School of Electrical, Computer and Energy Engineering

PhD Final Oral Defense
Security and Privacy in Heterogeneous Wireless and Mobile Networks: Challenges and Solutions

by
Rui Zhang
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Committee:
Dr. Yanchao Zhang (chair)
Dr. Tolga Duman
Dr. Guoliang Xue
Dr. Junshan Zhang

Abstract

The rapid advances in wireless communications and networking have given rise to a number of emerging heterogeneous wireless and mobile networks along with novel networking paradigms, including wireless sensor networks, mobile crowdsourcing, and mobile social networking. While offering promising solutions to a wide range of new applications, their widespread adoption and large-scale deployment are often hindered by people's concerns about the security, user privacy, or both. In this dissertation, we aim to address a number of challenging security and privacy issues in heterogeneous wireless and mobile networks in an attempt to foster their widespread adoption.

Our contributions are mainly fivefold. First, we introduce a novel secure and loss-resistant code dissemination scheme for wireless sensor networks deployed in hostile and harsh environments. Second, we devise a novel scheme to enable mobile users to detect any inauthentic or unsound location-based top-$k$ query result returned by an untrusted
location-based service providers. Third, we develop a novel verifiable privacy-preserving aggregation scheme for people-centric mobile sensing systems. Fourth, we present a suite of privacy-preserving profile matching protocols for proximity-based mobile social networking, which can support a wide range of matching metrics with different privacy levels. Last, we present a secure combination scheme for crowdsourcing-based cooperative spectrum sensing systems that can enable robust primary user detection even when malicious cognitive radio users constitute the majority.