Michigan Connected and Automated Vehicle Working Group

January 27, 2016

Meeting Packet

1. Agenda
2. Meeting Notes
3. Attendance List
4. Handouts
5. Presentations

Michigan Connected and Automated Vehicle Working Group

Detroit Regional Chamber
One Woodward Ave, 19th Floor
Detroit, MI 48226

Parking:
The Chamber does not have its own parking facilities, but the two closest garages are:

Griswold-Larned Garage
525 Griswold Street
Detroit, MI 48226

AMPCO Parking
150 W Jefferson Avenue
Detroit, MI 48226

Meeting Agenda

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

1:10 PM Overview of the Detroit Regional Chamber and MICHauto, Glenn Stevens, Vice-President, DRC and MICHauto

1:20 PM CAV Interests, Activities, and Partnering Opportunities at TARDEC's National Automotive Center, Paul Decker, Director, TARDEC NAC

1:50 PM V2X in the K-12 Classroom, Karl Klimek, Square One Education Network

2:10 PM Connecting Detroit, Odis Jones, CEO, Public Lighting Authority [Detroit]

2:25 PM NETWORKING BREAK

2:45 PM U.S. National V2I Deployment Coalition and Update on Michigan Connected Vehicle Environment, Matt Smith, MDOT

3:15 PM Mobile Apps for Connected Vehicle Infotainment Services, Perry MacNeille, Research Engineer, Ford

3:40 PM City of Ann Arbor ITS Center of Excellence, Mark Rogers, Regional Sales Manager, Mobility and Logistics Division, Siemens Industry, Inc.

4:00 PM Adjourn

Michigan Connected and Automated Vehicle Working Group

The winter 2016 meeting of the Michigan Connected and Automated Vehicle Working Group was held at the Detroit Regional Chamber (DRC) in Detroit, Michigan, on January 27, 2016.

Meeting Notes

Sandy Baruah, President & CEO of DRC gave a brief welcome to the meeting attendees and discussed the importance of CAV technologies as a society changing force. He mentioned the need to prepare Michigan companies for the transformation of the economy and vehicle ownership models.

Richard Wallace of the Center for Automotive Research (CAR) discussed the meeting agenda, working group mission, and noteworthy connected and automated vehicle (CAV) news. For the latter, he highlighted a TARDEC sources sought opportunity, the USDOT Smart Cities Challenge (a proposed $4 billion automated vehicle commitment from the Obama administration), and progress towards a vehicle testing facility at the Willow Run site. Richard briefly listed several upcoming CAV-related events and closed out his introduction by announcing that Joshua Cregger would be leaving CAR at the end of January. Administrative duties for the MI CAV Working Group will be taken over by Adela Spulber (aspulber@cargroup.org).

After Richard's introduction, Glenn Stevens, Vice-President of DRC and MICHauto, welcomed the group and gave a brief overview of MICHauto. Glenn outlined MICHauto's efforts in advocacy, awareness, business attraction, mobility, and talent attraction. With respect to CAV efforts, he discussed the Michigan Mobility Initiative, the Willow Run site (the American Center for Mobility), and the Smart City Challenge.

Following Glenn Stevens' presentation, Paul Decker of TARDEC provided a brief overview of his organization and its role in developing CAV technologies. He discussed several of the U.S. Army's challenges and how TARDEC is helping solve them. He also mentioned the Robotic and Autonomous Systems (RAS) Strategy 2015-2040 and TARDEC's demonstration work with MDOT along the I-69 corridor. Paul closed by highlighting some opportunities to engage with TARDEC, including GVSETS in Novi (August 2-4) and TARDEC Industry Days in Warren (April 27-28).

After Paul's presentation, Karl Klimek of Square One Education Network described some of his organizations' recent efforts. He mentioned V2X Lab Schools, public platooning demonstrations using V2V technologies, and a teacher certification program. Karl noted several avenues for companies to engage with Square One, including the opportunity to sponsor a $1,000 starter kit for schools. Square One has set the goal of creating 50 V2X Lab Schools by June 2016 and is seeking to partner with schools

and companies. Karl also noted that his organization is in talks with the University of Michigan to demonstrate projects at Mcity.

Following Karl's presentation, Odis Jones of the Detroit Public Lighting Authority (PLA) discussed upgrades to Detroit's public lighting system. Much of the system has already been modernized, and phase two of PLA's efforts is aimed at making Detroit the most connected city in the country by adding V2I and V2X capabilities into the lighting units, including a fiber backhaul. PLA is working with the police department to stream video from body cameras and is working to improve other city services (e.g., infrastructure repairs, salting roads) with real-time data. PLA is also looking to provide Wi-Fi through the lighting system to help bridge the "digital divide" and provide access to all residents.

After a short break, Matt Smith of MDOT provided an update on the southeast Michigan Connected Vehicle Environment initiative. There are currently 115 infrastructure units installed in southeast Michigan. Phase one has been deployed in Farmington Hills, and other hotspots include Ann Arbor, Southfield, and Detroit. MDOT is working to connect these disparate areas into a functioning environment. Matt also spoke about the deployment in Lansing (eight intersections) and the MDOT fleet deployment, which currently includes 10 DSRC-equipped vehicles, but will grow to 50 vehicles over the next year. He also discussed the initial V2I pilot applications, the RFI for business cases, and the V2I deployment coalition (more information available here).

Perry MacNeille of Ford presented his company's vision for connected vehicle services. He played a video from 2009 demonstrating some of the potential capabilities of more connected infotainment systems (e.g., voice activated scheduling, calling, internet and email searches, optimized route guidance, and personalized entertainment), and compared it to current projects in development. Perry also discussed Ford's CES announcement that Toyota would be using Ford's SmartDeviceLink in Toyota vehicles.

Mark Rodgers of Siemens closed out the meeting with a discussion of its City of Excellence Award, which was recently given to Ann Arbor, Michigan. He discussed several of Siemens relevant product areas and mentioned several of the ITS features in Ann Arbor and the software (e.g., SCOOT, TACTICS) used to manage Ann Arbor's roads. Mark said that Ann Arbor was picked due to its results-oriented, knowledgeable staff, as well as its experimental use of Siemens systems and creative adaptation of system features (e.g., modifying signals for football game day traffic).

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

First name	Last name	Organization	Email
James	**Ahee**	Macomb County	james.ahee@macombgov.org
Niles	**Annelin**	MDOT	annelinn@michigan.gov
Sandy	**Baruah**	DRC	
Sara	**Blackmer**	Pratt & Miller	sblackmer@prattmiller.com
Michael	**Blicher**	Autotalks	mike.blicher@auto-talks.com
Robert	**Brincheck**	PTC	rbrincheck@ptc.com
Valerie	**Brugeman**	CAR	vbrugeman@cargroup.org
Ed	**Clemente**		eclemente@wowway.com
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Joshua	**Cregger**	CAR	jcregger@cargroup.org
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Liana	**Daltoe**	Industry Canada	liana.daltoe@canada.ca
Paul	**Decker**	TARDEC	paul.a.decker6.civ@mail.mil
Eric Paul	**Dennis**	CAR	epdennis@cargroup.org
Rami	**Elsaleh**	Mobis	relsaleh@mobis-usa.com
Bob	**Feldmaier**	Macomb CC	feldmaierr@macomb.edu
Anthony	**Gasiorowski**	WSP / PB	gasiorowski@pbworld.com
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Kim	**Hill**	HWA Analytics	kimhill@hwa-analytics.com
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Karl	**Klimek**	Square One Education	karl@squareonenetwork.org
Barb	**Land**	Square One	barb@squareonenetwork.org
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Alan	**Lecz**	Washtenaw CC	alecz@wccnet.edu
Luke	**Liu**	City of Ann Arbor	yliu@a2gov.org
Christyn	**Lucas**	DRC	
Perry	**MacNeille**	Ford Motor Company	pmacneil@ford.com
Ali	**Maleki**	Nexteer	ali.maleki@nexteer.com
Jim	**Miller**	HP	jim.miller@hpe.com
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Mark	**St. Andrew**	SBD	markstandrew@sbd-na.com
Glenn	**Stevens**	Detroit Chamber	gstevens@detroitchamber.com
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Barbara	**Swan**	SEMTOC and AECOM	swanb1@michigan.gov;
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Richard	**Wallace**	CAR	rwallace@cargroup.org
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Joe	**Zanchetta**	Cisco Systems	

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Michigan Connected and Automated Vehicle Working Group

Handouts

Michigan Chapter NDIA National Defense Industrial Association

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

Cybersecurity: Defense Sector Summit

March 1-2, 2016

Troy Marriott, 200 W. Big Beaver Rd.
Troy, Michigan

www.ndia-mich.org

IN PARTNERSHIP WITH PURE MICHIGAN® Michigan Economic Development Corporation

Michigan Chapter NDIA National Defense Industrial Association

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

Cybersecurity: Defense Sector Summit

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

IN PARTNERSHIP WITH PURE MICHIGAN® Michigan Economic Development Corporation

www.ndia-mich.org

Send us your thoughts!!

What would you like addressed at the conference?

Engage in intimate roundtable discussions on specific cybersecurity topics. Send us your Topics!

Sponsorship and Tabletop Exhibit Space Available – email us at

cybersecurity@ndia-mich.org

Michigan Connected and Automated Vehicle Working Group

Presentations

Michigan Connected and Automated Vehicle Working Group

Detroit Regional Chamber

Detroit, MI

January 27, 2016

Agenda for This Afternoon

- 1:00 PM Introductions and Update, Richard Wallace, CAR
- 1:10 PM Overview of the Detroit Regional Chamber and MICHauto, Glenn Stevens, Vice-President, DRC and MICHauto
- 1:20 PM CAV Interests, Activities, and Partnering Opportunities at TARDEC's National Automotive Center, Paul Decker, Director, TARDEC NAC
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- 3:40 PM City of Ann Arbor ITS Center of Excellence, Mark Rogers, Regional Sales Manager, Mobility and Logistics Division, Siemens Industry, Inc.
- 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

- TARDEC seeking sources for development of vehicle cyber technology consortium
  - "TARDEC seeks to collaborate with educational, nonprofit, and commercial partners, across barriers that include military/civilian, public/private, local/regional/national, and political/jurisdictional concerns, through the establishment of a consortium to perform a coordinated research and development program"
  - https://www.fbo.gov/index?s=opportunity&mode=form&tab=core&id=9d58abda558a1f7f20f700d907672dde
- City of Detroit working with MDOT, PLA, NextEnergy, and other partners to prepare a proposal in response to the USDOT Smart Cities Challenge: https://www.transportation.gov/smartcity
  - Five small awards expected to enable further planning, followed by down select to one $40 million award
- USDOT/Obama administration has proposed spending $4 billion to expedite development of fully automated vehicles
  - http://www.wsj.com/articles/obama-administration-proposes-spending-4-billion-on-driverless-car-guidelines-1452798787
- Snyder administration working with Michigan congressional delegation to establish CAV testing center at Willow Run site
  - http://www.freep.com/story/money/business/michigan/2016/01/20/michigan-pushes-connected-car-test-track-willow-run/79063048/

Upcoming Connected and Automated Vehicle Events

- NDIA Cybersecurity: Defense Sector Summit, March 1-2, Troy, MI
- 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
  - Use code **GTC16CAR** and save 20% at http://www.gputechconf.com
- 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)
- TU-Automotive Detroit, June 8-9, 2016, Suburban Showcase, Novi, MI
- ITS America 2016, June 12-15, San Jose, CA
- TRB-AUVSI Automated Vehicles Symposium, July 19-21, 2016, San Francisco
  - Plus ancillary meetings July 18 and 22
- CAR Management Briefing Seminars, August 1-4, 2016, Acme, MI

MICH auto™

Michigan's Automotive *Accelerator*

Connected Vehicle Working Group

1/27/15

Detroit, Michigan

Sandy Baruah

President & CEO
Detroit Regional Chamber

Glenn Stevens

Vice President, MICHauto and Strategic Development
Detroit Regional Chamber

The Detroit Regional Chamber: How We Work for the Region

Regional Collaboration

Economic Development

Education Reform

Membership Value

DetroitRegionalChamber Foundation

DetroitRegionalChamber

DetroitRegionalChamber Foundation

Leading regional economic development stategy for Southeast Michigan for over 20 years by:

- Marketing the region
- Growing the next generation of talent
- Building on our economic strengths
- Advancing regional collaboration

MICHauto is a key economic development initiative of the Detroit Regional Chamber, dedicated to promoting, retaining and growing the automotive and mobility industries in Michigan.

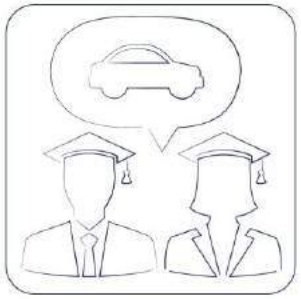
MICHauto

Advocacy

Awareness

Business Attraction

Mobility



Talent Attraction

Michigan is auto™

MICH auto
Michigan's Automotive Accelerator

MICHauto Investors

GM
PURE MICHIGAN
Michigan Economic Development Corporation
Visteon
BorgWarner
ECONOMIC DEVELOPMENT GROWTH ENGINE EDGE WAYNE COUNTY, MICHIGAN
DANA
TI Automotive
AAM
DELPHI
automotive engineering iav
DENSO
brose Technik für Automobile
TOYOTA
NISSAN
Deloitte.
CLARK HILL
Warner Norcross&Judd LLP ATTORNEYS AT LAW
pwc
KPMG
FOLEY FOLEY & LARDNER LLP
MAGNA COSMA BODY & CHASSIS SYSTEMS
DYKEMA bodman
YAZAKI
BRIDGESTONE
IAC International Automotive Components
KOSTAL
Steel Market Development Institute
HARMAN
AMI Manchester
Highgate
PENSKE
KAUTEX A Textron Company
HYUNDAI
ADAC AUTOMOTIVE
GOODYEAR
PHOENIX CONTACT
FLG
GKN Automotive
SAE INTERNATIONAL
Novelis
Infineon
TIMKEN
EB Elektrobit
Mahindra
LE&A LAMBERT EDWARDS & ASSOCIATES
LACKS ENTERPRISES, INC.
WALSH COLLEGE LIVE. BREATHE. BUSINESS.
up2go INTERNATIONAL
Edelman
DESA
NVIDIA
BÖLLHOFF
AISIN
SKF
I-69 INTERNATIONAL TRADE CORRIDOR
BIANCHI PUBLIC RELATIONS
CAR CENTER FOR AUTOMOTIVE RESEARCH
AXALTA
faurecia
ESG
LTU
MICHIGAN
TechShop
WAYNE STATE UNIVERSITY
PGW
ABCgroup
SPENCER BUTCHER
AUTOMOTIVE HALL OF FAME

Advocacy

MICHIGAN AUTO CAUCUS

Michigan is auto

Awareness

Tell us why
MICH auto
#Michigan is Auto

Michigan is auto

Detroit: The Hub for Next Generation Mobility Solutions

Business Attraction

SL AMERICA

SHILOH

VALIANT

YFS

Mobility

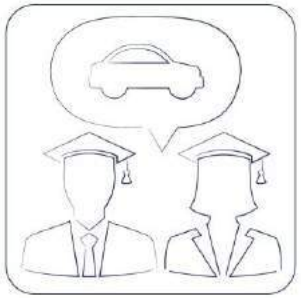
Business Leaders for Michigan

MDOT Michigan Department of Transportation

Pure Michigan Michigan Economic Development Corporation

MICH auto Michigan's Automotive Accelerator

Michigan's URC University Research Corridor
University of Michigan · Wayne State University
urcmich.org



Talent Attraction

MICHauto Auto Industry Career Perception

Highlighting the need for closing the perception gap

Talent is one of the defining issues in the automotive industry and essential to growing Michigan companies. Providing the innovation necessary to meet rapidly changing consumer demand rests largely on attracting the best and brightest to fill the talent pipeline. As part of a larger effort to address the existing skills gap, MICHauto completed a survey in May 2014 of youth and influencers of their career decisions. The data highlights the need for increased statewide efforts to address misperceptions about the exciting careers in today's high-tech automotive industry. Addressing these perception gaps are essential to the growth and prosperity of Michigans automotive industry.

PURE MICHIGAN®
We run on brainpower.

MICH auto
Michigan's Automotive Accelerator

#Michigan is Auto™

No. 1 in Light Vehicle Production in the U.S.
No. 1 in Automotive R & D in North America
No. 1 in Auto industry jobs
No. 1 in Engineers
No. 1 in Supplier plants and facilities
No. 1 in Tool and Die shops
61 of top Suppliers with HQ in Michigan

Leading in connected and Autonomous vehicle development.

Talent and R&D: Engineering a Workforce

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- Michigan is home to 375 automotive R&D centers, 120 of which are foreign-owned.
- Michigan accounted for $8.9 billion, or 76 percent, of business funded automotive R&D - leading the nation in automotive-related R&D.

Global or North American R&D Headquarters in Michigan

FCA FIAT CHRYSLER AUTOMOBILES
Ford
GM
HYUNDAI
KIA MOTORS
NISSAN
TOYOTA

Additional Auto Manufacturers with R&D Facilities in Michigan

DAIMLER
HONDA
ISUZU
mazda
MITSUBISHI
SUBARU
SUZUKI
Das Auto.

