Michigan Connected and Automated Vehicle Working Group Meeting Packet

October 29, 2015

1. Agenda
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5. Presentations
MEETING AGENDA

1:00 PM Introductions and Update, Richard Wallace, CAR

1:10 PM Overview of the Oakland County Connected Vehicle Initiative, Matt Gibb, Deputy Oakland County Executive

1:40 PM Modeling the Systems of Systems Associated with V2X, Bob Brinchek, PTC

2:05 PM “Evolution of Steering Systems for Automated Driving,” Ashok Chandy, Nexteer

2:25 PM NETWORKING BREAK

2:40 PM MDOT Need for Connected Vehicle Business Models and Smart Road Network Update, Collin Castle, MDOT

3:10 PM DISCUSSION: 2015 ITS World Congress (Bordeaux)


3:40 PM “Advance Michigan Defense Collaborative,” Tricia Walding, Senior Project Manager, Defense Sector Lead, Workforce Intelligence Network

4:00 PM Adjourn
The fall 2015 meeting of the Michigan Connected and Automated Vehicle Working Group was held at the Oakland County Executive Office Building in Waterford, Michigan, on October 29, 2015.

MEETING NOTES

Richard Wallace of the Center for Automotive Research (CAR) gave a brief welcome and began introductions around the room. After attendees introduced themselves, Richard discussed the meeting agenda, working group mission, and noteworthy connected and automated vehicle (CAV) news. For the latter, he highlighted the recent U.S. Department of Transportation awards for deployments in New York, Florida, and Wyoming; recent CAV-related hires at Apple and Google; and the Michigan Department of Transportation (MDOT) Request for Information (RFI) regarding innovative business models for connected vehicle deployment. Richard also played a video showing drivers experimenting with automated features in their Tesla Model S vehicles. Richard closed out his introduction by briefly listing several upcoming CAV-related events.

After Richard’s introduction, Matt Gibb, Deputy Oakland County Executive, welcomed the group and gave a brief overview of Oakland County’s CAV efforts. He acknowledged the various Connected Vehicle Task Force members at the meeting and described the discussions and processes related to connected vehicle development in Oakland County. He also discussed international deployment plans in South Korea and compared those plans deployment needs in Michigan.

Following Matt Gibb’s presentation, Bob Brincheck of PTC provided a brief overview of his company and discussed the evolving internet of things. He also presented on the challenges of engineering systems of systems, and described some of the model-based systems engineering solutions to addresses those challenges.

After Bob’s presentation, Ashok Chandy of Nexteer described the evolution of his company over the past 100+ years. Since 2010, when General Motors sold Nexteer for $465 million, the company’s value has grown to $3.2 billion. With respect to CAV technologies, Nexteer has developed several electronic steering technologies that enable many of the current and near-term automated vehicle applications, including traffic jam assist, lane change assist, and higher level automated driving functions.

After a short break, Collin Castle of MDOT presented on the Connected Vehicle Business Models RFP and provided an update on the Michigan Smart Road Network. He also presented on the connected vehicle infrastructure deployment in Lansing. Colin then continued on to the second part of his presentation, which covered the major points in the “Review of the Status of the Dedicated Short-Range Communications Technology and Applications [Draft] Report to Congress” document.

In between Collin’s two presentations, Richard introduced Eve Lerman of the U.S. Department of Commerce, who briefly spoke about the 2016 Hannover Messe event, the top global trade show for industrial technology. Eve provided a handout (see the Handouts section of this meeting packet for a copy) describing some of the opportunities at Hannover Messe. Following Collin’s second presentation, Richard led a brief discussion on the ITS World Congress in Bordeaux. He asked several attendees about their experiences and perceptions of the event. All agreed that the Detroit World Congress was superior.
Tricia Walding of Workforce Intelligence Network closed out the meeting with an overview of the Advance Michigan Defense Collaborative, which is primarily funded through a $5.97 million grant from the Department of Defense Office of Economic Adjustment. The effort will “promote research, industrial development, and talent development relevant to the defense industry,” and contains several CAV-relevant projects, including social network analysis, asset mapping, and demonstration projects.

MDOT maintains a webpage dedicated to its work related to CAV technologies (available here). The page includes documents, presentations, and other materials that may be of interest to CAV stakeholders. Meeting packets containing materials (e.g., agenda, meeting notes, attendance, and presentation slides) from past Michigan Connected and Automated Vehicle Working Group meetings can also be found on the page in the bottom right corner under the heading Connected Vehicles Working Group.
## MICHIGAN CONNECTED AND AUTOMATED VEHICLE WORKING GROUP

### ATTENDANCE LIST

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Objective: www.IGVC.org
Challenge college engineering & science students to design, build, test & compete autonomous robotic vehicles in unmanned mobility competitions

Goal:
Advance intelligent mobility for civilian automotive and military vehicles

Interoperability Profiles (IOP) Challenge: IP and JAUS ID Assignment
Cybersecurity: Defense Sector Summit

March 1-2, 2016

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Send us your thoughts!!

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Shape the defense sector's strategy for platform cybersecurity. Be the conversation!

Don’t miss out on the opportunity to be a part of the conversation regarding how cybersecurity is impacting not only ground vehicles, but air and maritime platforms.

- What are the Primes doing to protect their platforms and our military?
- What does cybersecurity mean to you as a supplier?
- What can we learn from connected car initiatives in the automotive industry?
- Who’s doing what in cybersecurity?
- What and who are driving cybersecurity requirements?
- What are the challenges leadership is faced with relative to cybersecurity?
- When and how will funding be provided to support platform cybersecurity development?
Partner Country USA: An Opportunity for Global Connectivity

The Connected World Requires Global Innovations
Growth in demand, new renewable energy technology, and smart energy and transportation system integration will mean billions of dollars in new opportunities for innovative U.S. companies.

- 1.7 billion additional global citizens will connect to electric grids by 2030.
- The global power sector will require $16.4 trillion in investment over the next 30 years.
- Global Smart City initiatives will require billions of dollars in new technology and investment in coming decades.

Partner Country USA: More Opportunity for Your Company
HANNOVER MESSE is the best trade show for connecting to global opportunities, and USA Partner Country status means more exposure than ever for showcasing your innovations:

- Connect directly to more than 200,000 attendees, 68 percent of whom have purchase decision-making authority.
- Network with more than 100 business delegations that come to the event ready to make business and investment deals.
- Connect across industry sectors including energy, industrial automation, digital factory, industrial supply, and research technology.

U.S. participation as the Partner Country means U.S. exhibitors receive prime location and increased visibility throughout the show—an excellent advantage for any U.S. exhibitor!

