

Michigan Connected and Automated Vehicle Working Group

April 28, 2016



Meeting Packet

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Michigan Connected and Automated Vehicle Working Group



April 28, 2016

Oasis Trucking Center
4195 Central St.
Detroit, MI 48210

Meeting Agenda

- 09:00 AM** **Introductions and Update**
Richard Wallace, Director, Transportation Systems Analysis Group, CAR
- 09:10 AM** **Welcome and Overview of Smart Truck Parking**
Rick Warner, President and CEO, Truck Smart Parking Services
- 09:30 AM** **P3 Mobility Innovation Center: An Introduction**
Dr. Samit Ghosh, President and CEO, P3 North America
- 09:40 AM** **Update on Select Federal Connected Vehicle Efforts**
Frank Perry, Connected Vehicle Program Director, Leidos
- 09:55 AM** **Lidar 101: How Lidar Contributes to Automated Vehicles**
Patrick Brunett, Director, Business Development, Quanergy
- 10:20 AM** **Networking Break**
- 10:40 AM** **Update on MDOT Deployments and Other State Efforts**
Collin Castle, Connected Vehicle Specialist, MDOT
- 11:10 AM** **Michigan Mobility Branding**
Bob Metzger, Business Marketing Director, MEDC
- 11:20 AM** **Overview of Intelligent Ground Vehicle Competition Event**
Bernard Theisen, Engineer, TARDEC
- 11:30 AM** **Smart Truck Parking Demo**
Rick Warner, President and CEO, Truck Smart Parking Services
- 12:00 PM** **Adjourn**

Michigan Connected and Automated Vehicle Working Group



The spring 2016 meeting of the Michigan Connected and Automated Vehicle Working Group was held at the Oasis Trucking Center in Detroit, Michigan, on April 28, 2016.

Meeting Notes

Richard Wallace, Director of the Transportation Systems Analysis Group at the Center for Automotive Research (CAR), started the meeting by detailing the meeting agenda and working group mission, as well as presenting noteworthy connected and automated vehicle (CAV) news and upcoming CAV events. For the latter, Richard highlighted strategic actions from GM and Ford linked to autonomous vehicle development, Google's first "at fault" crash, and Roborace, the first autonomous vehicle race competition. Michael Blicher from Autotalks explained the Connected Transportation Virtual Environment that will aim to provide opportunities for the connected vehicle community to actively engage and develop business relationships. More information can be obtained from Linda Daichendt, Executive Director/CEO of the Mobile Technology Association of Michigan (Linda@GoMobileMichigan.org).

After Richard's introduction, Rick Warner, President and CEO of Truck Smart Parking Services (TSPS), gave a brief overview of TSPS's activities and collaboration with MDOT. Rick stated that the biggest problem for truck freight is finding adequate and secure parking. Lack of accurate and real-time information on parking has a negative impact on safety, productivity, and emissions. In Michigan, MDOT, TSPS, and HNTB have been working on a pilot project to create a smart system for truck parking. The service gives real-time information on available parking, has predictive parking capacities, enables reservations, and provides secure parking. The pilot has been working successfully for 18 months. In addition, there is an opportunity to expand it to ten Midwest states through the Truck Parking Information and Management System (TPIMS) project. The ultimate goal is to develop a nation-wide interoperable and interconnected information service network for truck parking.

Following Rick Warner's presentation, Samit Ghosh, President and CEO of P3 North America, provided a brief overview of the Mobility Innovation Center that P3 opened in April. The center has a research, development, and implementation focus. With this center, P3 aims to expand its support of the automotive industry and the development of connected, automated, and electric vehicles, as well as other mobility solutions.

After Samit Ghosh's presentation, Frank Perry, Connected Vehicle Program Director at Leidos, gave an update of several noteworthy federal connected vehicle efforts. Leidos operates and maintains the USDOT Michigan Connected Vehicle Testbed. The architecture of the testbed consists of 50 RSUs, OBUs, a Test Lab Environment, seven test vehicles, and a Situation Data Clearinghouse (SDC). This testbed is

available free of charge, but USDOT Test Vehicles require users to provide drivers and fuel. Sign up is available at <https://cvcs.samanage.com>. Frank also gave a brief update on other USDOT/FHWA projects, as well as City of Detroit, TARDEC, and Colorado projects.

Following Frank Perry's presentation, Patrick Brunett, Director of Business Development at Quanergy gave a brief introduction on the functioning principles of LiDAR and its role in the development of automated vehicles. LiDAR is the most complete perception sensor currently used for the development of autonomous driving. In combination with radar and cameras, it can achieve the sensor redundancy that a reliable autonomous vehicle would need. LiDAR produces data in the form of a 3D composite point cloud. This data can be processed for object detection, tracking, and classification. Patrick also described Quanergy's research to develop a compact, mechanical LiDAR that has been on the market since November 2014, and, ultimately, a solid state LiDAR, scheduled for production in 2017.

After the networking break, Collin Castle, Connected Vehicle Specialist at MDOT, provided an update on the southeast Michigan Connected Vehicle Environment initiative. Collin outlined the latest progress for four initial pilot applications: red light violation warning, work zone warning and management, road weather management, and pavement condition. Collin also explained the architecture of the network linking the RSUs, SEMTOC, the DUAP Server, the Situation Data Clearinghouse, and the Security Credential Management System (SCMS). Collin finished his presentation with a brief reminder on the USDOT ATCMTD (Advanced Transportation & Congestion Management Technologies Deployment) Program Grant, for which applications are due June 3, 2016. The Notice of Funding Opportunity is available on the FHWA website: https://www.fhwa.dot.gov/fastact/nofo_atcmtd_20160325.pdf.

Following Collin, Bob Metzger, Business Marketing Director at MEDC, spoke about the Michigan mobility branding that will be launched at ITS America 2016 (San Jose, June 12-15). This brand is being developed by MEDC, MDOT, MichAuto, and Business Leaders of Michigan. It will be treated with an "open-source" philosophy, meaning that all organizations working in Michigan on connected and automated vehicles will be able to use the content available on the dedicated website, which will be operational in June.

Bernard Theisen, Engineer at TARDEC, gave an overview of the Intelligent Ground Vehicle Competition (www.igvc.org), which will hold its 24th edition this year. The event will take place June 3-6, 2016 at Oakland University in Rochester, Michigan. Each year, teams from about 50 to 60 universities coming from eight to nine countries participate in the event.

To conclude the meeting, TSPS demonstrated several of the technologies that enable the Truck Parking Information and Management System. On display within the conference room were a dynamic message sign to be deployed in the expanded areas of the program and a live demonstration of the web interface. Several meeting participants ventured outside to tour a working prototype of a TSPS field operations center—a converted shipping container fitted with technology and human comforts to provide quick and easy deployment of TSPS operation within a secured truck parking lot.

MDOT maintains a webpage dedicated to its work related to CAV technologies (http://www.michigan.gov/mdot/0,1607,7-151-9621_11041_38217---,00.html). 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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**Michigan Connected and
Automated Vehicle
Working Group**



Handouts



**You are cordially invited to attend the
2016 Innovative Vehicle Design Competition**

Date: **Saturday, May 14, 2016**
Time: **9am to 4pm**
Location: **Mcity Test Facility,
University of Michigan Mobility Transformation Center
2901 Baxter Rd., Ann Arbor MI**

Linking excellent teaching and learning practices with increasing corporate demands for skilled, creative and energetic employees, the IVD programs showcase the creative engineering strengths of today's students at a regional competition that focuses on vehicle performance and endurance.

These three land-based vehicular engineering projects are exciting, complex and relevant learning opportunities for youth. Join us to meet the 60 competing teams from around the state as well as our new connected vehicle exhibition teams.

Admission is free. We hope you will join us!

Square One is a Michigan-based 501c3 educational grant funding organization. Square One's mission is to identify, fund and enable STEM projects for K-12 teachers and students, which are experiential, compelling and challenging.



Proud Partners in



**The Square One Education Network Innovative
Vehicle Design Mobility Challenge Competition is
Made Possible With the Support of...**

Ford Motor Company Fund

Nissan

Brose

P3 Group

Washtenaw Community College

Harman

**Michigan Economic Development
Corporation**

Eaton

Tata Technologies

Piston Group

Denso

Eisbrenner Public Relations

Good Sense Media ~ Harris Battery ~ Larry's RC

PRESS RELEASE FOR IMMEDIATE RELEASE

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**ITS America 2016 San Jose To Open With The Next Generation Workforce Student-Led V2X Lab
Monday, June 13, 2016**

(Washington, DC, April 26, 2016) – Bringing attention to the Next Gen intelligent transportation workforce, ITS America 2016 San Jose, the new venue highlighting intelligent transportation and integrated mobility, will kick off the three-day event by launching its first-ever V2X High School Lab (V2XHS). San Jose area students will participate with Michigan students in a V2X connected vehicle open, hands-on laboratory where, utilizing a 3D printer, they will design and build their own connected and autonomous vehicles. A news conference to introduce the program will be held Monday, June 13, 9:00 a.m. PDT, at the McEnergy Convention Center.

“ITS America 2016 San Jose brings with it a commitment to the community of San Jose by serving as an incubator for next generation ITS. By partnering with Mobile Comply and Square One Education Network, ITS America 2016 San Jose will bring this exciting field of next generation transportation to future engineers, entrepreneurs and financiers,” said Regina Hopper, president and CEO of ITS America. “This workshop will allow students to get a hands-on view of this burgeoning sector of the transportation industry as the need to attract and retain a talented workforce grows.” V2X (Vehicle-to-X) refers to intelligent transportation systems where vehicles and infrastructure systems are interconnected, providing more precise knowledge of the traffic situation across the entire road network. Connected transportation promises increased safety, environmental, and economic benefits.

The Mobile Comply-Square One Education Network partnership brings together industry and education to develop a connected vehicle certification for teachers and students through classroom training, materials, and lessons. A full classroom curriculum is expected to be in place in Michigan for the 2016-2017 school year.

“It has been a passion of ours to aid in the growth of the community by bringing awareness to the ever-evolving connected and autonomous vehicle environment,” said Elaina Farnsworth, CEO of Mobile Comply. “The training required for the future workforce to support the convergence of technologies needs to begin before students even enter the workforce. It is only through dedicated partnerships, such as those with ITS America and Square One that we can increase the visibility of intelligent transportation and promote mobility nationwide.”

“With the structured and scalable curriculum Mobile Comply can provide, the hands-on applications Square One can impart, and ITS America leading this movement in intelligent transportation, together, we have a robust, consistent and multi-sector learning environment that is crucial for our future professionals entering into this space,” said Karl Klimek, executive director of Square One Education Network.

Mobile Comply is the international leader in developing and delivering curriculum, training, and credentialing programs that prepare businesses and technical professionals to participate in the evolution of intelligent transportation. Mobile Comply's competency-based training programs equip employees and organizations with the knowledge and skills they need to understand connected and autonomous vehicle technology and the systems the technology enables, so they may leverage that knowledge to drive results in their companies and projects.

Square One Education Network is a Michigan-based nonprofit organization, providing grant funding to schools and other K-12 learning environments, enabling them to provide innovative, meaningful STEM (science, technology, engineering, and mathematics) programs.

The Intelligent Transportation Society of America (ITS America) advocates for industries marrying tech and transportation, putting transportation at the center of the Internet of Things (IoT). ITS America works to identify and drive public policy issues at the local, state, and federal levels to advance deployment of the technologies that will support data-driven integrated mobility.

To register and ensure discounted hotel rates, visit the [ITSAmericaRegistrationPortal](#). Working, credentialed press may register at no cost.



We are pleased to offer you an opportunity to be a part of the ITS America 2016 V2X Student- Led Lab Classroom. This exciting event will launch at ITS America 2016, Integrated Mobility Transportation Refined event in San Jose, CA June 12th-15th 2016.

ITS America, Mobile Comply and Square One Education Network will conduct a four-hour V2X High School Student-Led Lab Classroom to support the development of the future ITS workforce. **This event will be the first-ever V2X Connected Vehicle curriculum/workshop for middle and high school students and teachers at ITS America.** This is a unique partnership in the Intelligent Transportation Systems sector, bringing together leaders from education and industry to develop connected vehicle certification for K-12 teachers and students through classroom training, materials, and lessons. This visibility on a national scale will bring awareness to sponsors, students, and to ITS America's new approach to promoting workforce development starting with secondary education.

We have included a list of our sponsorship opportunities. We invite you to be a part of this exciting program - **ITS America Supports the Future Workforce - V2X Student-Led Lab.**

Sincerely,
Karl Klimek, Executive Director, Square One Education Network
Elaina Farnsworth, CEO Mobile Comply

Sponsorship Opportunity

Mobile Comply and Square One Education Network are requesting a sponsorship for the V2X Student-Led Lab classroom held within the ITS America 2016, Integrated Mobility Transportation Refined event. The three levels of sponsorship are:

Gold:	\$10,000
<ul style="list-style-type: none"> • Logo on student and teacher event t-shirts • Logo on all workshop printed and online materials • Opportunity to speak on stage at one of the ITS America session • Opportunity to speak to workshop attendees • Logos on all workshop kit cars 	
Silver:	\$7,500
<ul style="list-style-type: none"> • Logo on all workshop printed and online materials • Opportunity to speak to workshop attendees • Recognized as the luncheon sponsor for the workshop • Logo on all workshop kit cars 	
Bronze:	\$5,000
<ul style="list-style-type: none"> • Logo on all workshop printed and online materials • Opportunity to speak to workshop attendees • Logo on all workshop kit cars 	

Deadline

Deadline for sponsorship is ***May 1, 2016***

Please send high-resolution company logos to krobertson@mobilecomply.com by May 1, 2016 to be included in print and online materials.