Our World is Changing

Technology, Regulatory, Business Model Changes

Global Megatrends

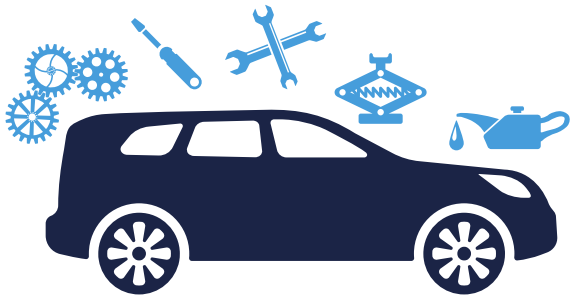
Production Shifts

The Competition

MICH auto
Michigan's Automotive Accelerator

#1

#2



Today

Future

MICH auto
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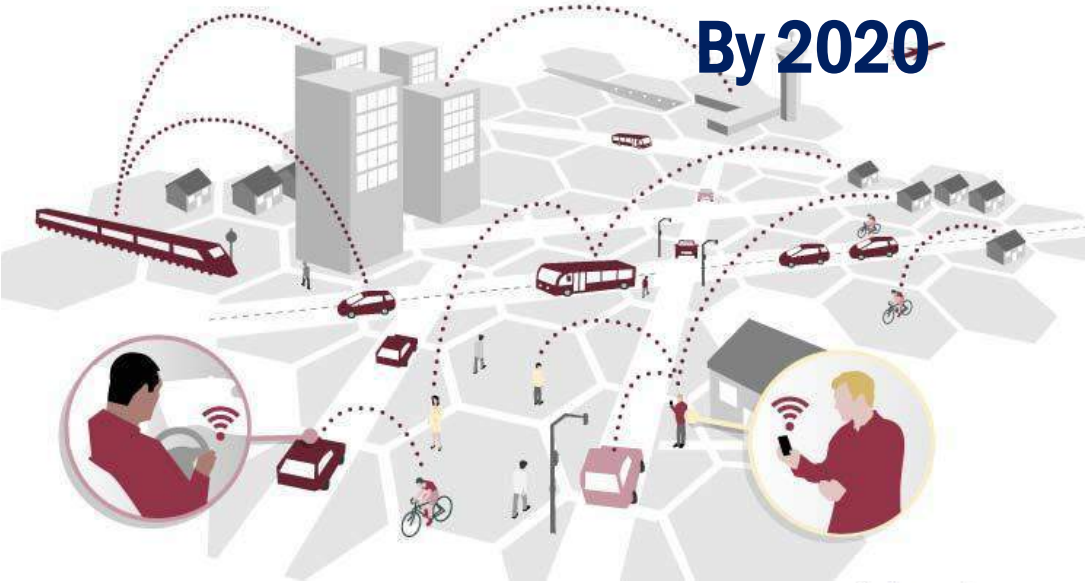
#3

$57 Billion

Today

$200 Billion

By 2020



"The future of the car is in Silicon Valley"

THE WALL STREET JOURNAL.

Motor City West Revs Up Demand for Space

Tesla Motors Has Driven Much of the Growth in the Bay Area

CO CDOT | ROADX

iot UK

techno MONTREAL

DRIVE SWEDEN

MICH auto
Michigan's Automotive Accelerator

PROSPECT
Silicon Valley

Michigan Mobility Initiative

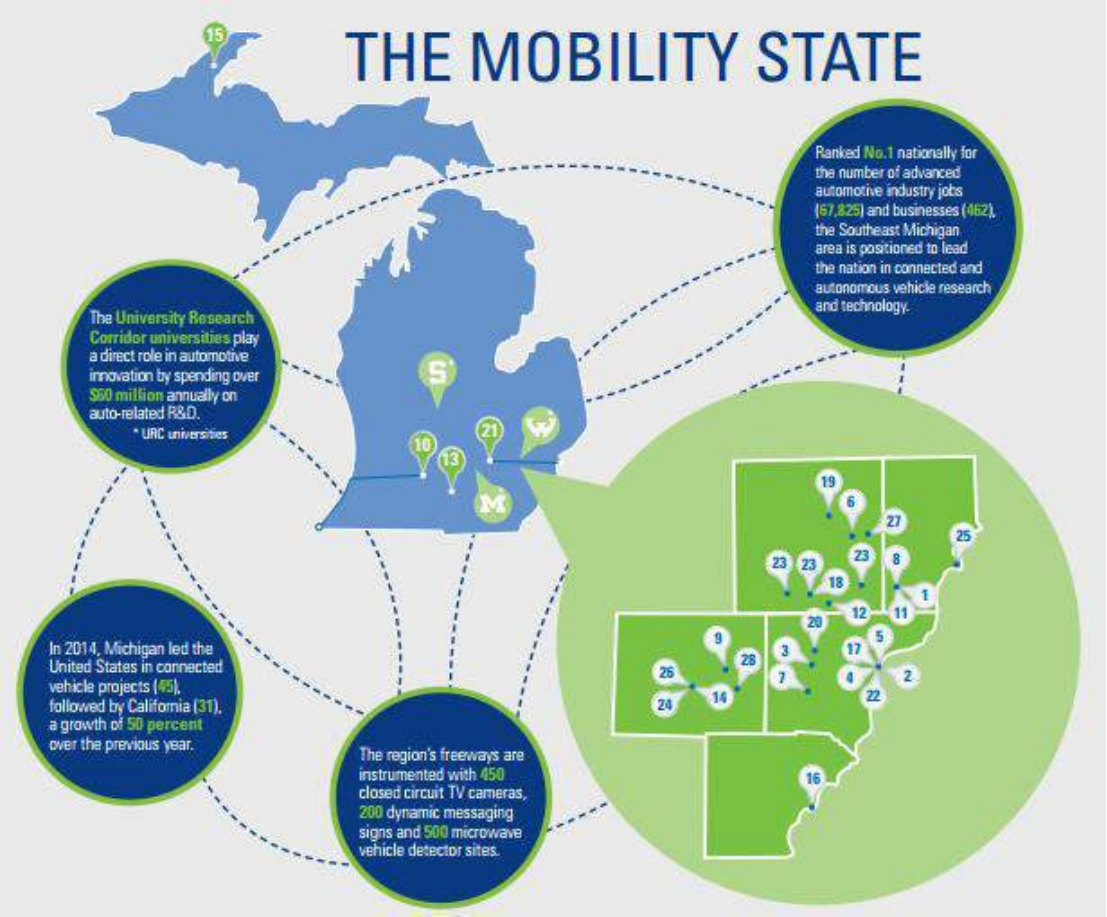
Positioning Michigan as Connected and Autonomous Vehicle Center

1. Infrastructure & Projects
2. Marketing Michigan - Branding
3. Policy
4. Education & The Talent Pipeline

MICHIGAN:
GLOBAL CENTER OF MOBILITY

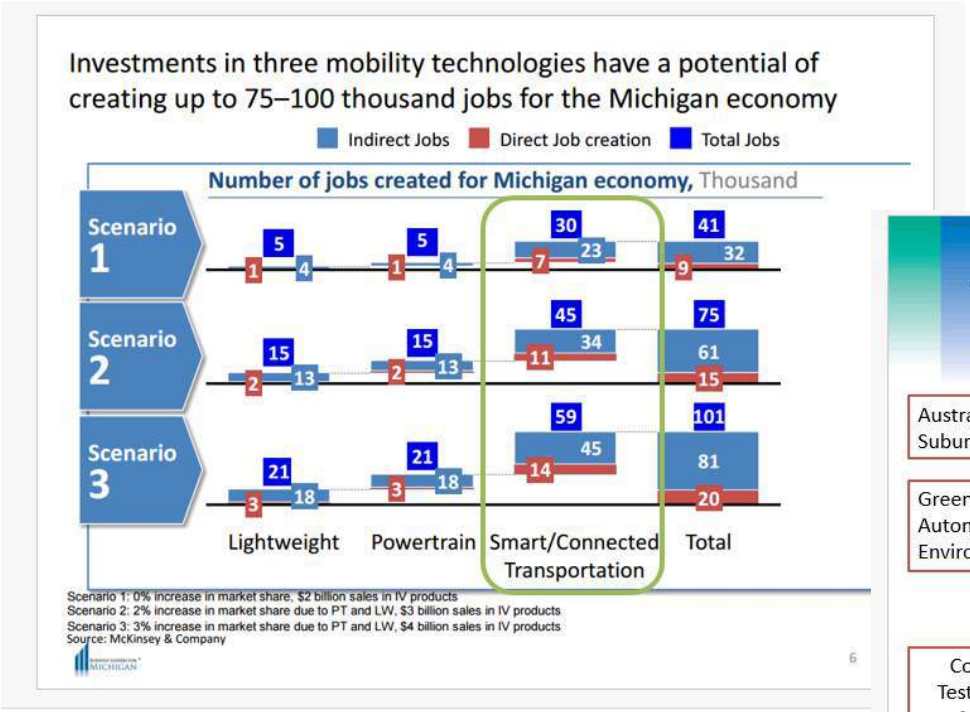
Mapping the future of smart mobility is easy – it starts in Michigan. Home to unrivaled automotive R & D and advanced manufacturing assets, Detroit and Michigan are positioned as the global center of connected vehicle technology. The research, design, testing and infrastructure development that is revolutionizing mobility, connecting the automobile and reshaping the world happens here.

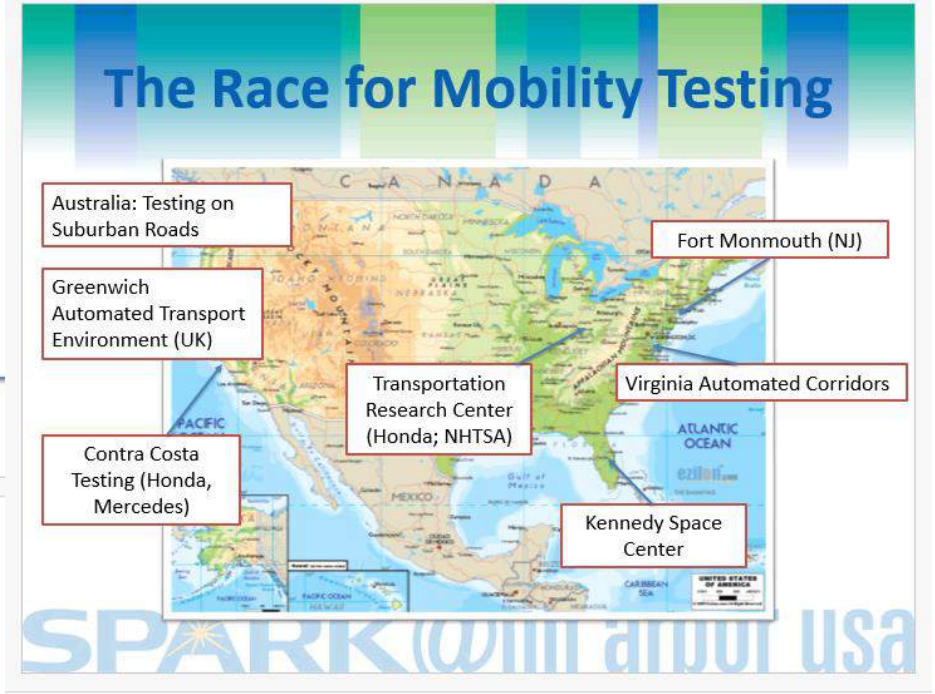
Michigan is the place to be for emerging opportunities in smart mobility.



Infrastructure & Projects

Competing for the Economic Impact

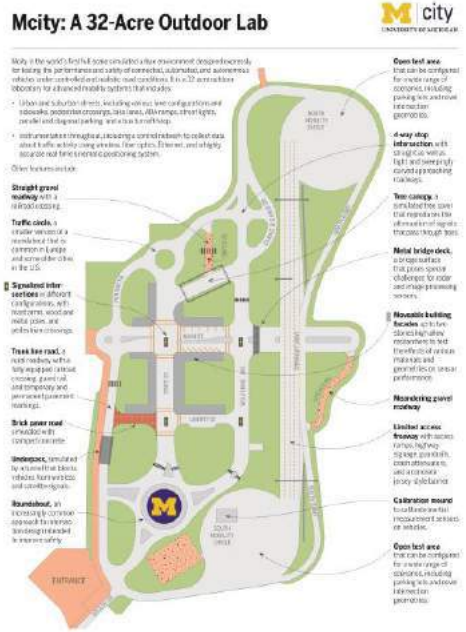




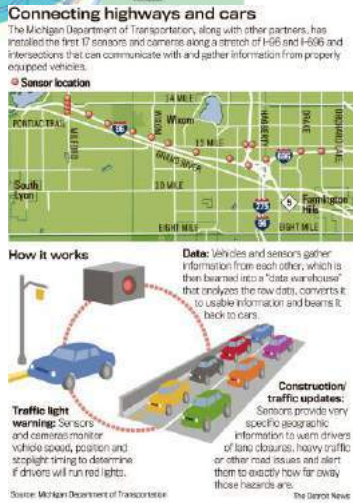
Michigan: Three Key Projects

If You Build It…

Mcity



The Smart Corridor



Willow Run

MICH auto
Michigan's Automotive Accelerator

$ 40 Million One City

#DOTSmartCity

Transportation.gov
U.S. Department of Transportation

Smart City Challenge

Glenn Stevens
Vice President – MICHauto
& Strategic Development
gstevens@detroitchamber.com

U.S. ARMY TANK AUTOMOTIVE RESEARCH, DEVELOPMENT AND ENGINEERING CENTER (TARDEC)

TARDEC Overview

Disclaimer: Reference herein to any specific commercial company, product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or the Department of the Army (DoA). The opinions of the authors expressed herein do not necessarily state or reflect those of the United States Government or the DoA, and shall not be used for advertising or product endorsement purposes.

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How We Fit

GEN David G. Perkins,
CG TRADOC
Requirements
GEN Dennis L. Via,
CG AMC
Mission Command
Ms. Heidi Shyu,
ASA(ALT)
Programs
MG John F. Wharton,
CG RDECOM
AMRDEC
ARDEC
ARL
CERDEC
ECBC
NSRDEC
TARDEC

Mission & Vision

MISSION:

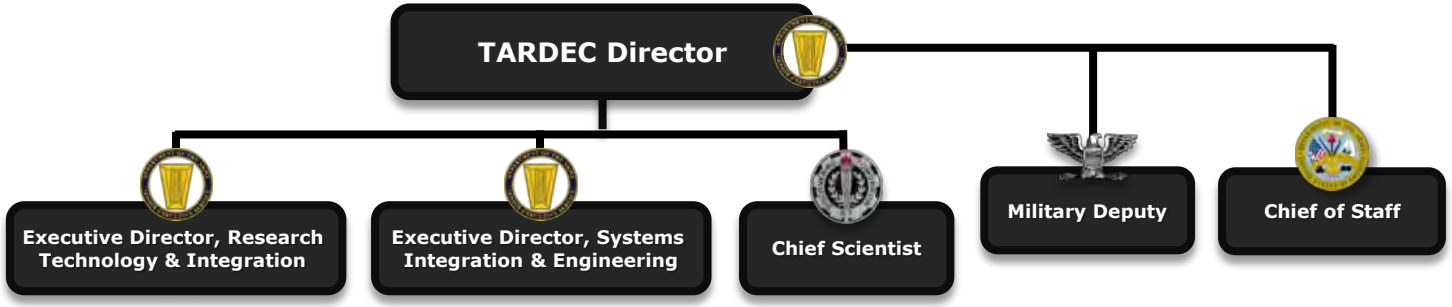
Develop, integrate and sustain the right technology solutions for all manned and unmanned Department of Defense(DOD) ground systems and combat support systems to improve Current Force effectiveness and provide superior capabilities for the Future Force.

VISION:

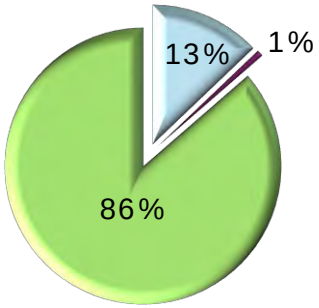
The first choice of technology and engineering expertise for ground vehicle systems and support equipment – today and tomorrow.

We help our Warfighters succeed and come home alive

Organizational Structure & Personnel



Total Workforce



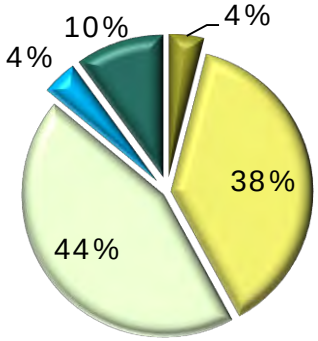
- Civilians*
- Military
- Contractors

Total: 1641

*Includes permanent/term employees, local interns, STEPs, and local SCEPs (in a pay status).

Education

(Does Not Include Contractors)



- Doctorate Degree
- Master's Degree
- Bachelor's Degree
- Associate's Degree
- HS/ Some College/ Technical Cert

TARDEC has a proven, technically proficient workforce that meets mission requirements.