U.S. Commercial Service and SelectUSA Support
Our team will support your company or EDO to capitalize on every possible in-road to success—before, during, and after HANNOVER MESSE.

- Our global network of industry experts will provide personalized, one-on-one counseling for your company or EDO.
- We will help connect you to qualified, pre-screened buyer delegations from around the world.
- Our team will help maximize your trip’s value, whether you are an experienced exhibitor or are attending for the first time.

U.S. Commercial Service—Connecting you to global markets.
USA Energy Storage Solutions & Mobility Technologies at HANNOVER MESSE 2016

Leading Trade Fair for Integrated Energy Systems and Mobility

HANNOVER MESSE 2016 will focus on key challenges of the fourth industrial revolution such as achieving universal standards for machine-to-machine communication, maintaining data security, and finding new business models.

**Energy** is the leading trade fair for integrated energy systems and mobility. In other words, the trade show will be a one-stop showcase for everything to do with energy – from electricity generation, transmission, distribution and storage to alternative mobility solutions as well as energy and resource efficiency. In short, the focus will be on the system as a whole.

The **US Energy Storage & Mobility Technologies Pavilion** will ideally be located near the MobiliTec Area and the group presentation Hydrogen + Fuel Cells + Batteries.

Your business will be vital in showcasing these energy solutions to the highly valued audience of 90,000 industry professionals attending this event.

**USA Partner Country**

The USA will preside as Official Partner Country for the first time since the massive show’s 1947 inception. It’s the biggest U.S. technology display in Europe in generations, so if there ever was a time for companies to “take your tech” across the seas, this is it!

**Benefits only HANNOVER MESSE can provide:**

1. **Promising new contacts** – Senior decision-makers with firm project commitments come to Hannover from every continent to invest in new technology
2. **Innovations on a global scale** – Innovative solutions, cutting-edge technology, and new product launches attract highly-qualified professionals from your target sectors worldwide
3. **Massive crossover potential** – Five leading international trade fairs combined under one roof
4. **New networks** – Some 150 business delegations from industry, business, and government offer huge potential for developing new partnerships
5. **Maximum media exposure** – International press conferences, preview events, and over 2,300 journalists from 42 countries in attendance

**HANNOVER MESSE 2015 Review:**

6,500 exhibitors
6,500 companies from 70 countries

**216,000 attendees**
More than 70,000 from outside of Germany

hannovermesse.com
An open-air site for test drives next to the Hall 27 will allow you to demonstrate your innovations in charging technology and infrastructure. Contact us for more details and participation costs.

USA Energy Storage Solutions & Mobility Technologies at HANNOVER MESSE 2016

HFUSA Pavilions are geared towards companies seeking maximum exposure from their HANNOVER MESSE investment. Each turnkey package includes a fully furnished booth to help you capture the attention of international purchasing managers, distributors, resellers, and the media.

Booth Package Includes:
- Booth with wall elements and carpeting
- Overhead company name sign and company logo
- Furniture package
- Overhead spotlights
- Electrical receptacle w/ 2 KW service, spotlights
- Internet connection
- 1 company profile listing and 5 product descriptions in online catalog
- 2 exhibitor entrance tickets
- Unlimited complimentary visitor tickets

Discover the opportunities and be part of the U.S. Energy Pavilion!
U.S. Commercial Service and the U.S Department of Commerce will facilitate business connections on-site and assist U.S. Companies with counseling.

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ISRAEL & JORDAN TRADE MISSION 2016
JANUARY 23-29, 2016

WHY ISRAEL AND JORDAN?
- The U.S. is Israel's largest single trading partner.
- Israel has a strong, diversified high-tech sector, and is a leader in R&D spending at 4.3% of GDP.
- The U.S.-Israel Free Trade Agreement, signed in 1985 was the first FTA for the USA and continues to provide easy market access to U.S. products and services.
- Jordan is strategically positioned at the crossroads of the MENA region, close to Europe Asia, and Africa.
- Since the U.S.—Jordan Free Trade Agreement came into full effect in 2010, there has been a surge in bilateral trade increasing 600% over the past ten years.

SERVICES
- Matchmaking: customized appointments with prospective partners and distributors
- Comprehensive business program: on-site guides and interpreter services
- In-country briefing by local experts
- Turn-key business service support: travel logistics, ground transportation, hotel group rates, networking events
- Complete customized day-by-day itinerary

KEY INDUSTRIES IN JORDAN: Healthcare technology and medical devices, information and communication technology, renewable energy, safety and security equipment, green build, environmental technologies, agriculture

KEY INDUSTRIES IN ISRAEL: Hi-tech design and R&D, defense, cyber security, safety and security equipment and services, medical technologies and biotechnology products, power generation and education/training

COST
- Participation fee: *$1,995
  > Includes: B2B matchmaking services, in-country staff support; in-country ground transportation; country briefing and networking events
  > *International airfare, hotel, drivers and meals not included
  > *Fee varies depending on number of days of matchmaking meetings
- Eligible Michigan companies may receive 50 percent reimbursement for travel expenses and the participation fee through the State Trade Export Promotion (STEP) grant.

For more information, visit http://www.michiganbusiness.org/grow/export-assistance/

For registration and more information, please contact: Emily Tucker, International Trade Development Manager Michigan Economic Development Corporation 517.862.9865 | tuckere4@michigan.org

REGISTRATION DEADLINE IS DECEMBER 11, 2015.
Michigan Connected and Automated Vehicle Working Group

Oakland County Executive Office Building
Waterford, MI
October 29, 2015
Agenda for This Afternoon

- 1:00 PM Introductions and Update, Richard Wallace, CAR
- 1:10 PM Overview of the Oakland County Connected Vehicle Initiative, Matt Gibb, Deputy Oakland County Executive
- 1:40 PM Modeling the Systems of Systems Associated with V2X and Traffic Management, Bob Brinchek, PTC
- 2:05 PM “Evolution of Steering Systems for Automated Driving,” Ashok Chandy, Nexteer
- 2:25 PM NETWORKING BREAK
- 2:40 PM MDOT Need for Connected Vehicle Business Models and Smart Road Network Update, Collin Castle, MDOT
- 3:10 PM DISCUSSION: 2015 ITS World Congress (Bordeaux)
- 3:40 PM “Advance Michigan Defense Collaborative,” Tricia Walding, Senior Project Manager, Defense Sector Lead, Workforce Intelligence Network
- 4:00 PM Adjourn
Working Group Mission

- Cooperatively pursue projects and other activities that are best accomplished through partnerships between multiple agencies, companies, universities, and other organizations and that ultimately advance Michigan’s leadership position in connected and automated vehicle research, deployment, and operations.
  - Benefit our state and our industry (automotive and more)
  - Enhance safety and mobility in Michigan and beyond
Noteworthy News

- USDOT awarded up to $42 million for connected vehicle safety pilot deployments in New York, Florida, and Wyoming.
  - In New York, on-board units will be installed in 10,000 city-owned vehicles, and roadside infrastructure will be installed throughout Midtown Manhattan and Brooklyn.
  - The pilot in Tampa, Florida will focus on pedestrian safety using smartphones and connected vehicle technologies.
  - The pilot in Wyoming will focus on safety and efficiency improvements in freight traffic on I-80 east-west corridor.

