SecuFone: Android Security Advisor
Tejas Padliya | tsp3859@rit.edu
Advisor: Dr. Leon Reznik
Rochester Institute of Technology

**Objective**

Develop Android application to evaluate security and privacy of Android devices. Compute overall score using rule engine. Provide comparison of scores with similar devices and other users. Provide advisory to improve score and overall security.

**Introduction**

Android is one of the most popular mobile operating system (OS). It is an open source OS, based on the Linux kernel. Android is found on devices like smartphones, tablets, smartwatches and smart TV. Android OS has different flavors and versions due to its open nature. Android support different types of applications, hardware and firmware.

Android devices can be infected easily from unwanted application downloaded from unregulated app store or side-loading an app from untrusted sources. Further app distribution from Google Play Store is not tightly controlled. Some apps like AvPass, TapSnake and ZergRush are popular malware for Android.

In this project, I develop an Android application to evaluate overall security of android devices by building an expert system using fuzzy logic. After performing security evaluation using parameters collected from their devices, I provide user with a relative score on scale 0 to 100. User is also given recommendation and general tips to improve their score based on their evaluation results. User can perform evaluation periodically and compare scores among other users.

**Implementation**

Application supports user management, handles multiple requests and provides past scores. Clients sent test data to the server, server analyzes it and stores it in database. Based on test data, a score is computed using an expert system which is built using jFuzzyLogic. Scores and advisory are provided back to the client.

- **Client**
  Client connects to the web server ‘Apache Tomcat’ using HTTP protocol. Data is exchanged as json (JavaScript Object Notation). Google gson is used to serialize and deserialize data.

- **Server**
  RDBMS: MySQL is used to store user information and test related data. User can retrieve previous test results. MySQL also stores identifier unique to user, user device and device model to provide comparison of scores.

Scraping: Scraping is a process of extracting information generally from websites. jsoup, Java HTML parser library is used to perform web scraping by scraping and parsing data using HTML and DOM elements. Web scraping is used to analyze information related to installed applications from application distribution store.

Expert System: Expert system is a knowledge based system which uses inferences to solve a problem of particular application domain. It consist of two subsystem: the inference engine and the knowledge base.

**Design**

**Conclusion**

This project uses metrics obtained from Android device to develop an expert system based on fuzzy logic to evaluate its security. The use of an expert system is highly scalable and efficient. New rules and metrics can be added easily.

**jFuzzyLogic**


Fuzzy Logic

Fuzzy logic is an extension of a multivalued logical system where each value represent only a partial degree of membership.

Membership Functions

A membership function (MF) defines how each point in the input space is mapped to degree of membership [1]. The input space is referred as the ‘universe of discourse’.

FCL Elements

Fuzzification: The process of conversion of an input values into degrees of membership. jFuzzyLogic uses keyword ‘FUZZIFY’.

Defuzzification: The process of conversion of a linguistic value of a variable to a numeric value. It uses keyword ‘DEFUZZIFY’.

Rule Block: Rule block consist of rules (knowledge base) and a rule settings like activation and accumulation.

**Technologies**

Android SDK, Android Studio, Apache Tomcat, Eclipse IDE.
Google Gson, Gradle, Java, jFuzzyLogic, json, jsoup, MySQL.
Supported Devices: Android Phones and Tablets
Supported Versions: Android 4.0.3 to 6.0

**References**

http://www.mathworks.com/help/fuzzy
http://jfuzzylogic.sourceforge.net