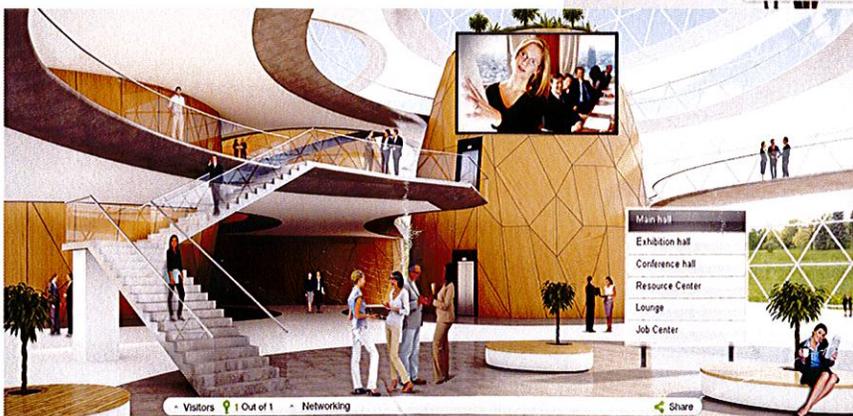
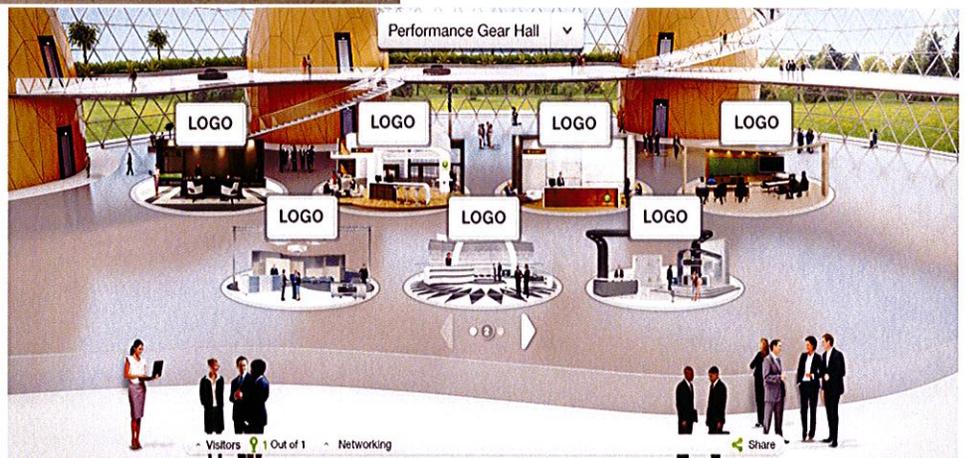
CONNECTED TRANSPORTATION VIRTUAL TRADE SHOW

A partnership of the *US Dept of Transportation Intelligent Transportation Systems Joint Program Office* and the *Mobile Technology Association of Michigan* for the creation of an on-going, online environment where the connected transportation community can actively engage and develop business relationships.



- Business development
- Commerce
- Upload company videos, brochures, whitepapers, photos & more for prospect access

- 24 hour access
- 365 days / year access
- Company branding
- Real-time access
- Live events; webinars, webcasts, conference



To receive information to participate in this program, scan the QR code below, or access the URL

<http://dld.bz/epjQS>





Truck yard operators face a variety of challenges in trying to extract maximum profitability from their limited inventories of tractor and trailer parking spaces. Most yards are either multi-tenanted and/or are open to all drivers who wish to park there. In either case, managing the vast amount of data about a yard's inbound and outbound traffic in order to provide timely and accurate information and billing to its clients is of increasing importance in an industry fraught with theft and safety issues.

Fleet managers encounter their own hurdles in that they lack current information about the whereabouts and status of their equipment, drivers and cargo. Bills that arrive for parking charges from various yards take a variety of formats and may have inaccuracies. Furthermore, there is a shortage of data about where parking exists and how safe it may or may not be.

Individual truck drivers also experience difficulties in finding available safe parking. They often spend a great deal of time (and money on fuel) at the end of a driving shift attempting to locate a facility with space.

Designed and tested by truck yard operators, **Sentinel Truck Yard Management System** assumes the task of tracking equipment and personnel that visit the yard, freeing up valuable time otherwise spent recording all this information by hand. Timeliness of information allows the yard operator to bill its clients much more promptly and collect its receivables faster.

Fleets can access the system and view real-time data about their equipment on a given site, with the ability to view detailed information about arrivals and departures, seals, whether a trailer is/was loaded or empty. Fleets can also authorize the release of a unit if this is required.

The system integrates with Truck Smart Parking Services (TSPS), thereby offering yard availability information throughout the network and permitting a driver to reserve his parking space in advance of his arrival, liberating his time and reducing fuel consumption.

A flexible system which is customizable to the business rules any given yard follows, Sentinel provides tangible benefits to the yard operator, its employees and its clients.

FEATURES and BENEFITS

Benefits to			
Feature	Fleet Manager	Yard Operator	Driver
Real-time tracking of entry/exit of all drivers and equipment	<ul style="list-style-type: none"> - Enhances security for drivers and equipment, lowering theft/damage and insurance expenses - Provides fleet manager with real-time information about the status of equipment, drivers, seals, etc. 	<ul style="list-style-type: none"> - Facilitates and automates management of available space - Improves traffic management - Minimizes manpower requirements 	<ul style="list-style-type: none"> - Once registered in the Sentinel system, the driver is recognized at all network locations, reducing the duration of entry/departure procedures - Registered drivers will be greeted by name on arrival at network locations, boosting goodwill
Alerts fleet manager when at/near yard capacity and/or going into "overflow"	<ul style="list-style-type: none"> - Allows greater control over expenses 	<ul style="list-style-type: none"> - Upgrades traffic management capability 	<ul style="list-style-type: none"> - Driver never turned away because lot is full
Real-time billing system	<ul style="list-style-type: none"> - Improves transparency and accountability of billing by yard operator 	<ul style="list-style-type: none"> - Reduces billing disputes, thereby improving customer relations - Reduces need for collection activity - Accelerates payment cycle 	<ul style="list-style-type: none"> - Improves transparency of billing process
Multi-platform payment collection system		<ul style="list-style-type: none"> - Streamlines payment procedure, reducing collection activity and manpower requirements 	<ul style="list-style-type: none"> - Ease of payment
Equipment release protocol built into management system	<ul style="list-style-type: none"> - Gives fleet operator exclusive control over release of its equipment from the yard 	<ul style="list-style-type: none"> - Puts responsibility for equipment release into hands of the client - Simplifies departure procedure - Reduces manpower requirements 	<ul style="list-style-type: none"> - If the driver is part of a fleet, this reduces the duration of departure procedure
Multi-platform, real-time parking and services availability information (through TSPS)	<ul style="list-style-type: none"> - Allows manager to direct traffic to yards with availability, reducing fuel consumption and "overflow" costs 	<ul style="list-style-type: none"> - Brings traffic to the yard, increasing revenue - Advertising of auxiliary services to all users 	<ul style="list-style-type: none"> - Reduces time spent finding parking, thereby reducing fuel expense and liberating personal time - Provides location information about availability of services
Multi-platform reservation system (through TSPS)	<ul style="list-style-type: none"> - Guarantees availability of parking, reducing fuel consumption 	<ul style="list-style-type: none"> - Brings traffic to the yard, increasing revenue - Helps optimize yard utilization by facilitating "overbooking" 	<ul style="list-style-type: none"> - Guarantees availability of parking, reducing time spent finding parking and liberating personal time - Ease of payment

**Michigan Connected and
Automated Vehicle
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Presentations

Michigan Connected and Automated Vehicle Working Group



Oasis Trucking Center, Detroit, MI

April 28, 2016

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Matt Smith, ITS Program Manager, MDOT
- 11:10 AM** **Michigan Mobility Branding**
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Rick Warner, President and CEO, Truck Smart Parking Services
- 12:00 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.

Goals

- Benefit our state and our industry (automotive and more)
- Enhance safety and mobility in Michigan and beyond

Noteworthy News

- General Motors
 - Invested in Lyft (\$500 million), bought Cruise Automation (a vehicle automation company), and began a program with Lyft to provide rental cars to Lyft drivers
- Ford
 - Created a subsidiary called Ford Smart Mobility focused on digital mobility services and tripled its investment in driver assistance and autonomous vehicle technologies
- Google
 - Had its first “at fault” crash of one of its test fleet vehicles (hit a bus) and announced that it will expand its automated vehicle testing program to Kirkland, WA, and Phoenix
- Michigan
 - Approved first installment from Michigan Strategic Fund to develop the American Center for Mobility; John Maddox announced as the first CEO of the ACM
- Mobile Technology Association of Michigan
 - With ITS JPO, launched Connected Transportation Virtual Environment
- Roborace
 - Automated vehicle race competition announced; all competitors will use the same car; competition purely around software and linked to FIA Formula E



Upcoming Connected and Automated Vehicle Events

- 24th Annual Intelligent Ground Vehicle Competition, June 3-6, 2016, Oakland University (Rochester, MI)
 - More details to come later in the program
- TU-Automotive Detroit, June 8-9, Novi, MI
- ITS America 2016, June 12-15, San Jose, CA
- TRB-AUVSI Automated Vehicles Summit, July 19-21, San Francisco (with ancillary meetings July 18 and 22)
- CAR Management Briefing Seminars, August 1-4, Acme, MI
- World Mobility Leadership Forum, September 28-29, Detroit
- ITS World Congress, October 10-14, Melbourne, Australia



Connecting Parking
For A Better World

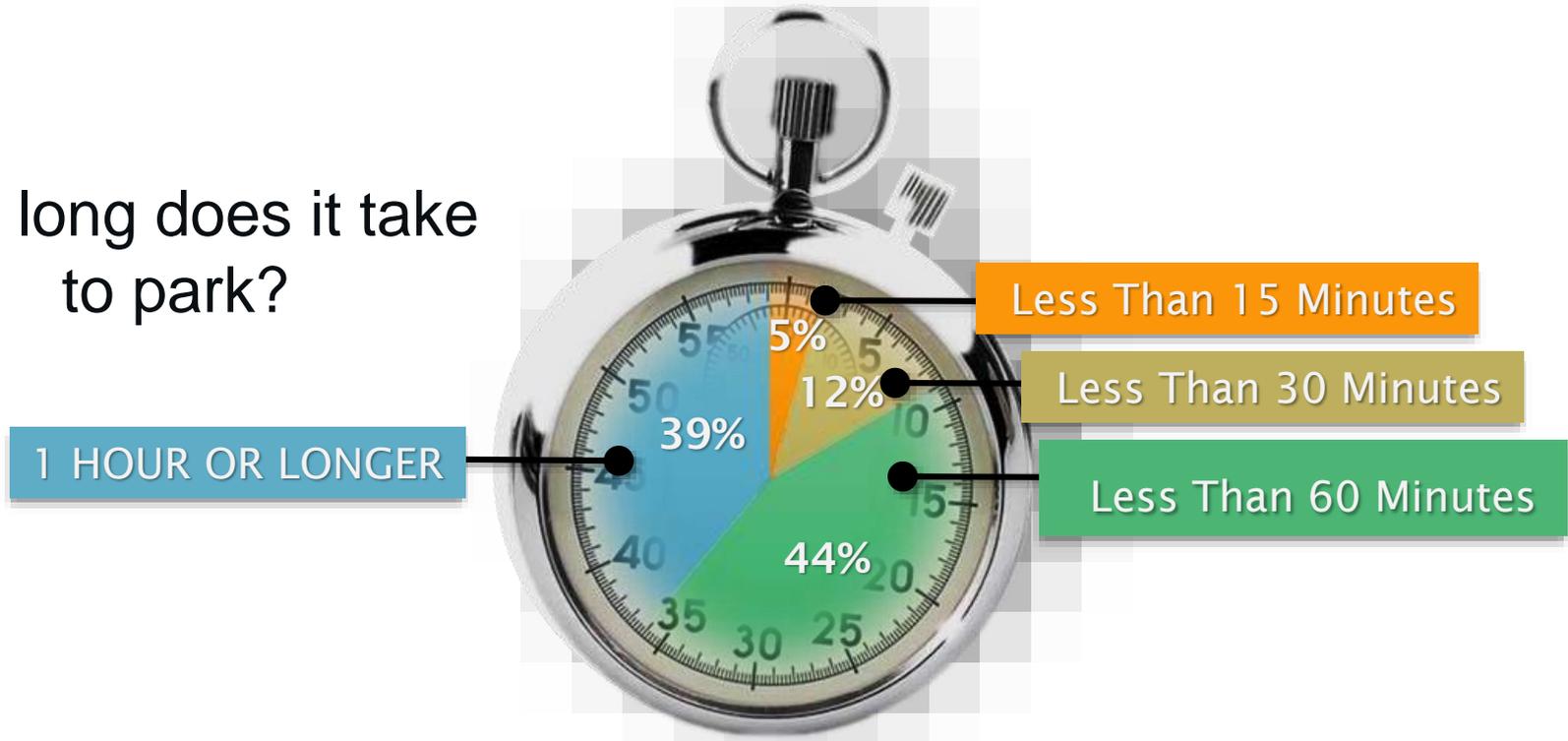


Michigan Connected and Automated Vehicle Working Group

April 28, 2016

PROBLEM - WASTED TIME SPENT LOOKING FOR PARKING

How long does it take to park?