Supporting the Army's Top Priorities

TARDEC supports Seven of the Army's Eleven Persistent Challenges

Greater force protection for Soldier, air and ground platforms

Ease overburdened Soldiers in small units

Timely mission command & tactical intelligence to provide situation awareness and communications in all environments

Reduce logistics burden of storing, transporting, distributing and retrograde of materials

Create operational overmatch (enhanced lethality and accuracy)

Achieve operational maneuverability in all environments and at high op-tempo

Enable ability to operate in CBRNE environment

Improve early detection of TBI

Improve operational energy

Improve individual & team training

Reduce life cycle cost of future Army capabilities

Unique Capabilities: Full Life-Cycle Technical Support

Research/Technology Development

Systems Engineering

Product Development

Integration

Production Support

Field Support

Conduits of Collaboration

Power & Energy Vehicle Environmental Lab (PEVEL)

Air Filtration Lab

Calorimeter Lab

Power Lab

Thermal Management Lab

Fuel Cell Lab

Electric Components Lab

Energy Storage Lab

Fuels & POL Research Laboratories

Bridging Technology Laboratory at Selfridge Air National Guard Base

Fresh Water Test Facility at Selfridge Air National Guard Base

Water Quality Laboratory

Army Petroleum Laboratory (APL) located at DLA Distribution Susquehanna, PA (DDSP)

TARDEC Fuels & Lubricants Research Facility at Southwest Research Institute (GOCO)

Survivability Armor Ballistic Lab(SABL)

Large Robotics Integration Cell

Reconfigurable N-Post Simulator

Vehicle Inertial Properties Evaluation Rig

VICTORY SIL

Unique Facilities

TARDEC's operations have a resource value of over $1.1B and occupy 936,000 square feet of laboratory space on the Detroit Arsenal.

Power and Energy Vehicle Environment Lab

Ride Motion Simulator

TARDEC Fuels and Lubricants Research Facility at Southwest Research Institute

Turret Motion Base Simulator

- Warren (MI)
- Southwest Research Institute (SWRI) (TX)
  (GOCO = Government Owned-Contractor Operated)
- Selfridge (MI)
- Susquehanna (PA)

Michigan

- Ground Systems Power and Energy Laboratory (GSPEL)
- Vehicle Full Load Cooling Test Chamber
- Crew Station/Turret Motion Base Simulator (CS/TMBS)
- Ride Motion Simulator
- System-level Analysis Capability
- Center for Systems Integration (CSI)
- Vehicle Inertial Properties Evaluation Rig (VIPER)
- Mission Equipment Vibration Table (MEVT)
- Suspension Parameter Identification Device and Evaluation Rig (SPIDER)
- Tire, Run-Flat, and Roadwheel Simulation Laboratory (TR2SL)
- Elastomer Improvement Laboratory
- Fuels & Lubricants Laboratory

Michigan

- Fresh Water Test Facility
- Bridge Dynamic Structural Load Simulation Laboratory

Texas

- TARDEC Fuels and Lubricants Research Facility (TFLRF) *(GOCO with SWRI)*

Penn.

- Quality Surveillance Laboratory (Army Petroleum Laboratory; APL)

TARDEC's 30-Year Strategy

The three principal ways TARDEC provides value to its stakeholders are through these **Value Streams**

The Strategy will direct and pace **technology discovery, development, demonstration** and **transition** to secure Enduring Value and continued battlefield dominance of the Army's current and future ground systems.

Why is TARDEC's 30-Year Strategy Important?

The Strategy will **Direct** and **Pace**
technology discovery, development, demonstration, and transition
to ensure battlefield dominance through the **Enduring Value**
of the Army's current and future Ground Systems

Purposeful Engagement
- Industry
- Academia
- International

Purposeful Investment
- Human Capital
- Laboratories & Equipment
- IT Infrastructure

Purposeful Management
- Portfolio
- Enabling Business Processes
- External/Internal Communications

Shaping the future to fundamentally change the way we fight

TARDEC's Top Initiatives 2014-2019

Combat Vehicle Prototype (CVP)

Focusing technology efforts to position the Army for the next generation combat vehicle…

- Provide leap ahead technology enabled capability to the combat vehicle fleet
- Reduce Risk to future combat vehicle program of record
- Inform future combat vehicle requirements
- Sustain advanced concept design teams in the defense industrial base

New Start Capability Demonstration

Upgraded Industry Designs (FFV)

Technology Insertion to Current Force

Autonomy-Enabled Systems

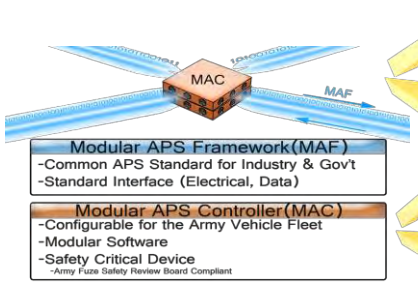
Focusing on:

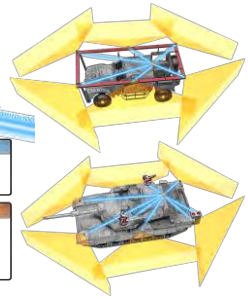
- Manned-unmanned teaming for mounted and dismounted units
- Coordinated unmanned air and unmanned ground systems operations
- Improved 360 degree vision
- Development of optionally-manned and unmanned vehicles
- Applied robotics for installation and base operations

Modular Active Protection Systems (MAPS)

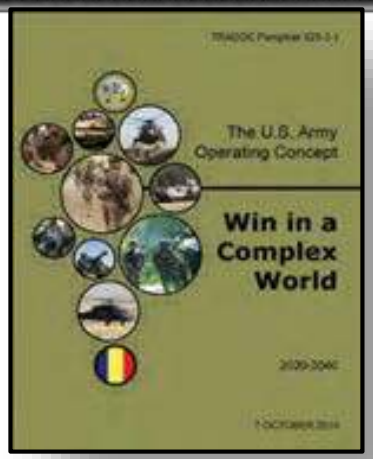
Focusing on the challenges of transitioning APS, and the development of the HW/SW that enables integration of tailored APS subsystem suites.

- Establishes a common starting point for all APS systems, a common basis for all vehicles
- Provides a structure that enables tailoring to meet needs and constraints
- "Best of Breed" component flexibility
- Potential component commonality between vehicles
- Growth capability and designed for safety



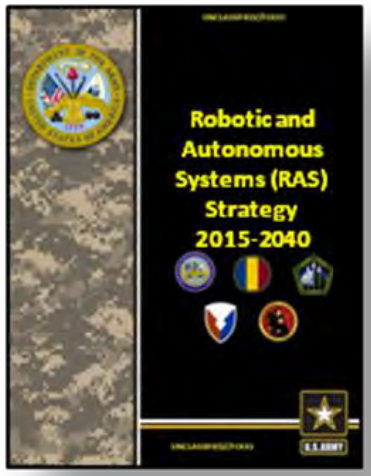


AOC and the RAS -
An Autonomy-Enabled Future Force



AOC: RAS is an enduring capability that will:

- Reduce risk to Soldiers and units
- Provide opportunities for increased efficiencies
- Provide differential advantages over U.S. adversaries



Army Operating Concept: Win in a Complex World

- The Future is Complex: Unknown, unknowable and constantly changing
- The Army Must:
  - Present the enemy with *Multiple Dilemmas*
  - Give commanders *Multiple Options*
  - Operate across *Multiple Domains*
  - Integrate the efforts of *Multiple Partners*

Robotic and Autonomous Systems (RAS) Strategy:

- RAS is key to the Army's differential advantage over adversaries
- RAS Strategy aligns and prioritizes robotics and autonomous systems requirements across all formations
- RAS Strategy describes operational employment of RAS in Force 2025 and Beyond

Strategic Capability Progression

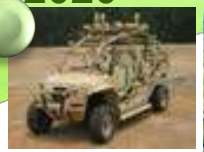
"Maturation, Integration and Demonstration"

Unmanned Air Systems Autonomy (2020)

2015 Active Safety Driver Assist Appliqué Kits (2015)

Synergistic Unmanned-Manned Intelligent Teaming (SUMIT) (2020-2025)

2020



Extend the Reach of the Warfighter (2020)

2030

Autonomous Convoy Operations (2020-2025)

Autonomy (2030-2040+)

2040

Combined Arms Maneuver (2030-2035)

"Adapt, Evolve, and Innovate"

Near Term Capabilities:

- *Leader Follower Convoy Technology Employment*
- *Lighten the Soldier load*
- *Enhance stand-off from threats and improve situational awareness*

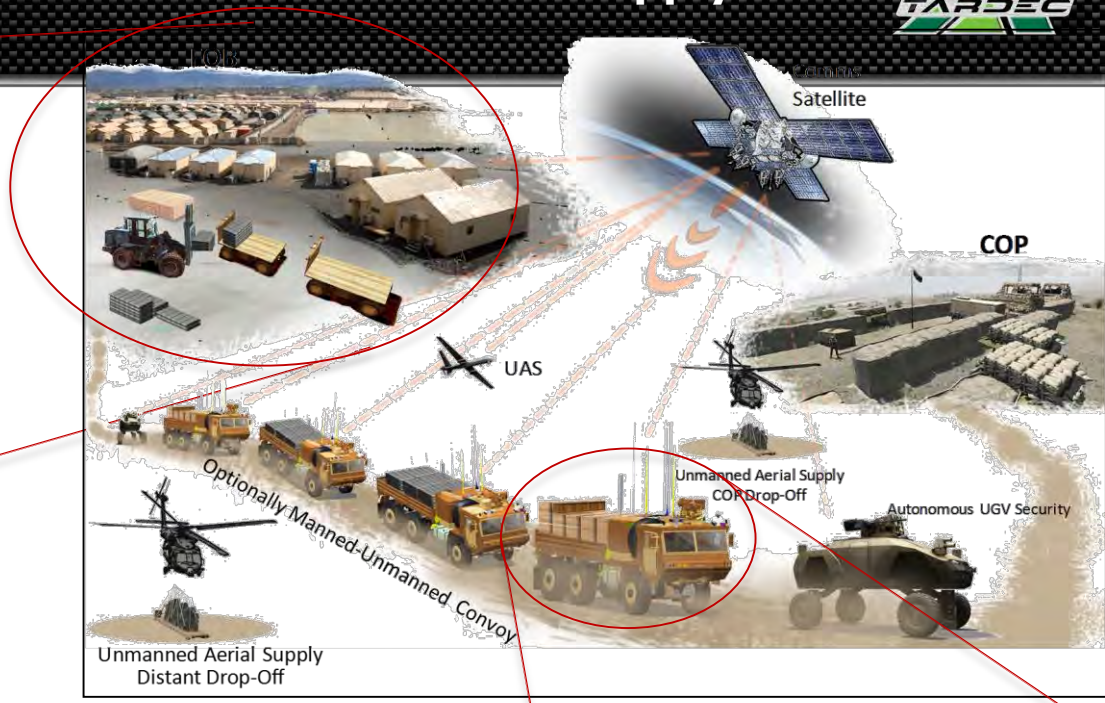
Mid Term Capabilities:

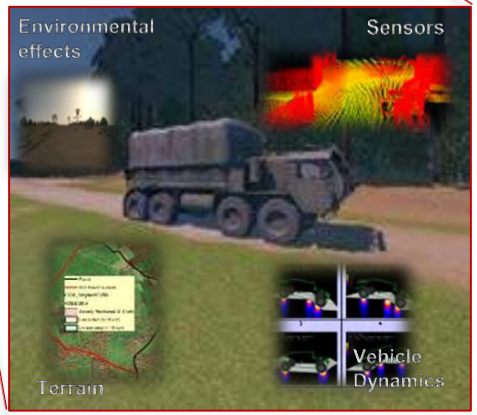
- *Improve the **autonomy** of unmanned systems*
- *Enable unmanned cargo delivery*
- *Act as a "teammates" rather than tools*
- *Micro autonomous air/ground systems will enhance Platoon, Squad, and Soldier situational awareness.*

Far Term Capabilities :

***Enable manned and unmanned teaming in both air and ground maneuver** through scalable sensors, scalable teaming, **Soldier-robot communication**, and shared understanding through advancements in machine learning.*

Example: Autonomous Ground Resupply



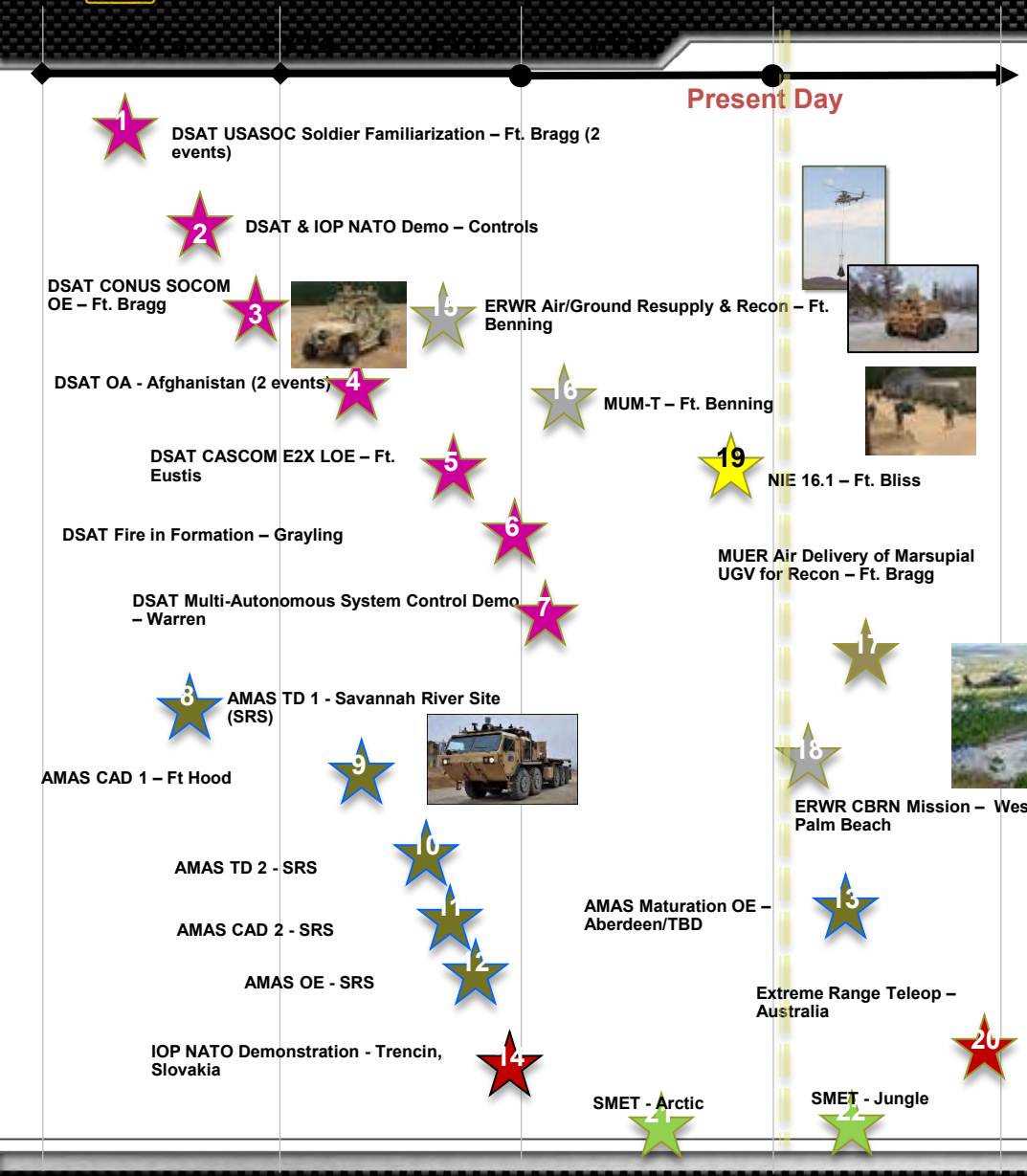


Near-Term Challenges:

- Development of Open Robotics Architecture
- Advanced Autonomous Behaviors and Software Development Tools
- Incorporating modeling and simulation into the design, development, and testing of unmanned ground systems
- Enabling assured trust
- High-speed, low latency, secure tele-op

