Android 2G/3G/4G Network Analyzer Project

American University of Beirut

EECE 451
Fall 2022-2023

Tentative Deadline: End of November 2022

Introduction

You are asked to develop an android application named as “Network Cell Analyzer”, which will be used to analyze the cell specific data received from the serving base station of the cellular network to which your android device is connected. This would allow to track the history of network operators and cellular network types to which a mobile device gets connected and provide statistics about the experienced link quality and measurements in a distributed manner.

Proposed System

With the need for automated network measurements in all generations of mobile networks, a new approach is to use smartphone’s APIs so that many mobile users can take part in the process of collecting measurements and reporting it to data centers.

In this project, you will develop an android application that collects cell info from the actively connected base station. The application should support GSM/GPRS/EDGE (2G/2.5G), UMTS (3G), and LTE (4G) networks. Thanks to the android API, this is enabled using a set of methods that allow the device to acquire cell related information.

This project will also involve the design of a server that will receive network’s cell data from the various running phones on a regular basis (for example, each 10 seconds). The android app running on the mobile device is expected to send the following cell information regularly to the server along with a time stamp:

1. **Operator**: Alfa
2. **Signal Power**: -11dBm
3. **SINR (Signal to Interference Noise Ratio) or SNR (Signal to Noise Ratio) when applicable**: 5 dB
4. **Network Type**: 4G
5. **Frequency Band** (if available): 20 (800MHz)
6. **Cell ID** (could have different name with different standards): 37100-81937409
7. **Time Stamp**: *17 OCT 2022 12:05 pm*

The server should accept multiple connections for different mobile application simultaneously. Then the server is expected to save the data it receives from the application in a database and provide statistics for the network information it received based on requests from the android application. The android application is expected to show in addition to the real-time cell info mentioned above (Operator, Signal Power, Network Type, …), the following statistics (between two specific dates determined by the user) that can be requested from the server:

- Average connectivity time per operator (for example 100% Touch)
- Average connectivity time per network type, for example: 4G (70%), 3G (30%), 2G (0%)
- Average Signal Power per network type
- Average Signal power per device
- Average SNR or SINR per network type (when applicable)

Grading Criteria

1. Design and Functionality:
    a. 2G Cell Information Querying (10%)
    b. 3G Cell Information Querying (10%)
    c. 4G Cell Information Querying (10%)
2. Server Design and Functionality (15%)
3. Database of Network Statistics (10%)
4. Realtime & Statistical Services Provided Using the Android App (15%)
5. User Interface design (10%)
6. Presentation and Reporting:
    a. Source Code Quality (10%)
    b. Presentation and documentation (10%)