- Apple car plans were unveiled by Wired, and Apple also appears to have hired the chief AI (deep learning) scientist away from NVIDIA.

- Google hired former auto executive John Krafcik to lead its self-driving car team.

- Michigan Department of Transportation issued a Request for Information (RFI) regarding potential innovative business models for connected vehicle and vehicle-to-infrastructure deployment. The RFI can be found at http://www.michigan.gov/mdot/0,1607,7-151-9625_32842---,00.html under "Specialty Services" as "Request for Information_ITS".
  - More info later in this meeting from MDOT
This slide originally contained a video showing drivers experimenting with automated features in their Tesla Model S vehicles. That video can be accessed here:

https://www.youtube.com/watch?v=iSasPVYzSQ0
Upcoming Connected and Automated Vehicle Events

- SEMA Show, November 3-6, Las Vegas, NV
- Autonomous Trucks, November 11-13, Detroit, MI
- Connected Fleets, November 16-17, Atlanta, GA
- Consumer Electronics Show, January 6-9, Las Vegas, NV
- Transportation Research Board, January 10-14, 2016, Washington, DC
- North American International Auto Show, January 11-24, Cobo Center, Detroit
- Automotive Megatrends USA, March 15-17, Dearborn, MI
- TU-Automotive Cybersecurity USA 2016, March 29-30, Novi, MI
- GPU Technology Conference, April 4-7, 2016, San Jose, CA
- SAE 2016 World Congress & Exhibition, April 12-14, Cobo Center, Detroit
- 24th Annual Intelligent Ground Vehicle Competition, June 3-6, 2016, Oakland University (Rochester, MI)—handout
“Well, tonight I am delighted to announce another technology first for Oakland County. A bold leap into the future of technology and smart cars. If successful, I will be placing Oakland County on the global map as the first county in the world to initiate a countywide Connected Car Ecosystem.”

“When people think of Autonomous Cars, they immediately think of Google. But when people think about Connected Vehicles, they will think Oakland County. Our history has been first in cars, and with this new initiative, will be first in Connected Cars.”

State of the County Address

L. Brooks Patterson
Oakland County Executive
Connected Vehicle Task Force
Members

- Fred Nader, AutoTech Technology Development
- Matthew Gibb, Oakland County
- Gary Piotrowicz, RCOC
- Elaina Farnsworth, Mobile Comply
- Greg Kreuger, Leidos
- Paul Haelterman, IHS Automotive
- Martin Nathanson, Paxgrid
- Arada, HERE, many more
Our Challenge

• V-V & V-I technology is working in numerous operational applications…. So why is it not implemented commercially?
• Industry is waiting for a legislative edict rather than developing a market driven solution
• GPS does not work for all vehicle locations (I.E.: urban canyons, covered garages and subterranean roads)
• There is no cohesive plan for rapid aftermarket roll-out
• 300 Million vehicles in current car park
• 220 Million vehicles with OBD-II
• 16 Million new vehicles per year
• New vehicle production alone will take more than 10 years to achieve reasonable density
• There is no business model to pay for the costs for DSRC development, rollout, and maintenance
Aftermarket Product Concept

• Utilize existing Smart Phone as the driver interface device for a Wireless Access Vehicular Environment (WAVE) connected car

• Integrated applications for parking, vehicle maintenance, insurance, etc., that we believe the consumer will find valuable
Wave Aftermarket Product

SAE J-2735 Aftermarket OBU

Front-End: Automotive Telematics Server

V2V and ATIS

Roadside Alerts

Intersection Status

OBD-II CAN

ATP

PVD

BS

HMI

Roadside Alerts over LTE

Wave Aftermarket Product

OAKLAND COUNTY MICHIGAN
Consumer Applications

Cloud Service Providers

- Government (state mileage tax, emissions test)
- Usage-Based Insurance
- Parking Authority
- Electronic Service History

ATP Gateway

- AAA (administration, accounting, authentication)

Activation of any service at discretion of consumer

Activating Consumer Applications

Consumer Applications

Cloud Service Providers

- Government (state mileage tax, emissions test)
- Usage-Based Insurance
- Parking Authority
- Electronic Service History

ATP Gateway

- AAA (administration, accounting, authentication)

Activation of any service at discretion of consumer

Activating Consumer Applications
ITS 2014 Partners
ITS World Congress Demo
RFI

DO NOT ERASE

1. ROW
   - In Row - Phy
   - Over Row - Air

2. DATA
   - wrong term?
   - Row = $ or and Data or and Info or and Knowledge

3. Who is in Charge?
   - OEM, Tech, User, NASA, ???

4. PAY OR GET =

   - Vodafone paid in return to sell 5G in exchange for Data
   - Control &利润

   - Legislation
   - State/Local
   - Private Access
   - Extent of Infrastructure Control
   - Alternative to WADE
   - What do we need
   - Who will manage raw data
   - Is not U, what
   - V+V or V+U
   - Does safety win
   - If OEMs lose - who pays?
   - Prioritization - Freeway Secondary
AGENDA
Connected Vehicle Collaboration Work Study
Session 1 – September 1, 2015

1. INTRODUCTIONS

2. BRIEF STATUS UPDATES (Intended to allow entities to provide a summary overview of where they are in terms of strategy development)
   a. MDOT
   b. RCOC
   c. OCCV TASK FORCE

3. FUNDAMENTAL AREAS OF DISCUSSION
   a. Right of Way
      i. The distinction of physical use and spectrum access
      ii. The status of existing contracts affecting future rights and use
      iii. Is the ROW an asset
      iv. Liability and Use
   b. Data
      i. Is that the right term
      ii. What is MDOT/RCOC et al. expecting to retain/obtain
   c. Who’s in Charge?
      i. Reality versus Intent
   d. Who Pays and How is this Paid For?
      i. Discussion of modeling how this may be monetized

4. MDOT Request for Information
   a. Process
   b. Steps for assistance

5. NEXT STEPS
Traffic Condition in Korea

Safety
- The number of accidents: 215,354
- The number of deaths: 5,092
- The number of injuries: 328,711
- The number of registered cars: 20,002,967 (14.11)

Korea National Police Agency, 2013

Mobility
- Congestion cost: 25 billion euros
- In 2015, it might be gone up to 26.5 billion euros which is equivalent to 2.16% of GDP

Korea Transport Institute, 2013

Environment
- 80 million tons of CO2 emission caused by Road section every year
- 85 million tons of CO2 emission caused by Traffic section (road, railroad, vessel, aircraft, etc.)

