

Design of a Shared Parking System with special attention to security aspects

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Structure

- Introduction (PIBA)
- Related work and background
- System Model and Requirements
- Design
- Security Analysis
- Implementation
- Future Work and Conclusion

Introduction

- Problem:
 - Amount of parking spaces limited, amount of cars steadily increasing
 - Creation of new parking spaces difficult and expensive
- Idea:
 - More efficient use of existing parking spots
- Benefit:
 - Less frustration when searching for parking spot, fewer traffic jams
 - Less air pollution, less petrol use
- Action:
 - Shared Parking
 - -> Different people are able to use the same parking spot at different times

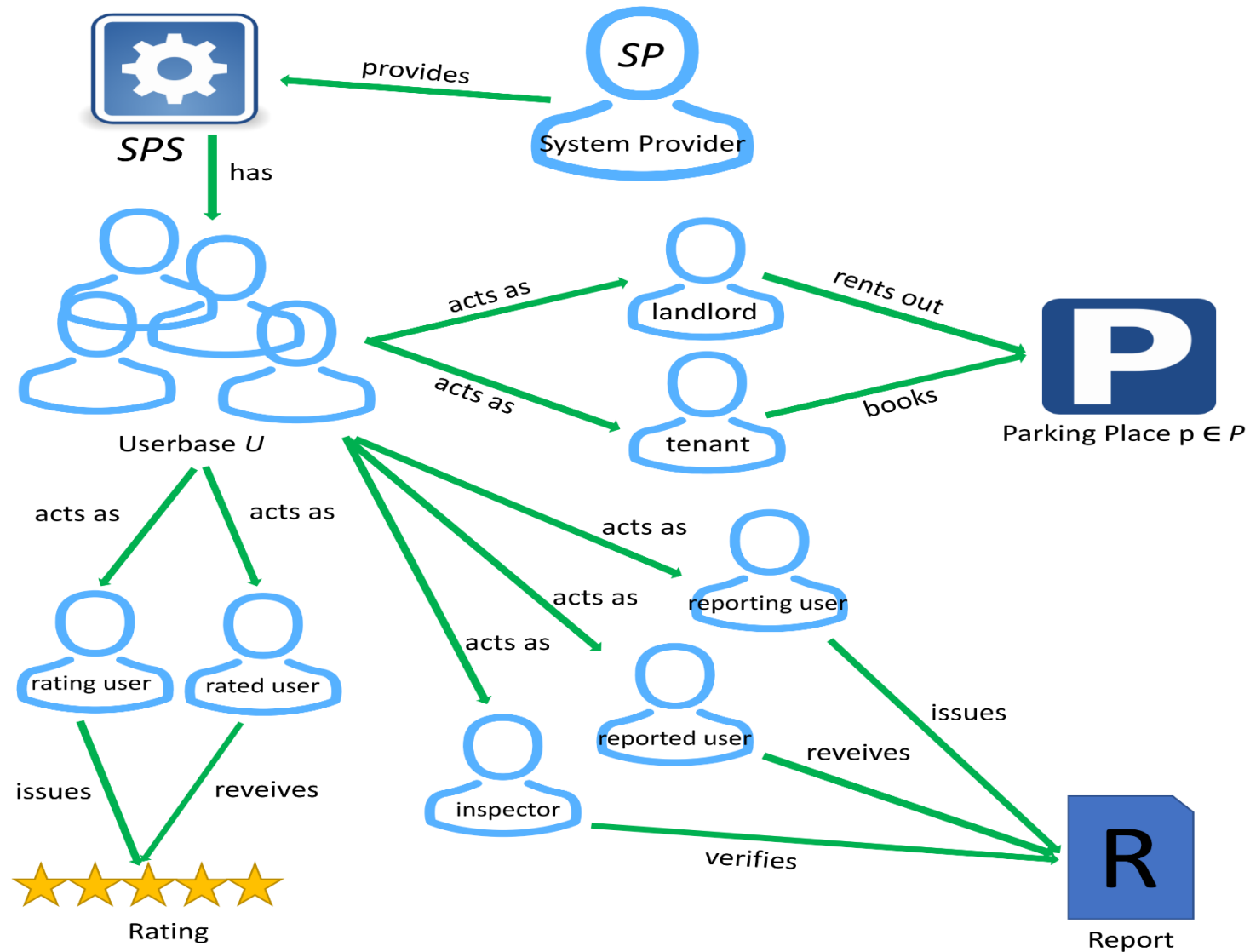
Related work and background

- Great amount of scientific work about ‚intelligent parking systems‘
- Nearly no scientific work about ‚Shared Parking‘
- Few amount of applications that implement Shared Parking
 - Not really successful (success is city based)
 - No information on security aspects