Lack of connected infrastructure costs!



IMPACT - WASTED TIME COSTING BILLIONS

- Safety
- Mobility
- Productivity
- Emissions



Costing
Economy
\$Billions/Year



Government
Spending
\$50M+++ /Year



There is not enough spaces at the **time** and **place** truckers need it...

...and no **real-time** information to make decisions.





V2I OPPORTUNITY - REAL-TIME & ACCURATE INFO



Current



Smart





Watch video ...

<https://www.youtube.com/watch?v=2LXibE0I1Ak>

SOLUTION – NATIONAL PRIVATE/PUBLIC NETWORK



There must be an **interoperable** and **interconnected** information service network.

MICHIGAN – FIRST AND ONLY REAL-TIME NETWORK



HNTB

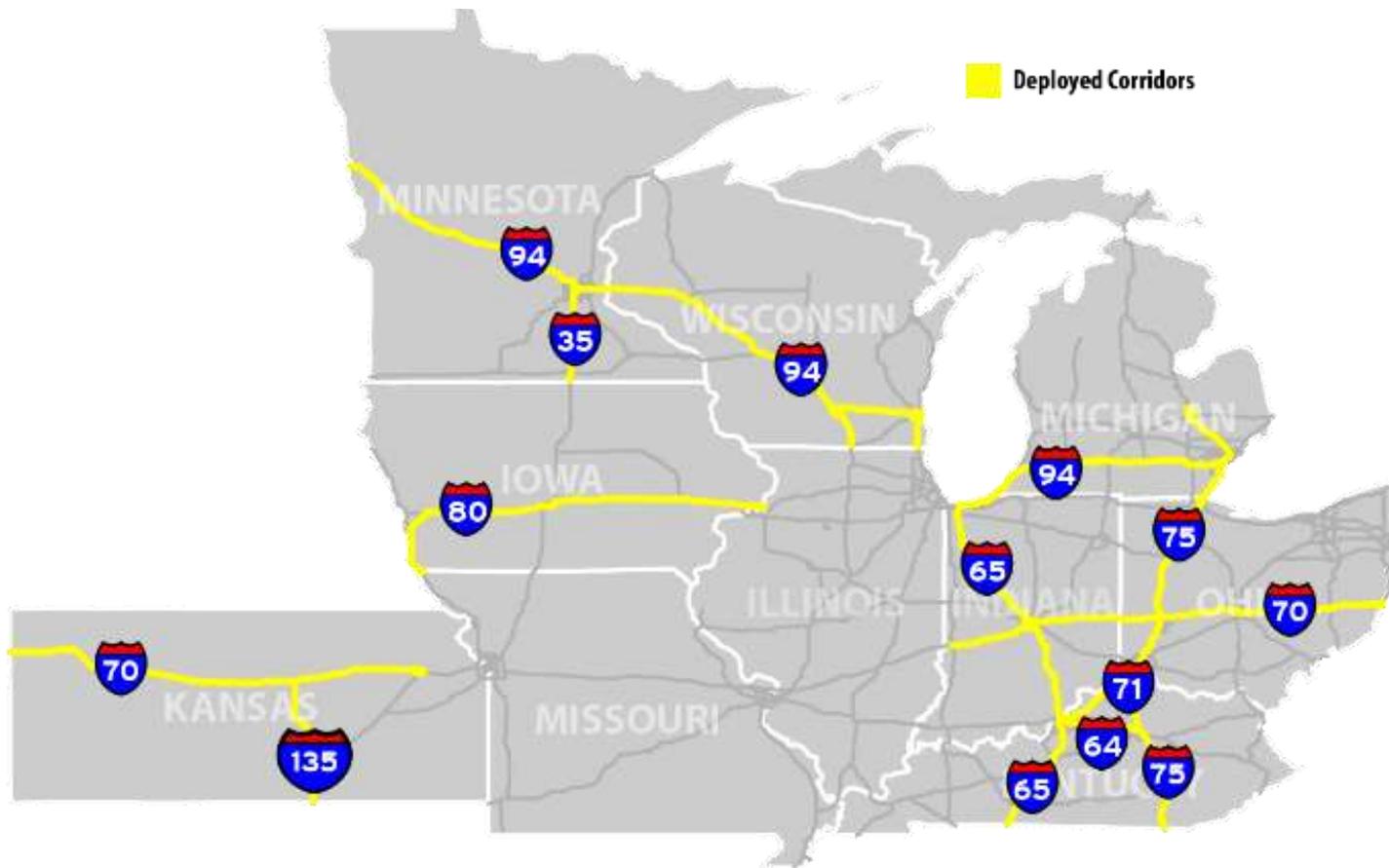
TSPS™



System has been operating successfully for 18 months



TIPMS EXPANSION – FIRST REGIONAL OPPORTUNITY





Cloud Data

+

TSPS Process

=

Valuable Information
(National)



Back Office



Aggregation/Analysis



Predictability

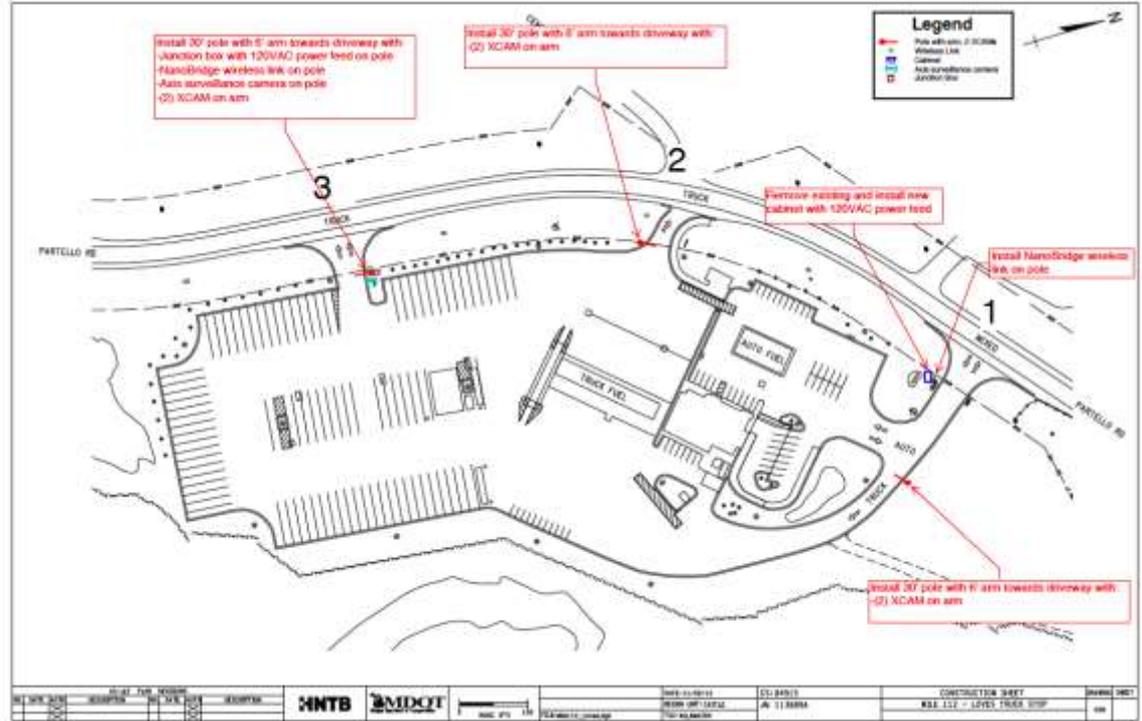


Patent Protected





INSTALLATION - LOW SITE IMPACT





1. Real-time Availability
2. Predictive Parking
3. Reservations
4. O&M
5. Secure Parking





- Sentinel Services - **NOW!**
- Enhance Attributions via Self Provisioning
- Queuing for Ports and Terminals
- Origin and Destination
- Performance Metrics
- Geo-Fence
- Carbon Credit





Thank You



Rick Warner

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TSSPS™



P3 Mobility Innovation Center

Leaders in Infotainment, Telematics System Integration and Connected Vehicles

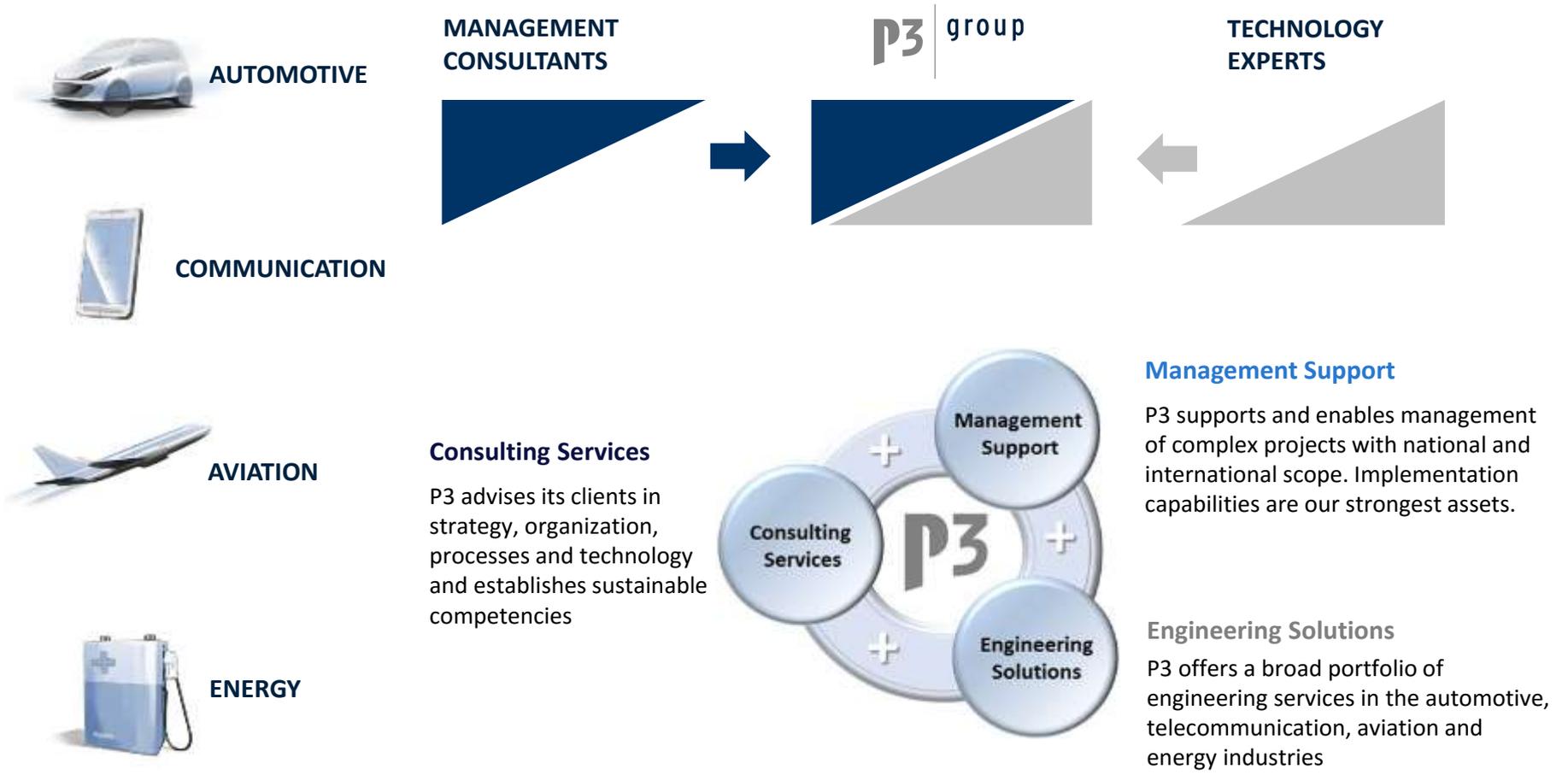
Detroit, MI

4/28/2016

Dr. Samit Ghosh

President & CEO

P3 - Bridging solutions globally, focused on four primary industries, with over 3,200 consultants and engineers worldwide



We have a global presence on 6 continents with Technology Centers, Consulting Hubs and client serving locations



- *BUSINESS & STRATEGY CONSULTING CENTERS*
- *TECHNICAL CENTERS*
- *CUSTOMER-BASED CENTERS*

EUROPE

- Germany**
- Stuttgart European In-Vehicle Test Facility
 - Aachen World Headquarters and European Wireless Connectivity Electrical Lab & Research Center
 - Hamburg Aerospace Engineering Center
 - Bremen
 - Berlin
 - Wolfsburg
 - Braunschweig
 - Ingolstadt
 - Munich
 - Dusseldorf
 - Augsburg
 - Boblingen