Korea Transportation Safety Authority, 2011
Cooperative ITS

C-ITS system helps to prevent car accidents and to improve traffic efficiency by exchanging real-time vehicle data between cars and infrastructures.
## Trends of Cooperative ITS over the world

<table>
<thead>
<tr>
<th>Region (Namco of PJT)</th>
<th>02</th>
<th>04</th>
<th>06</th>
<th>08</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
</tr>
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<tbody>
<tr>
<td>EU (C-ITS)</td>
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<td></td>
<td>Development</td>
<td>Technical Assessment</td>
<td>Effectiveness Assessment</td>
<td>Pre-deployment</td>
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<td></td>
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<td></td>
<td>CVIS, SAFESPOT</td>
<td>Drive C2X</td>
<td>Compass4D</td>
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<td></td>
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<tr>
<td>USA (Connected Vehicle)</td>
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<td></td>
<td></td>
<td>Development</td>
<td>Technical Assessment</td>
<td>Effectiveness Assessment</td>
<td>Pre-deployment</td>
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<td>VSC1</td>
<td>VSC2</td>
<td>Safety-pilot (VSC3)</td>
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<tr>
<td>Korea (C-ITS)</td>
<td></td>
<td></td>
<td></td>
<td>Development</td>
<td>Technical Assessment</td>
<td>Effectiveness Assessment</td>
<td>Pre-deployment</td>
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<td>Smart Highway R&amp;D</td>
<td>Smart Highway Testing road</td>
<td>Pilot Project</td>
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</tbody>
</table>

### Frequency Allocation for C-ITS
- Frequency band: 5.855 ~ 5.925 GHz
- Channel bandwidth: 10 MHz/CH, 7 CH
- Countries: EU, US, Canada, Mexico, Australia
- Note: South Korea
  - Currently it is allocated for Mobile Broadcasting
  - Several CH allocation proposals are being reviewed
  - The same mechanism will most likely be applied for global harmonization in near future
Wireless Access in Vehicular Environment (WAVE)

- Real-time data
- Safety warning
- Frequency Band: 5.855 ~ 5.925 GHz
- Transmission Range: ~ 500 m
- Date Rate: 6~27 Mbps

Providing Safety & Mobility Services using bi-directional communication between Vehicle and/or Infrastructure

Automatic Events Detection System
C-ITS Budget Plan

Pilot Project
2014 ~ 2016 (3 years)
- Location: 75km (Expressway, National Highway, Urban)
- OBU: 3,000 devices
- Costs: 14.7 million Euros

Short term - Introduction
2017 ~ 2020 (4 years)
- Location: 3,494km (Expressway)
- OBU: 2 million devices
- Costs: 700 million Euros
  (construction rate: 4%
  penetration rate: 10%)

Medium term - Expansion
2021 ~ 2025 (5 years)
- Location: 11,870km (Metropolitan)
- OBU: 9 million devices
- Costs: 1.15 billion Euros
  (construction rate: 16%
  penetration rate: 50%
  total: 1.885 billion Euros)

Long term - Maturity
2026 ~ 2030 (5 years)
- Location: 10,332km (Local)
- OBU: 5 million devices
- Costs: 1.135 billion Euros
  (construction rate: 30%
  penetration rate: 70%
  total: 3 billion Euros)
Conclusions

• The rest of the world is approaching fast in the rear view mirror
• If we don’t win this battle we may lose the war

Matthew A Gibb
Deputy Executive
(248) 975-9636
gibbm@oakgov.com
Modeling the Systems of Systems Associated with V2X

Robert Brincheck
Business Transformation Director – PTC
Email: rbrincheck@ptc.com

October 29th, 2015
PTC Enables Transformation

Next-generation technology platforms and enterprise applications

Transforming how customers...

...smart and connected products, operations and systems
<table>
<thead>
<tr>
<th>Passenger Cars</th>
<th>Automotive Suppliers</th>
<th>PowerTrain Suppliers</th>
<th>Commercial Vehicles</th>
<th>Light Vehicles</th>
<th>Racing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toyota</td>
<td>LUK, TRW, Bosch</td>
<td>AVL, YANMAR, GETRAG</td>
<td>Volvo, John Deere, Peterbilt</td>
<td>Harley-Davidson, KTM</td>
<td>SEAT Sport</td>
</tr>
<tr>
<td>Volkswagen</td>
<td>FAG, Cooper, Eaton</td>
<td>ZF, Teksid</td>
<td>FAW, LiEBHERR, FAW</td>
<td>AGCO, LIEBHERR</td>
<td>Renault Sport</td>
</tr>
<tr>
<td>Daimler</td>
<td>Webasto, DANA, Federal Mogul</td>
<td>Bally, Liebherr</td>
<td>Hino, Hino</td>
<td>Toyota Motorsport</td>
<td>TRD Sport</td>
</tr>
<tr>
<td>BMW</td>
<td>ThyssenKrupp</td>
<td>MERCURY, Continental</td>
<td>FAW, Hino</td>
<td>BMW, Mercedes</td>
<td>Maserati</td>
</tr>
<tr>
<td>Hyundai</td>
<td>Harman, Continental</td>
<td>Cummins, Cummins</td>
<td>FAW, Atlas Copco</td>
<td>Aprilia</td>
<td>Aprilia</td>
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<tr>
<td>Chery</td>
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<td>FAW</td>
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Source: PTC
## Smart Traffic Monitoring & Public Safety

All Traffic Solutions is the leader in radar speed displays and variable message signs designed to improve traffic safety outcomes.