System Model and Requirements – High-level Overview

- Offers an online marketplace where both private and business users can rent and lease parking spaces
- End user participation through smartphone
- Particular importance is given to handling fraud
- SPS does not aim at preventing unauthorized access to parking spaces, but instead incorporates mechanisms to punish misbehaving users

System Model and Requirements – System Model



System Model and Requirements – Functional Requirements

- Basic rental functions (+ search function via a map)
- Low deployment costs and of the shelf hardware
- Automatic Processing

System Model and Requirements – Adversary Model

- Adversary Model and Classes of Fraud
 - Class 1: stem from the general nature of a shared parking system
 - Class 2: stem from introduction of reputation system, e.g.
 - Corruption attack
 - On-Off attack
 - Re-entry attack
 - ...
 - Class 3: exceptional cases that cant be solved without manual intervention

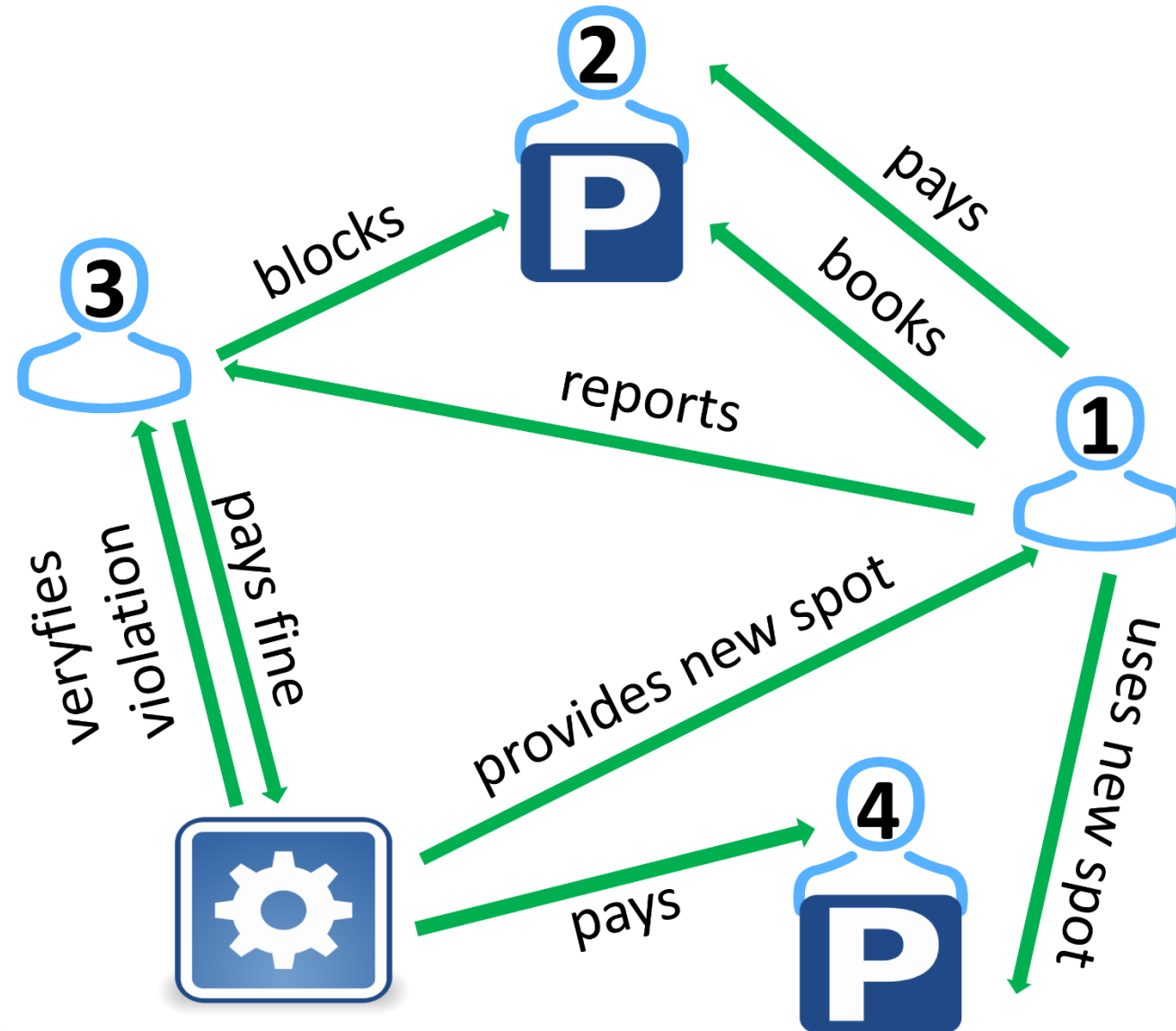
System Model and Requirements – Security Requirements