These investments form the foundation for successful future Programs of Record

Sampling of Autonomy-Enabled Capability Demonstrations

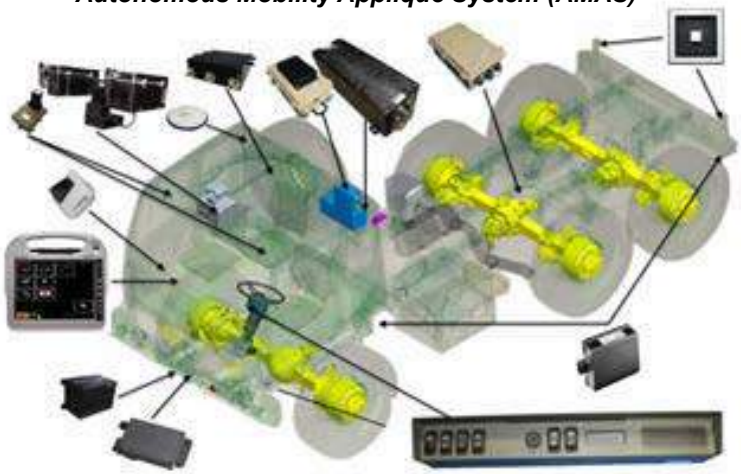


Capability Demonstration Purpose

(1) Familiarization of soldiers with DSAT technology for USASOC Soldiers.
(2) Demonstrate use of a common controller to interface multiple vehicles for verification of IOP validity.
(3) Demonstration of vehicle capabilities to SOCOM soldiers.
(4) Operational Assessment of DSAT capabilities in Afghanistan.
(5) Autonomous tactical resupply demonstration.
(6) Table VI scout/gunnery qualification demonstration with M240 armed (blanks, man-in-loop) autonomy-enabled system.
(7) Multi-vehicle control from a single operator control unit, extending the range via mesh networking.
(8) Engineering test on by-wire active safety kit.
(9) ARCIC requested demonstration for identifying the realm of possibilities for unmanned systems.
(10) Engineering test on autonomy kits.
(11) Demonstration of higher truck speeds.
(12) Provide vehicles to Soldiers & Marines for 8 weeks to use system in combat scenarios to determine if there is a military user assessment by COCOMS (CENTCOM and TRANSCOM).
(13) Soldier testing for driver warning/driver assist for M115.
(14) UGV Interoperability Profile demonstration at the NATO EOD CoE Demonstration and Trials Event.
(15) Demonstrate the added capability resultant from merging unmanned air and unmanned ground systems with long-distance control capabilities.
(16) Synchronized employment of Soldiers, manned and unmanned air and ground vehicles, robotics, and sensors to achieve enhanced situational understanding, greater lethality, and improved survivability.
(17) Perform an extended duration RSTA mission with an autonomous marsupial vehicle and small UGV's.
(18) Demonstrate the ability to perform a high-risk mission at long distances without placing the Warfighter in harms way.
(19) Technical integrator for TRADOC with MUM-T
(20) Demonstrate ability to conduct extreme range tele-op
(21) SMET Arctic Operational Assessment in Alaska
(22) SMET Jungle Operational Assessment in Hawaii

Leveraging Michigan's Automotive Capabilities

Autonomous Mobility Applique System (AMAS)



TARDEC's Michigan Automotive Partners for AMAS

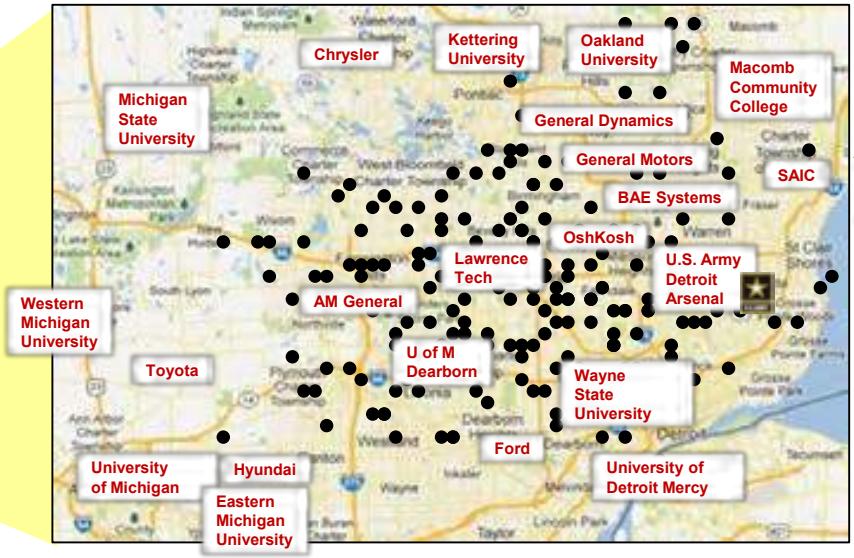
"…MDOT and TARDEC have agreed upon using Michigan's I-69 Corridor to test and demonstrate autonomous vehicles and convoys on public roadways."

MDOT
Michigan Department of Transportation

CRADA between Michigan Department of Transportation and U.S. Army TARDEC

Building Strategic Partnerships OGAs, Industry and Academia

Recognized conduit connecting RDECOM and the Ground Vehicle Community



Industry

- 66 Active CRADA's
- 30 Active TSAs-FY12
- 21 CRADA's Concluded

Chartered by Secretary of the Army 21 June 1993

PEO GCS | PEO CS&CSS | TACOM LCMC | PEO Land Systems

Created Joint Center *JAN 2010*

TARDEC | MARCORSYSCOM | Office of Naval Research | ILSC

AVPTA Chartered 18 July, 2011

Partnering is critical to the success of our long-term strategy

Doing Business with TARDEC

- **TARDEC's Ground Vehicle Gateway**

  https://tardec.groundvehiclegateway.com

- **The Small Business Innovation Research (SBIR) program**

  http://www.acq.osd.mil/osbp/sbir/

- **Cooperative Research And Development Agreements (CRADA)**

  http://tardec.army.mil/business/crada.aspx

- **Test Services Agreement (TSA)**

  http://tardec.army.mil/business/testservices.aspx

- **Diminishing Manufacturing Sources and Material Shortages (DMSMS)**

  http://dmsms-tardec-army.com/dmsms_index

- **TARDEC OMNIBUS Contract**

  http://contracting.tacom.army.mil/research/omnibus/tardecomnibus.htm

- **Broad Agency Announcement (BAA) on Fed Biz Ops**
- **USA Job Search**

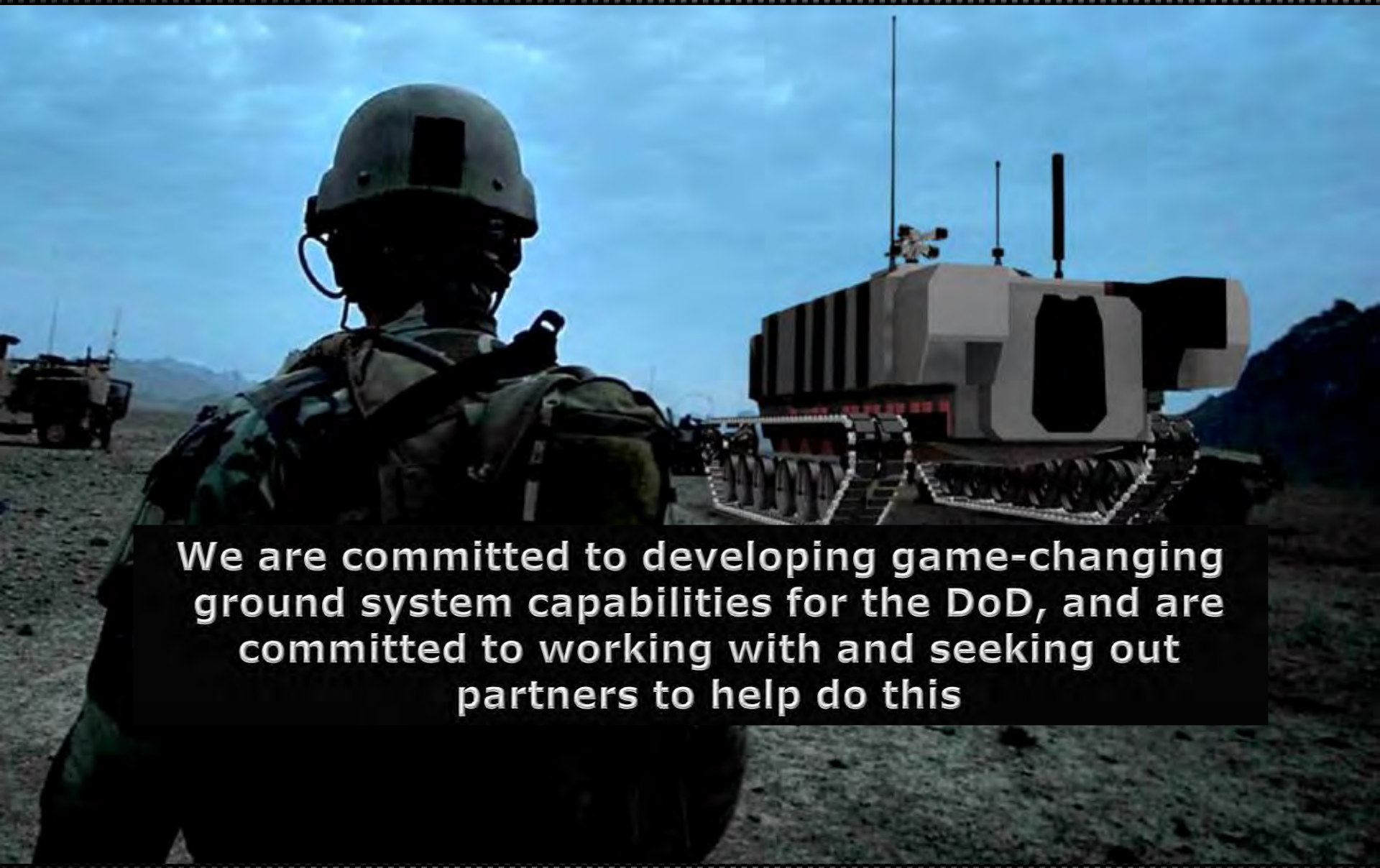
New Opportunities

- Attend TARDEC Industry Days, or GVSETS to talk with TARDEC Technical SME's
- Submit proposals through the TARDEC Gateway
- Find new opportunities on TARDEC's Web Site www.army.mil/TARDEC
  - Left side of main web page, under "Engage TARDEC"

- TARDEC Industry Days; 27-28 Apr, Warren
- GVSETS: 2-4 Aug, Novi

Discover New Opportunities at- www.army.mil/TARDEC

Summary



We are committed to developing game-changing ground system capabilities for the DoD, and are committed to working with and seeking out partners to help do this

Questions??

paul.a.decker6.civ@mail.mil

Connected Vehicle Technologies in Michigan's K-12 Classrooms

SQUARE ONE™
EDUCATION NETWORK
the future starts with us

V2X Lab Schools

Vision – Action - Reality

Connected Vehicle Working Group – Jan 27, 2016

Connected Vehicle Graphical Planning Strategy

5 May 2015 v3

OBJECTIVE: Develop a V2X program that is highly relevant, highly visible, resource rich, project-based and affordable/scalable for teachers in grades 6-12.

VISION: Establish the first school course(s) that are available for credit in schools throughout Michigan…and eventually the country.

Initial Development Goals:

1) Establish "V2X Research and Demonstration Lab Schools"
   - Focus on ability to create basic V2I infrastructure within the halls/classrooms of schools using simple interactive transponders, sensors, mobile devices, wearable technologies, indoor vehicles, etc.
   - Provide kit of non-consumable, compatible hardware/devices (transponders, mini-cars, "wearables," small robots, etc.) as a component of teacher training workshop.

2) Develop "Highly Visible" public Demonstration program showcasing "Platooning" technologies as one example of V2V technologies
   - Design, Manufacture and Engineer 3D Printed Mobile platform (Exclusive to SQ1)
   - Utilize SQ1 Jeep (or any available similar device (Ford F-150, Mustang, Corvette, etc.) as platform vehicle
   - ~~Utilize RC "Rock-Crawler" as platform vehicles~~
   - At various public exhibitions, the lead vehicle directs 4-6 following, connected through "Show Center" of event, thus touting the work going on in Michigan's school with V2X

Connected Vehicle Technologies in Michigan's K-12 Classrooms

V2X Lab Schools

Portage Central High School
New Buffalo High School
Waterford Kettering High School
Clinton High School
Center Line High School
Lakeshore High School
Wm. D. Ford Career Center, Wayne-Westland
Dollar Bay High School
Warren Woods Tower High School
Tecumseh Tech Center
International Academy of Flint

V2X Lab Schools

Summer Camp – Middle School 2016 & 2017

Washtenaw Community College

Connected Vehicle Technologies in Michigan's K-12 Classrooms

P3 group

HARMAN INSPIRED

11 High Schools – Aug 26, 2015

Washtenaw Community College

10 High Schools – Feb 18, 2016

OPEN SPONSORSHIP

$10K

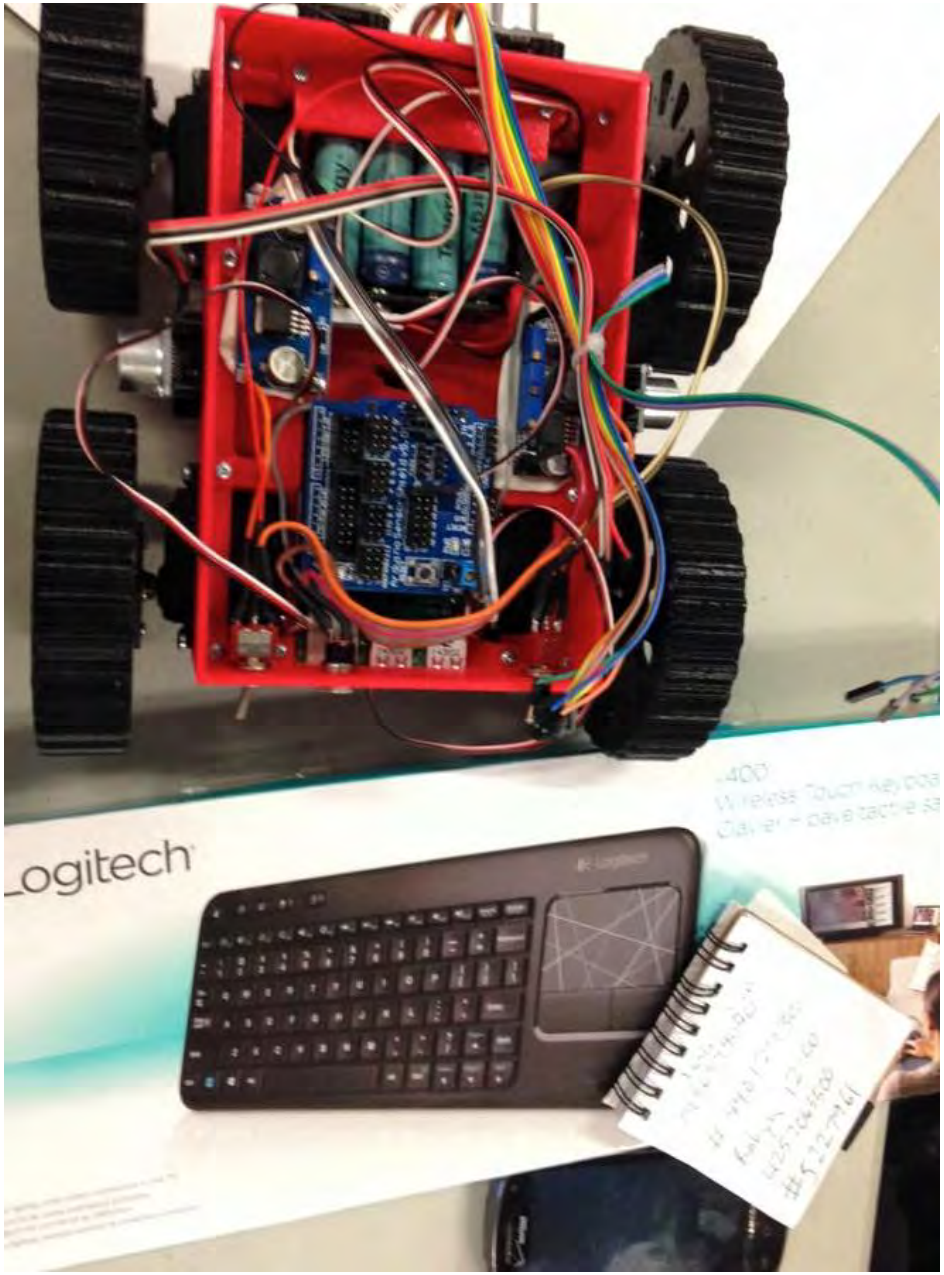
10 High Schools – Apr 2016

30-35 Planned for 2015-16 School Year

SQUARE ONE EDUCATION NETWORK
the future starts with us

We don't buy workbooks… We buy gear!

