

**Performance Indicators for University Transportation Centers (UTCs)
Reporting Period 4: January-December 2015**

Part I – Program-Wide Indicators

Report the program-wide indicator metrics for the completed grant year and for the institution(s) comprising your UTC, unless the indicators are included in Part II below. In the event that a sub-grantee university participates in more than one UTC, include only the metrics corresponding with your grant.

Program-wide Indicators
<p>1. Number of transportation-related courses offered during the reporting period that were taught by faculty and/or teaching assistants who are associated with the UTC:</p> <ul style="list-style-type: none"> · Undergraduate courses <u> 5 </u> · Graduate courses <u> 7 </u>
<p>2. Number of students participating in transportation research projects funded by this grant.</p> <ul style="list-style-type: none"> · Undergraduate students <u> 11 </u> · Graduate students <u> 27 </u>
<p>3. Number of transportation-related advanced degree programs that utilize grant funds to support graduate students:</p> <ul style="list-style-type: none"> · Master's Level Programs <u>Three, one at each consortium university (TISE @ VTTI; NRC @ Morgan State, and CTS @ UVA)</u> · Doctoral Level Programs <u>Three, one at each consortium university (TISE @ VTTI; NRC @ Morgan State, and CTS @ UVA)</u>
<p>4. Number of graduate students supported by this grant:</p> <ul style="list-style-type: none"> · Master's Level Students Supported <u> 5 </u> · Doctoral Level Students Supported <u> 22 </u>
<p>5. Number of students supported by this grant who received degrees:</p> <ul style="list-style-type: none"> · Master's Level Degrees <u> 1 </u> · Doctoral Level Degrees <u> 4 </u>
<p>6. Number and total dollar value of research projects selected for funding using UTC grant funds (Federal and/or Recipient Share) that you consider to be applied research: and advanced research:</p> <ul style="list-style-type: none"> · Applied research projects & dollar value <u> 1 projects; \$149,857.00 </u> · Advanced research projects & dollar value <u> 0 projects; \$0 </u>

2015 Consortium University Demographic Information:

	Virginia Tech	University of Virginia	Morgan State Univ.
Tenure and Tenure-track Engineering Faculty	9 ⁽¹⁾ , 52 ⁽²⁾ , 352 ⁽³⁾	5 ⁽¹⁾ , 15 ⁽²⁾ , 141 ⁽³⁾	5 ⁽¹⁾ , 5 ⁽²⁾ , 23 ⁽³⁾
Master's Students Enrolled	43 ⁽¹⁾ , 232 ⁽²⁾	17 ⁽¹⁾ , 30 ⁽²⁾	11 ⁽¹⁾
Master's Degrees Awarded	5 ⁽¹⁾ , 42 ⁽²⁾	7 ⁽¹⁾ , 13 ⁽²⁾	9 ⁽¹⁾
Doctoral Students Enrolled	27 ⁽¹⁾ , 141 ⁽²⁾	20 ⁽¹⁾ , 35 ⁽²⁾	4 ⁽¹⁾
Doctoral Degrees Awarded	3 ⁽¹⁾ , 17 ⁽²⁾	8 ⁽¹⁾ , 13 ⁽²⁾	0 ⁽¹⁾
Transportation Graduate-level Courses	8 ⁽¹⁾	7 ⁽¹⁾	30 ⁽¹⁾
Students Funded by Assistantships or Scholarships	47 ⁽¹⁾ , 252 ⁽²⁾	34 ⁽¹⁾ , 56 ⁽²⁾	2 ⁽¹⁾
Undergraduate Students Enrolled in Engineering ⁽³⁾	9,730	2,688	1,012
Graduate Students Enrolled in Engineering ⁽³⁾	2,674	630	103
Total Undergraduate Enrollment ⁽⁴⁾	31,376	15,669	6,319
Total Graduate Enrollment ⁽⁴⁾	8,633	6,316	1,406
Total University Enrollment ⁽⁴⁾	40,260	21,985	7,725
¹ Transportation-related only, ² Civil Engineering only, ³ All Disciplines, ⁴ University-wide			

Part II – UTC-Specific Indicators

Report here the annual performance metrics that you identified in your application for each category below, include the description of the indicator and the corresponding metric.

In the event that a sub-grantee university participates in more than one UTC, include only the metrics corresponding with your grant.