<table>
<thead>
<tr>
<th>Business Challenge</th>
<th>Solution</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Increased customer demand for new features and an overall increase in application sophistication.</td>
<td>• SmartApps web-based traffic control suite.</td>
<td>• Faster time to market</td>
</tr>
<tr>
<td>• Provide more comprehensive business system integration</td>
<td>• All Traffic’s SmartApps solution suite allows law enforcement professionals, as well as state and local agencies, to remotely monitor, manage, and interact with traffic safety signs using a web-based application and virtual map.</td>
<td>• Rapid development of mobile user interfaces</td>
</tr>
<tr>
<td>• Need to offer advanced data mining for customers requesting predictive analytics for traffic control</td>
<td>• With ThingWorx, All Traffic is able to rapidly develop mobile interfaces using the ThingWorx Mashup Builder, provide more comprehensive business system integration, and offer advanced data mining for customers requesting predictive analytics for traffic control.</td>
<td>• Advanced data mining that All Traffic can now offer its customers</td>
</tr>
</tbody>
</table>

"ThingWorx’s rapid application development environment and scalable platform allow us to extend our solution and deliver new services to our customers in ways that were previously impossible."

- Scott Johnson, CEO, All Traffic Solutions
Smart, connected products will give rise to the next era of IT-driven productivity growth at a time when the impact of earlier waves of IT has largely played itself out.  

– November 2014

Smart, connected products are transforming how companies design, manufacture, operate and service products, and ultimately, how they organize to create and capture value.  

– October 2015

Michael Porter  
Harvard Business School

Jim Heppelmann  
President and CEO, PTC
“The changing nature of products is disrupting value chains, forcing companies to rethink and retool nearly everything they do internally.”
• INCOSE definition: Systems of interest whose system elements are themselves systems; these entail large-scale inter-disciplinary problems involving multiple, heterogeneous, distributed systems.*

*INCOSE Systems Engineering Handbook v 3.2.2
Unique Challenges Engineering Systems of Systems

- There are 7 unique challenges that influence the development of a system of systems solution*
  1. System elements operate independently
  2. System elements have different life cycles
  3. The initial requirements are likely to be ambiguous
  4. Complexity is a major issue
  5. Management can overshadow engineering
  6. Fuzzy boundaries cause confusion
  7. Systems of Systems engineering is never finished

- V2X systems exhibit all of these conditions and must be designed to address them in the near and long term

*INCOSE Systems Engineering Handbook v 3.2.2
1. System elements operate independently
   – Each system in an SoS is likely to be operational in its own right.

• Application to Connected Vehicles:
  – Vehicles are produced by multiple independent OEMs using unique designs
  – Traffic will consist of connected & unconnected vehicles for decades
  – Transportation infrastructure is designed, owned, and operated by hundreds of different state, local, & federal transportation authorities
2. **System elements have different life cycles**
   - An SoS involves more than one system element. Some of the system elements are possibly in their development life cycle while others are already deployed as operational. In extreme cases, older systems elements in an SoS might be scheduled for disposal before newer system elements are deployed.

- **Application to Connected Vehicles:**
  - Vehicle development cycles are 2-4 yrs.
  - Average vehicle age is 11.3 years
  - Infrastructure replacement cycles can be up to 30 years
  - Mobile tech. dev. cycles are 6-12 months
3. The initial requirements are likely to be ambiguous
   – Requirements for an SoS mature as the system elements mature.

• Application to Connected Vehicles:
  – V2X standards are still being developed
  – Test and validation scenarios are still being defined and refined
  – Regulations will need to be significantly revised to fully accommodate connected and automated vehicles
  – Mobile technology is disrupting previous infrastructure plans
4. **Complexity is a major issue**
   - As system elements are added, the complexity of system interaction grows in a non-linear fashion. Furthermore, conflicting or missing interface standards can make it hard to define data exchanges across system element interfaces.

   **Application to Connected Vehicles:**
   - Driving Automation Levels IV & V will add elements of driving context and driver preference that will expand complexity exponentially
   - V2X interfaces will continue to evolve, standards will be refined and added
   - Combining connected & automated will add more complexity
5. Management can overshadow engineering
   – Since each system element is independent, the coordination of requirements, budget constraints, schedules, interfaces, and technology upgrades further complicate the development of an SoS.

• Application to Connected Vehicles:
  – Traditional top-down regulatory model is not suitable for V2X because definition and management of common interfaces, behaviors, and communication is required
6. Fuzzy boundaries cause confusion
   – Unless someone defines and controls the scope of an SoS and manages the boundaries of system elements, no one controls the definition of the external interfaces.

• Application to Connected Vehicles:
  – Standards and regulations are in place and being developed
  – Are system behaviors and context being developed collaboratively at the regional/national/global level?

*INCOSE Systems Engineering Handbook v 3.2.2*
7. Systems of Systems engineering is never finished
   - Even after all system elements of an SoS are deployed, product/project management must continue to account for changes in the various system element life cycles, such as new technologies that impact one or more system elements, and normal system replacement due to pre-planned product improvement.

• Application to Connected Vehicles:
  - Technology for V2X will evolve or be replaced by something different, possibly disruptive, tomorrow
  - New business models may also impact a number of system elements
On January 21, 2004, NASA lost contact with Mars Rover Spirit. The rover transmitted a message with no data, and the next day, sent a beep indicating that it was in fault mode.

By February 5 the problem was corrected by reformatting Spirit's flash memory and using a software patch to avoid memory overload. Spirit returned to full scientific operations.

NASA engineers were able to diagnose and repair the craft with minimal communications and data.

The problem could have existed in any number of systems all owned or operated by different organizations (Rover Spirit, communications satellites, communication center, command center, etc.).
Model Based System Engineering Addresses The Challenges

- **MBSE** is a model-based approach to Systems Engineering, typically applying the **SysML** modeling language to deal with system complexity and enabling unambiguous communication amongst interested parties.
Changing Approach Is Key

Change from Document centric to Model centric

Old Approach

Requirement Specifications
Interface Definitions
System Architecture
System Functionality
Trade-off Analysis
Test Specifications

New Approach
• The **Systems Modeling Language (SysML)** is an open, general-purpose modeling language for systems engineering developed by the Object Management Group (OMG). It enables the specification, analysis, design, verification and validation of a broad range of systems and systems-of-systems.
The Four Pillars of SysML

- Behavioral Models
- Requirements Models
- Structural Models
- Parametric Models
The Four Pillars of SysML

- System Model
- What The System Can Do
- What The System Must Do
- How The System Does It
Defining Behavior Is Critical

Requirements Should Be Derived From Behavior & Structure

- August 2015 a violent storm moved thru Traverse City blowing over large trees and blocking the roads

- Since a connected and automated vehicle is required to obey all traffic regulations would it:
  - Wait in the road 2 days until the tree is cleared?
  - Report me to the police or my insurance company if I took control and illegally used the center turn lane to go around the tree?
Linking Behaviors & Requirements & Functions

Functional Views - SysML

- Requirements ↔ Use Cases ↔ Functions
Linking Provides Traceability Across Model Elements

