University of Rochester
Department of Electrical and Computer Engineering

Physics-Based Communication Security

Dr. Jonathan Habif

Wednesday, April 12th
12:00PM – 1:00PM
Computer Studies Building (CSB) 209

Abstract: Assured communication security continues to grow in importance in both the commercial and military communities, as the amount of data transmitted and the importance of that data increases rapidly. Traditional communication security (COMSEC) protocols rely on trust models that can be proven faulty or algorithmic techniques rooted in conjectures in complexity theory. These COMSEC protocols are being challenged by sophisticated network intrusion techniques, omni-present channel monitoring, and the emerging threat of quantum computation. Quantum key distribution (QKD) emerged as one of the first applications of quantum information, and the first protocol to offer a security proof that was rooted in the immutable laws of quantum mechanics, robust against quantum computers. In this talk, I extend the concept of physics-based COMSEC beyond QKD to encompass direct-secure communication and provably covert communications. Direct-secure and covert communications protocols have blossomed from the rich research field of quantum information, and benefit from enabling technologies developed within this field. I present information theoretic bounds for these protocols, and experimental results demonstrating implementation in the laboratory. The information theoretic bounds presented calculate the number of 'bits per mode' (or channel use) that can be reliably communicated for a given protocol. To achieve high data rates, I will present concepts for designing systems that can transmit and receive a high number of modes per second, independent of the traditional bandwidth associated with data rates. In addition, I address the looming "valley of death" for the transition of these technologies, providing system engineering strategies for easing the insertion of these protocols into already-existing platforms where end-users can capitalize on the capabilities.

Bio: Dr. Jonathan L. Habif is an experimental physicist and research lead at the University of Southern California information Sciences Institute (ISI). His research has focused on photon-starved, classical communication and imaging, quantum-secured optical communications in free-space and fiber, and integrated nano-photonic for both classical and non-classical applications. Prior to joining ISI, Dr. Habif was with BBN technologies where he served as principal investigator for a number of DARPA-sponsored research programs, partnering with university collaborators to demonstrate revolutionary optical technologies impacting traditional communications, sensing and computation systems. Dr. Habif earned a Ph.D. from the University of Rochester in the field of superconducting quantum computing and continued this course of research as a postdoctoral associate at MIT.

Pizza and soda provided.