Serbia

- Belgrade SW Development & Mobile Application Factory

France

- Toulouse
- Paris

Great Britain

- Bristol
- London/Hounslow

Spain

- Manresa
- Madrid

Italy

- Rome

AFRICA

- South Africa**
- Capetown

ASIA

India

- Bangalore Aerospace & Automotive Offshore Center
- Mumbai Asian Wireless Test Facility

China

- Shanghai Business & Strategy Consulting Center
- Peking

Japan

- Tokyo

AUSTRALIA

- Sydney

SOUTH AMERICA

Brazil

- Sao Paulo

NORTH AMERICA

Canada

- Montreal
- Toronto

USA

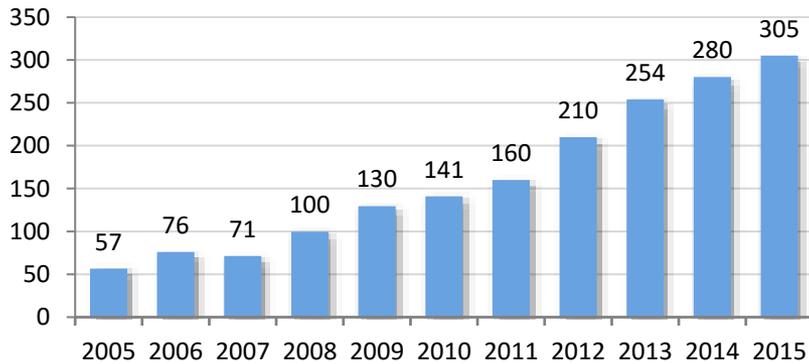
- Detroit Mobility Innovation Center & Test Facility
- Morristown US Wireless Connectivity Electrical Lab & Research Center
- Dallas Business & Strategy Consulting Center
- Durham
- Portland
- San Francisco
- Newport Beach

Mexico

- Mexico City – Near Shore Electrical Engineering

P3 has been serving our clients from Innovation to Implementation for the last 20 years

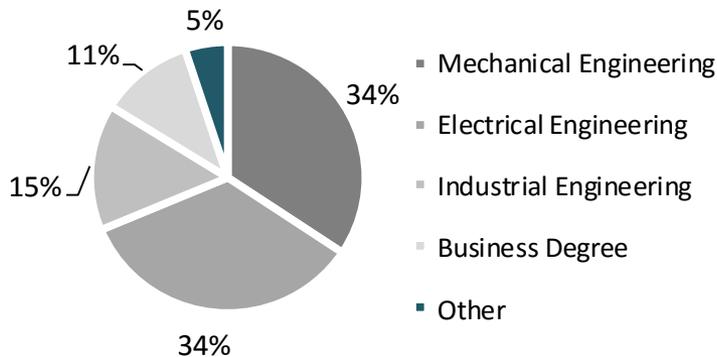
Revenue (Million EUR)



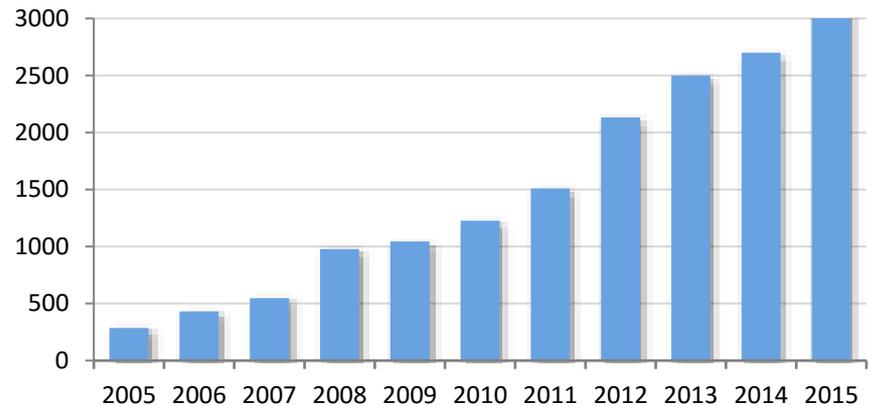
Clients



Employee Mix



Headcount Growth



P3 combines Automotive and Telecommunication expertise to offer an End-to-End service portfolio for Connected and Autonomous Vehicle Development

Automotive

> 800 Consultants & Engineers

- Technology-Strategy
- Business Model
- Organizational Development & Processes
- Quality Management/ Monitoring and Roll-Out
- User Experience Tests
- Component Tests
- Component Integration Tests
- Bluetooth IOP
- Media Compatibility
- Multimedia Stress Test



Combining expertise from different fields of connected mobility delivers maximum value to our clients.

Covering user experience, safety and security and functional integration – world wide.

IT/Telecommunication

> 800 Consultants & Engineers

- Network Tests and –Architecture
- Mobile Hardware Testing
- Service Quality
- Security Test
- Drive Tests
- Big Data Analysis
- Rapid Prototyping
- Mobile App Development
- Business Continuity Management



References:



CAV is evolving into a complex ecosystem touching every aspect of the customer experience, with end-to-end implications throughout the vehicle space

CUSTOMER CONNECTIVITY ECOSYSTEM

CONNECTIVITY ENABLEMENT ECOSYSTEM



We opened our Mobility Innovation Center on 4/20/2016 with strong support from our clients, MDOT , MEDC and Oakland County



The Center is Located at 25650 W Eleven Mile, Southfield, MI 48034



The Mobility Innovation Center has a research, development and implementation focus and is a local partner for future automotive technologies



The P3MIC is a modern 25,000 sqft facility focused on the research, development and implementation of

- technologies and
- organizational services

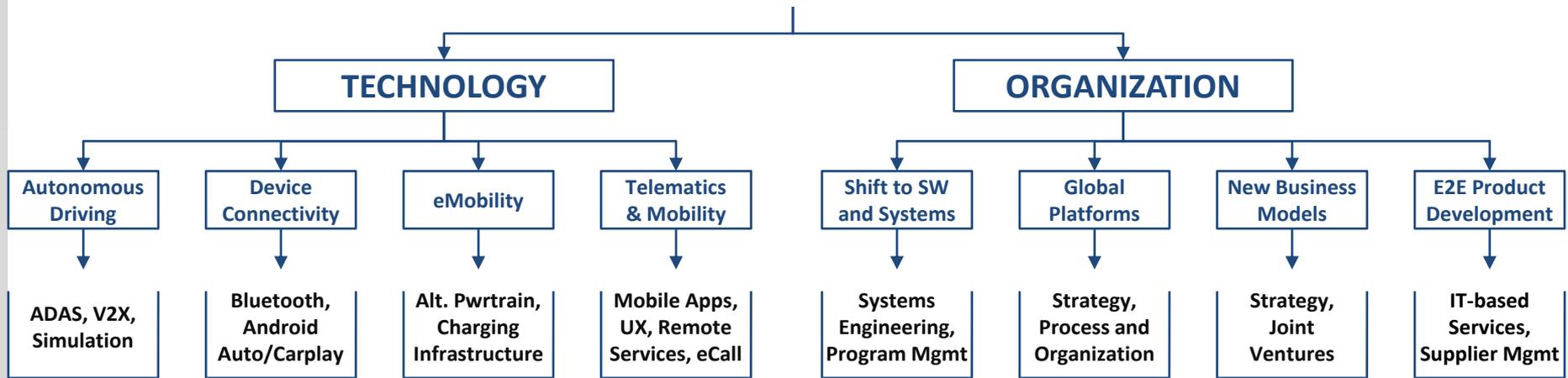
required to support the automotive industry to realize future innovations in connected, autonomous and E-Mobility solutions.



The vision and structure of the MIC addresses the cross-functional needs of our clients and the changing conditions of the automotive market.



Mobility Innovation Center



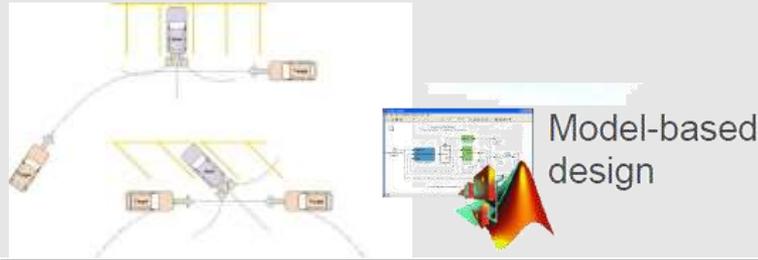
The Mobility Innovation Center offers a modern space with extensive labs, research and collaboration space

- ***25,000 Sqft Modern Facility***
- ***Full Vehicle Workshop with Prototyping Capabilities***
- ***Private Customer Testing & Validation Labs***
- ***Telematics Test & Validation Labs***
- ***Device & Connectivity Library***
- ***Voice Recognition Lab***
- ***Advanced Research & Development Team (HW/SW)***
- ***Organizational & Process Subject Matter Expert Team***



Some example projects for CAV are focused on ADAS, V2V Technology and Data based Traffic projects at the Mobility Innovation Center

ADAS - Reverse Brake Assist Vehicle Integration



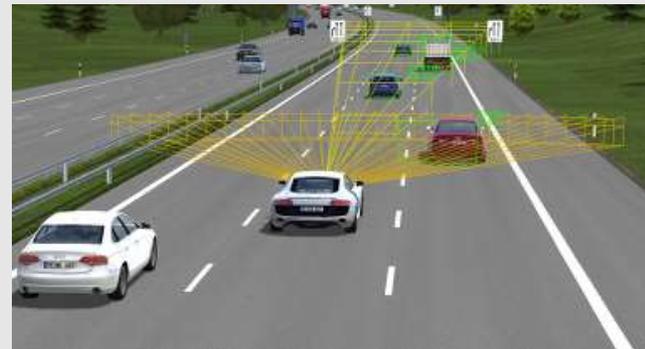
ADAS Roadsign Recognition: Product Development Support



V2V Prototype System Development and Integration



Model Based Testing Traffic Jam Pilot



Research & Development projects include proof of concept build, whitepapers and industry benchmarking

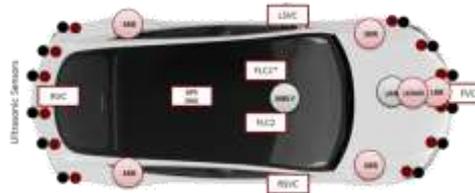
E-Mobility Solutions

- AC and DC charging infrastructure
- Charging equipment development
- Charging IOP testing
- EV fleet management
- Project management



Proof of concept for new technologies solutions

- Advanced Driver Assistance Systems (ADAS)
- Connectivity
- Advanced HMI Systems
- Vehicle Features



Ongoing Future Automotive Technology Trend Reporting

- Technology Oriented Benchmark
 - Experience product from a developer's point of view
 - Focus lays on quantified measurements
 - Results lead to better understanding of technical utilizations
- Customer Oriented Benchmark
 - Experience product from a customer point of view
 - Focus lays on perception of HMI, Mobile App and Web Portal

Cybersecurity – Industry Whitepapers & Benchmark

- Holistic approaches to automotive cybersecurity ecosystem Implementations
- Internal organization of business and product development processes
- Changes in testing and validation procedures.



Contacts



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P3 enables our clients to succeed in their business by delivering tangible value

Founded in 1996 as a spin off from a globally-recognized, leading technical university, P3 began with the goal of implementing an innovative new process and has remained focused on serving clients from innovation to implementation. P3 has grown rapidly to over 3,200 employees across 34 locations globally.

Who we work with

We work within client organizations and teams to develop and implement innovative solutions to complex technology challenges. Our clients are open-minded, secure leaders who seek solutions. They have the courage to bring in outside experts who can provide long-term value to their organization.

What we do

Our fresh, innovative application of technical and managerial best practices puts tailored solutions in place – not just on paper – with continuous guidance until a project or process is implemented and tangible value has been achieved.

Our commitment

We do not accept the status quo, so we leverage our global footprint and solution capabilities to bridge organizational boundaries. Client success is our highest objective!

Leidos CV Projects

Michigan CAV Working Group Meeting

Frank Perry
Connected Vehicle Program Director
04/28/16



Agenda

- ▶ Intro to Leidos
- ▶ USDOT Connected Vehicle Support Services
- ▶ USDOT/FHWA CV Projects
- ▶ State & Local CV Projects

Introduction to Leidos

- ▶ Headquartered in Reston VA, Leidos provides Science and Technology solutions in National Security, Health, and Engineering.
- ▶ Leidos is a result of Science Applications International Corporation (SAIC) spinning-off its technical, engineering and enterprise IT business on Sept. 27, 2013.
- ▶ ~18,000 employees
- ▶ ~\$5.1 billion in revenues
- ▶ 70% National Security
 - 97% Government
 - 3% Commercial
- ▶ 30% Health and Engineering
 - 60% Government (CV Team)
 - 40% Commercial
- ▶ Acquiring Lockheed Martin's Information Systems & Global Solutions Group (IS&GS), which will bring ~20,000 additional employees and \$5 Billion in Revenue

USDOT CV Support Services

- ▶ We operate and maintain the USDOT MI Connected Vehicle Testbed.
- ▶ The Testbed consists of:
 - ~50 RSUs, from several manufactures located in Novi, Farmington Hills, Southfield, and surrounding areas
 - OBUs from several Manufactures
 - Offer a Test Lab Environment in our Farmington Hills Office
 - 7 Test Vehicles
 - Situation Data Clearinghouse (SDC)
 - Subscribe to Vehicle and SPaT/Map Data
 - Enhanced Vehicle Situation Data is a cross between BSMs and Probe Data; BSM data sets bundled into IP Messages
 - Intersection Situation (SPaT and Map) Data is sent from the Roadside into the SDC once every 2 seconds

USDOT CV Support Services (cont.)