- Fraud Prevention
- Fraud Detection
- Fraud Punishment
- Fraud Compensation

Design – Features

- Functional Features
- Security Features
 - Rating Module
 - Reporting Module
 - Verification Module
 - Reputation Module
 - Based on Dynamic Trusted Set Based Reputation System for use in Mobile Participatory Sensing Applications
 - Sanctioning and Compensation

Design – Example

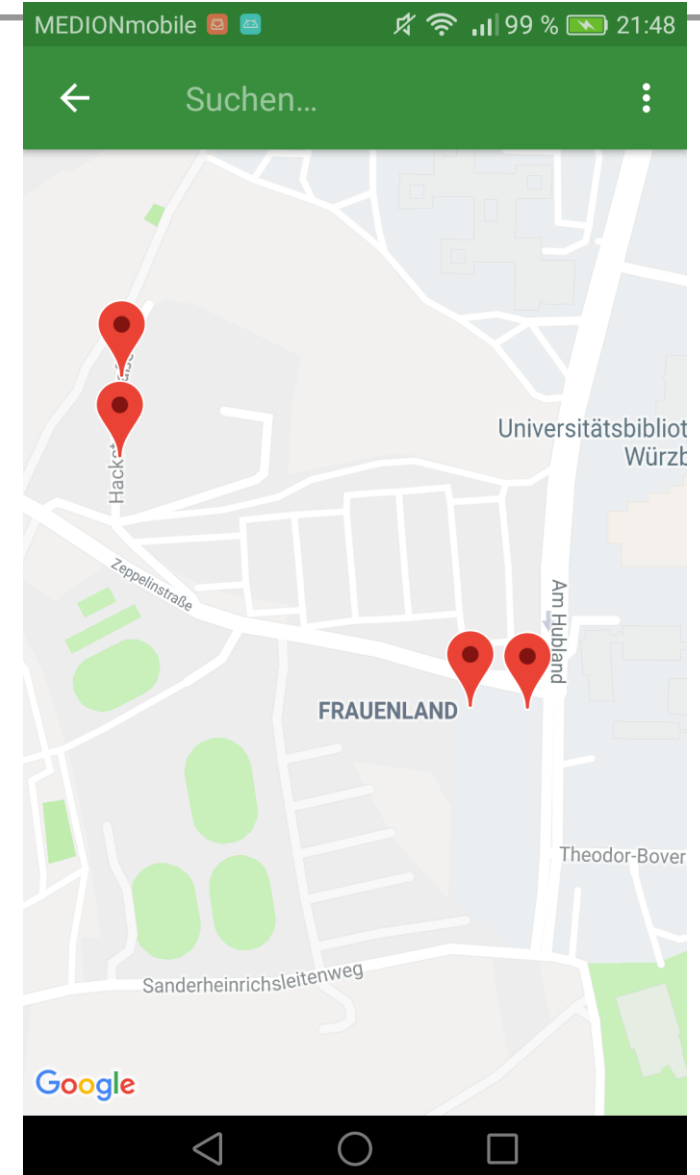
