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: *April 1st, 2022 – June 30th, 2022*
Submission Date: *July 1st, 2022*

Overview:

- During this last quarter of the no-cost extension (NCE) period of this project, the research team continues to work on the final project report which is expected to be completed by July 31st, 2022.
- The research team continues to leverage the knowledge and system (6TiSCH real-time wireless mesh network) developed through this project to help another TIDC project on bridge joint monitoring (Project 1-16: "Wireless Joint Monitoring System (w-JMS) for Safety of Highway Bridges", PI, Shinae Jang@UConn) to develop a real-time wireless sensor system to perform continuous monitoring on the bridge joint displacement.
- The research team works on the design and development of a secure over-the-air firmware update method to enable autonomous firmware update for wireless devices over the air.

Meeting the Overarching Goals of the Project:

- The final project report will provide a comprehensive summary on the design, development and performance evaluation on the methods developed throughput this project to provide real-time intrusion detection for the network infrastructure deployed for smart transportation systems.
- Leveraging the knowledge and system developed in this project to help other TIDC project will help disseminate the research findings to the broader research community and the transportation industry.
- The design of the secure over-the-air firmware update method will enable researchers and practitioners to update the firmware of wireless devices in a remote an secure fashion.

Accomplishments:

- The system developed through this project is being utilized in another TIDC project for continuous bridge joint monitoring.

Task, Milestone, and Budget Progress:

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	100%
Task 4: Final report preparation	April 1st, 2022	July. 31st, 2022	30%
Overall Project	Oct. 1st, 2018	Sept. 30th, 2022	Around 96%

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

Is your Research Project Applied or Advanced?

☒ **Applied** (*The systematic study to gain knowledge or understanding necessary for determining the means by which a recognized and specific need may be met.)*

☐ **Advanced** *(An intermediate research effort between basic research and applied research. This study bridges basic (study to understand fundamental aspects of phenomena without specific applications in mind) and applied research and includes transformative change rather than incremental advances. The investigation into the use of basic research results to an area of application without a specific problem to resolve.)*

Education and Workforce Development:

Answer the following questions (N/A if there is nothing to report):

1. Did you provide any workforce development or training opportunities to transportation professionals (already in the field)? If so, what was the training? When was it offered? How many people attended? (i.e. The research team provided an in the field training for the SAR technology for 3 maintenance crew members of the MassDOT on 3/31/2021. The members learned how to use the technology and interrupt the data.)

   N/A

2. Did you hold meetings with any transportation industry organizations or DOTs? If so, what was the meeting's purpose? When was it offered? How many people attended? (i.e. The research team held a meeting with MaineDOT to update them on the progress of the research findings and how the findings can be implemented on 3/31/2021. 15 DOT maintenance members were present at the meeting.)

   N/A

3. Did you host/participant in any K-12 education outreach activities? If so, what was the activity? What was the target age/grade level of the participants? How many students/teachers attended? When was the activity held? (i.e. 25 8th graders and 2 teachers visited the concrete lab and created small concrete trinkets like Legos on 3/31/2021. They learned about the different types of fibers that can be used in the concrete.)

   N/A

Technology Transfer:

Complete all of the tables below and provide additional information where requested. Please provide ALL requested information as this is one of the most important sections for reporting to the USDOT. ***ONLY provide information relevant to this reporting period.***

Use the table below to complete information about conference sessions, workshops, webinars, seminars, or other events you led/attended where you shared findings as a result of the work you conducted on this project:

Table 4: Presentations at Conferences, Workshops, Seminars, and Other Events					
Type	**Title**	**Citation**	**Event & Intended Audience**	**Location**	**Date(s)**
N/A					

Use the table below to report any publications, technical reports, peer-reviewed articles, newspaper articles referencing your work, graduate papers, dissertations, etc. written as a result of the work you conducted on this project. Please list only completed items and exclude work in progress.

Table 5: Submitted/Accepted Publications, Technical Reports, Theses, Dissertations, Papers, and Reports				
Type	**Title**	**Citation**	**Date**	**Status**
N/A				

Answer the following questions (N/A if there is nothing to report):

1. Did you deploy any technology during the reporting period through pilot or demonstration studies as a result of this work? If so, what was the technology? When was it deployed?

   N/A

2. Was any technology adopted by industry or transportation agencies as a result of this work? If so, what was the technology? When was is adopted? Who adopted the technology?

   N/A

3. Did findings from this research project result in changing industry or transportation agency practices, decision making, or policies? If so, what was the change? When was the change implemented? Who adopted the change?

