

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 **2/22/2016**.

Cover Period: 9/30/2015 – 3/31/2016

NTC Funded Project Information (Round/Year 2, 2014-2015)	
University Name	University of Maryland, College Park
Project Title	Improving the Reliability of Freight Transportation
Principal Investigator	Paul Schonfeld
PI Contact Information	301-405-1954 pschon@umd.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	9/30/2015 – 3/31/2016
1. Transportation-related courses offered during the reporting period that were taught by faculty and/or teaching assistants who are associated with the UTC	Webinar on Freight Transportation Reliability Taught by Prof. George List from North Carolina State Univ. and prof. Paul Schonfeld from Univ. of Maryland In November 2015.
Undergraduate courses	ENCE 472 Transportation Engineering
Graduate courses	ENCE 672 Regional Transportation Planning ENCE 681 Freight Transportation Analysis
2. Students supported by this grant	
Undergraduate students	[Student Name] [Supervisor]
Masters students	[Student Name] [Supervisor]
Doctoral students	Yanshuo Sun Linxi Chen Advisor: Paul Schonfeld
3. Students participating in transportation research projects funded by this grant (but not supported by this grant)	
Undergraduate students	[Student Name] [Supervisor]
Graduate students	[Student Name] [Supervisor]
4. Students supported by this grant who received degrees	
Undergraduate degrees	[Student Name]
Masters degrees	Yanshuo Sun is expected to receive his MS degree in the Spring semester, 2016

	His thesis entitled “Holding Decisions for Correlated Vehicle Arrivals at Intermodal Freight Transfer Terminals” is supported by this NTC project.
Doctoral degrees	Linxi Chen is expected to receive his Ph.D degree in Dec. 2016 or May 2017, with a Ph.D. dissertation funded partly by this project.

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	9/30/2015 – 3/31/2016
1. What are the major goals of the program?	<p>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:</p> <ul style="list-style-type: none"> • 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

	<p>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.</p>
<p>2. What was accomplished under these goals?</p>	<p>We propose a vehicle holding method for mitigating the effect of service disruptions on coordinated intermodal freight operations. We extend existing studies mainly by (1) modeling correlations among vehicle arrivals and (2) considering decision risks with a mean-standard deviation optimization model. We prove that the expected value of the total cost is not affected by the correlations, while the variance can be miscomputed when arrival correlations are neglected. We also identify some implications of delay propagation when optimizing vehicle holding decisions in real-time. We provide general criteria for determining the boundary of the affected region and length of the numerical search, based on the frequency of information updates. Theoretical analyses are supported by three numerical examples.</p>
<p>3. How have the results been disseminated?</p>	<p>Research outcomes on multimodal freight transport schedule coordination and vehicle holding have been summarized into technical papers, currently under review for publications in refereed journals. Partial results have also been presented in both undergraduate and graduate classes. Additional papers will be presented at professional conferences.</p>
<p>4. What do you plan to do during the next reporting period to accomplish the goals? (10/1/2014 – 3/10/2016)</p>	<p>We will develop improved methods for analyzing the effects of correlated vehicle arrivals at transfer terminals (such as vehicles affected by the same traffic congestion or limits on incoming capacity) and for alleviating the propagation of transfer delays in transportation networks.</p>

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Part II – 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	9/30/2015 – 3/31/2016
1. Journal publications:	<p>1. Chen, L. and Schonfeld, P. “A Simulation Study of Coordinated Logistic Network Design With Dispatching Control” Rereview by Transportation Research Record, Oct. 2015. NTC funding acknowledged.</p> <p>2. Chen, C.C., Tsai, Y.H. and Schonfeld, P. “Schedule Coordination, Delay Propagation and Disruptions Resilience in Intermodal Logistic Networks” Rereview by Transportation Research Record, Oct. 2015. NTC funding acknowledged.</p> <p>3. Sun, Y. and Schonfeld, P. “Holding Decisions for Correlated Vehicle Arrivals at Intermodal Freight Transfer Terminals” Initial Review by Transportation Research Part B, Dec. 2015. NTC funding acknowledged.</p>
2. Books or other non-periodical, one-time publications	Nothing to report in this period.
3. Other publications, conference papers and presentations	<p>2. Chen, L. and Schonfeld, P. “A Simulation Study of Coordinated Logistic Network Design With Dispatching Control”, Presentation at the January 2016 TRB Annual Meeting</p> <p>3. Chen, C.C., Tsai, Y.H. and Schonfeld, P. “Schedule Coordination, Delay Propagation and Disruptions Resilience in Intermodal Logistic Networks”, Presentation at the January 2016 TRB Annual Meeting</p>

4. Website(s) or other Internet site(s)	NA
5. Technologies or techniques	NA
6. Outreach activities	
7. Courses and workshops	
8. Inventions, patent applications, and/or licenses	NA
9. Other products	

Part III – 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	9/30/2015 – 3/31/2016
1. What organizations have been involved as partners?	Dr. Paul Schonfeld (UMD), Dr. George List (NCSU) and Dr. Hyeonshic Shin (MSU) and their graduate assistants are working the project.
2. Have other collaborators or contacts been involved?	Dr. Schonfeld has also collaborated in this research with Dr. Cheng Chieh Chen (whose PhD dissertation on freight logistics he had advised at the Univ. of Maryland) and his students at National Dong Hwa University in Taiwan

Part IV – 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	9/30/2015 – 3/31/2016
1. What is the impact on the development of the principal discipline(s) of the program?	The methodological advancements in freight operations can improve the scheduling, design, control and assessment of multi-modal freight systems. Better understanding has been gained on practical factors in real world practice, such as correlations among vehicle arrivals and implications of real-time vehicle holding.
2. What is the impact on other disciplines?	The method of network design and vehicle controls developed in this project is not limited to freight transport. With modifications and combinations with other techniques, the method can also be applied to public transport, commercial aviation, data transmission, and other fields.
3. What is the impact on the development of transportation workforce development?	This project will help educate both undergraduate and graduate students in the general civil engineering. Research results will also provide useful guidelines for freight operators, such as FedEx and UPS.

4. What is the impact on physical, institutional, and information resources at the university or other partner institutions?	<ul style="list-style-type: none"> • NA
5. What is the impact on technology transfer?	Methods developed in this project can be help design more advanced scheduling and controlling systems for freight transport companies.
6. What is the impact on society beyond science and technology?	<ul style="list-style-type: none"> • NA
7. Additional impacts	<ul style="list-style-type: none"> • NA

Part V – 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	9/30/2015 – 3/31/2016
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.