Category	Metrics with Descriptions from FY 2013 Grant
1. Research Capability	<ul style="list-style-type: none"> - Number of inner-consortium research papers received and funded: due to grant funding ending in July 2016, only 1 research project was funded in 2015. This project is expected to be a capstone project, taking the results of the preceding 23 CVI-UTC research projects and develop viable real-world applications. - Number of outside university submission for research participations in the CVI-UTC and utilizing CVI-UTC resources, such as the CV Fleet and the two testbeds: due to grant funding ending in July 2016, no new calls for research were extended outside the CVI-UTC consortium. - Number of outside university collaborations on research with CVI-UTC consortium researchers: 6; McConnell Public Safety and Traffic Operation Center (PSTOC) of VDOT in Fairfax, VA; Joyoung Lee, Assistant Professor at New Jersey Institute of Technology; Brian Katz at Leidos; Iteris; Sang H. Son and the Cyber Physical System Center at DGIST in South Korea; Miguel Sepulcre at the Ubiquitous Wireless Communications Research Laboratory Uwicore, Signal Theory and Communications Division, University Miguel Hernández. - Number of members: stakeholders, subject matter experts, and researchers participating in the CVI-UTC: 62. - Number of graduate students participating in and taking a lead role in a CVI-UTC research project: 27, with many of those participating in a PI or Co-PI role. - Number of research teams and research papers from the CVI-UTC that is recognized and accepted by national and international transportation conferences and institutions: 38; including papers accepted and presented at the Transportation Research Board (TRB) Annual Meetings, ITS World Congresses, and 6th International Conference on Applied Human Factors and Ergonomics 2015, 9th University Transportation Centers Spotlight Conference Automated and Connected Vehicles, and at international conferences such as the IEEE 18th International Conference on Intelligent Transportation Systems, Las Palmas de Gran Canaria, Spain, the International Cyber Physical System Workshop at DGIST, Daegu, Korea, and many other prestigious national and international conferences.

Category	Metrics with Descriptions from FY 2013 Grant
<p>2. Leadership</p>	<p>In addition to the traditional UTC performance metrics described previously (e.g., publications, students graduated, patents awarded, etc.), the Consortium will track several measures that relate to the CVI-UTC impact upon the national and international transportation communities. These measures include: a) growth in both private and public sector partners and stakeholders; b) numbers of CVI applications developed, improved, or evaluated that are adopted (or planned for future adoption) by private or public sector entities; and c) impacts on the design of deployed (or pre-deployment) CVI technologies.</p> <ul style="list-style-type: none"> - Growth in both private and public sector partners and stakeholders: the CVI-UTC continues to grow their private and public sector partners and stakeholders, including a continuing relationship with Iteris to develop, deploy, and maintain equipment along the Northern Virginia and Smart Road Connected Vehicle Test Beds, continuing communication with Transurban to implement at minimum, one of the applications developed under a CVI-UTC research project, collaboration with HERE to develop the next generation of connected and automated data services and device applications, and initiating conversations with the District of Columbia Department of Transportation (DDOT) to expand the Northern Virginia Connected Vehicle Test Bed across the Potomac River and into the District region. - Number of CVI applications, developed, improved, or evaluated that are adopted (future adoption): 13; many research projects are currently underway and several have completed experimental activities which designed, developed, improved or evaluated CVI applications. The CVI applications that were developed during the reporting period include an Emergency Vehicle V2V communication prototype, an advanced messaging application, a Virtual Dynamic Message Sign (VDMS) system, an advanced, second generation of the Virtual Dynamic Message Sign (VDMS) system, an in-vehicle active traffic and demand (ATDM) system application, a Cumulative Travel-time Responsive (CTR) Intersection Control algorithm, a school bus alert application, a test control application, a Road Side Equipment (RSE) Basic Safety Message (BSM) generator, a vehicle-based BSM generator algorithm and software application, a user location-based mobile application and server program to enhance transit service efficiency and safety, a Transit Signal Priority (TSP) application, and a naturalistic cycling data collection system. - Impacts on design of deployed (pre-deployment) CVI Technologies: During this period, many CVI-UTC research projects began or continued to perform experimental activities on the Northern Virginia and Smart Road Connected Vehicle Test Beds. The test beds have allowed for growth opportunities with various stakeholders, including additional funding support through VDOT and VCTIR to further the current deployment. In addition, the mobile application that is being developed as part of the CVI-UTC research project "Mobile User Interface Development for the Virginia Connected Corridors" is transferring technology by providing drivers in Northern Virginia a downloadable user interface application where drivers can receive traveler information messages from the VDOT traffic operation systems and make reports of driving conditions back to a cloud system, actualizing the results of many CVI-UTC research projects. During a high-level VIP demonstration of CVI-UTC research and applications on the Northern Virginia Connected Vehicle Test Bed, examples of connected automation were exhibited, with such scenarios as receiving information about an upcoming work zone through CVI technologies and responding through automated technologies, such as automatically braking to safe work zone speed and to avoid roadway workers. These CVI technologies will also greatly aid in paving the way to connected automation, enabling vehicles to communicate with one another and the infrastructure, and respond accordingly.
<p>3. Education and Workforce Development</p>	<p>The performance metrics that are currently tracked by the consortium universities and that will be used to measure the effectiveness of the CVI-UTC education and workforce development activities include: a) The number of graduate students funded under the program; b) The number of M.S. and Ph.D. graduates each year; c) A tracking of the placement of the graduate students after completion of their degrees; d) The number of summer internships offered to undergraduate students; e) The number of under-represented students funded by the CVI-UTC; f) The number of continuing education short-course offerings and the number of attendees; and g) The number of K-12 students attending the School Day event. These statistics will be compiled on an annual basis, and mid-course adjustments may be made to address any deficiencies in achieving the desired measures.</p> <ul style="list-style-type: none"> - Number of graduate students funded under the UTC: 27 - Number of M.S. and Ph.D. graduates: 5 M.S., 22 Ph.D. - Placement after graduation: 5; all graduates were placed in employment post-graduation at private engineering practices or public institutions, or continuing on to pursue higher education. - Summer internships offered to undergraduate students: 0; as the grant funding period is ending in July 2016, no internships were offered during this period. - Number of underrepresented students funded under the UTC: 8, many funded students are from underrepresented groups, and is largely due to the consortium partnership and the commitment of the UTC to support underrepresented students in STEM education and careers. - Number of short courses and other professional presentations, and attendees: 0;0. - Number of K-12 students attending School Day: 200

