**COLLOQUIUM**

Department of Computer Science and Engineering

University of South Carolina

**Secure Intelligent Radio for Trains (SIRT)**

**Damindra Bandara**

Date: **March 23, 2017**

Time: **3:00-4:00pm**

Place: **300 Main, B110**

# Abstract

Safety objectives of Positive Train Control (PTC) are to avoid train to train collisions, train derailments and ensure railroad worker safety. Under published specifications of Interoperable Electronic Train Management System (I-ETMS), the on-board PTC controller communicates with two networks; the Signaling Network and the Wayside Interface Unit (WIU) network to gather navigational information such as the positions of other trains, the status of critical infrastructure and any hazardous conditions along the train path. PTC systems are predicated on having a reliable radio communication network.

Secure Intelligent Radio for Trains (SIRT) is an intelligent radio that is customized for train operations with the aim of improving the reliability and security of the radio communication network. SIRT system can (1) operate in areas with high train congestion, different noise levels and interference conditions, (2) withstand jamming attacks, (3) improve data throughput and (4) detect threats and improve communication security. My work includes (1) Analyzing the PTC system to identify communication constraints and vulnerabilities, (2) Designing SIRT to overcome them, (3) Developing a prototype of SIRT using Software Defined Radios and (4) Testing it under varying channel conditions, noise levels and attackers. My experiments show that SIRT dynamically chooses the best modulation schemes based on the channel noise level and switches channels in response to channel jamming. Also, it changes cryptographic key values using a scheme like Lamport scheme and detects replay and forgery attacks with an accuracy more than 93%.

**Damindra Bandara** is a Ph.D. candidate at George Mason University, Fairfax, Virginia. She will defend her Ph.D. by the end of March 2017. She received her Bachelor's degree in Electrical and Electronic Engineering from University of Peradeniya, Sri Lanka and Master degree in Information Security and Assurance from George Mason University. Previously she has worked as a Wireless Quality Assurance intern at Time Warner Cable, Herndon Virginia and as a lecturer in Department of Electrical and Electronic Engineering, University of Peradeniya, Sri Lanka. Her research interests are network security, wireless controlled trains and Software Defined Radio.