Cyber Resiliency Exercises in the Design and Operation of Transportation Infrastructure

April 30, 2024

Joe Minicucci
Our Consortium …

- University of Massachusetts - Amherst, MA
- University of Connecticut - Storrs, CT
- Bunker Hill Community College - Boston, MA
- Holyoke Community College - Holyoke, MA
- Norwich University - Northfield, VT
- University of Maine - Orono, ME
- Massachusetts Institute of Tech. - Cambridge, MA
- University of New Hampshire - Durham, NH
“The NEUTC mission is to advance equitable safety through transformational research, education, and technology transfer.”

Our Mission
1) **Embedding Equity and Community Engagement within Transportation Safety**: developing and integrating best practices to comprehensively improve transportation safety through an equity lens (or existing inequities), while actively engaging the public in generation (e.g., knowledge co-development) and dissemination of safety solutions.

2) **Developing Smart Infrastructure and Connected Systems**: optimizing roadway infrastructure to improve safety and reduce congestion through advancements in telecommunication, sensors, improvement in geometric design, augmented reality, driver assistance systems, human-machine interactions, as well as by addressing cybersecurity risks of hardware, software, and infrastructure systems.

3) **Improving Safety for all Modes and Populations**: examining the synergistic relationships between safety and mobility and considering specific needs of vulnerable populations (e.g., underserved communities, disadvantaged populations, and people with disabilities) across modal preferences (e.g., pedestrians, bicyclists, commercial vehicles, and automated vehicles) to develop a fully integrated transportation system.

4) **Promoting Automated Vehicle Safety**: identifying, developing, and evaluating novel approaches that promote safety between automated vehicles, which move both people and goods, and all road users, including all types of vehicle drivers, bicyclists, and pedestrians; evaluating the human and machine interface as well as the cybersecurity risks of automated vehicle systems.

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**Our Thematic Focus**
## Our Thematic Focus & National / Regional Priorities

<table>
<thead>
<tr>
<th>NEUTC Research Thrusts</th>
<th>USDOT Strategic Plan &amp; National Roadway Safety Strategy Priorities</th>
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<tbody>
<tr>
<td></td>
<td>Safe System</td>
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<tr>
<td></td>
<td>Safer People/Public</td>
</tr>
<tr>
<td>Equity &amp; Engagement</td>
<td>✔ Yes</td>
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<tr>
<td>Smart Infrastructure and Connected Systems</td>
<td></td>
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<tr>
<td>Safety for all Modes &amp; Populations</td>
<td>✔ Yes</td>
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<tr>
<td>Automated Vehicle Safety</td>
<td>✔ Yes</td>
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</tbody>
</table>
Why it Works

The DECIDE® (Distributed Environment for Critical Infrastructure Decision-making Exercises) Platform simulates cyber-attacks for organizations and their partners to stress and test incident response plans, resulting in after-action reports to improve strategic communication, compliance, risk, and overall resilience.
Our Research Contributions (amongst others)

Coordinated & Collaborative Research Projects

- Smart & Connected Infrastructure
- Safety for all Modes and Populations
- Automated Vehicle Safety
- Embedding Equity & Engagement in Safety

Advances related to US DOT Strategic Plan Key Indicators in Safety, Equity & Transformation

- Advance the capabilities within a safe system paradigm to reduce roadway fatalities and serious injuries.
- Advance connected infrastructure technology and adoption to reduce roadway worker fatalities and injuries.
- Remove traffic safety related barriers that limit the number of transit and/or active transportation trips.
- Create safe travel options that decrease the cost burden on travel in underserved communities.
- Through active community engagement – create tools that facilitate competitive discretionary grant program applications in underserved communities.
- Establish a consortium-wide digital forum to share best practices and test bed that facilitates breakthrough discoveries to introduce new technology or methods
Request for Proposals

New England Regional University Transportation Center (NEUTC)

Promoting Safety

Center Objective:

The New England Regional UTC (NEUTC) is a diverse, multidisciplinary consortium committed to addressing the pressing issue of traffic safety. Our objective, in line with the Infrastructure Investment and Jobs Act (IIJA), is to drive transformative research, education, and technology transfer to address critical traffic safety needs in a time when roadway fatalities are distressingly high.