- Situation Data Warehouse (SDW)
 - Query data
 - Vehicle Data
 - SPaT/Map data
 - TIM Messages; Operators deposit messages, RSU query for messages

- ▶ Security Credential Management System (SCMS) v1
 - Generates and Distributes IEEE 1609.2 Security material
 - used for Safety Pilot

- ▶ Tools available for accessing the SDC and SDW and generating Map and TIM messages
 - <https://webapp.connectedvcs.com>

- ▶ All systems being upgraded to 2016 versions of the SAE and IEEE DSRC Standards; complete in late summer early fall

USDOT CV Support Services (cont.)

- ▶ Testbed is available free of charge
 - USDOT Test Vehicles require users to provide drivers and fuel
- ▶ All requests will come through our new online Service Desk
- ▶ Sign up is easy
 - Navigate to <https://cvcs.samanage.com>
 - Click “**Sign up to submit and track your service requests**” at the bottom of the homepage.
 - Avoid using popular public email domains like Gmail if possible
 - An activation email will be sent to your email address
 - Click the link to activate your account and create a password

USDOT\FHWA Projects

- ▶ CV Pilots (Tampa FL, Wyoming, New York)
 - Leidos is supporting through the Testbed
- ▶ DSRC OBU and RSU Certification
 - Leidos is supporting through the Testbed
- ▶ SCMS v2 Development
 - Led by CAMP
 - Leidos is leading Test Activities (for CAMP)
- ▶ Saxton Transportation Operation Laboratory (STOL)
 - Located on the FHWA Turner Fairbank Campus in McLean VA
 - Operated by Leidos
- ▶ DSRC RSU Specification 4.0 update
 - Account for the new (2016) SAE and IEEE Standards as well as Lessons Learned from deployments (Leidos Lead)

USDOT\FHWA Projects (cont.)

- ▶ CV System Deployment at the Federal Law Enforcement Training Center (FLETC) in MD for Research
 - Leidos is lead the effort through STOL
- ▶ Proof-of-Concept Cooperative Adaptive Cruise Control (CACC) conducted in fall of 2015 at the former Willow Grove PA Naval Air Station (<https://youtu.be/2-WoV8nKQUE>)
 - Longitudinal Control using factory Radar/LiDAR and BSM (STD Part I and custom Part II)
 - Leidos is led the effort through STOL
- ▶ CACC follow up work at Aberdeen Proving Ground
 - Leidos is supporting through STOL

State & Local Projects

- ▶ City of Detroit
 - 17 RSUs along Larned and Congress
 - SPaT and Map
 - USDOT SDC and SDW
 - Leidos was the Systems Engineer

- ▶ TARDEC
 - MDOT and TARDEC are conducting an autonomous vehicle convoy on I-69 in June 2016
 - TARDEC investigating adding DSRC to their Autonomous Mobility Appliqué System (AMAS)
 - Leidos is the DSRC On-Board Unit (OBU) Systems Integrator

State & Local Projects (cont.)

▶ Colorado

- Self Funding CV Pilot Deployment Submission along the I-70 Corridor
- Leidos is leading the:
 - Security Management Operating Concept/System Security Plan
 - Safety Management Plan
 - Comprehensive Deployment Plan

Questions?

Frank Perry | Leidos

Connected Vehicle Program Director | Transportation Solutions Division

Mobile: 734.552.9638 | <http://www.linkedin.com/in/frankperry9638>

frank.perry@leidos.com



QUANERGY

The Future of 3D LiDAR Sensing

Quanergy Systems, Inc.

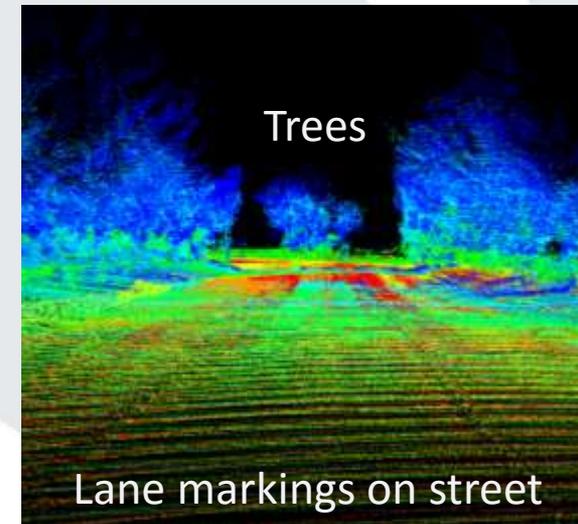
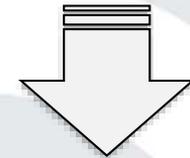
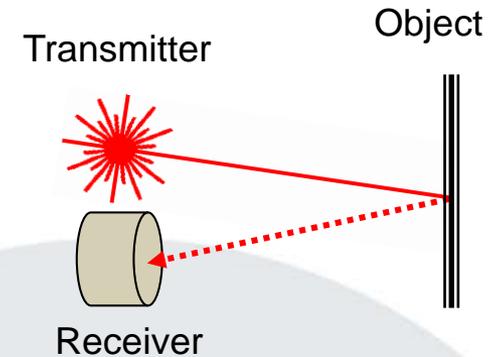
April 28, 2015

LIDAR 101

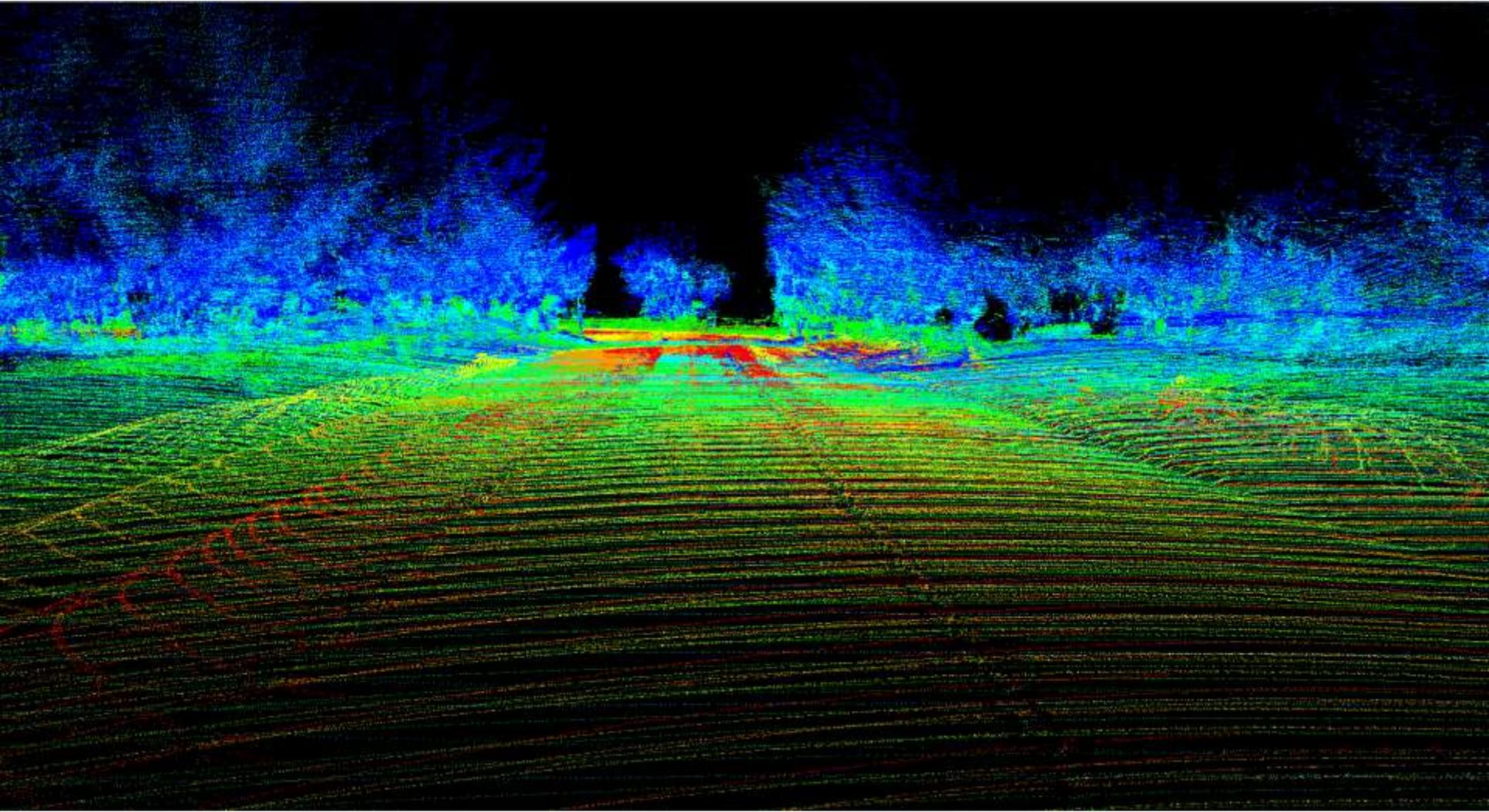


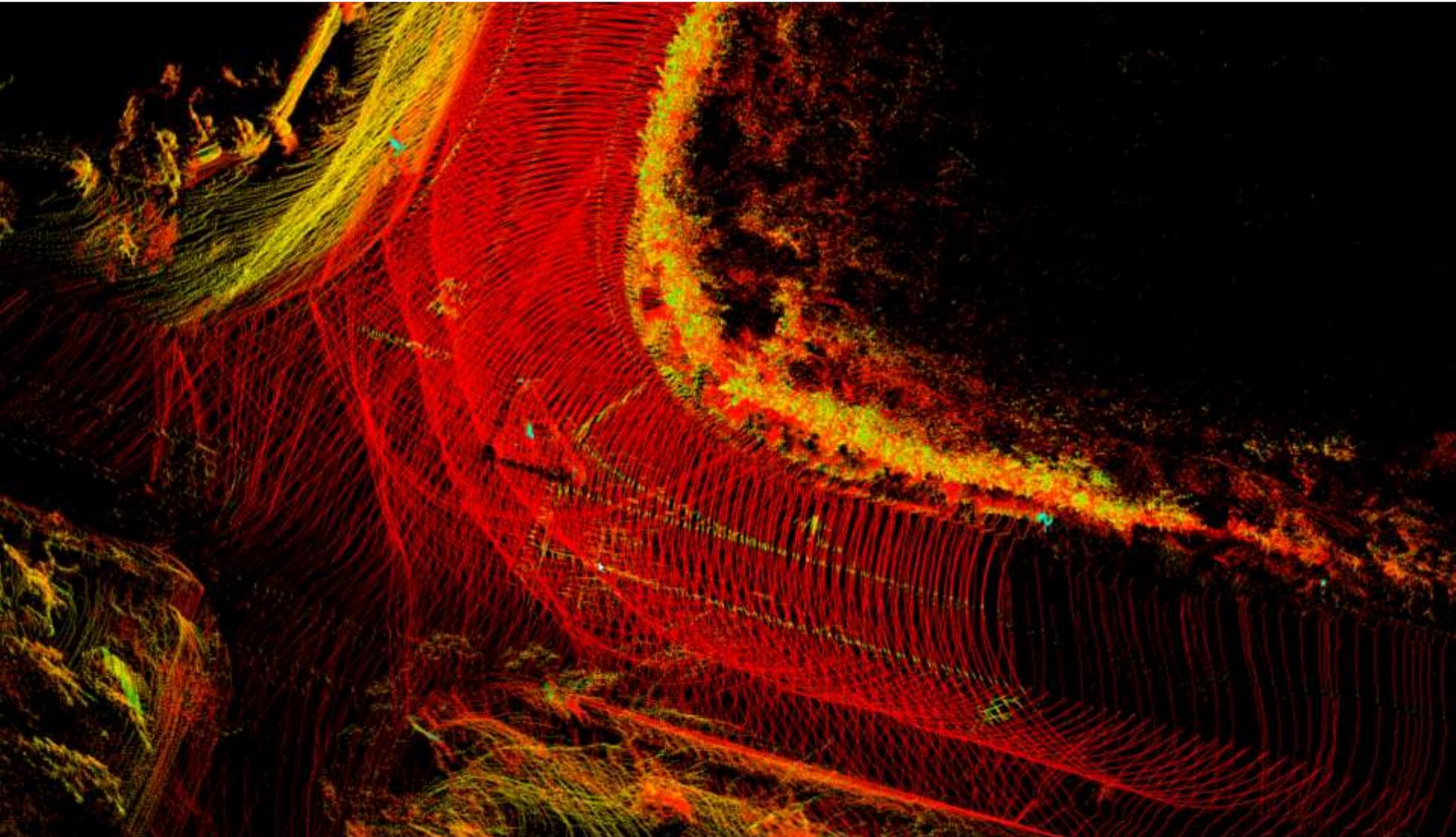
Time of Flight (ToF) LiDAR is the most complete perception sensor, using direct measurement:

- 3D shape with accurate width/height/depth
- Distance with high accuracy
- Intensity

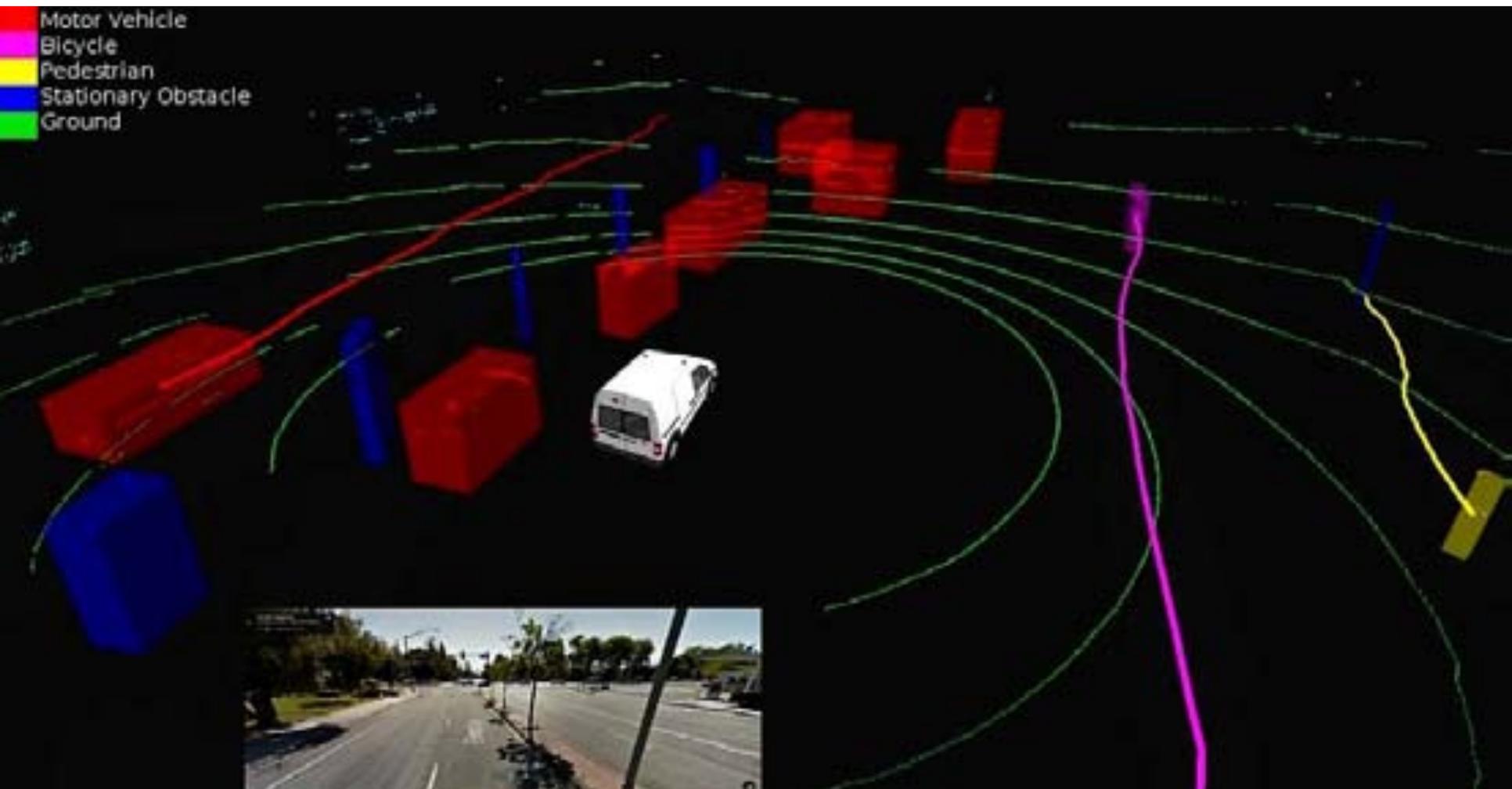


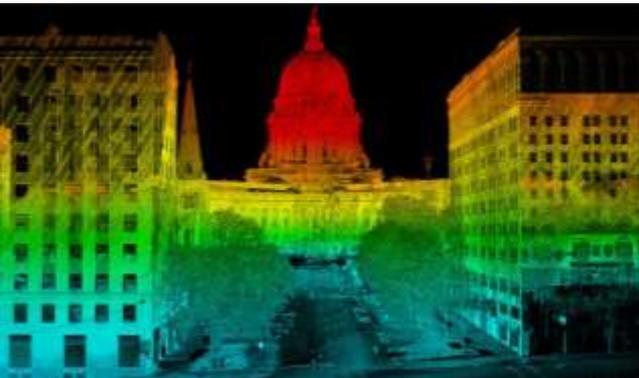
	LiDAR	Radar	Camera
Range	++	++	-
Range Rate	+	++	-
Field of View	++	-	-
Accuracy	++	-	+
Width & Height	++	-	+ (short range)
3D Shape	++	-	-
Positioning	++	-	-
Weather (rain, snow, dust)	+	++	-
Night time	++	++	-
Color	-	-	++





Object Detection, Tracking, Classification





3D Mapping/ Surveying



Safe & Autonomous Vehicles



Autonomous Systems



Mining and Construction



Smart Home/Building Security

- Founded in 2013, Sunnyvale, CA
- Louay Eldada, Founder & CEO
- >60 employees globally
- Fully funded at completion of current B Series
- Strategic partners include:



What automotive customers want/need...

- Higher performance & reliability
- Lower cost
- Reduced size, weight & power consumption



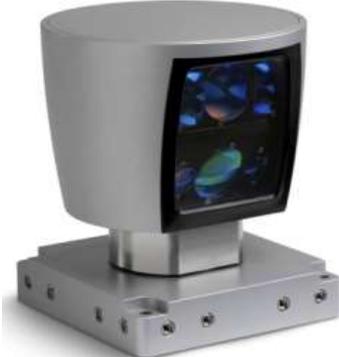
Quanergy
Solid State LiDAR*

**Multi Chip Module -> ASIC*



Quanergy Compact
Mechanical LiDAR

Competitor
Mechanical LiDAR



All Solid State



Gen 1
Mechanical
(Mark VIII – M8)

Shipping since Nov 2014



Gen 2 + 3
Solid State
(S3 MCM)

Launch: Jan 2016 (CES)
Production: Q1 2017

8 Patents Pending
15 Patent Apps in Prep



Gen 4
Solid State
(S3 ASIC)



100K Unit Target Pricing:	
Gen 1:	<\$1,000
Gen 2 + 3:	<\$250
Gen 4:	<\$100

MCM: Multi Chip Module
ASIC: Application Specific Integrated Circuit

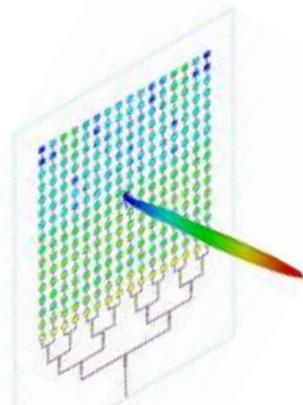
Design optimizes...

- Cost
- Performance
- Reliability
- Weight
- Size
- Power consumption



- 8 Laser beams
- 360° HFOV / 20° VFOV
- >400K points per second
- Adjustable frame rate: 5-30Hz
- PCL point cloud output via Ethernet
- Automotive temperature, vibration and environmental performance





Transmitter OPA Photonic IC
with far field radiation
pattern (laser spot)

Gen 3 Unique Capabilities

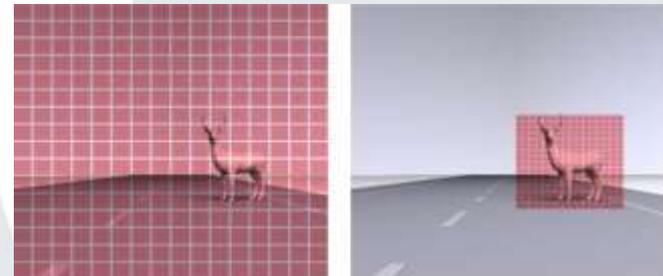
- 120° x 120° H/V FOV
- Fully Software Defined
- Adjustable Field of View
- Programmable Scan Pattern
- Adjustable Spot Size (Zoom in/out)

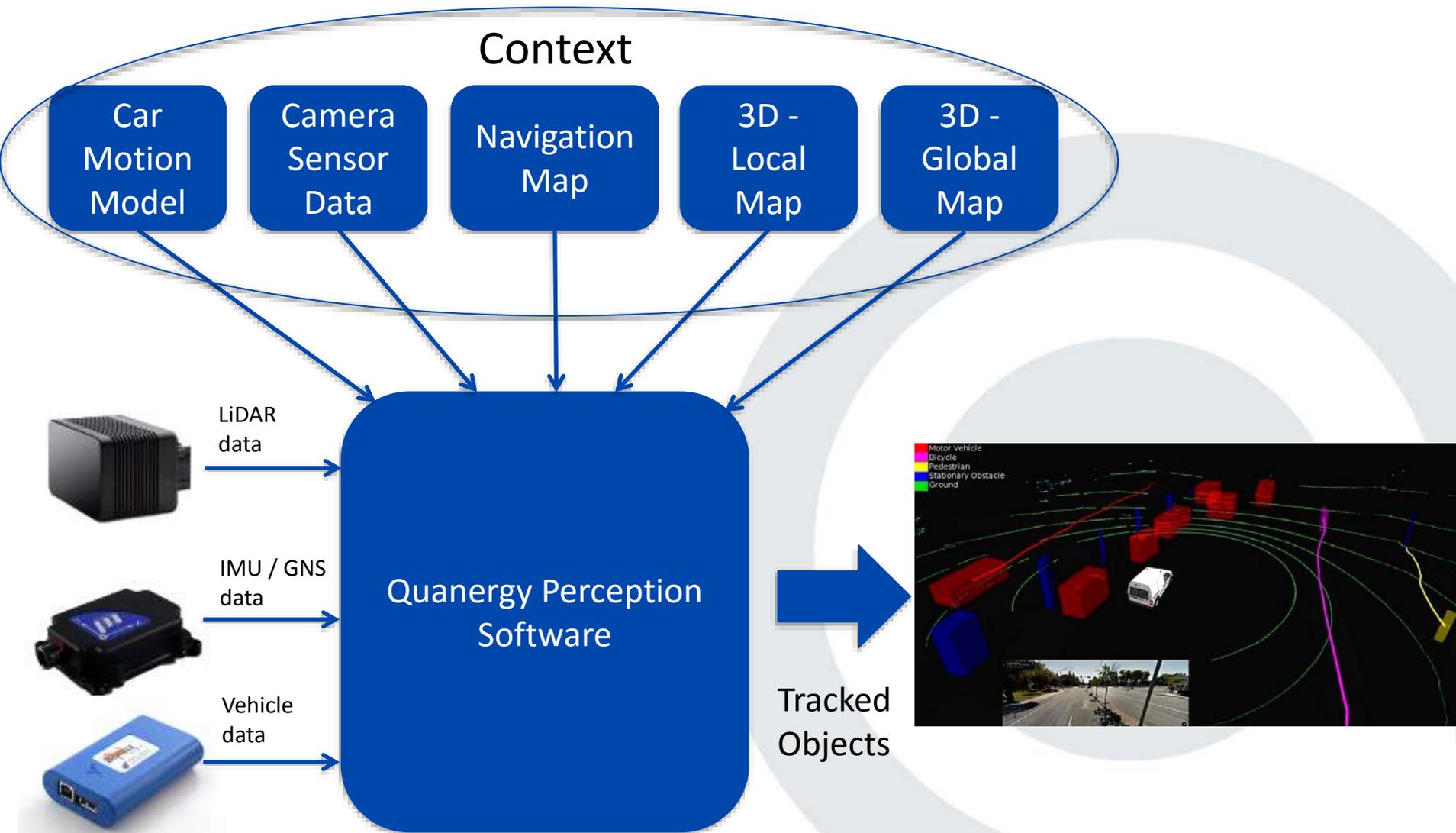
Traditional Solutions

Large, Expensive & Mechanical

Quanergy Solution

Compact, Low-Cost, Solid State







Connected Car Expo
Top 10 Automotive Startups
September 2015



Fast Company
Top 10 Most Innovative
Companies in Automotive
February 2016



Gartner
Cool Vendor in Automotive and
Smart Mobility
April 2015

Thank You

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@quanergy



Frost & Sullivan
Global LiDAR Entrepreneurial
Company of the Year
August 2015



CIO Review
20 Most Promising Robotics
Solution Providers
May 2015

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Michigan Connected Vehicle Initiative Update