Structure

- ibd [block] Anti-LockController
  - Internal Block Diagram
- d1:TractionDetector
  - allocatedFrom «ObjectNode» TractionLoss
- m1:BrakeModulator
  - allocatedFrom «ObjectNode» Module

Behavior

- act PreventLockup [Swimlane Diagram]
  - «allocate» : TractionDetector
  - «allocate» : BrakeModulator
  - DetectLossOfTraction
  - TractionLoss: ModulateBrakingForce
  - allocatedTo «connector» c1:modulatorInterface

Requirements

- req [package] VehicleSpecifications
  - Requirements Diagram
  - Braking Requirements

Parametrics

- par [constraintBlock] StraightLineVehicleDynamics
  - : VelocityEquation
  - : Acceleration Equation
  - : DistanceEquation
  - : BrakingForce Equation
  - v.brake.abs.m1.DutyCycle: v.brake.rotor.
  - v.chassis.tire.Friction:
  - v.Weight:

Equations:

- \[ v = \frac{dx}{dt} \]
- \[ a = \frac{dv}{dt} \]
- \[ f = ma \]
- \[ F = \frac{F_0}{t_0} \]
- \[ f = (tf*bf)*(1-tl) \]
PTC Integrity Modeler

**CAPABILITIES**

- Scalable UML, SysML, UPDM
- Repository Collaboration
- Built-In Traceability
- Document Generation
- Automated Design Review
- System Simulation
- Code Generation & Sync

**BENEFITS**

- Improved Quality through Early Design Review and Consistency
- Bring Systems to Market Faster with Parallel Design Effort
- Cost Reductions from Design and Development Automation
Who ‘owns’ the overall V2X system?

Auto OEMs own and engineer their vehicle’s systems but rely on standards/regulations for guidance on infrastructure behavior.

Infrastructure is owned by Federal, State, and Local governments.

Standards and regulations will govern what the system must do.

What defines what the overall system might/can do??
Who is Nexteer?

- #1 Electric Steering Supplier in North America
- Introduced world’s first mass market Electric Steering in 1999
- $3.0B* global company headquartered in Saginaw, MI
- 12,000+ global workforce
- Publicly traded on the Hong Kong Stock Exchange

Nexteer is the only global tier one automotive supplier committed exclusively to wheel-to-wheel advanced steering and driveline systems.

*2014 Revenue
1906 – Founded as Jackson, Church & Wilcox Co. in the U.S.

1998 – GM created Delphi Corporation, and its steering operations became a division under Delphi

1999 – Delphi was spun-off from GM as a publicly-held corporation

2005 – Delphi filed for Chapter 11 bankruptcy protection

2009 – GM acquired the steering operations from Delphi and renamed it Nexteer Automotive

2010 – 2012:
- AVIC Auto became the controlling shareholder of Nexteer
- Restructuring and operation optimization

2013 onwards:
- Listed in Hong Kong in October 2013
- Senior notes offering in November 2014
- Further expansion in China and other emerging markets

Solid foundation in technology, customer relationships and global presence

New shareholding

Successful IPO and future expansion

Trusted OEM Partner for 100+ Years

The New Era
Increasing Customer Diversity

Serving 10 of the Top12 Global Automotive Customers

- 1970’s
- 1980’s
- 1990’s
- Current & Booked
Regional Presence Increasing in High Growth Markets

- 12 Countries
- 21 manufacturing plants
- 5 regional engineering centers
- 11 customer service centers
Headquartered in Michigan

- **Long term commitment to Michigan**
  - $400 million investment since 2010
  - Workforce of 5,000
    - ~2,000 new jobs since 2010

- **New Auburn Hills global headquarters**
  - Opening in Q2 2016
  - ~150 corporate jobs
Value Creation

Enterprise Value*

- Nov. 30, 2010: PCM China acquired Nexteer; transaction value
  - US $465M
- Oct. 7, 2013: Listing day stock price closed at HK$2.57
  - US $1.1B
- Dec. 31, 2013: Stock price closed at HK$4.43
  - US $1.2B
- Dec. 31, 2014: Stock price closed at HK$6.64
  - US $1.7B
- Apr. 30, 2015: Stock price closed at HK$8.75
  - ~US $3.2B

* Enterprise value = Market capitalization + net debt
Strong Backlog to Drive Continued Growth and Diversification

Cumulative Booked Business*

As of Dec 31, 2014

$9.0B

As of Jun 30, 2015

$11.5B

* We compile booked business information through our internal records, and such information has not been audited or reviewed by our auditors. “Booked business” refers to Company’s estimation of the value of all booked business under contracts that have been awarded to us, but which have not yet begun production.
Nexteer Electric Steering
Wide Range of EPS Offerings

Column – EPS
Typ. A/B/C Segments

Attractive Price Point to Capture Emerging Market Growth
Wide Range of EPS Offerings

Rack – EPS
Typ. C/D/SUV/FST/LCV Segments

Swept NA Market to Steer 9/10 Full Size LD Trucks
Wide Range of EPS Offerings

Single Pinion – EPS
Typ. B/C Premium Segments

Premium Product to Address Global B/C Segment Vehicles
Over 30 million EPS units produced since 1999 saving more than 3.0 billion gallons of gasoline.
A Steering Supplier’s Perspective on…

Roadmap to Autonomous Driving
Historical Technology Milestones

- EPS System Was Made Available to the Market
- Pace Award for E-STEER™ EPS
- 1950s Saginaw Safety Power Steering
- 1959 Rotary Valve Power Steering
- 1967 Tilt-Wheel Steering Column and Front-Wheel-Drive Axles
- 1968 Anti-Theft Steering Column
- 1967 Rotary Valve Power Steering
- 1968 Tilt-Wheel Steering Column and Front-Wheel-Drive Axles
- 1967 Anti-Theft Steering Column
- 1967 Saginaw Safety Power Steering
- 1968 Rack and Pinion Steering System
- 1967 100-year Anniversary
- 1968 Produced 20 Millionth Energy Absorbing Column
- 1968 High Output 12-Volt Rack EPS
- 1968 100-year Anniversary
- 1970 Anti-Theft Steering Column
- 1970 Pace Award Finalist for Magnasteer and Torque Overlay and Smart Flow
- 1970 100-year Anniversary
- 1970 Rack and Pinion Steering System
- 1976 High Output 12-Volt Rack EPS
- 1976 100-year Anniversary
- 1976 100-year Anniversary
Nexteer Technologies
Roadmap to Autonomous Driving