V2X Lab Schools



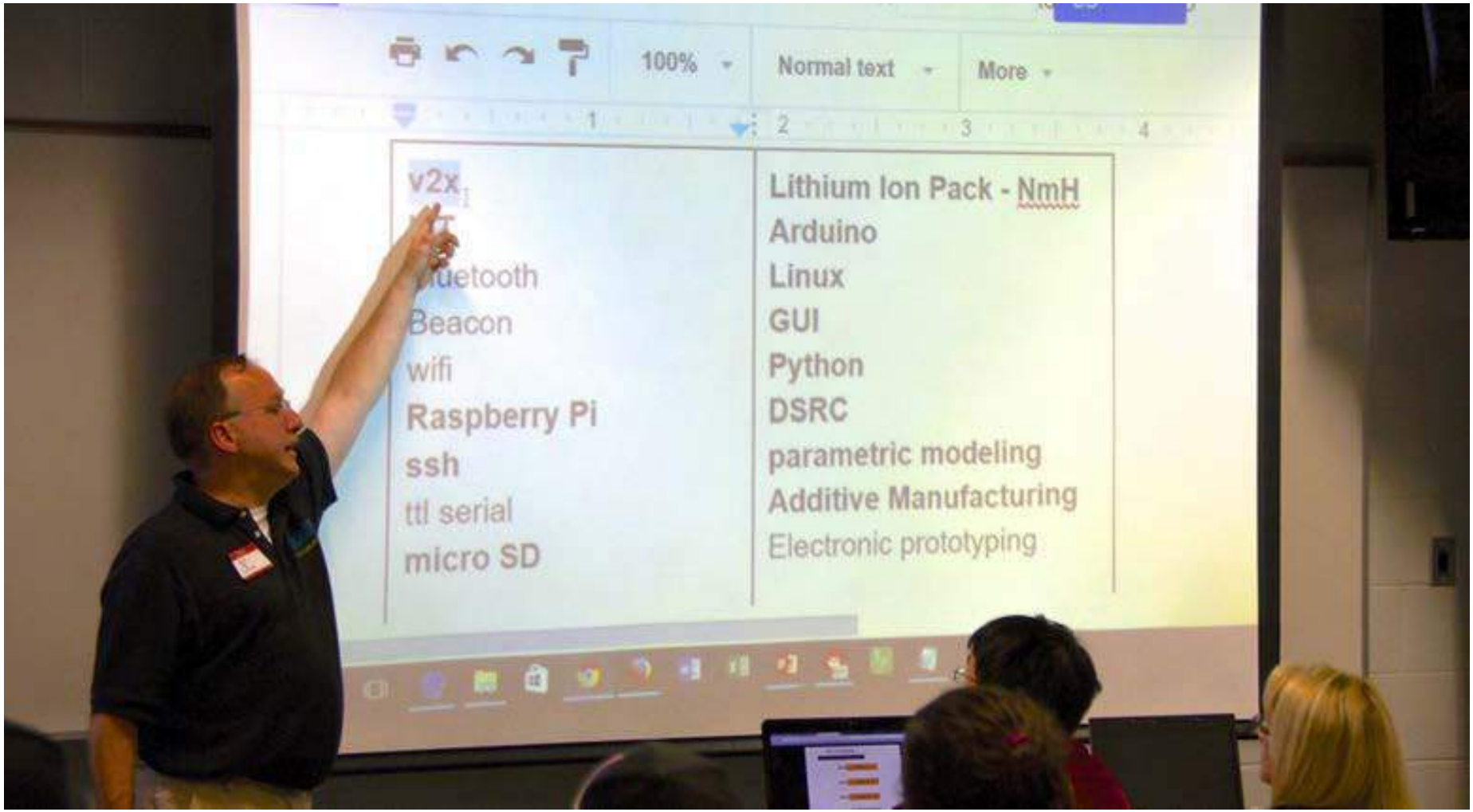
V2X Lab Schools

V2X Lab Schools

HARMAN
INSPIRED

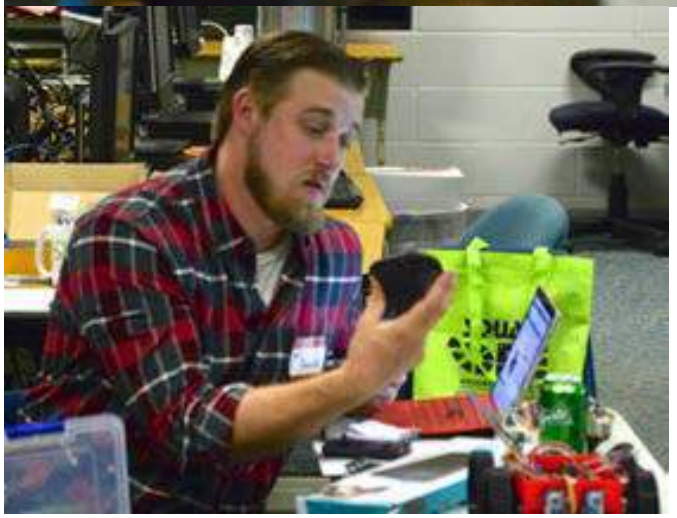
V2X Lab Schools

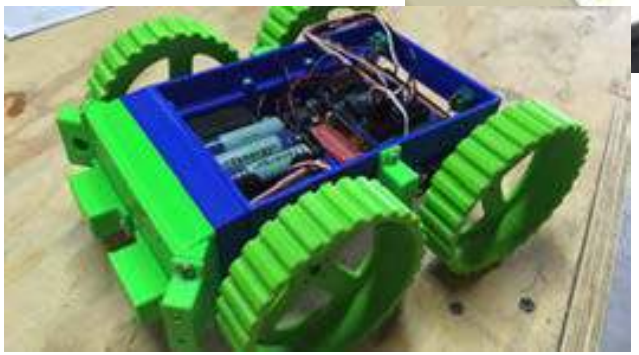
The Language of V2X



V2X Pilot Terms
File Edit View Insert Format Tool Comments Share
100% Normal text More
v2x
IoT
Bluetooth
Beacon
wifi
Raspberry Pi
ssh
ttl serial
micro SD
Lithium Ion Pack - NmH
Arduino
Linux
GUI
Python
DSRC
parametric modeling
Additive Manufacturing
Electronic prototyping
BITE FORCE
APTYX
WPI
Kettering
3098

Raspberry Pi 3





NATION

Connected Vehicle Technologies in Michigan's K-12 Classrooms

V2X Lab Schools

Connected Vehicle Technologies in Michigan's K-12 Classrooms

V2X Lab Schools

MICH auto

Michigan's Automotive *Accelerator*

Reality!

2016 – 2018

Developing

mobile comply

MICHIGAN VIRTUAL UNIVERSITY

You Can Learn Virtually Anything

SQUARE ONE™

EDUCATION NETWORK

the future starts with us

CERTIFIED!

Connected Vehicle Technologies in Michigan's K-12 Schools

$1000 / Starter Kit / School

Sponsorships Available

Initial Target of 50 V2X Lab Schools by June 2016

Partners and Engagement:

- Hardware,
- Expertise,
- Hard Copy and Electronic
- Funding
- Showcasing Opportunities
- Montreal 2017…ITS World Congress?
- Your Ideas?

From Belle Isle to Mcity?

Connected Vehicle Technologies in Michigan's K-12 Schools

An Initiative of the Square One Education Network

www.squareonenetwork.org

"Every Michigan child deserves an education that launches them into a successful career path and life. The best careers in the modern economy require training with accessed programs that gives them the skills and experience necessary to prepare them for college, career and for life.

We've made progress. We've made some good reforms. We've added tougher academics standards without federal mandates. We've talked about teacher effectiveness. We're a national leader in funding preschool. We've created the early literacy programs, in terms of Pre-3 reading. In terms of STEM programs, we're a leader with programs like First and Square One.

We've done some wonderful things with early and middle college programs and we've made a commitment; I have made a commitment, to make sure we're the nation's leader in career technical education. These are all great opportunities. We can see the great potential of our children when we see these things."

-- Governor Rick Snyder, State of the State Address (2016)

An Invitation to Join…

Karl Klimek
313-590-4000
karl@squareonenetwork.org

SIEMENS

Ann Arbor MI

Jan. 27, 2016

IRC-US MO MM-ITS S

Siemens Center of Excellence for Intelligent Traffic Technology Ann Arbor, Michigan

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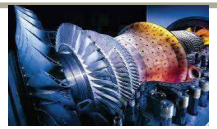
http://www.usa.siemens.com/mobility

What is the Siemens Center of Excellence Award?

- Siemens ITS Fits into the Siemens Infrastructure to Help Build Smart Cities
- Need to Show “In-Practice” how ITS Components are Used to Build Smart Cities
- Siemens Is Heavily Invested in the Smart Cites Concept



We Deliver Leading-Edge Technology, Making Our Customers More Efficient & Productive

We Are A Global Partner For Our Customers

We Help Customers Address Challenges Greater Than The Competition

SIEMENS

Siemens Caring Hands
For strong communities

We Take Our Responsibility As A Corporate Citizen Seriously

Our People Go the Distance to Ensure Customers Experience the Full Benefit of Our Technology

Our Long-Term Success Rests On Our Ability To Anticipate & Engineer the Future

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We Deliver Leading-Edge Technology, Making Our Customers More Efficient & Productive

SIEMENS

World's First Integrated MR/PET Scanner

1 Provider Light Rail in U.S.

"World's Most Efficient" Gas Turbines

Leading Global Industrial Software (PLM)

HVDC Increasing Power Supply to NYC

Modernizing Landmarks Building Automation

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We Take Our Responsibility as a Corporate Citizen Seriously

SIEMENS

Sustainable Solutions

Generates Renewable Energy

Pioneers Early Detection

Reduces Emissions & Costs

Increases Efficiency & Productivity

Sustainable Operations

Solar Generates 90+% of Plant Power

Rail Reduces Carbon Footprint up to 80%

US HQ is LEED Gold Certified

Improved Manufacturing Processes Save Energy

Corporate Citizenship

Dow Jones Sustainability Indexes #1

Dow Jones Sustainability Index

University of Maryland 1856

GO PLM Program

Joining Forces

Siemens Foundation

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What is Included in the Center of Excellence Award?

- SEPAC Local Controller Software Upgrade
- Upgrade the existing SCOOT (Split, Cycle and Offset Optimization Technique) System
- Upgrade the existing TACTICS system
- Trial of Newest Version of “Cloud Based” TACTICS SmartGuard
- Work with local distributor Carrier and Gable to implement the technology
- Ann Arbor helps us promote our technology

TACTICS package offers many contemporary features such as parameter “roll back”, FHWA Traffic Management Data Dictionary data transfer capabilities, etc.

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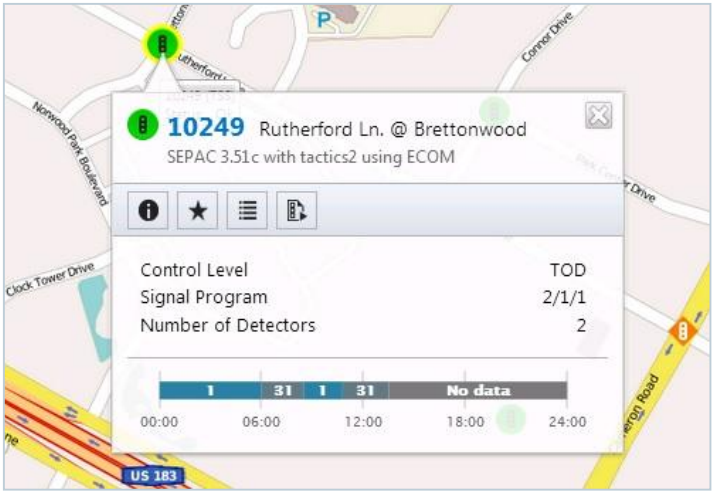
Why Is Ann Arbor a Good Choice?

- Most of All - Knowledgeable Staff
  - Results Oriented
  - “Power Users”
  - Innovative
  - Excellent local distributor (Carrier and Gable)
- Integration and Extensive Use of Products
  - Example: Single Controller
    - Connected Vehicle SPaT Messages
    - SCOOT Processing
    - Typical SEPAC capability as well
- Use Of Multiple Systems
  - TACTICS and SCOOT
  - Can be Run Separately but TACTICS Shows SCOOT Status
  - SmartGuard to be Added Soon



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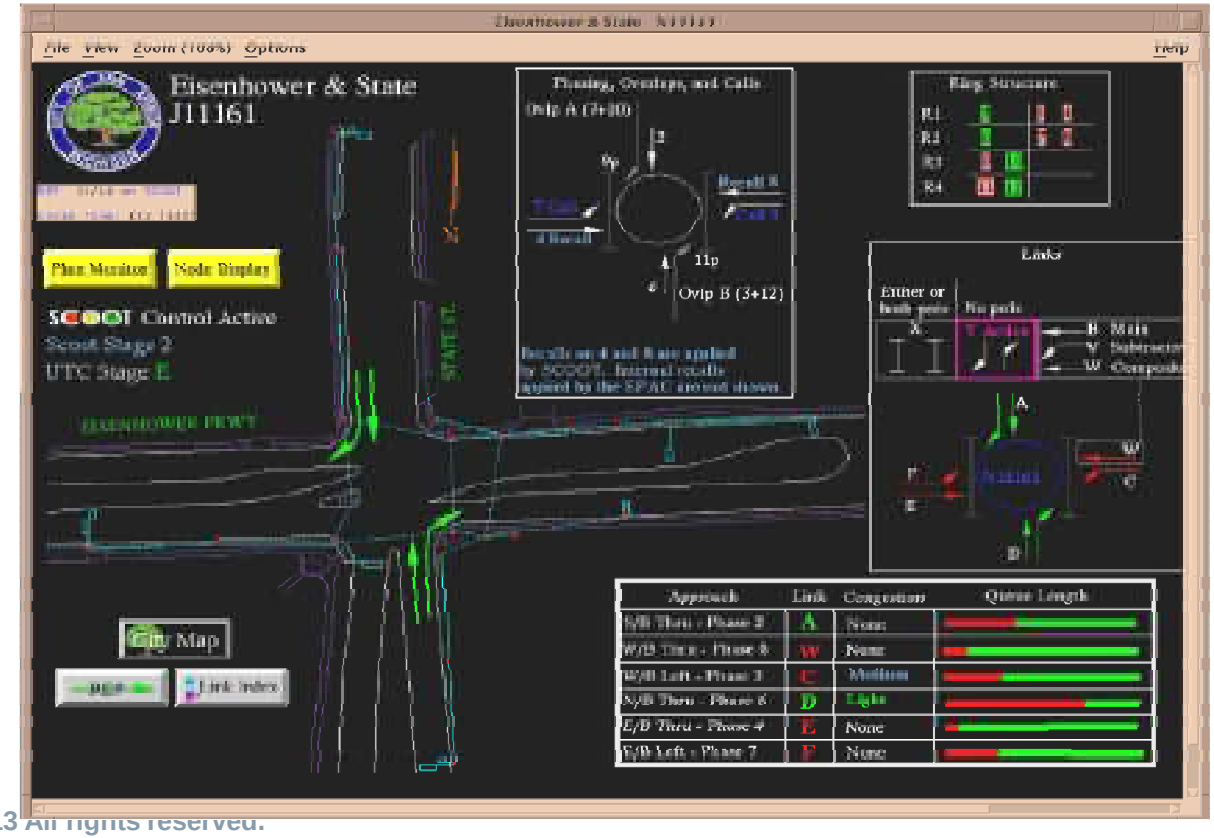
What is the Siemens History in Ann Arbor?

- 2004 Ann Arbor installed SCOOT system as an adaptive deployment
- 2011 Hundreds of Intersections Placed on TACTICS System, upgrade from ACTRA
- 2007 / 2012 Siemens Controllers Used in CV Test Bed
- 2015 Winner of “Siemens Center of Excellence Award”

One of Ann Arbors adaptive screens shows not only the status of current movements but also the queue length for various movements as well as the congestions active at each movement.

Connected Vehicles will eventually transmit locations so that systems will know their locations speed and numbers in order to make adjustments accordingly.



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What is Specific to Ann Arbor's Traffic Conditions?

- Michigan Stadium Holds 110,000 People
- Difficult to plan uniform arrival of fans
- Weather can alter traffic patterns by shutting down certain parking lots

Working with the traffic in such a concentrated congestion scenario offers outstanding preparation for how to handle varying traffic condition in day to day traffic.

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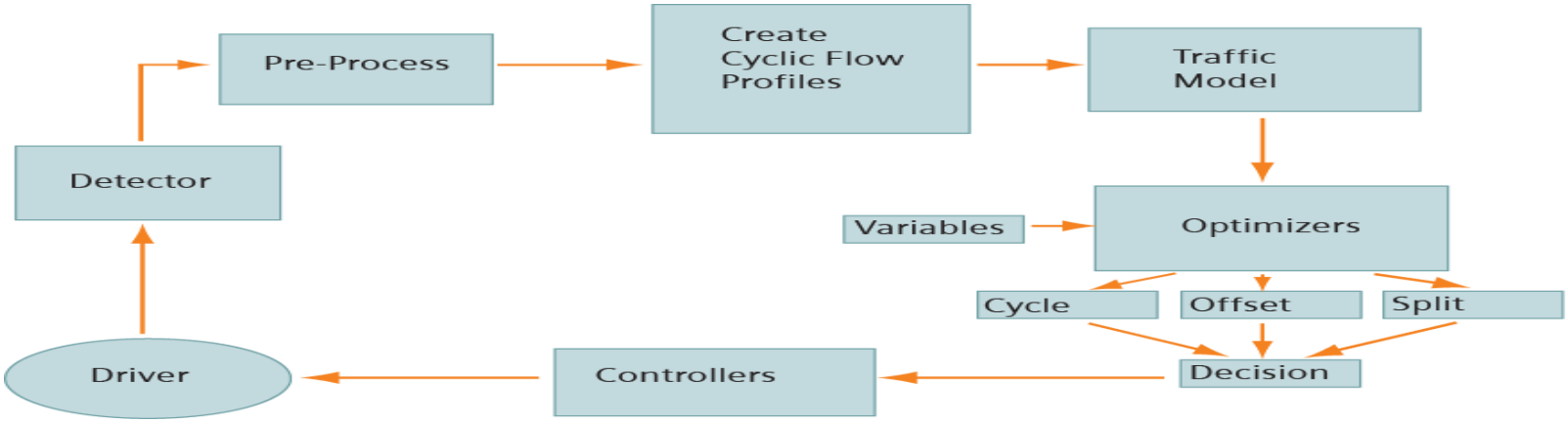
What Components / Strategies Have Helped ?

