School of Electrical, Computer and Energy Engineering

PhD Final Oral Defense
Security and Privacy in Mobile Computing: Challenges and Solutions

by
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Abstract
Mobile devices are penetrating everyday life. According to a recent Cisco report [1], the number of mobile connected devices such as smartphones, tablets, laptops, eReaders, and Machine-to-Machine (M2M) modules will hit 11.6 billion by 2021, exceeding the world's projected population at that time (7.8 billion). The rapid development of mobile devices has brought a number of emerging security and privacy issues in mobile computing. This dissertation aims to address a number of challenging security and privacy issues in mobile computing.

This dissertation makes fivefold contributions. The first and second parts study the security and privacy issues in Device-to-Device communications. Specifically, the first part develops a novel scheme to enable a new way of trust relationship called spatiotemporal matching in a privacy-preserving and efficient fashion. To enhance the secure communication among mobile users, the second part proposes a game-theoretical framework to stimulate the cooperative shared secret key generation among mobile users.
The third and fourth parts investigate the security and privacy issues in mobile crowdsourcing. In particular, the third part presents a secure and privacy-preserving mobile crowdsourcing system which strikes a good balance among object security, user privacy, and system efficiency. The fourth part demonstrates a differentially private distributed stream monitoring system via mobile crowdsourcing. Finally, the fifth part proposes VISIBLE, a novel video-assisted keystroke inference framework that allows an attacker to infer a tablet user's typed inputs on the touchscreen by recording and analyzing the video of the tablet backside during the user's input process. Besides, some potential countermeasures to this attack are also discussed. This dissertation sheds the light on the state-of-the-art security and privacy issues in mobile computing.