- Driver Override & Takeover
- Input/Output Torque Overlay
- HW Vibration Alert
- Overlay Arbitration
- Hands On/Off Wheel Detect
- Cyber-security Features
- Road Surface Detection
- Driver Monitoring

- Basic EPS
- Quadrasteer
- Auto Parking Assist
- Vehicle Stability Assist
- Lane Departure Warning
- Under-/Over-Steer Assist
- Lane Keeping Assist
- Embedded Black Box OEM Functions
- Traffic Jam Assist
- Trailer Backup Assist
- Lane Change Assist

- ISO26262 Safety Architecture
- Fail Operational HW/SW
- State of Health Monitoring
- High-speed Position Tracking
- Steer-by-Wire
- Enhanced Steering HMI Interfaces

- Low Speed Strg Position Control
- Steering Feel Dynamic Modulation
- AUTOSAR
- State of Health Monitoring
- Enhanced Cyber-security Features

- Level 2 Highway Driving
- Level 3 Highway Driving
- Level 4 Highway Driving
- Level 4 Auto City Driving
- Level 5 Driverless Vehicles

- QuadraSteer
- Lane Departure Warning
- Lane Keeping Assist
- Traffic Jam Assist
- Trailer Backup Assist
- Lane Change Assist

- Level 2 Highway Driving
- Level 3 Highway Driving
- Level 4 Auto City Driving
- Level 5 Driverless Vehicles

- Nexteer Technologies
- Vehicle Features
- Enhanced Cyber-security Features
What’s Next

Intuitive Motion Control
Building Blocks

Automotive or Non-Automotive

Mechanical Integration

Power Electronics | Software Algorithms

Motor Design | Sensor Design

Systems Engineering
Closed Loop Servo Control

Safety Critical Product Creation
from Requirements

Ability to Industrialize
Michigan
Connected Vehicle
Developments

Collin Castle, P.E.

Michigan CAV Working Group DOT
October 29th, 2015
Components of a V2I System
Detroit – The Michigan Department of Transportation (MDOT) is partnering with General Motors, Ford Motor Co., and a University of Michigan (U-M) consortium to deploy vehicle-to-infrastructure (V2I) communication technology-enabled corridors on more than 120 miles of Metro Detroit roadway, including stretches of I-96, I-696, I-94 and US-23.
Michigan RSU Deployments
V2I Application Considerations

- Public Benefit
- Agency Benefit
- Industry Need/Use
- Application Readiness
- Data Availability
V2I Applications

- SPaT/Red Light Violation Warning
- Road Weather Mngt.
- Work Zone Warning/Mngt.
- Pavement Condition
SPaT/Red Light Violation Warning

- **Traveling Public Benefit:**
  - Real-time SPaT Info
  - Red Light Violation Warning

- **Agency Benefit:**
  - Monitor Real-time SPaT Data
  - Monitor Real-time Speed Data
  - Monitor Red Light Violation Data

- **Performance Measurement:**
  - Reduction in Congestion
  - Reduction in Crashes
Work Zone Warning/Management

- **Traveling Public Benefit:**
  - Real-time Work Zone Info
  - Real-time Congestion Info

- **Agency Benefit:**
  - Monitor Real-time Work Zone Info
  - Monitor Real-time Congestion

- **Performance Measurement:**
  - Reduction in Congestion
  - Reduction in Crashes
DUAP Data Sources

- **Traditional System**
  - HPMS
  - Construction
  - Maintenance
  - Winter MDSS
  - Mobility
  - NWS Warnings (text)

- **Fixed**
  - ATMS (CCTV, DMS, VDS counts)
  - NWS Radar
  - Road Weather Information System (RWIS) Stations
  - National Weather Service (NWS) Stations

- **Mobile**
  - Integrated Mobile Observations (IMO) Project Fleet
  - Vehicle-Based Information and Data Acquisition System (VIDAS)
  - Safety Pilot Model Deployment Project Fleet
  - MDOT Automatic Vehicle Locator (AVL)

- **Other Future Data**
MDOT Fleet Data Collection

Mounted Processing Unit or Data Acquisition system (DAS)

Vehicle OBD

Bluetooth

Pavement Asset Condition Sensors

Expandable as needs are identified (i.e., atmospheric conditions, wheel speed sensors, camera, wipers, etc.)

VIDAS Architecture
Truck Parking Info & Mngt. System

- Provide Real Time Availability
- Improve Safety
- 5 Public Rest Areas
- 10 Private Truck Stops
- Counting ins/outs
- Dynamic Truck Parking Signs
- Mi Drive
- Truck Smart Parking Services
- Smartphone Application
- On-Board DSRC Equipment
MAASTO TPIMS TIGER Grant

<table>
<thead>
<tr>
<th>Corridor</th>
<th>State Deployed Across</th>
<th>Number of Deployed Rest Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-35</td>
<td>Minnesota</td>
<td>3 DOT</td>
</tr>
<tr>
<td>I-64</td>
<td>Kentucky</td>
<td>2 DOT, 2 Private</td>
</tr>
<tr>
<td>I-65</td>
<td>Indiana, Kentucky</td>
<td>13 DOT, 5 Private</td>
</tr>
<tr>
<td>I-70</td>
<td>Ohio, Indiana, Kansas</td>
<td>32 DOT, 21 Private</td>
</tr>
<tr>
<td>I-71</td>
<td>Kentucky</td>
<td>1 DOT, 3 Private</td>
</tr>
<tr>
<td>I-75</td>
<td>Michigan, Ohio, Kentucky</td>
<td>14 DOT, 23 Private</td>
</tr>
<tr>
<td>I-80</td>
<td>Iowa</td>
<td>14 DOT, 10 Private</td>
</tr>
<tr>
<td>I-94</td>
<td>Michigan, Indiana, Wisconsin, Minnesota</td>
<td>16 DOT, 11 Private</td>
</tr>
<tr>
<td>I-135</td>
<td>Kansas</td>
<td>4 DOT</td>
</tr>
</tbody>
</table>
Commercial Vehicle Platooning

- Corridor Characteristics
  - Relatively Flat
  - Mix of Rural & Urban
  - Staging Locations
  - Supporting Infrastructure
    - DSRC Radios
    - Comm. Infrastructure
    - CCTV Camera

- Testing Location
  - Port Huron (I-94) to M-15

- Test Scenarios
  - Vehicle-to-Vehicle (V2V)
  - Vehicle-to-Infrastructure (V2I)
M-City

All photos courtesy of the University of Michigan
Mobility Transformation Center (MTC) Affiliates

