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Keynote

A Multi-Layer Framework for Securing Wireless Sensor networks

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Abstract:

Wireless sensor networks (WSNs) are now being deployed for national and global security as well as for securing critical infrastructures via situation monitoring, data gathering and aggregation, and intelligence extraction from physical phenomena. Thus, providing high information assurance in WSNs is crucial, more so in unattended and hostile environments. However, due to severe resource limitations, wireless sensor nodes are extremely vulnerable to adversaries, often leading to revealed secrets and security breaches. An adversary can launch an attack by physically capturing a node, or carefully analyzing communication and battery usage patterns, or via cyber attacks such as virus spreading over wireless links. The consequence can be catastrophic as a compromised node can further launch internal attacks such as forged data, fake commands, and virus spreading where cryptographic techniques are merely futile. This calls for rigorous mathematical models for vulnerability analysis in WSNs.

In this talk, we will develop a novel multi-layer integrated security framework to help detect, revoke, isolate, and purge compromised nodes in WSNs. Our framework is based on a rich set of theoretical and practical design principles, such as epidemic theory, trust/reputation model, information theory, and digital watermarking techniques. Specifically, we will discuss how to: 1) characterize and measure trust to effectively detect malicious sensor nodes (internal attackers), thus resulting in secure aggregation against possible false data injection; 2) model the speed of malware propagation based on epidemic theory, leading to novel defense mechanisms to control possible outbreaks; and 3) design digital watermarking based aggregation scheme to correct tampered data. The talk will be concluded with open issues and challenges in WSN security.

Speaker's Biography:

Dr. Sajal K. Das is currently a Program Director at NSF in the Computer and Network Systems Division. He is also a University Distinguished Scholar Professor of Computer Science and Engineering and the Founding Director of the Center for Research in Wireless Mobility and Networking (CRWMan) at the University of Texas at Arlington. Dr. Das is a Visiting Professor at Indian Institute of Technology (IIT), Kanpur; Honorary Professor at Fudan University, Shanghai, China; and Visiting Scientist at the Institute of Infocom Research, Singapore. He is frequently invited as keynote speakers at various conferences and symposia.

Dr. Das' current research interests include wireless and sensor networks, security, smart environments, mobile and pervasive computing, applied graph theory and game theory. He has published over 400 articles in journals and international conferences, and over 40 invited book chapters. He holds 6 US patents, and coauthored two books: "Smart Environments: Technology, Protocols, and Applications" (Wiley, 2005), and "Mobile Agents in Distributed Computing and Networking" (Wiley, 2009). Dr. Das is a recipient of 7 Best Paper Awards in conferences including EWSN'08, IEEE PerCom'06, and ACM MobiCom'99. He is also a recipient of the IEEE Computer Society 2009 Technical Achievement Award, IEEE Region 5 Outstanding Educator Award (2009), Lockheed Martin Award for Teaching Excellence (2009), IEEE Engineer of the Year Award (2007), UTA Academy of Distinguished Scholars Award (2006), University Award for Distinguished Record of Research (2005), and UTA College of Engineering Research Excellence Award (2003).

Dr. Das serves as the Founding Editor-in-Chief of Pervasive and Mobile Computing (PMC) journal, and Associate Editor of IEEE Transactions on Mobile Computing, ACM/Springer Wireless Networks, IEEE Transactions on Parallel and Distributed Systems, and Journal of Peer-to-Peer Networking. He is the founder of IEEE WoWMoM and IEEE PerCom conferences. He has served as General Chair, Program Chair and TPC member of numerous IEEE and ACM conferences. He is a senior member of IEEE.