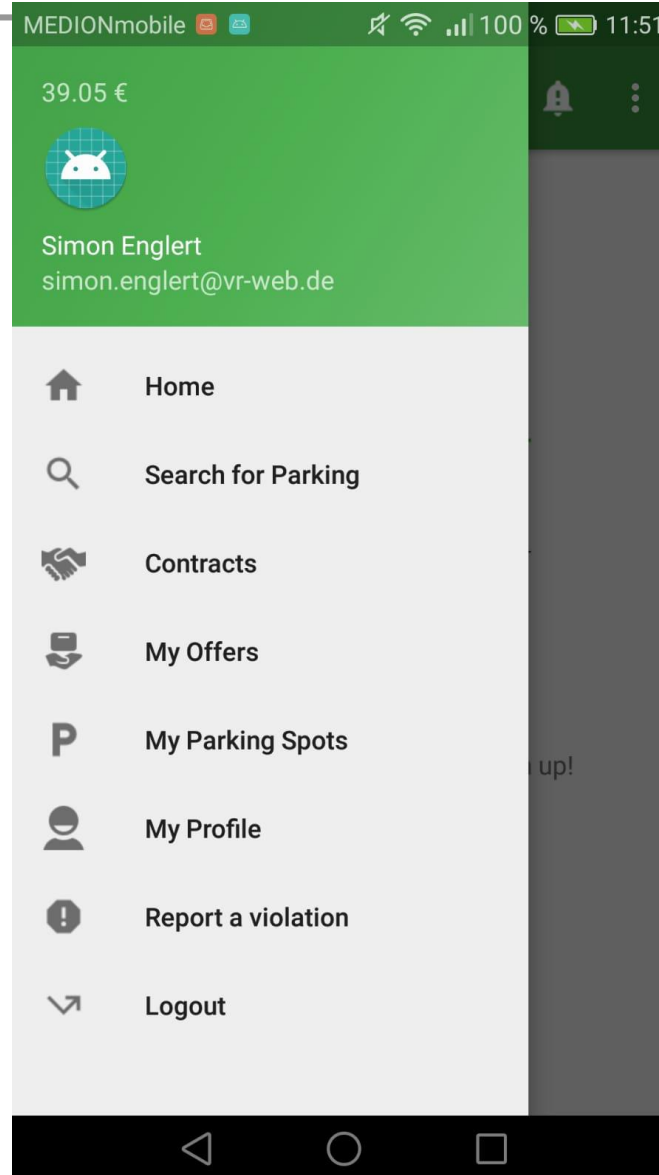
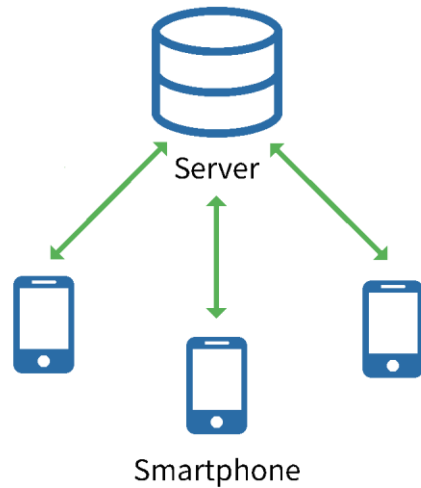


Design of a Shared Parking System

- Fraud Detection
 - Fraud recognition
 - Adversary identification based on reputation system
- Fraud Punishment
 - Based on the ability of adversary identification
- Fraud Compensation
 - Based on the ability of adversary identification
- Fraud Prevention
 - Through Deterrence
 - Through Elimination