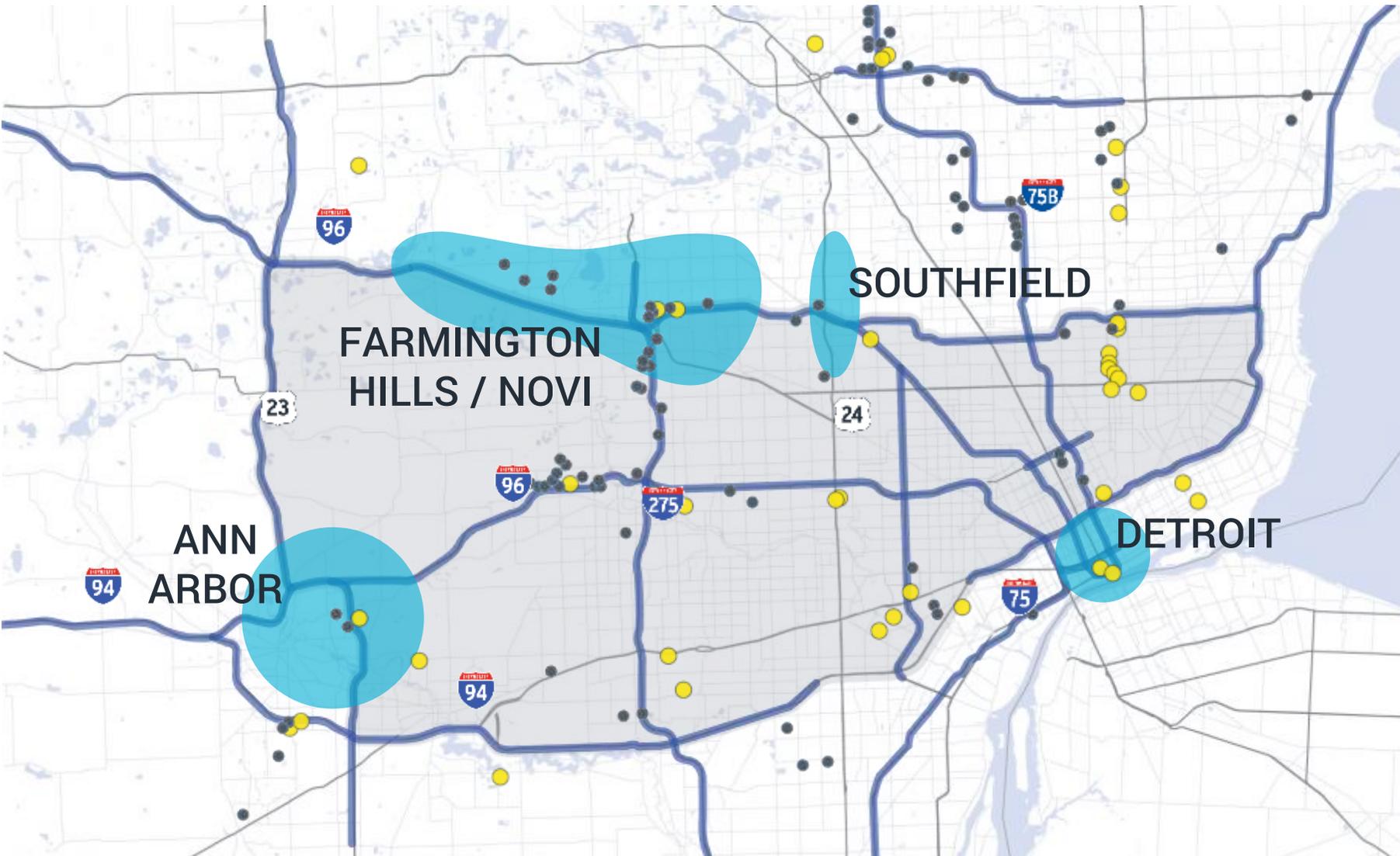
ADVANCING SAFETY AND OPERATIONS THROUGH TECHNOLOGY

Collin Castle (MDOT)

Michigan CAV Working Group Meeting | April 28th • 2016



Southeast Michigan Connected Vehicle Assets

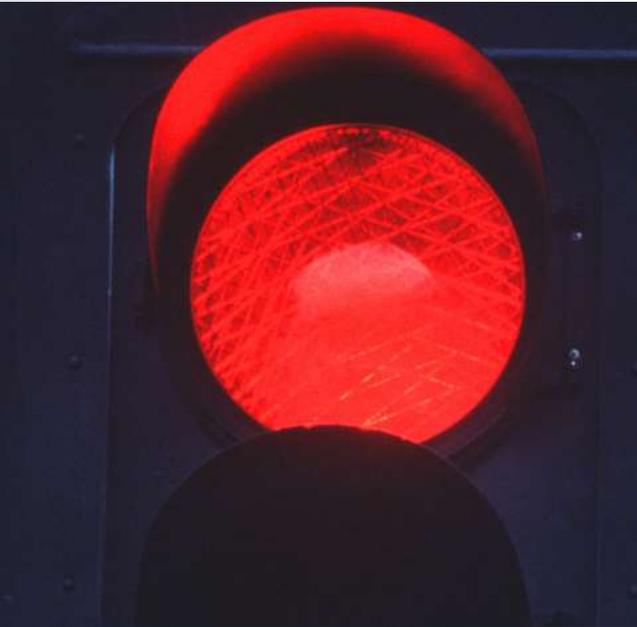


- Connected Vehicle Environment
- Connected Vehicle Test Beds
- Tier 1 Automotive Suppliers
- Major OEM Facilities
- MDOT Roadway ITS Coverage

Major Ongoing Activities

- ❑ Developing V2I Application Concepts of Operations
- ❑ CV Infrastructure and Fleet Deployment Planning
- ❑ CV Network and Security Design
- ❑ V2I Application Design/Development
- ❑ CV Testing/Deployments
- ❑ USDOT ATCMTD Grant

Initial Pilot Applications



Red Light Violation
Warning



Work Zone
Warning/
Management



Road Weather
Management



Pavement
Condition

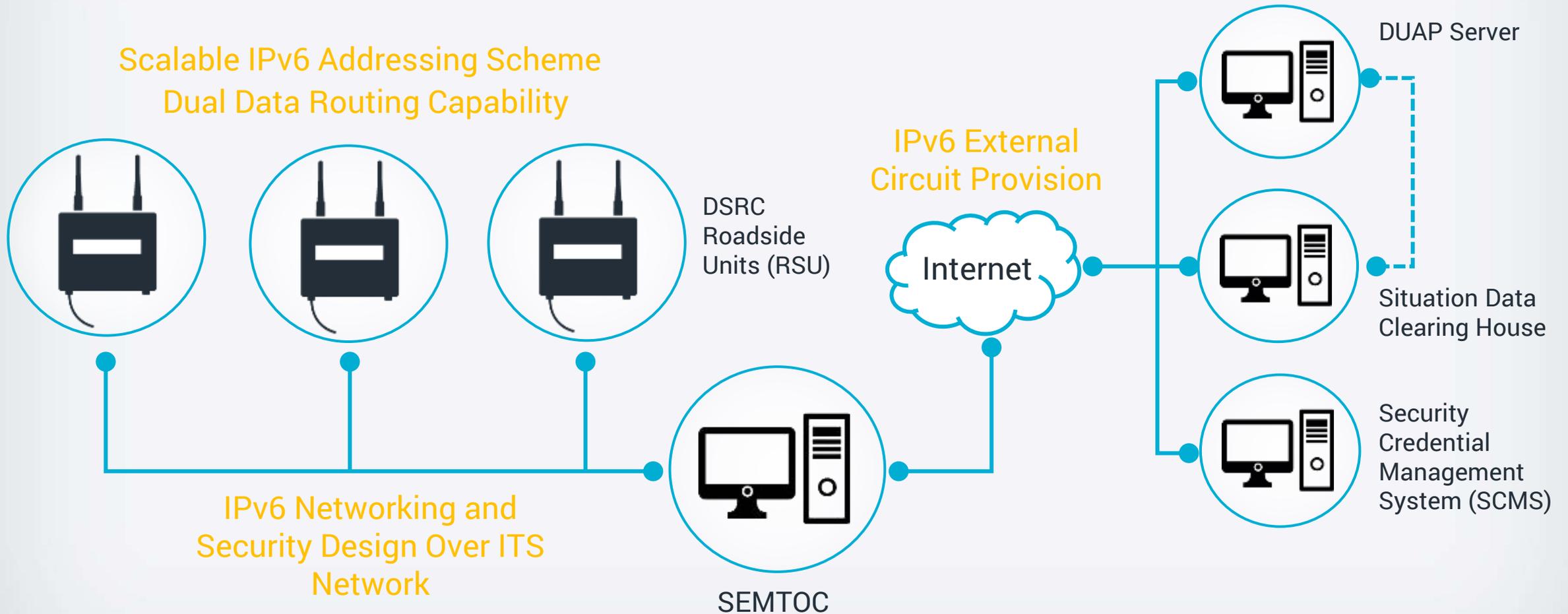
Infrastructure Deployment Plan

Infrastructure deployment decisions are based on a number of factors:

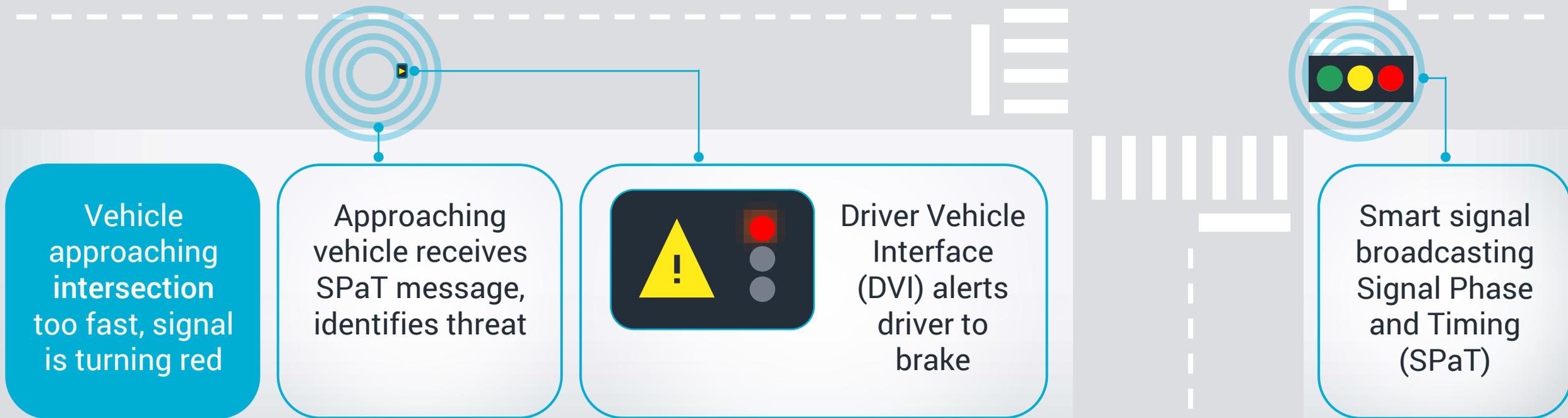
- ✓ Locations of equipped vehicles today
- ✓ Locations with issues which can be addressed by applications
- ✓ Locations most likely for early fleet penetration



Networking and Communications



Red Light Violation Warning



Lansing/M-43



W Saginaw Highway/M-43

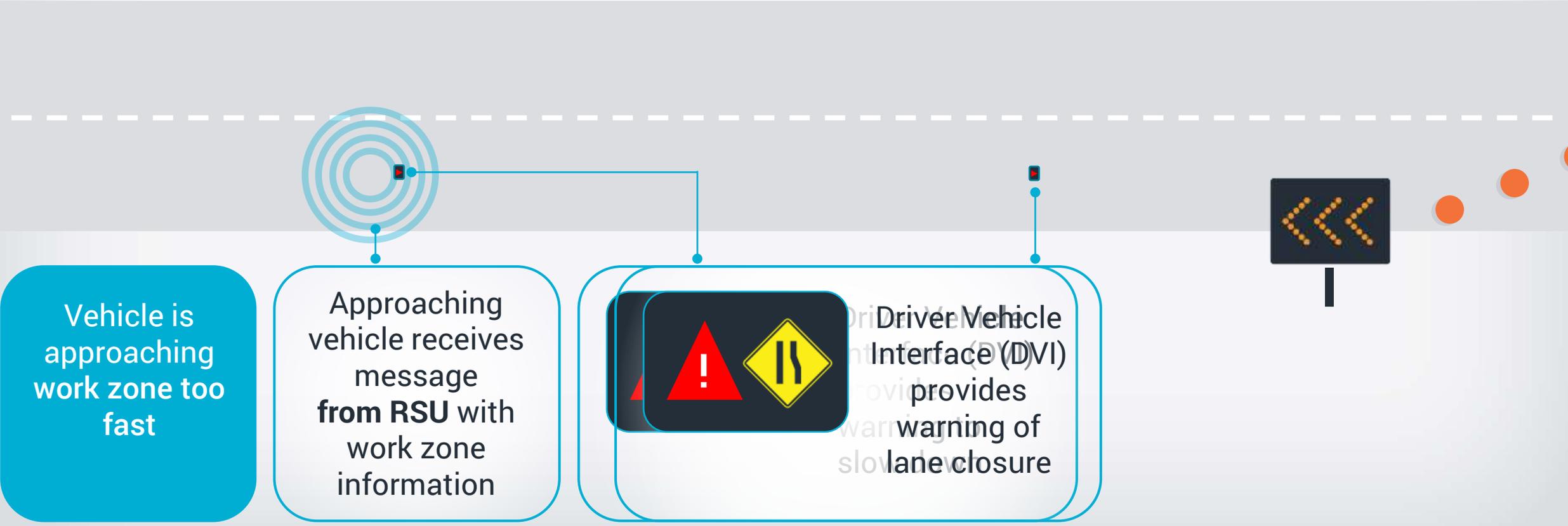
LANSING

Equipped Intersections

Work Zone Warning/Mngt.



