

ON THE SECURITY AND QUALITY OF WIRELESS COMMUNICATIONS IN OUTDOOR MOBILE ENVIRONMENT

Abstract

Candidate: Sharaf Malebary

Advisor: Dr. Wenyuan Xu

The rapid advancement in wireless technology along with their low cost and easy to deploy have been attracting researchers academically and commercially. Researchers from private and public sectors are investing into enhancing the reliability, robustness, and security of radio frequency (RF) communications to accommodate the demand and enhance lifestyle. RF base communications -by nature- are slower and more exposed to attacks than a wired base (LAN). Deploying such networks in various cutting-edge mobile platforms (e.g. VANet, IoT, Autonomous robots) adds new challenges that impact the quality directly. Moreover, adopting such networks in public outdoor areas make them vulnerable to various attacks (regardless of the attacker motive). Therefore, the quality and security of the communications cannot be neglected especially when developing outdoor wireless applications/networks.

While some wireless applications and platforms aim to provide comfort and infotainment, others are more critical to protect and save lives. Thus, the need for mobile broadband connections has been increased to accommodate such applications. The FCC took the first step to regulate and assure the quality when using these technologies by allocating spectrums and issuing standards and amendments (e.g. IEEE802.11a, b, g, n, and p) to deliver reliable and secure communications. In this dissertation, we introduce several problems related to the security and quality of communications in outdoor environments. Although we focus on the ISM-RF bands UHF and SHF (licensed and unlicensed) and their applications nevertheless, the concept of propagating signals through the air for communications remain the same across other bands. Therefore, problems and solutions in this work can be adopted and applied to different wireless technologies with respect to environment and mobility.