- Certain Parameters Have Been Allowed a Broader Range (ex. Cycle Length)
- Started with Some Parameters on “Game Day”. Now Commonly Used Daily
- Example: Congestion Importance Factor is Used Commonly
    - As Adaptive System Sees Congestion Increase, Importance Factor Works
    - Gives “Priority” From 1 to 10 to Control “Pecking Order” of Traffic Movements
- Offset values are optimized based on directional flow (Inbound vs. Outbound vs. Balanced. If approach becomes congested, a secondary offset, “Congestion Offset” can be automatically activated to be used in the offset optimization logic until congestion is mitigated. This is above and beyond the typical offset fine tuning.



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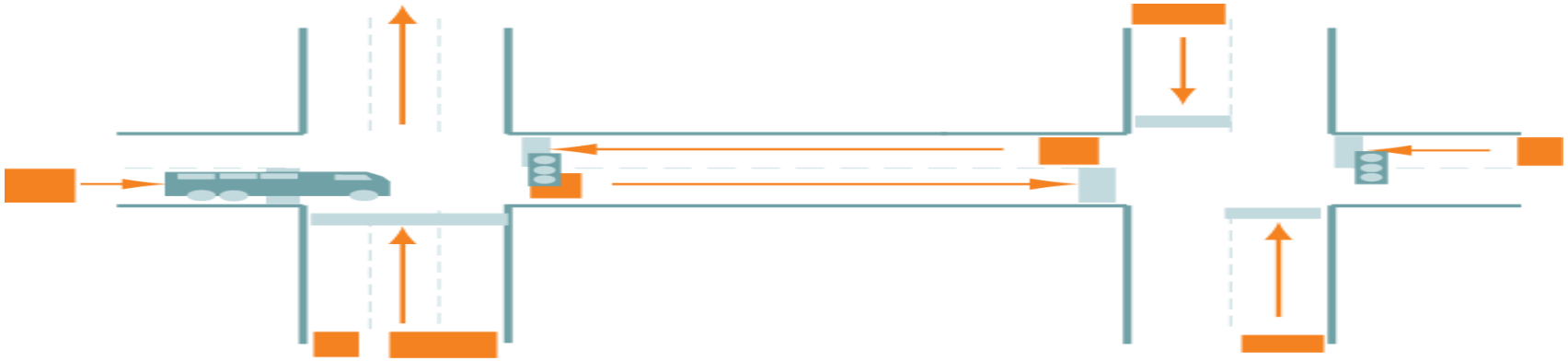
What is Planned for the Future?

- 40 to 50 intersections in the downtown area are to be joining SCOOT soon.
  - These are in a grid rather than the typical arterial arrangement for adaptive
  - Common configuration in other countries but US frequently uses arterials
- 2 other arterials are planned for SCOOT expansion by the City
- Future SCOOT intersections will use IP communications
- Legacy serial channels will be maintained due to excellent performance
- More detection technology to be used in the future
- Strong Connected Vehicle platform will remain.



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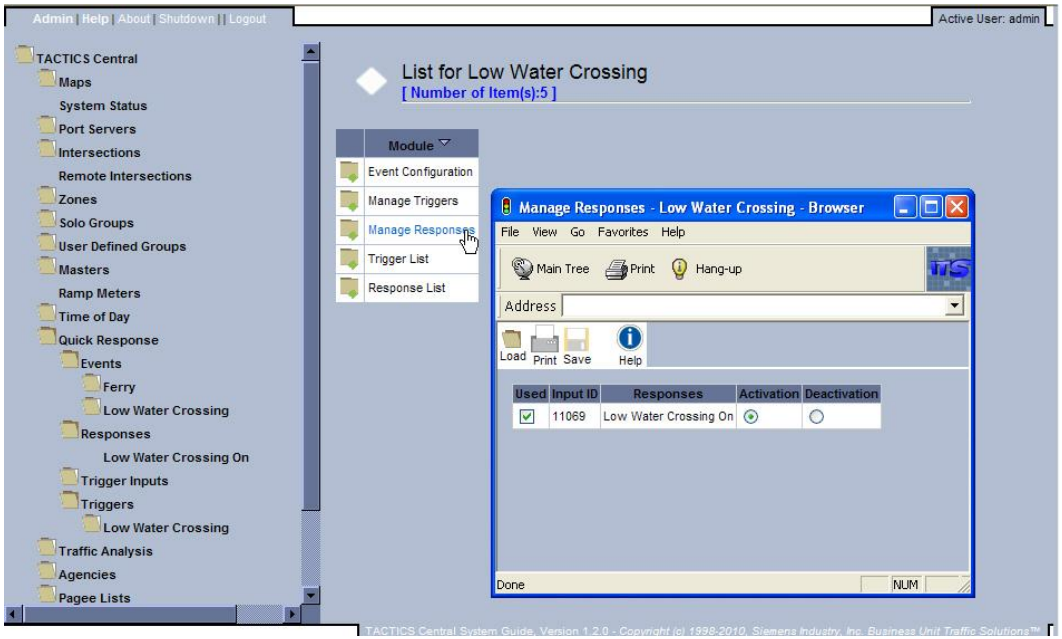
Unique Features to Ann Arbor (Creative Adaptation of System Features)

SIEMENS

- Snow Flash Plan Through TACTICS
  - Request of Remote Flash Pattern from TACTICS During Snow Emergencies
  - Intersections can be moved into a Zone that issues a “Flash Plan”
  - Activated By Quick Response Function Based On Activation of a Special Status Input from a Controller in Data Center

Typical Quick Response Screen



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MICHIGAN CONNECTED VEHICLE INITIATIVE AND NATIONAL V2I DEPLOYMENT COALITION UPDATE

Matt Smith, P.E.

