NTC Program Progress Performance Report (PPPR) Information Form

For P.I.'s Use

On a semi-annual basis the NTC sponsored P.I. must report Program Progress Performance Report (PPPR) using the format specified in this PPPR Information Form. The form must be submitted electronically to the corresponding NTC Associate Director by 9/15/2014.

Cover Period: 4/1/2014 – 9/15/2014

NTC Funded Project Information (Round/Year 1, 2013-2014)	
University Name	Old Dominion University
Project Title	Open Toll Lanes in a Connected Vehicle Environment: Development of New Pricing Strategies for a Highly Dynamic and Distributed System
Principal Investigator	Mecit Cetin
PI Contact Information	mcetin@odu.edu

The form includes the following six parts:

- Part I – Performance Indicators
- Part II – Accomplishments: What was done? What was learned?
- Part III – Products: What has the program produced?
- Part IV – Participants & Collaborating Organizations: Who has been involved?
- Part V – Impact: What is the impact of the program? How has it contributed to transportation education, research and technology transfer?
- Part VI – Changes/Problems

Supplementary documents/materials can be attached to this form with the submission.

Part I – Performance Indicators	
Reporting Period	**4/1/2014 – 9/15/2014**
1. Transportation-related courses offered during the reporting period that were taught by faculty and/or teaching assistants who are associated with the UTC	N/A
Undergraduate courses	CEE470- Transportation Fundamentals
Graduate courses	CEE570- Transportation Fundamentals CEE776/876 – Simulation in Transportation Networks MSIM895-Agent-based Modeling and Simulation
2. Students supported by this grant	N/A
Undergraduate students	N/A
Masters students	N/A
Doctoral students	Student: Gulsevi Basar Supervisor: Dr. Mecit Cetin
3. Students participating in transportation research projects funded by this grant (but not supported by this grant)	N/A
Undergraduate students	N/A
Graduate students	Student: Erika Frydenlund Supervisor: Dr. David Earnest
4. Students supported by this grant who received degrees	N/A
Undergraduate degrees	N/A
Masters degrees	N/A
Doctoral degrees	N/A

Part II – Accomplishments: What was done? What was learned?	
The information provided in this section allows the OST-R grants official to assess whether satisfactory progress has been made during the reporting period.	
Reporting Period	**4/1/2014 – 9/15/2014**
1. What are the major goals of the program?	The National UTC aims to promote strategic transportation policies, investment, and decisions that bring lasting and equitable economic benefits to the U.S. and its citizens. The Center is concerned with the integrated operations and planning of all modes serving the nation's passenger and freight transportation system, including the institutional issues associated with their management and investments. A balanced multi-modal approach will be used that considers freight and passenger travel mobility, reliability, and sustainability, as well as system operations during periods of both recurring and non-recurring incidents, including response to major emergencies. The modes in this theme include highway, transit, rail, and inter-modal interfaces including ports, terminals and airports. In particular, the center focuses on research, education, and technology transfer activities that can lead to (1) Freight efficiency for domestic shipping and for our international land, air, and sea ports; (2) Highway congestion mitigation with multi-modal strategies; and (3) Smart investments in intercity passenger travel facilities such as high speed rail. Major center activities are as following: • **Advanced & Applied Research Promoting Economic Competitiveness:** Our research activities are multimodal/intermodal and multidisciplinary in scope, with the aims of addressing nationally and regionally significant transportation issues pertinent to economic competitiveness and providing practice-ready solutions. • **Education, Workforce Development, Technology Transfer, & Diversity** The consortium is committed to providing high-quality transportation education and workforce development programs for a broad and diverse audience. Center's efforts will support the development of a critical transportation knowledge base and a transportation workforce that is prepared to design, deploy, operate, and maintain the complex transportation systems of the future.

2. What was accomplished under these goals?	Our research focuses on the mitigation of highway congestion through the use of multi-location auction tolling in a future environment where drivers are able to use vehicle-to-infrastructure (V2I) communication to exchange information with the toll operator. The main components of the tolling system were defined in this reporting period. The project was then split into two strands: (1) the development of analytical solutions, and (2) the development of a simulation tool to explore this potential future transportation scenario. The simulation is still under development in VISSIM environment. The initial analytical solutions to the scenario have been proven and analyzed. The project team brings together individual researchers from a diverse background and skillset. Apart from transportation engineering, the project team consists of Modeling and Simulation academics, an Operations Researcher, and a Social Scientist.
3. How have the results been disseminated?	The initial analytical results have been submitted to the Transportation Research Board's annual conference and it is hoped that it will be accepted for presentation in January 2015.
4. What do you plan to do during the next reporting period to accomplish the goals? (10/1/2014 – 3/31/2015)	During the next reporting period, it is expected that the simulation model will be completed and analyzed. Further developments of the analytical solution will also be derived. The development of a practical data-collection game will be investigated as well.

