UNIVERSITY OF SOUTH FLORIDA

Defense of a Doctoral Dissertation

Wireless Physical Layer Design for Confidentiality and Authentication

by

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As various of wireless techniques have been proposed to achieve fast and efficient data communication, it's becoming increasingly important to protect wireless communications from being undermined by adversaries. A secure and reliable wireless physical layer design is essential and critical to build a solid foundation for upper layer applications. This dissertation present two works that explore the physical layer features to secure wireless communications towards the data confidentiality and user authentication. The first work builds a reliable wireless communication system to enforce the location restricted service access control. In particular, the work proposes a novel technique named pinpoint waveforming to deliver the services to users at eligible locations only. The second work develops a secure far proximity identification approach that can determine whether a remote device is far away, thus preventing potential spoofing attacks in long-haul wireless communications. This dissertation lastly describes some future work efforts, designing a light-weight encryption scheme to facilitate sensitive data encryption for applications which cannot support expensive cryptography encryption operations such as IoT devices.

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Publications

1. **Tao Wang**, Tao Hou, Zhuo Lu, and Yao Liu, "When Third-Party JavaScript Meets Cache: Uncovering Insecure Practices on the Internet," *under submission*.
2. **Tao Wang**, Tao Hou, Yao Liu, Zhuo Lu, and Qingqi Pei, "Physical Layer One-time Pad Towards Wireless Security," *under submission*.
3. **Tao Wang**, Jian Weng, Jay Ligatti, and Yao Liu, "Far Proximity Identification in Wireless Systems," *under submission*.
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5. Tao Hou, **Tao Wang**, Dakun Shen, Zhuo Lu, and Yao Liu, "Autonomous Security Mechanisms for High-Performance Computing Systems: Review and Analysis", *Autonomous Adaptive Cyber Systems*, Springer, 2019.
6. **Tao Wang**, Yao Liu, Tao Hou, Qingqi Pei, and Song Fang, "Signal Entanglement based Pinpoint Wave- forming for Location-restricted Service Access Control," *to appear in IEEE Transactions on Dependable and Secure Computing(TDSC)*, vol. 15, no. 5, pp. 853-867, 2018.
7. Song Fang, Yao Liu, Wenbo Shen, Haojin Zhu, and **Tao Wang**,"Virtual Multipath Attack and Defense for Location Distinction in Wireless Networks," *in IEEE Transactions on Mobile Computing (TMC)*, vol. 16, no. 2, pp. 566-580, 2017.
8. Yuexin Zhang, Yang Xiang, **Tao Wang**, Wei Wu, and Jian Shen, "An over-the-air key establishment protocol using keyless cryptography," *to appear in Future Generation Computer Systems (FGCS)*, 2016.
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