   N/A

4. Were any licenses granted to industry as a result of findings from this work? If so, when? To whom was the license granted?

   N/A

5. Were any patent applications submitted as a result of findings from this research? If so, please provide a copy of the patent application with your report.

   N/A

6. Did industry organizations or DOTs provide cost-share (cash or in-kind) to your research during the reporting period? Who was the organization? Please provide an in-kind support invoice from the organization with your report (this is kept confidential and used for record keeping purposes only).

   N/A

Outputs:
Definition: Any new or improved process, practice, technology, software, training aid, or other tangible product resulting from research and development activities. They are used to improve the efficiency, effectiveness, and safety of transportation systems. List any outputs accomplished during this reporting period: N/A

Outcomes:
Definition: The application of outputs; any changes made to the transportation system, or its regulatory, legislative, or policy framework resulting from research and development activities. List any outcomes accomplished during this reporting period: N/A

Impacts:
Definition: The effects of the outcomes on the transportation system such as reduced fatalities, decreased capital or operating costs, community impacts, or environmental benefits. The reported impacts from UTCs are used for the assessment of each UTC and to make a case for Federal funding of research and education by demonstrating the impacts that UTC funding has had on technology and education. NOTE: The U.S. DOT uses this information to assess how the research and education programs (a) improve the operation and safety of the transportation system; (b) increase the body of knowledge and technologies; (c) enlarge the pool of people trained to develop knowledge and utilize technologies; and (d) improves the physical, institutional, and information resources that enable people to have access to training and new technologies. List any outcomes accomplished during this reporting period: N/A

Participants and Collaborators:

Use the table below to list individuals (compensated or not) who have worked on the project other than students.

Table 6: Active Principal Investigators, faculty, administrators, and Management Team Members				
Individual Name & Title	**Dates involved**	**Email Address**	**Department**	**Role in Research**
Song Han	song.han@uconn.edu	CSE@UConn	Principle Investigator	Song Han

*Use the table below to list **all** students who have participated in the project during the reporting period. (This includes all paid, unpaid, intern, independent study, or any other student that participated in this project.) **ALL FIELDS ARE REQUIRED.***

Table 7: Student Participants during the reporting period								
Student Name	**Start Date**	**End Date**	**Advisor**	**Email Address**	**Level**	**Major**	**Funding Source**	**Role in research**
Zelin Yun	March 10th	June 30th	Dr. Song Han		PhD	Computer Science	TIDC	Research Assistant

Use the table below to list any students who worked on this project and graduated or received a certificate during this reporting period. Include information about the student's accepted employment during the reporting period (i.e. the student is now working at MaineDOT) or if they are continuing their students through an advanced degree (list the degree and where they are attending).

Table 8: Students who Graduated During the Reporting Period			
Student Name	**Degree/Certificate Earned**	**Graduation/Certification Date**	**Did the student enter the transportation field or continue another degree at your university?**

Use the table below to list any students that participated in Industrial Internships during the reporting period:

Table 9: Industrial Internships			
Student Name	**Degree/Certificate Earned**	**Graduation/Certification Date**	**Did the student enter the transportation field or continue another degree at your university?**

*Use the table below to list **organizations** that have been involved as partners on this project and their contribution to the project during the reporting period.*

Table 10: Research Project Collaborators during the reporting period						
Organization	**Location**	**Contribution to the Project**				
		Financial Support	**In-Kind Support**	**Facilities**	**Collaborative Research**	**Personnel Exchanges**

*Use the table below to list **individuals** that have been involved as partners on this project and their contribution to the project during the reporting period. (**List your technical champion(s) in this table.** This also includes collaborations within the lead or partner universities who are not already listed as PIs; especially interdepartmental or interdisciplinary collaborations.)*

Table 11: Other Collaborators				
Collaborator Name and Title	**Contact Information**	**Organization and Department**	**Date(s) Involved**	**Contribution to Research**
Peter J. Calcaterra, Transportation Planner		Connecticut Department of Transportation	Since August 2019	Technical Champion

Use the following table to list any transportation related course that were taught or led by researchers associated with this research project during the reporting period:

Table 12: Course List						
Course Code	**Course Title**	**Level**	**University**	**Professor**	**Semester**	**# of Students**
SE5402	Architecture of IoT	Graduate	UConn	Prof. Song Han	Spring, 2022	30

Changes:

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

Planned Activities:

- We will work on the final project report and complete it by July 31st, 2022.
- We will continue to contribute our knowledge and system development experience to the ongoing TIDC project on bridge joint monitoring.