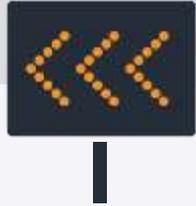
Portable RSU sends work zone info to vehicle



Vehicle is approaching work zone too fast

Approaching vehicle receives message from RSU with work zone information

Driver Vehicle Interface (DVI) provides warning of lane closure



Providing Dynamic Data for Use in Vehicles

Data Entry Portal for
Construction Personnel



Data Elements Including:

- Speed Limit
- Lane and Ramp Closures
- Workers Present
- Truck Restrictions



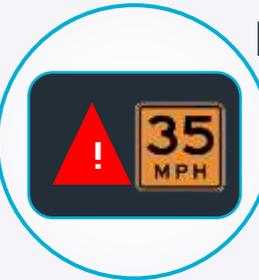
Data Collection and
Processing



Message
Development



DSRC



DVI



Mobile
Device

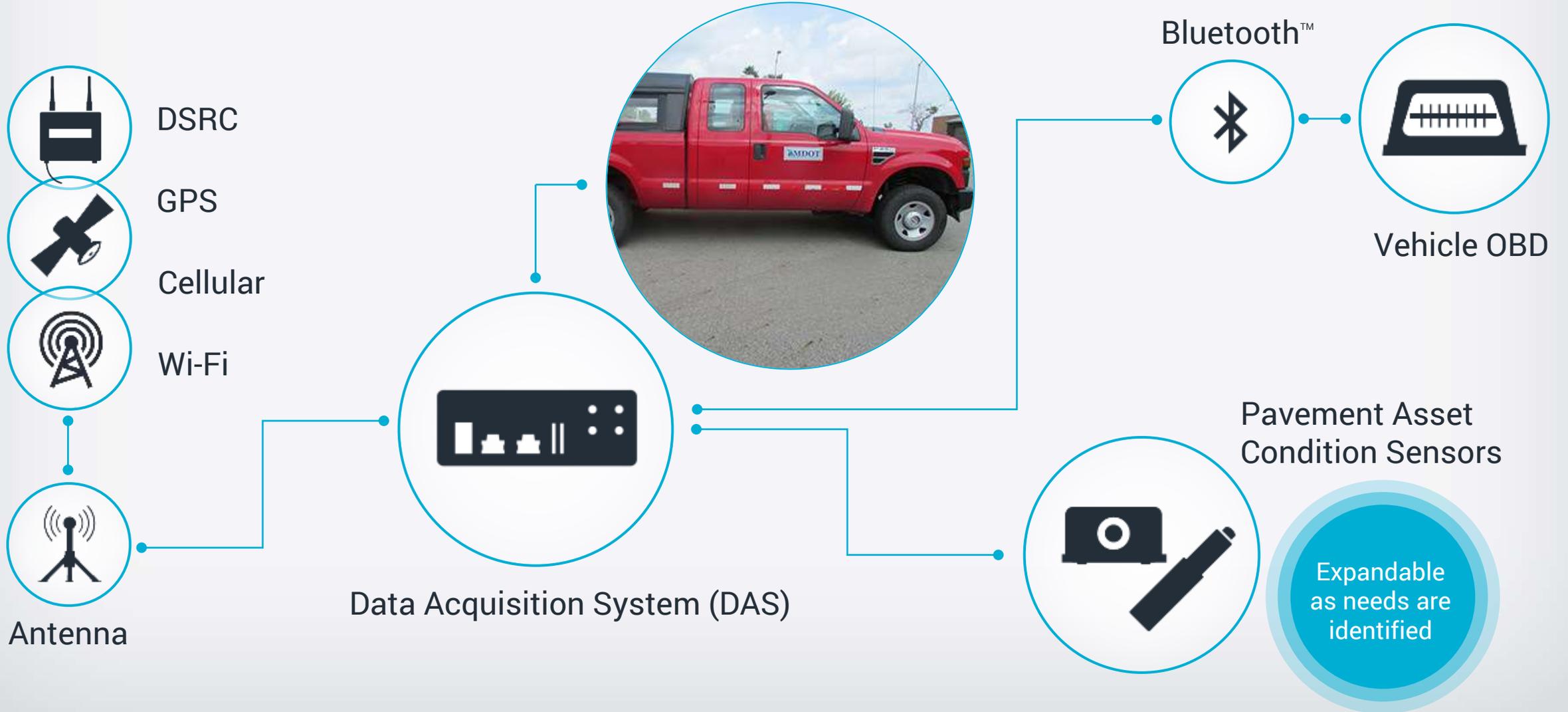


Cellular

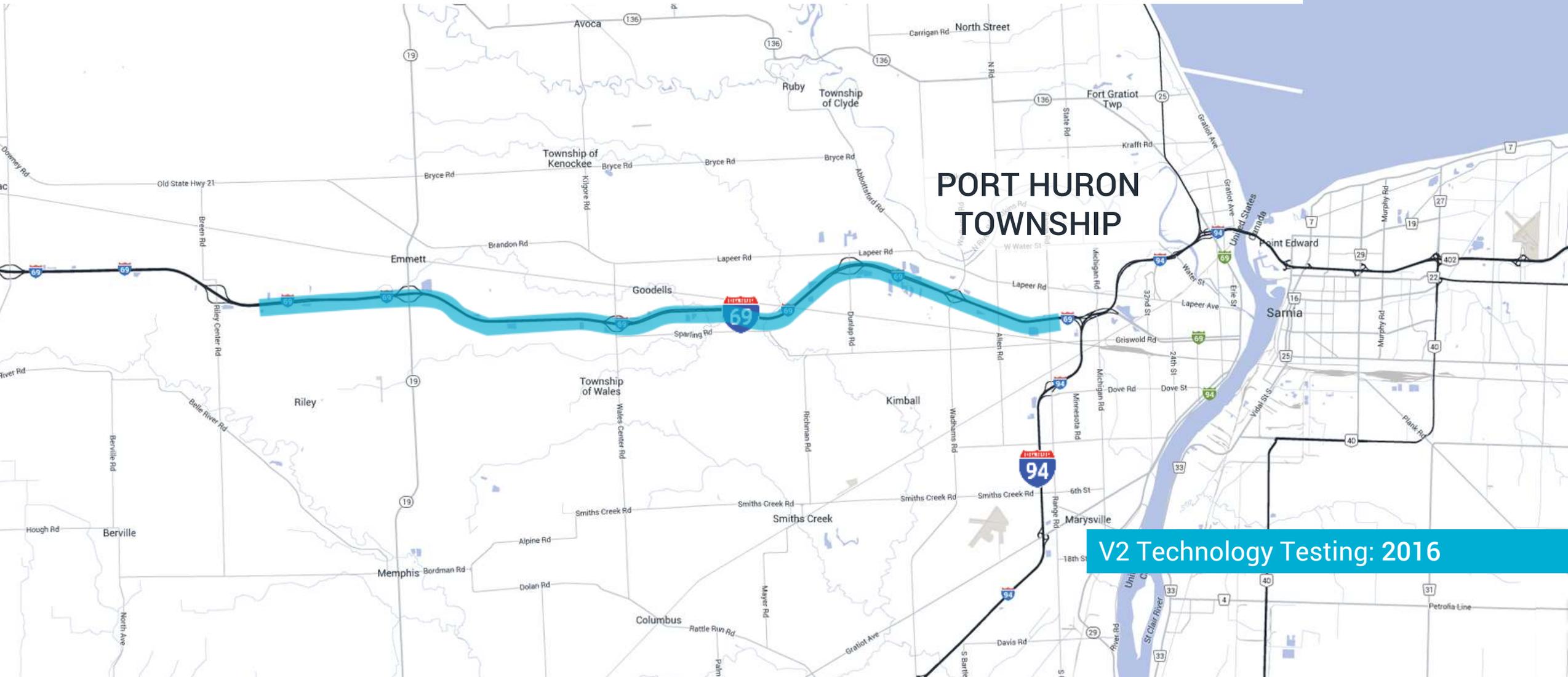


Internet

MDOT Fleet Deployment



I-69 Freight Vehicle CV Testing



**PORT HURON
TOWNSHIP**

V2 Technology Testing: 2016

Truck Parking Information and Management System (TPIMS)

Mi Drive
Michigan Department of Transportation

Michigan.gov Home | MDOT Home | Contact Us | Disclaimer | Requirements

MICHIGAN.GOV
Michigan's Official Web Site

Construction & Traffic | Mi Commute | Laws & Licensing | Maps | Truckers | My Cameras | Lane Closures

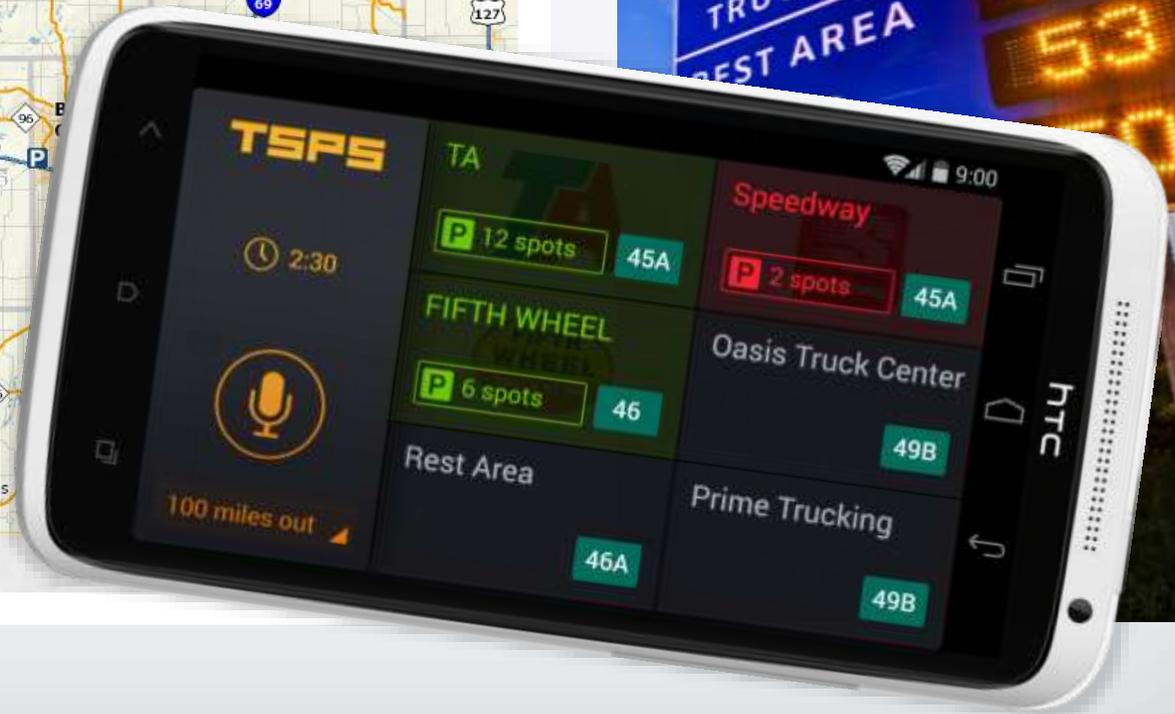
Jump to a Location
Enter Zip or City [Go] Save View as Default

Map Legend

- Partial Construction Closure
- Future Construction
- Total Road Closure
- Camera Image
- Camera with Weather
- Current Speed (mph)
- Active Incident
- Clearing Incident
- Message Signs
- Truck Parking
- Carpool Lots
- Rest Areas
- Roadside Parks
- Passenger Airports
- Public Airports
- Major 2014 Projects

I-94 @ Exit 12 - Available

Status: Available
Name: TA Travel Center
Route: I-94
Cross Street: Exit 12
Open Spaces: 94
Total Spaces: 174
Update Time: 9/5/2014 2:02:36 PM



Truck Parking Information and Management System (TPIMS)



Federal
TIGER Grant
Awarded



USDOT ATCMTD Program Grant

- ❑ Advanced Transportation & Congestion Management Technologies Deployment (ATCMTD) Program
- ❑ Applications Due: 6/3/16
- ❑ Max Single Award \$12M (Requires 50% Cost Share)
- ❑ MDOT Emphasis: CV Infrastructure/Applications
- ❑ Potential Partnerships for Vehicle Deployment
- ❑ NOFO: http://www.fhwa.dot.gov/fastact/nofo_atcmtd_20160322.pdf

Communications

Talent

Research

Infrastructure

Applications

Vehicles

Data

Get Engaged

Michigan is Open for Business for CV Partnership Opportunities