Center Themes:

Our research and educational activities at NEUTC are guided by four principal safety themes, each addressing a critical challenge in transportation safety. These themes capture the various integral components of the transportation system, focusing on technology, infrastructure, vehicles, and users with a commitment to equity and public engagement. Our overarching theme is promoting safety, with the common underlying science being the study of behavioral, systemic, environmental, and mobility-driven factors on safety.

Project Requirements:
Our approach to Education, Workforce Development & Student Leadership
Welcome

- NEUTC – Mike Knodler
- Introduction to the program
  - Address multi year effort
  - Crawl, walk, run philosophy
  - Exercise at various organization levels
  - Exercise various concepts with various organizational groups
Welcome

- NEUTC – Mike Knodler
  - Introduction to the program
- The Opportunity
- Who We Are
  - People
  - Process
  - Platform
- Focus on the customer
- Execution
- Way Forward
- Discussion/Questions
Opportunity

- Cyber Resiliency Exercises in the Design and Operation of Transportation
- Plan, design, and execute custom transportation related exercises.
- Focus on increasing cyber resilience in the design and operation of transportation critical infrastructure.
- State DOT organizations, New England University Transportation Center partners, and other industry stakeholders
- Highway operations center is the primary focus
- Explore increasing cyber resilience in the design and operation of transportation critical infrastructure.
Opportunity

• Exercise at multiple organization levels
  • Technical – response to cyber threats
  • Managerial – Communications between departments
  • Senior – Decision making (who, how)
  • Other – Public information/notification

• Various exercise concepts
  • State-wide
  • Regional such as various regional centers (borders)
  • Functional such as rail, port, highway, rural, urban

• Flexibility in the People, Process, Platform
• Norwich University Applied Research Institutes (NUARI) studies and identifies solutions to critical national security issues driven by our mission to enable a resilient society through rapid research, development, and education in cybersecurity, defense technologies, and information warfare.

• NUARI is a 501(c)(3) non-profit corporation and has been a leader for more than a decade in developing cyber war gaming, distributed learning technology, distributed simulation technology, critical infrastructure exercises, and cybersecurity curriculum.

• We are partially funded by the U.S. Department of Homeland Security and the U.S. Department of Defense.

• NUARI is co-located with Norwich University in Northfield, VT, and shares their ideals of academic excellence, innovation, and service to the country.
People

• Introduce NUARI to the audience – Joe Minicucci
  • Who we are (The Team)
    • Chris Tucker
    • Taylor Beaudet
• Bench of Exercise Designers
  • 165 exercises over the past 4 years
• Transportation Organizations
  • MassDOT
  • Port of Vancouver
  • Trucking associations
  • VTrans
Process

- Homeland Security Exercise Evaluation Process (HSEEP)
  - Proven, flexible
  - Sponsor, Planning Team, Trusted Agents, SME’s, Evaluators, Facilitators, Players, Observers
- Exercise findings
  - Data Driven
  - Focus on:
    - Improved communications
      - North/South
      - East/West
    - Process improvement
    - Identify gaps in process, equipment, people, training etc.
DECIDE® Platform Capabilities

- A web-based platform that is used to help facilitate decision-based exercises in a virtual and distributed manner (or in person!)
- **Measure and validate decision making during any type of scenario or threat**
- Improve strategic communications with key stakeholders, and with 3rd Party Vendors
- Improve incident response plans and understand better recovery times
- The ability to test, assess, & retest more often
- Automatic data capture of exercise events and **player actions**
- Real-time performance assessment
- Allows participants to validate operational readiness and execute roles/responsibilities
Focus on the Customer - YOU

• Customized inject examples
  • Identify specific Organization Goals and Objectives
  • Develop Evaluation criteria
  • Develop detailed, customized scenarios
  • Conduct real time data capture
  • Perform post event evaluation
• Concept
  • Planning workshops to gather requirements.
  • Follow HSEEP
  • Produce exercise documentation
Execution

• In Person or Remote
  • What works best for each state DOT and academic institution
  • Real time data collection
  • Post event analysis
• NUARI After Action Reports
  • Recommend ways for organizations to mitigate risk
  • Recommend steps to improve strategic communication, compliance
  • Recommend changes to enhance overall cyber resilience in transportation safety.
Way Forward

• Reach out to NUARI
• Gather your Team
• Start exercise planning
  • explore potential goals and objectives
  • identify scenarios to simulate cyber threats
  • stress and test incident response plans as a base for future exercises.
Discussion | Questions

Thank you!