- Auto Club Enterprises an AAA affiliate
- AGC Automotive
- Allstate Insurance Co.
- Arada Systems, Inc.
- Autoliv
- Brandmotion LLC
- Calspan Corporation
- Changan Automobile
- Cohda Wireless
- Desjardins
- DURA Automotive Systems
- Faurecia
- Harada Industry of America, Inc.
- Harman International Industries
- HERE, a Nokia company
- Hitachi, Ltd.
- IAV
- IDIADA
- LG Electronics
- New Eagle
- Mechanical Simulation Corporation
- Miller Canfield
- MOBIS
- Munich Re
- Nexteer Automotive
- OSIsoft, LLC
- PTC, Inc.
- Realtime Technologies, Inc.
- Renesas Electronics America Inc.
- Savari Inc.
- Subaru
- Sumitomo Electric Industries, Ltd.
- Suncorp Group
- TASS International, Inc.
- TRW Automotive
- Zip Car
## V2I Deployment Coalition

<table>
<thead>
<tr>
<th>Time Period</th>
<th>V2I Stakeholders anticipated status</th>
<th>V2I DC Role &amp; Focus</th>
</tr>
</thead>
</table>
| **Initial 18 Months** | - Owners/operators are early in V2I Decision Process  
- Strong interest in V2I issues & guidance  
- Want to be part of the solution | - Clarify most of the initial 15 V2I issues identified  
- Provide Feedback to Guidelines  
- Define Standards & Research Needs  
- Encourage dialog between owners/operators & OEMs  
- Peer exchange, technology transfer |
| **June 2016 – June 2021** | - Increasing # of V2I pilot deployments  
- V2I Early Adopters are beginning V2I infrastructure investments | - Track and support resolution of initial 15 issues  
- Align & support of training & education  
- ID additional issues  
- Peer to Peer exchanges  
- Help ID funding sources  
- Feedback to Pilot Sites  
- Feedback to CAMP & VIIC |
| **June 2021 – June 2026** | - V2I use by ‘Early Adopters’ is expanding & maturing  
- ‘Late Adopters’ are beginning V2I infrastructure investments | - Coordinate resolution of remaining issues  
- Peer to Peer among ‘Early Adopters’ to exchange Best Practices  
- Peer to Peer between ‘Early Adopters’ and ‘Late Adopters’  
- Help ID funding sources  
- Alignment & support of training & education |
MDOT RFI
CV Infrastructure Business Models

- Posted: 10/26/15
- Responses Due: 11/25/15
- Potential Business Models:
  - Supporting Communications
  - Instrumented Fleets
  - Digital Maps
  - Message Distribution Methods

Status of DSRC Communication Technology and Applications: Report to Congress

TRB Committee Review Highlights

Michigan CAV Working Group
October 29th, 2015
Review of the USDOT Report on Connected Vehicle Initiative Communications Systems Deployment

On April 28, 2015, the Committee for the Review of the U.S. Department of Transportation (USDOT) Report on Connected Vehicle Initiative Communications Systems Deployment sent a letter to Anthony R. Foxx, Secretary of the USDOT. The committee, as directed by Congress, conducted an independent peer review of a draft USDOT report to Congress, Status of the Dedicated Short-Range Communications Technology and Applications.

The committee agrees with the USDOT's draft report about the benefits that digital short-range communication (DSRC) technology offers compared with other communications technologies for safety-critical messages. It also agrees that proposed spectrum sharing in the 5.9 GHz band is the most serious risk and uncertainty of relying on DSRC for safety-critical messages. The committee, however, identified other unknowns and uncertainties that the report should address, including spectrum frequency coordination, scalability of DSRC communications levels beyond those tested to date, message security, and other issues.

E-Newsletter Type: Recently Released TRB Publications
TRB Publication Type: Letter Reports

This Summary Last Modified On: 4/27/2015

Download: http://www.trb.org/Main/Blurbs/172448.aspx
Questions

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Advance Michigan Defense Collaborative
Eligibility

- Decline of $1.2 billion dollars in total defense spending in the region, a disinvestment of 38%.
- Defense job losses identified-2012-2014: 3,413
What is OEA?

• Created to help state and local governments plan and carry out community adjustment and diversification programs in response to DoD actions, including:
  ✓ Base closures or realignments
  ✓ Base expansions
  ✓ Personnel reductions
  ✓ Industry/contractor reductions
  ✓ Operational/training impacts

• Partner with an affected community to support community-based actions
Quick Facts

- “Advance Michigan Defense Collaborative”
- Department of Defense Office of Economic Adjustment Defense Industry Adjustment Grant
- Grant Period: Aug 1, 2015-July 31, 2017
- $5.97 million awarded-$6.7 million total
- Lead organization: Macomb/St. Clair Workforce Development Board
- Advance Michigan project and region
- WIN staffing as project management
To provide immediate and sustained assistance to firms and workers in a 13-county region in Southeast Michigan affected by reduced Department of Defense procurement. The coalition coordinates assistance to organizations that promote research, industrial development, and talent development relevant to the defense industry.
The Advance Michigan Defense Collaborative will support resiliency and capacity in:

• Autonomous transportation and connected mobility (particularly the electronics, sensors, and componentry sector)

• Lightweight materials manufacturing sector

• Information technology with a focus on increasing security of automated transportation systems and products
Subtask 1

Social Network Analysis and Network Development for Defense-Relevant Partners
Subtask 3

Defense-related skills gap analysis

![Chart showing 2012 completions vs. 2012-2013 job demand. The chart indicates that demand is between 2.5 and 15 times higher than the number of new graduates each year. Higher education cannot be the only source of talent for military employers.](chart.png)
Subtask 4

Asset Mapping of Regional Defense-Relevant Programs, Initiatives, and Infrastructure
Subtask 5
Subtask 6

Planning and Analysis to Align and Leverage Regional Connected/Automated Transportation Systems Assets and Initiatives

Already in progress? Regional needs?
Advance Michigan Defense Collaborative

Fiduciary
Macomb/St. Clair Workforce Development Board

Co-Chairs
Macomb County Planning & Economic Development
Michigan Defense Center

Project staff
WIN

Executive Committee
Macomb County Economic Development, Michigan Defense Center,
Macomb/St. Clair Workforce Development Board,
Wayne EDGE, Oakland County Community & Economic Development,
Detroit Economic Growth Corporation,
Lansing Economic Area Partnership, Greater Flint Chamber of Commerce
Ann Arbor SPARK, University Research Corridor,
Southeast Michigan Community Alliance, Mott Community College,
Capital Area Michigan Works, Michigan Ec Dev Corporation, Michigan National Guard,
National Center for Manufacturing Sciences, Center for Automotive Research,
United Auto Workers

Direct subcontractors
Thank You

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