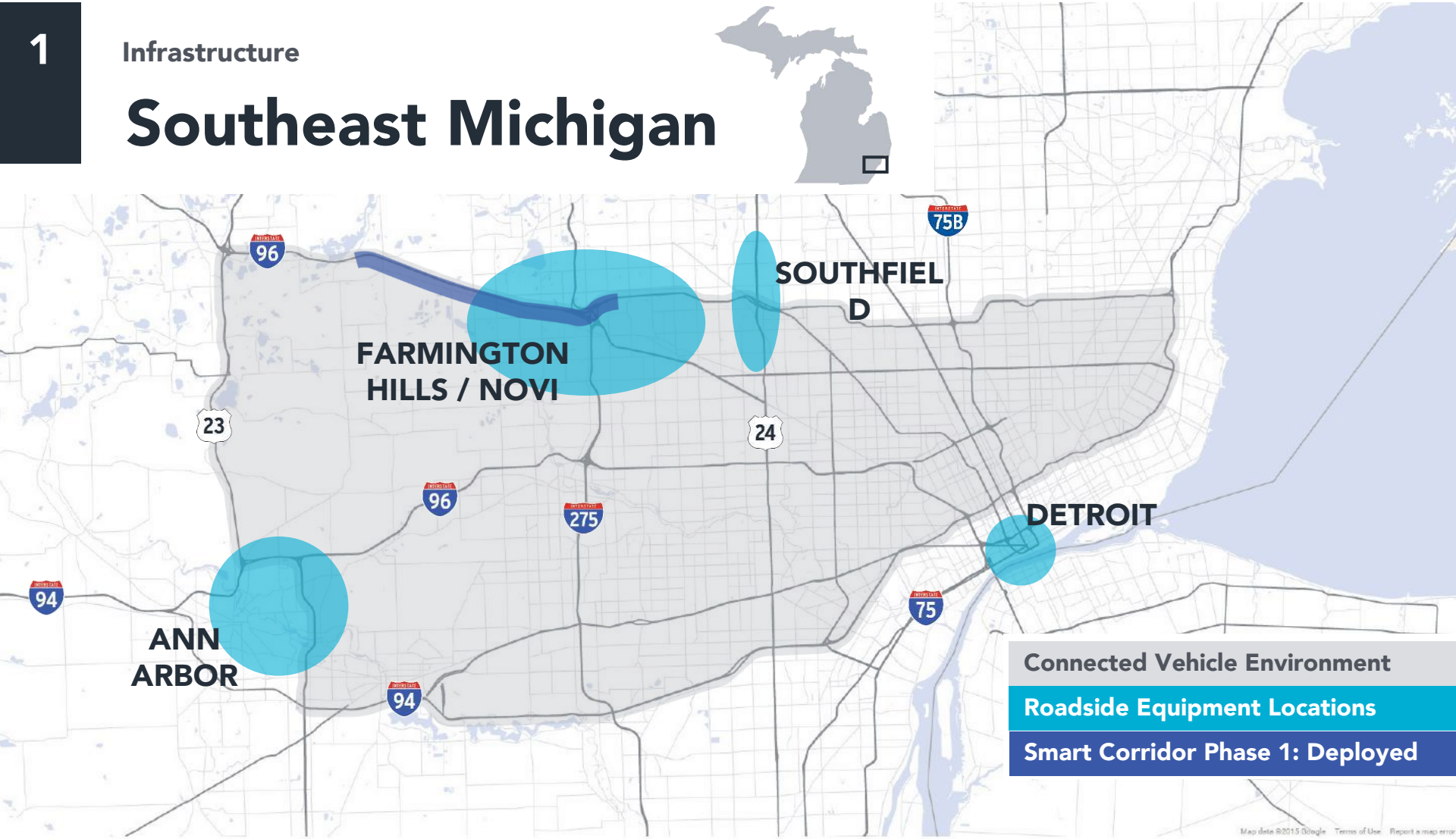
Michigan Department of Transportation

Detroit, MI | Date · January 27, 2016

1

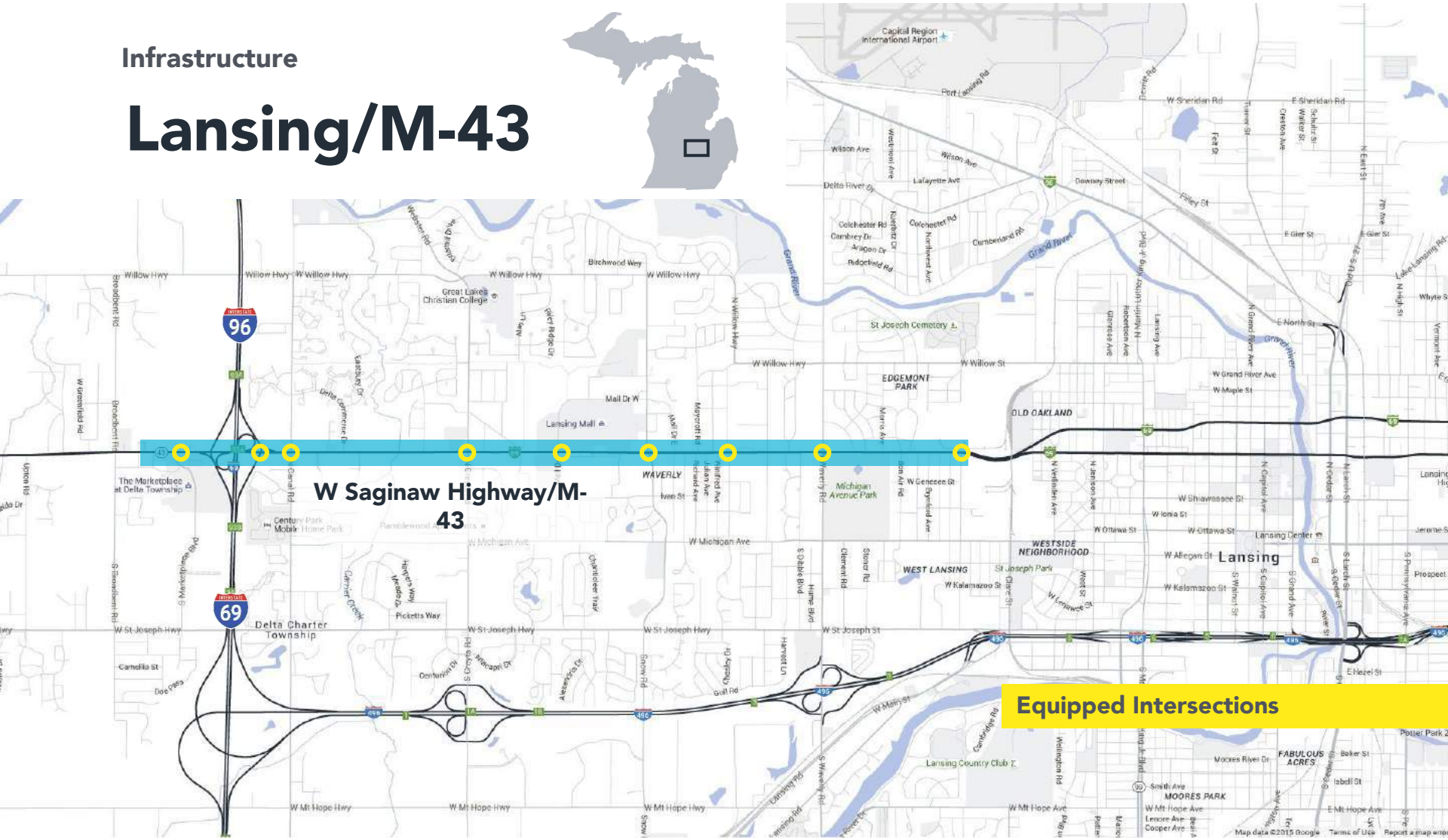
Infrastructure

Southeast Michigan



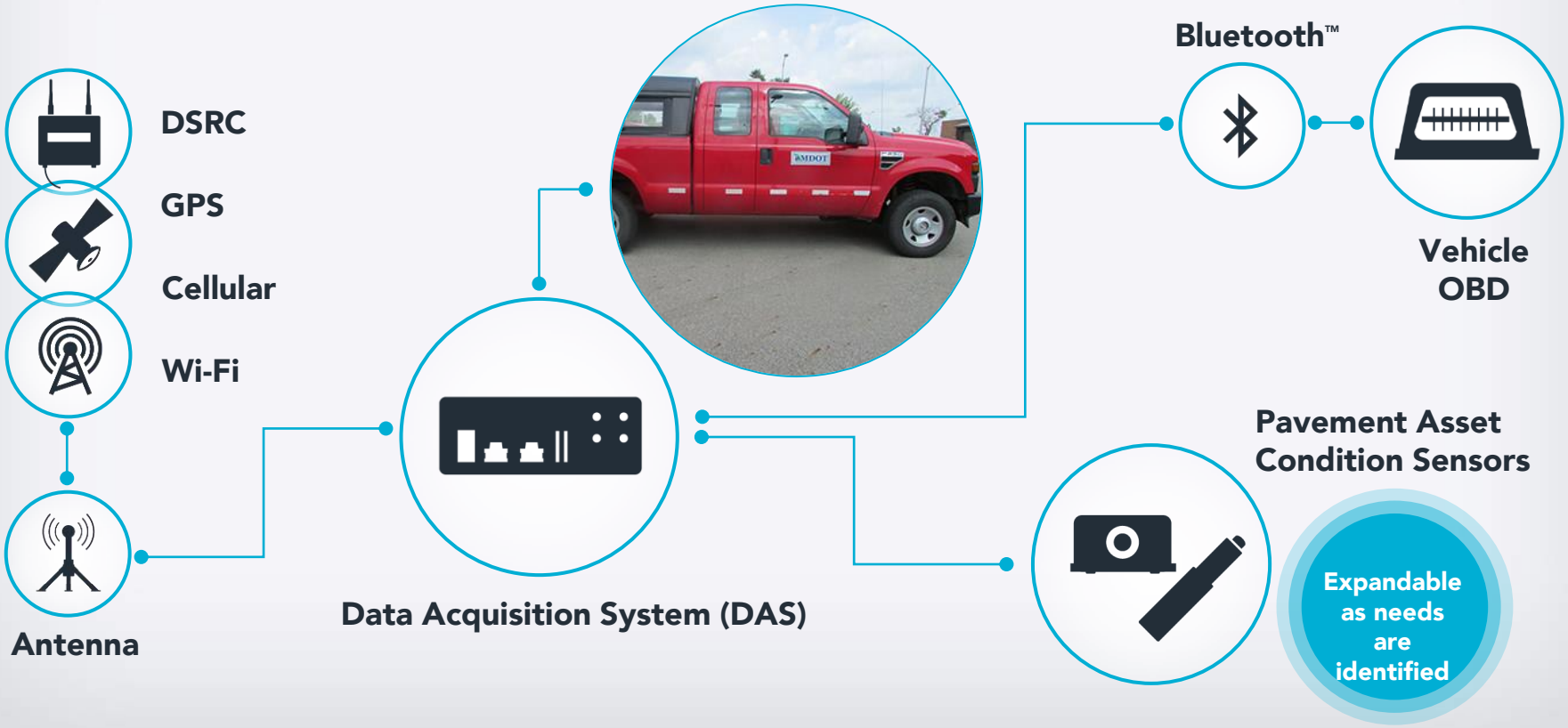
Infrastructure

Lansing/M-43

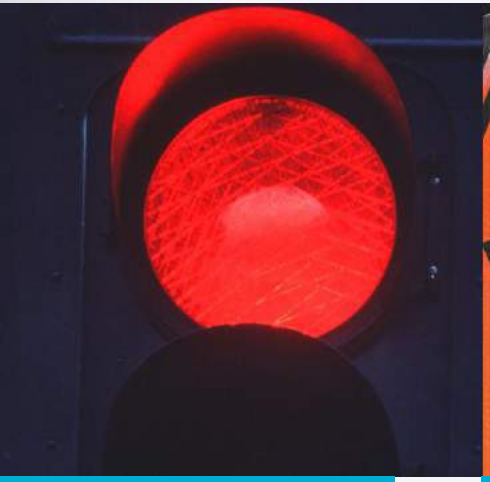


V2I Applications

MDOT Fleet Deployment



Initial Pilot Applications

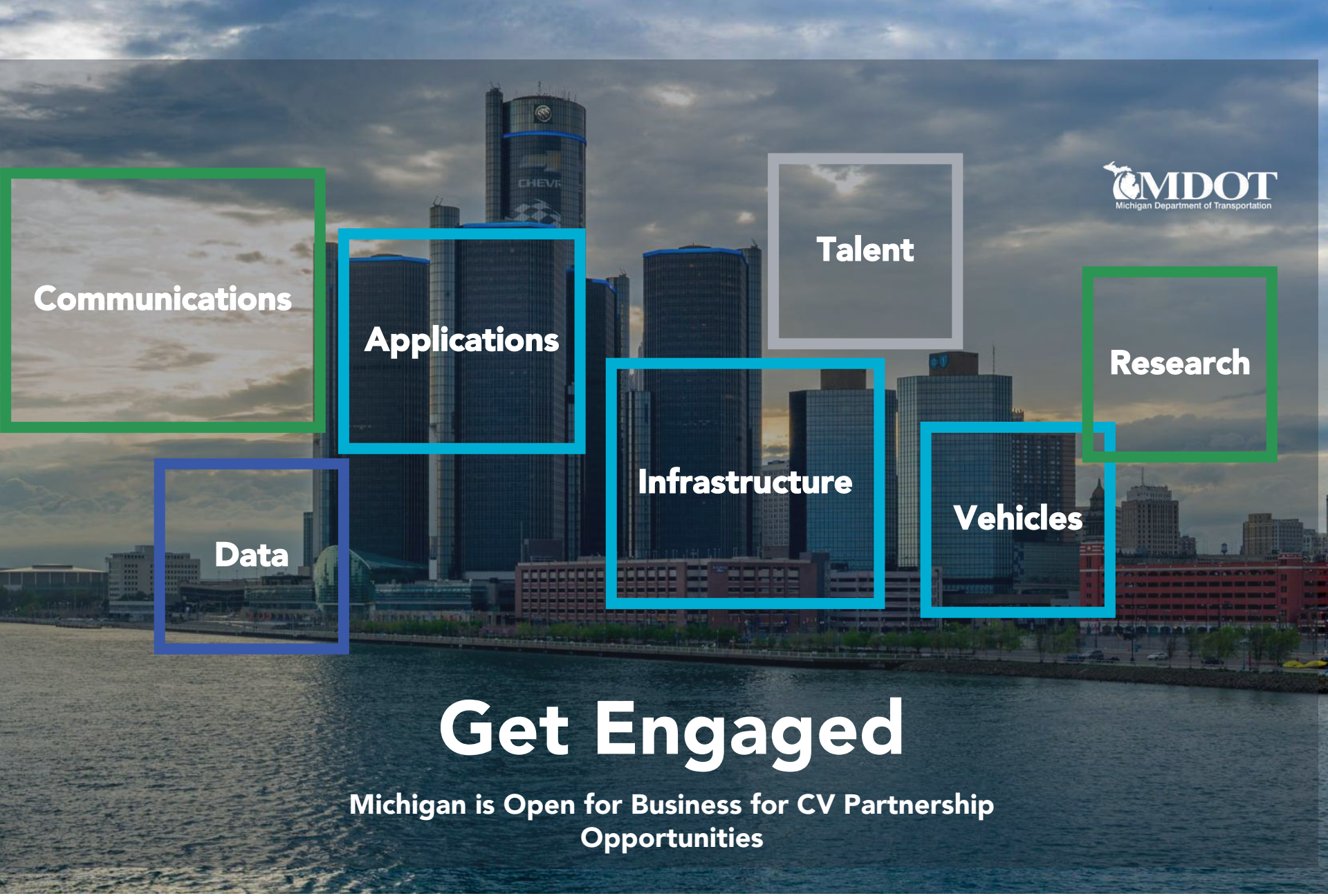


Red Light Violation Warning

Work Zone Warning/ Management

Road Weather Management

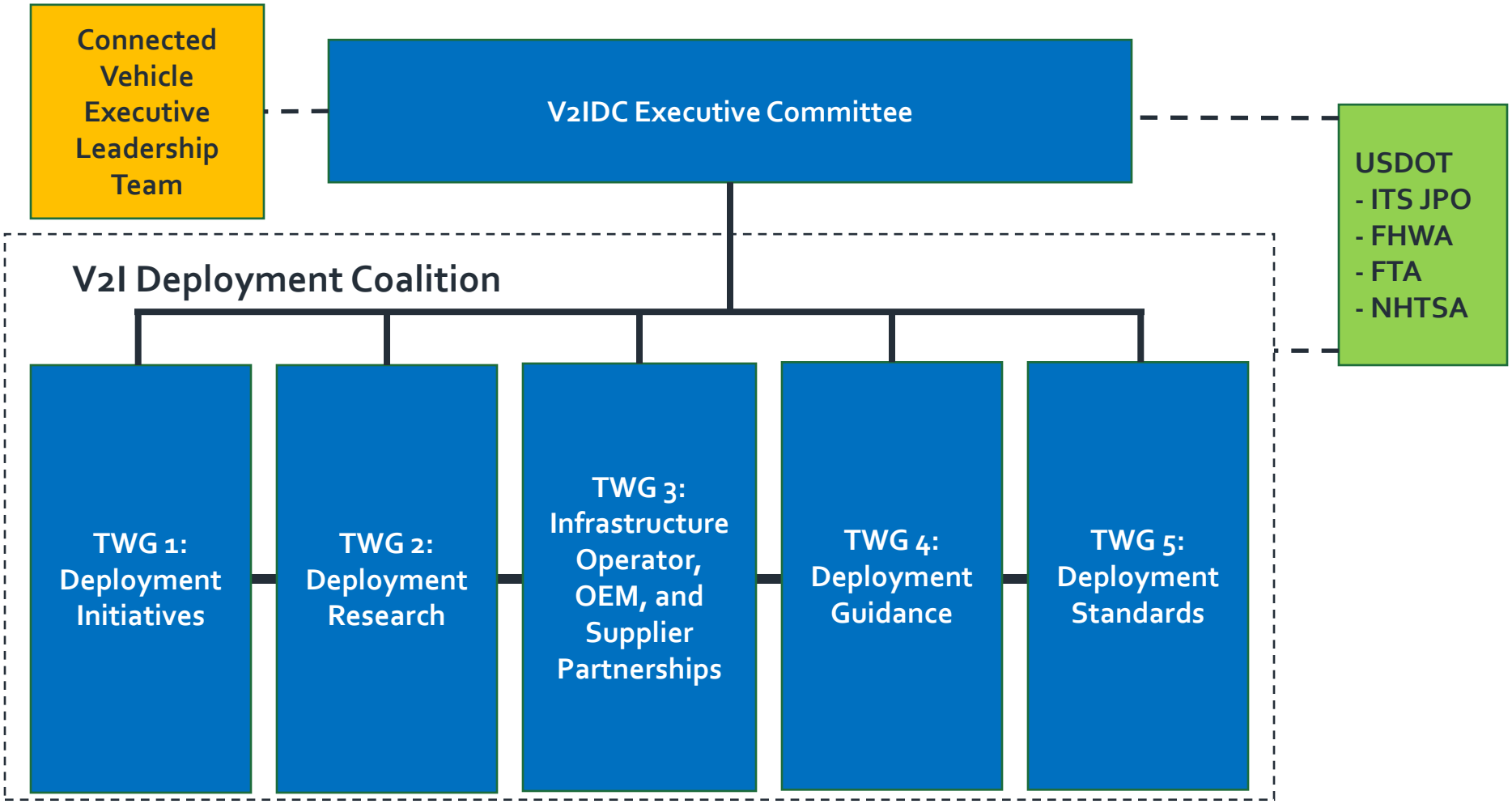
Pavement Condition


MDOT
Michigan Department of Transportation
Communications
Applications
Talent
Research
Infrastructure
Vehicles
Data
Get Engaged
Michigan is Open for Business for CV Partnership Opportunities

Role of V2I DC

"To help accelerate consistent and effective deployments of Connected Vehicle technologies that address passenger vehicles, freight, and transit operations in both urban and rural areas."

V2I DC Structure



V2I DC Initial
Focus Areas and Goals

- To help accelerate V2I deployments related to:
  - Intersections (signalized and non-signalized)
  - End of queue warnings
  - Work zone management
  - Curve warning systems

Issue Coordination

Issue	TWG 1 Initiatives	TWG 2 Research	TWG 3 Partners	TWG 4 Guidance	TWG 5 Standards
Issue 1: V2X Applications	P	S	P	S	S
Issue 2: Complementary Communications to DSRC	N	P	N	N	N
Issue 3: V2I Data	N	S	P	N	S
Issue 4: Patents-Intellectual Property	N	P	N	N	N
Issue 5: Security	No action planned at this time				
Issue 6: V2I Outreach	N	S	N	P	S
Issue 7: Understanding the Benefits and Costs of V2I Deployment and Operation	S	S	P	S	N
Issue 8: V2I Standards	N	N	N	N	P
Issue 9: Understanding V2I Liability Assignment	N	P	N	S	N
Issue 10: V2I Synergies with Other Emerging Technologies	No action planned at this time				
Issue 11: V2I Consumer Messaging	N	N	N	P	N
Issue 12: V2I Multimodal Applications	No action planned at this time				
Issue 13: Infrastructure Processes as V2I Obstacles	P	N	N	S	N
Issue 14: Federal V2I Policy Statement	P	N	N	S	N
Issue 15: Maintaining V2I Infrastructure	P	N	N	N	N
Issue 16: Operator and OEM Goals for V2I	N	N	P	N	N

Summary of Business Plan

Time Period	Proposed Activities
Initial 18 months	- Clarify & define actions for the initial 15 V2I issues identified - Provide Feedback on V2I Guidelines - Define Standards & Research Needs - Encourage dialog between owners/operators & OEMs - Peer exchange, technology transfer
2016 – 2021	- Define remaining issues - Track and support resolution of issues (Help seek funding) - Align and Support training & education (existing education frameworks are expected to perform the actual training & education) - ID & define additional issues - Peer to Peer exchanges - Help 'Late Adopters' plan for deployments - Feedback to Pilot Sites - Feedback to CAMP & VIIC
2021-2026	- Coordinate resolution of remaining issues - Peer to Peer between 'Early Adopters' and 'Late Adopters' - Assist Late Adopters in investment decisions - Alignment & support of training & education - Feedback to Pilot Sites, CAMP & VIIC

Members of V2I DC EC

V2I DC EC Position	Current Appointee
CEO from State DOT – AASHTO Appointed (Chair of V2IDC-EC)	Shailen Bhatt, CDOT
CEO from Public Sector – ITE Appointed	Randy Iwasaki, CCTA
Executive from Public Sector – ITS America Appointed	Carlos Braceras, UDOT
Executive from Private Sector	Trish Plonski, Xerox
CEO from Private Sector	David St. Amant, Econolite
AASHTO STSMO CV Working Group Chair	Blaine Leonard, UDOT
V2IDC Deployment Initiatives TWG Chair	Bill Legg, WSDOT
V2IDC Deployment Research TWG Chair	Greg Larson, Caltrans
V2IDC Operator, OEM, and Supplier Partnerships TWG Chair	Matt Smith, MDOT
V2IDC Deployment Guidance TWG Chair	Faisal Saleem, Maricopa County
V2IDC Deployment Standards TWG Chair	Ed Seymour, TTI
Executive Participation from USDOT FHWA (Observer Capacity)	Jeff Lindley, USDOT FHWA
Executive Participation from USDOT NHTSA (Observer Capacity)	John Harding, USDOT NHTSA
Executive Participation from USDOT ITS-JPO (Observer Capacity)	Ken Leonard, USDOT ITS JPO
Executive Committee Support	Gummada Murthy, AASHTO
Executive Committee Support	Siva Narla, ITE
Executive Committee Support	Jennifer Carter, ITS America

Coalition Updates

- http://www.transportationops.org/V2I/V2I-overview
- April 20-22, 2016 – Ann Arbor

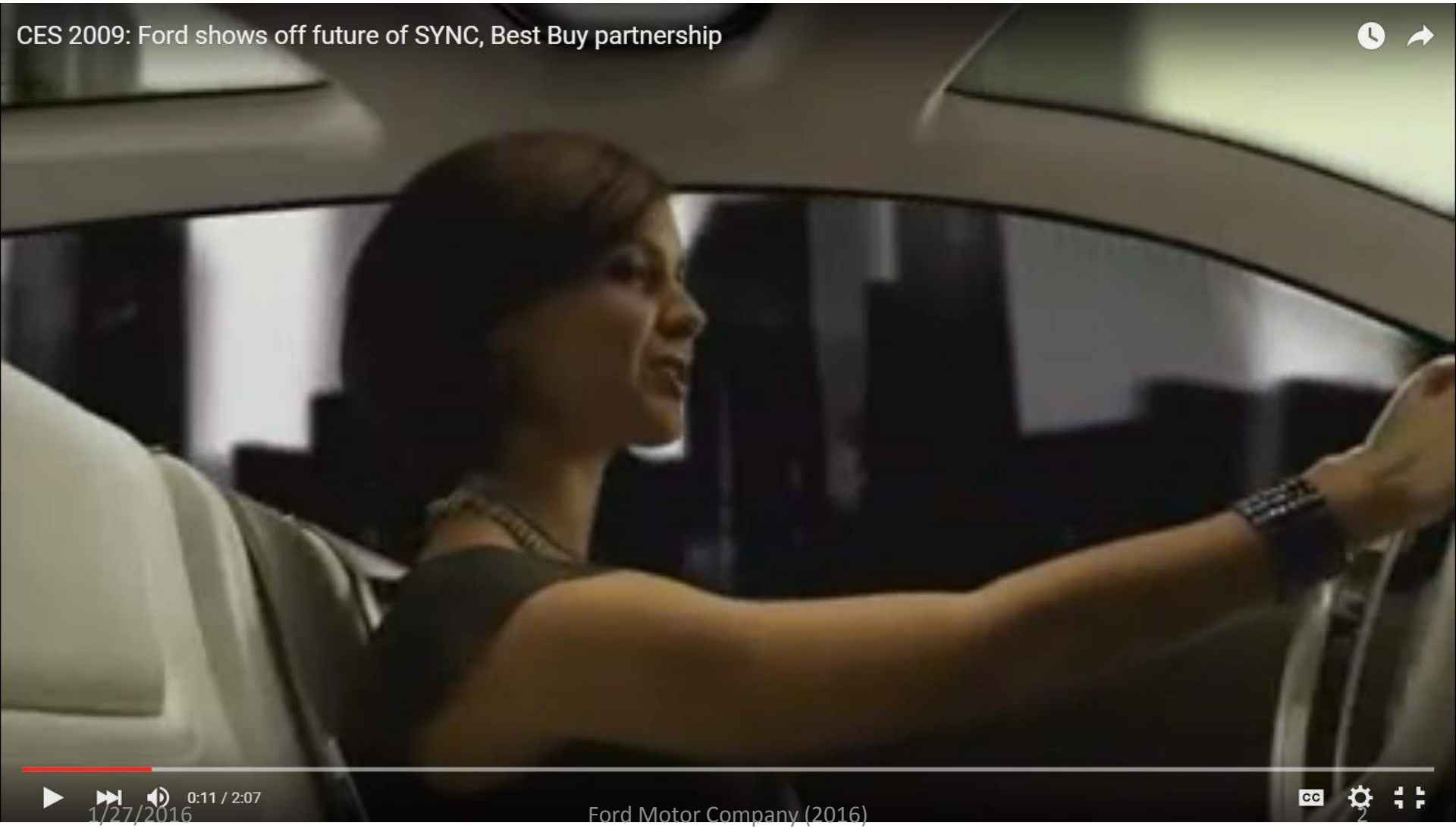
Mobile apps for Connected Vehicle Infotainment Services

