indicated.

To make a trip ticket purchase the user must be authenticated and indicate a date, departure station, arrival station and a train. A graphical touch selection is better. You can consider (or not) that trains don't have reserved seats, but have a maximum capacity that must not be exceeded between any two stations. Authenticated users can also consult all their unused tickets. Tickets are emitted with a unique identifier (16 bytes) and other needed information (train, date, ...). The ticket can be imported to local storage in the application and can be shown to the ticket inspector in the train.

The railway company server uses an external debt service that verifies the validity of credit cards and performs the purchase operations. You can simulate this service, randomly generating a small number of rejections.

To avoid ticket falsifications they should be signed with the company private key at the server, before they are sent to the user.

3. Ticket inspectors

Ticket inspectors, with their own Android devices and app, should be able to verify the electronic tickets and signature (with the public key of the company). Before the trip starts, or in any station, inspectors should and can download the emitted ticket data from the company server into local memory, for that trip, using each station wireless network. The validating application should take note of all verified tickets and this information should be uploaded to the server at the end of the trip. Inspectors can also see statistics about the use of tickets, no shows, etc.

The ticket information should be transferred from the phone traveler to the phone inspector using QR codes and NFC (if the user chooses and is available in the user phone).

Note: if you are using only emulators the communication channel between them has to be TCP. See <http://developer.android.com/tools/devices/emulator.html#emulatornetworking> and the section “Interconnecting Emulator Instances” for instructions. With one real phone and an emulator, the emulator should be the user phone presenting the QR code and the real phone can capture it with the camera.

QR codes are limited in the content size they can convey. For this app the best way is to represent the data in binary form (an array of bytes). For the signature use RSA and 368 bits for generating the keys and “SHA1WithRSA” for the signature algorithm. This produces a signature of 46 bytes. The ticket representation should be kept to the minimum to generate a small and easy to read QR code.

4. Design and development

You should design and implement the set of applications capable of complying with the described functions and demonstrate its use. The applications should have a comfortable and easy to use interface. You can add any functionalities considered convenient.

You should also write a report, describing the architecture, data schema, included features and performed tests. The applications use should also be included in the report, presenting a screen capture sequence. Explain how ticket falsifications or copies are prevented.