Implementation

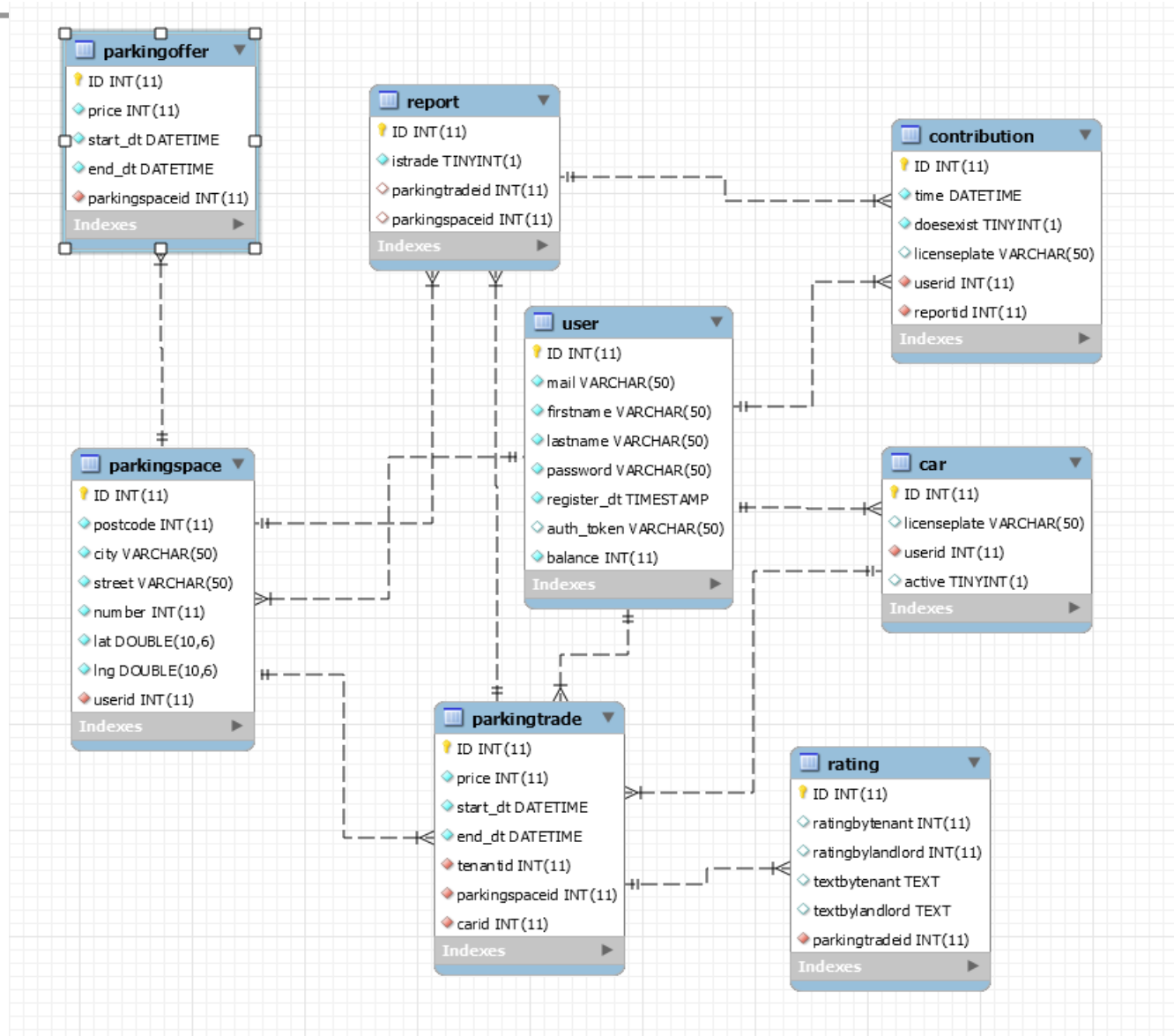
- Database
- Java Web Service
- Java Android Prototype



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Implementation



Future Work and Conclusion

- Elaboration of the reputations system
- Extending the functionality of the prototype
- Testing usability and performance of the app