Category	Metrics with Descriptions from FY 2013 Grant
<p>4. Technology Transfer</p>	<p>Performance metrics that the CVI-UTC uses to assess the progress of technology transfer activities include: a) the number of CVI applications developed that result in IP that is either solely developed by the Consortium or developed in conjunction with its public and private sector partners; b) the number of outside universities participating in CVI-UTC open solicitations and their progress in developing or improving CVI applications; and c) the number of participants attending Center workshops, short courses, and distance learning opportunities.</p> <ul style="list-style-type: none"> - Number of CVI applications developed that result in IP: 0 - Number of outside universities participating in open solicitation: 0 (note no solicitations occurred during this period) - Number of outside universities developing or improving CVI applications: 0; all universities involved with developing or improving CVI applications are within the CVI-UTC consortium universities. - Number of participants attending educational events: 4,225 <p>Intellectual property has not been developed yet because no research is complete enough in order to register it, but it is anticipated that this will occur before the end of the grant in 2016.</p> <p>Finally, we have been very successful at holding educational and outreach events at TRB, and through each university UTC educational program. During our last 6 months of funding, we will seek to continue our educational and outreach efforts as funding allows, transferring our research into public consumption.</p>
<p>5. Collaboration</p>	<p>The CVI-UTC Consortium will carefully track the success of collaboration within the Center. The following metrics will be reviewed on a monthly basis and will be used as benchmarks when identifying new projects:</p> <ul style="list-style-type: none"> - Size of advisory board – As the grant is coming to an end in the next 6 months, all collaborative outreach efforts have been completed and the advisory board of the CVI-UTC is not expected to grow. There are currently 14 members on the advisory board from groups like Denso, Savari, Kapsch, Volvo, Toyota, Fairfax County and VDOT/VCTIR. - Average number of investigators per project – Each project will include at least one member from each of the core partners. However, given the breadth of connected-vehicle activities, it will be important to include a variety of investigators from each consortium member. 2-3; there is generally a PI or co-PI team between consortium universities, with at least 1 or 2 graduate students taking on lead research roles in each of the 24 projects.