Part III – Products: What has the program produced?	
Publications are the characteristic product of research projects funded by the UTC Program. OST-R may evaluate what the publications demonstrate about the excellence and significance of the research and the efficacy with which the results are being communicated to colleagues, potential users, and the public, not the number of publications. Many research projects (though not all) develop significant products other than publications. OST-R may assess and report both publications and other products to Congress, communities of interest, and the public.	
Reporting Period	**4/1/2014 – 9/15/2014**
1. Journal publications:	N/A
2. Books or other non-periodical, one-time publications	N/A
3. Other publications, conference papers and presentations	Collins, A. J., E. Frydenlund, R. M. Robinson and M. Cetin (2015). Exploring a Toll Auction Mechanic Enabled By Vehicle-To-Infrastructure Technology. 94th Transportation Research Board Annual Meeting, Washington, D.C., 15-2825. (under review).
4. Website(s) or other Internet site(s)	N/A
5. Technologies or techniques	N/A
6. Outreach activities	N/A
7. Courses and workshops	N/A
8. Inventions, patent applications, and/or licenses	N/A
9. Other products	An agent-based simulation is currently being developed in VISSIM to analyze the behavior under the dynamic and differentiated tolling scenarios.
Part IV – Participants & Collaborating Organizations: Who has been involved?	
OST-R needs to know who has worked on the project to gauge and report performance in promoting partnerships and collaborations.	
Reporting Period	**4/1/2014 – 9/15/2014**
1. What organizations have been involved as partners?	This project is currently conducted at ODU as a collaborative effort between faculty from Civil Engineering and Modeling, Simulation, and Visualization Engineering (MSVE) Department.

2. Have other collaborators or contacts been involved?	None.

Part V – Impact: What is the impact of the program? How has it contributed to transportation education, research and technology transfer?

DOT uses this information to assess how the research and education programs:

- **increase the body of knowledge and techniques;**
- **enlarge the pool of people trained to develop that knowledge and techniques or**
- **put it to use; and,**
- **improve the physical, institutional, and information resources that enable those people to get their training and perform their functions.**

Reporting Period	**4/1/2014 – 9/15/2014**
1. What is the impact on the development of the principal discipline(s) of the program?	Tolling lanes and High Occupancy Vehicle lanes (HOV) have long been used as mechanisms to relieve traffic congestion as well as a mechanism to generate funds to build new facilities to further reduce congestion. By investigating a new tolling mechanism involving V2I technology, this research will provide decision-makers with information, not available through empirical means, to generate and implement innovative tolling policies. The analytical models provide an understanding of how a private toll operator might use the derived tolling mechanism to maximize profit and thus appropriate policy could be put in place to ensure that other goals of the toll (i.e., reduction of congestion) are also met.
2. What is the impact on other disciplines?	Incorporating an auction tolling mechanism within a transportation simulation model helps bridge the gap between economics/revenue management and transportation research. The project team has to develop new ideas and approach that incorporate not only driving behavior but also an individual's economic behavior.
3. What is the impact on the development of transportation workforce development?	Through the graduate courses taught related to this project, the students have obtained the skills necessary to engage in the transportation community and workforce, especially in the area of Modeling and Simulation.
4. What is the impact on physical, institutional, and information resources at the university or other partner institutions?	N/A
5. What is the impact on technology transfer?	N/A
6. What is the impact on	N/A

society beyond science and technology?	
7. Additional impacts	By using V2I technology to allow drivers to bid on road tolls will produce a competitive pricing for the toll road as opposed to a pricing scheme set by the toll operator. This will also allow drivers to communicate their desire to use the toll road operators, through the bids they make, giving them input into the pricing scheme for using the toll road.

Part VI – Changes/Problems	
If not previously reported in writing to OST-R through other mechanisms, provide the following additional information or state, "Nothing to Report, if applicable:	
Reporting Period	**4/1/2014 – 9/15/2014**
1. Changes in approach and reasons for change	Nothing to Report
2. Actual or anticipated problems or delays and actions or plans to resolve them	Nothing to Report
3. Changes that have a significant impact on expenditures	Nothing to Report
4. Significant changes in use or care of human subjects, vertebrate animals, and/or biohazards	Nothing to Report
5. Change of primary performance site location from that originally proposed	Nothing to Report