

**Quarterly Progress Report:**

**Project Number and Title:** 4.3. *Towards Quantitative Cybersecurity Risk Assessment in Transportation Infrastructure*

**Research Area:** Thrust 4 *Connectivity for enhanced asset and performance management*

**PI:** Dr. Song Han, Associate Professor and Castleman Term Professor in Engineering Innovation, Department of Computer Science and Engineering, University of Connecticut

**Reporting Period:** July 1<sup>st</sup>, 2021 – September 30<sup>th</sup>, 2021

**Submission Date:** October 2<sup>nd</sup>, 2021

**Overview:**

During this reporting period, the research team continues to work on enhancing the survey article on security issues in industrial wireless networks. Based on the input from our industrial collaborators, we provided more details on the design challenges of industrial wireless networks, including but are not limited to resource constraints, dynamic topologies and harsh environmental conditions, stringent QoS requirements, large-scale deployment and sometimes ad hoc architecture. We also provided a layer-to-layer comparison among the representative industrial wireless protocols regarding the functions provided by each layer. For the security issues in each layer, we re-organized the structure of the article to include the desired properties of individual layers, the challenges to provide those properties, and the common attacks and their existing countermeasures in those layers. For each attack, we perform another round of literature review (still ongoing) to include the most update-to-date defending solutions. Once these sections are ready, we will be working on the literature review for privacy issues in industrial wireless networks and prepare a future direction section to summarize our vision on the promising research directions on this topic to conclude this survey article.

During this reporting period, the PhD student was mainly doing an internship with MathWorks and was not financially supported through this project. Instead the PI created multiple course projects related to the scope of this project in his course titled “Architecture of IoT” which is being offered in the Fall semester of 2021. For example, one project focuses on the design and development of a robust and secure communication system to support real-time monitoring and control of vehicle(s) for collision avoidance; and another project aims to develop a driver coaching system which can be brought into a vehicle and provide the driver instant feedback on the road. These projects will provide the students hands-on experience for communication protocol design, secure system design, and their implementation and evaluation.

Table 1: Task Progress			
Task Number	Start Date	End Date	% Complete
Task 1: Context establishment	Oct. 1st, 2018	Sept. 30th, 2019	100%
Task 2: Threat identification	Oct. 1st, 2019	December 31st, 2020	100%
Task 3: Consequence identification and impact assessment	Oct. 1st, 2020	March 31th, 2022	75% (some parts of Task 2 are concurrent with Task 3)
Task 4: Final report preparation	April 1 <sup>st</sup> , 2022	Sept. 30 <sup>th</sup> , 2022	0%
Overall Project	Oct. 1st, 2018	Sept. 30th, 2022	Around 90%

Table 2: Budget Progress		
Project Budget	Spend – Project to Date	% Project to Date*
* The information will be provided by the Institutional Lead.		

**Training/professional development:** During the reporting period, the PhD student, Mr. Peng Wu, is mainly doing an internship with MathWorks and was not financially supported through this project. The PI created multiple course projects in his course titled “Architecture of IoT” and is working with several groups of graduate students on those projects which are related to the scope of this project.

**Dissemination of research results:** During the reporting period, the research team mainly focuses on enhancing the survey article and does not have paper or technical report published.

Table 3: Presentations at Conferences, Workshops, Seminars, and Other Events				
Title	Event	Type	Location	Date(s)

Table 4: Publications and Submitted Papers and Reports				
Type	Title	Citation	Date	Status

**Participants and Collaborators:**

Table 5: Active Principal Investigators, faculty, administrators, and Management Team Members			
Individual Name	Email Address	Department	Role in Research
Song Han	song.han@uconn.edu	CSE@UConn	Principle Investigator

Table 6: Student Participants during the reporting period				
Student Name	Email Address	Class	Major	Role in research

Table 7: Student Graduates			
Student Name	Role in Research	Degree	Graduation Date

Table 8: Research Project Collaborators during the reporting period						
Organization	Location	Contribution to the Project				
		Financial Support	In-Kind Support	Facilities	Collaborative Research	Personnel Exchanges

Table 9: Other Collaborators			
Collaborator Name and Title	Contact Information	Organization and Department	Contribution to Research

*Who is the Technical Champion for this project?*

Name: Peter J. Calcaterra  
 Title: Transportation Planner  
 Organization: Connecticut Department of Transportation  
 Location (City & State): Connecticut  
 Email Address: Peter.Calcaterra@ct.gov

**Changes:** No significant changes on the scope and methodology design in the project.

**Planned Activities:** Based on the study in this reporting period, we are planning the following activities in the project:

- We will continue to enhance and then finalize the survey article.
- We will continue to design the authentication method for low-power wireless networks based on the fine-grained SNR performance map.
- PI Han will recruit undergraduate students at UConn to join the PI's research lab to work with the PhD student researchers on R&D tasks related to this project.