Perry MacNeille

MI CAV Working Group meeting

January 27, 2016

Vision of future driving experience circa 2009

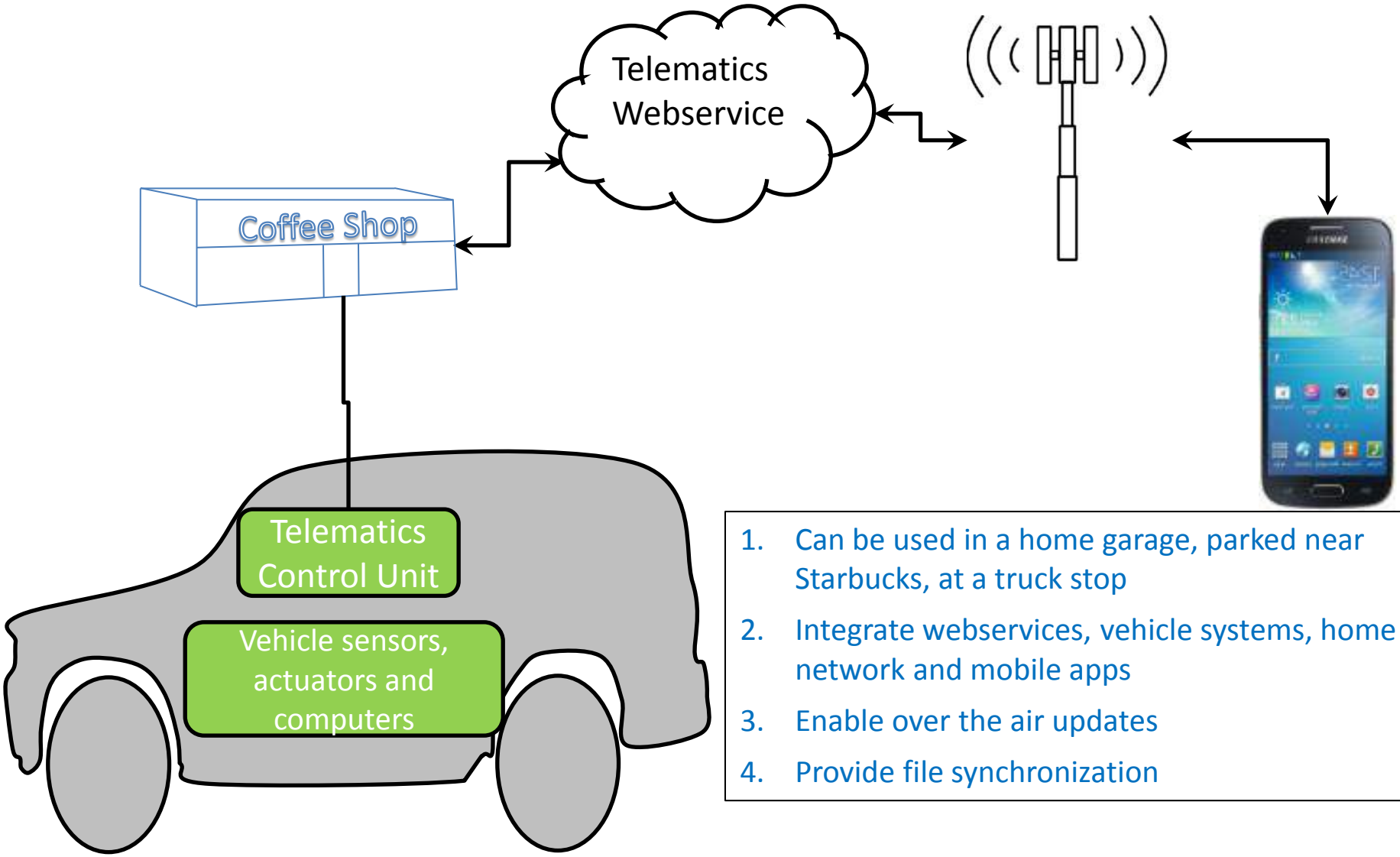


Ford Motor Company (2016)

Elements of the vision

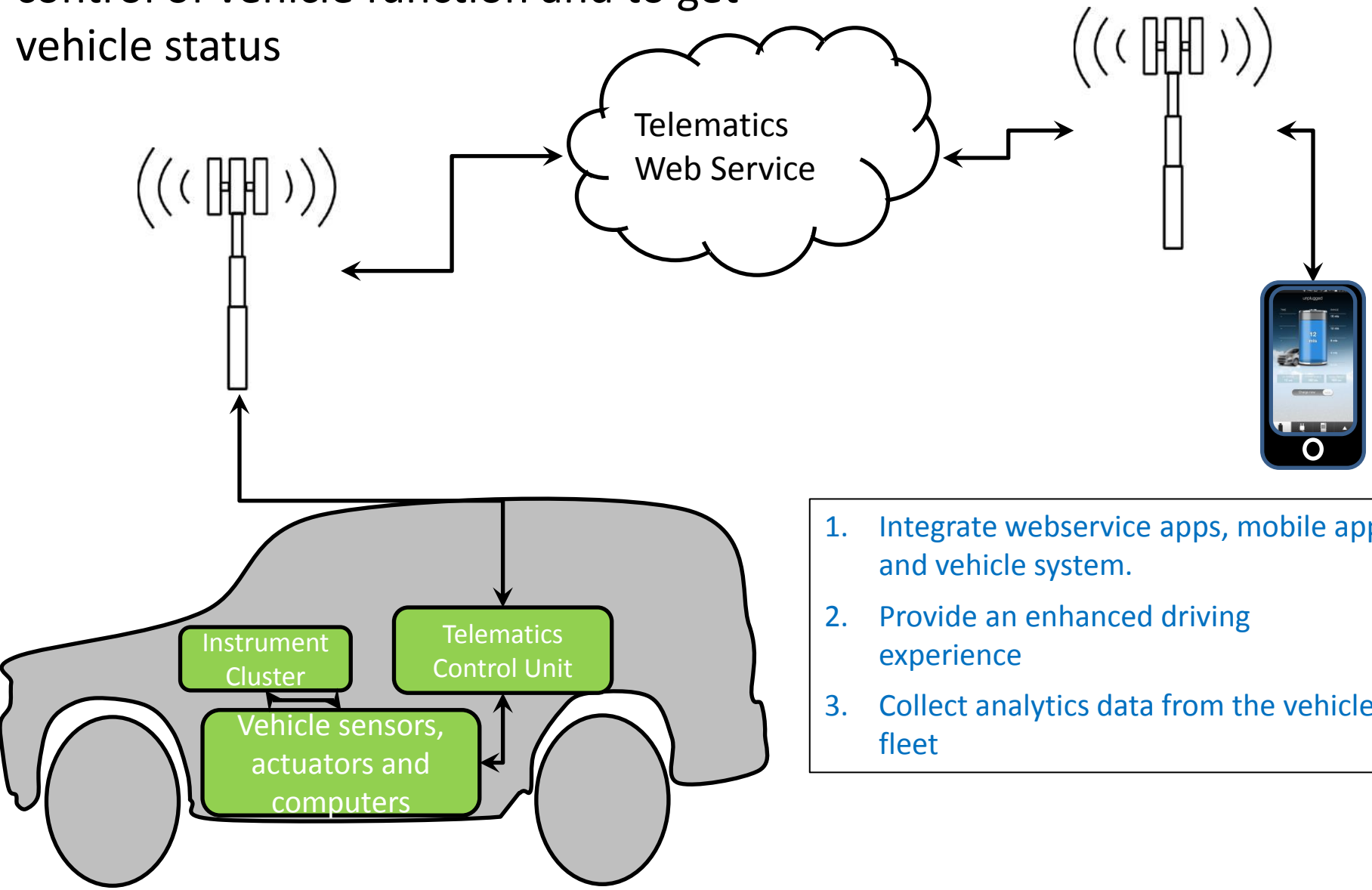
- Vehicle Information
  - Vehicle Diagnostics
  - Trip Computer
  - Fuel Economy
  - Diagnostics – ex. Notification when its time to rotate tires
  - Settings
- Messaging
  - Sends/Receives email
  - Manages calendar (with verbal notifications)
- Internet webservices
- Navigation
  - Traveler Information
  - Route Guidance – most fuel efficient route
- Mobile Phone
  - Preferences – Knows who to call based on context of the news article
- Audio
  - Private Collection; mobile device or disk
  - FM/AM/HD/SDAR Radio
  - Text-to-speed Internet news
- Emotive speech dialog system
  - Complex sentences
  - Prosody
- Recommender system
  - Reduces selections by learning operator preferences

Where Wi-Fi is available it can be used to deliver information and updates



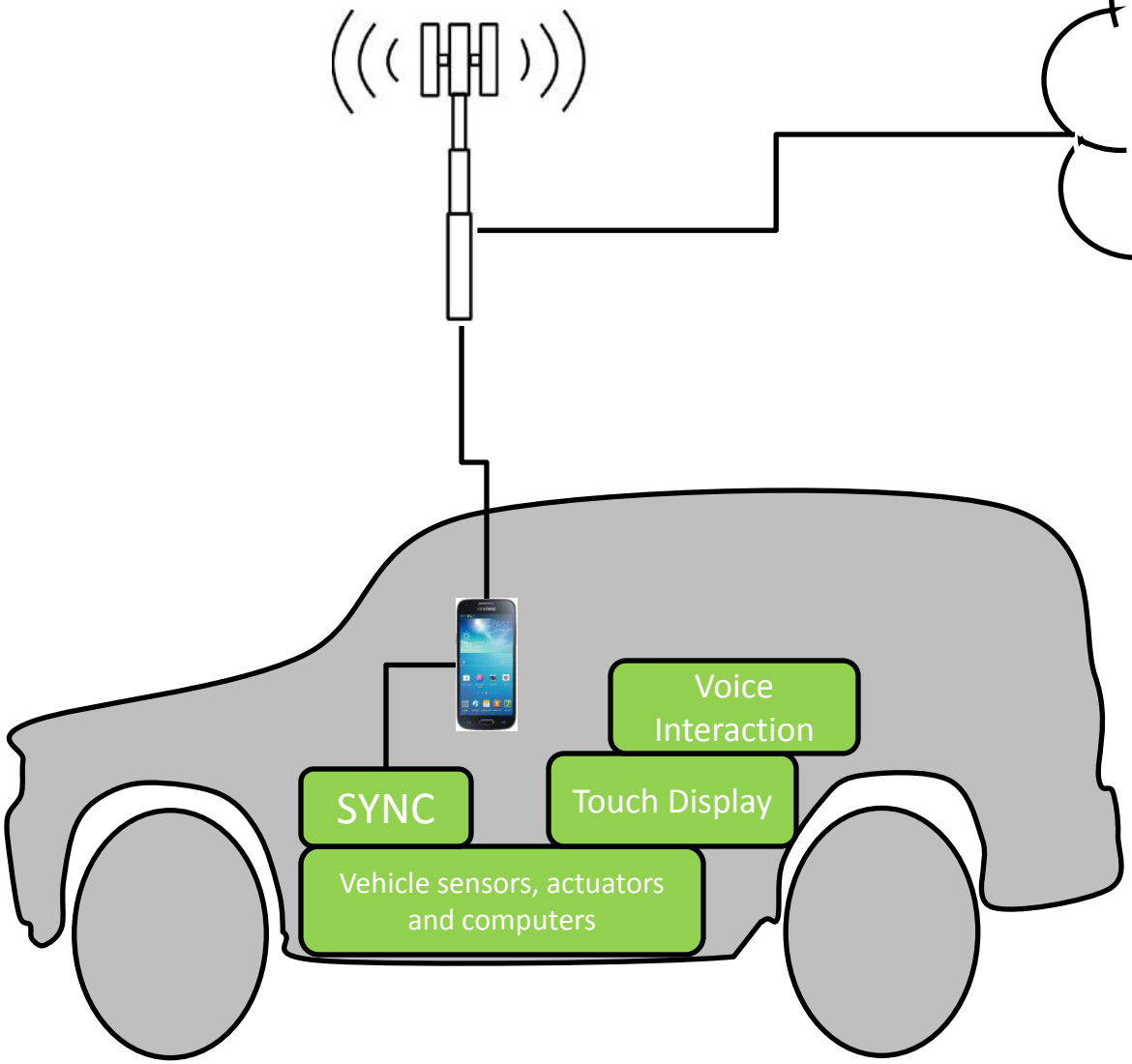
1. Can be used in a home garage, parked near Starbucks, at a truck stop
2. Integrate webservices, vehicle systems, home network and mobile apps
3. Enable over the air updates
4. Provide file synchronization

The Embedded Telematics for long-distance control of vehicle function and to get vehicle status



1. Integrate webservice apps, mobile apps and vehicle system.
2. Provide an enhanced driving experience
3. Collect analytics data from the vehicle fleet

Sync and the smartphone connection tool AppLink and Smart Device Link



Internet Webservices

- TagServers
- Weather
- News
- Prognostics
- Traveler Information
- More…

1. Integrate webservices, vehicle systems, human-machine interfaces and mobile apps in the connected vehicle
2. Provide an enhanced driving experience
3. Produce analytics data from the vehicle fleet
4. Improve advertisement effectiveness and get advertising revenue

What it looks like today

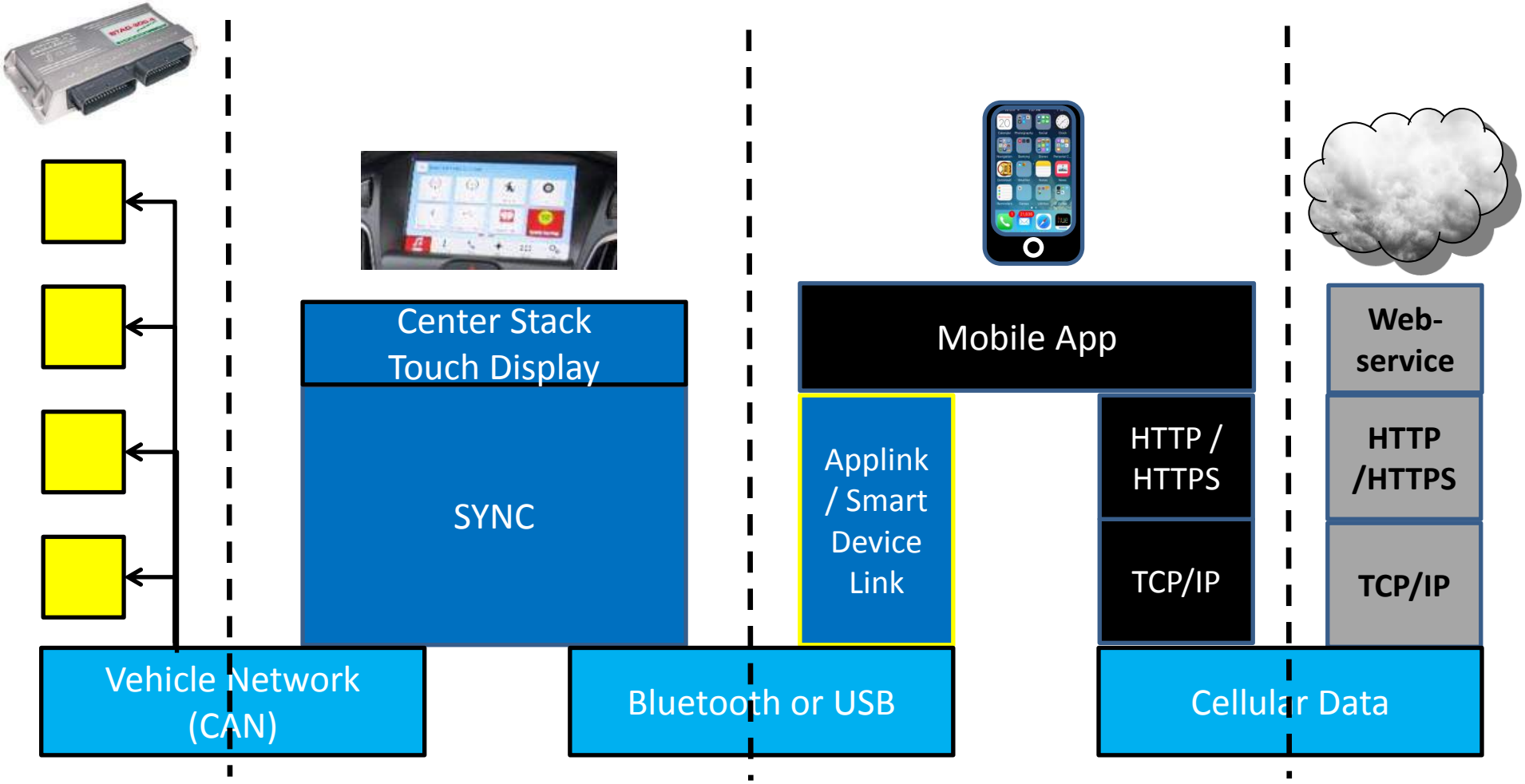
SYNC® 3 in-vehicle connectivity system:

- Google Automotive Link (GAL):
  - Theoretically supports all apps in the Google Play Store, Millions of Apps
  - Renders the mobile device screen on the center stack display
  - Accepts touch commands
- Apple Car Play:
  - Replaces the SYNC voice with Siri, mobile device receives microphone inputs
  - Renders the mobile device (iPhone, iPod, iPad, etc.) to the center-stack touch screen
  - Screen touches are transmitted to the mobile device and taken as commands
  - Uses knobs and controls in the vehicle for control
  - Outputs audio to car speakers
  - Integrates Apple wearable devices
  - Smart Phone Interface
- SmartDeviceLink and AppLink
  - Allows apps to use SYNC voice commands
  - Provides templates for controlling the center-stack display that meet NHTSA guidelines
  - Screen touches, knobs and buttons are input into the mobile app when it is active
  - Receives data from the vehicle systems devices
  - Sends data to vehicle systems devices
  - Enforces certification for branded and unbranded mobile apps
  - Smart Phone Interface

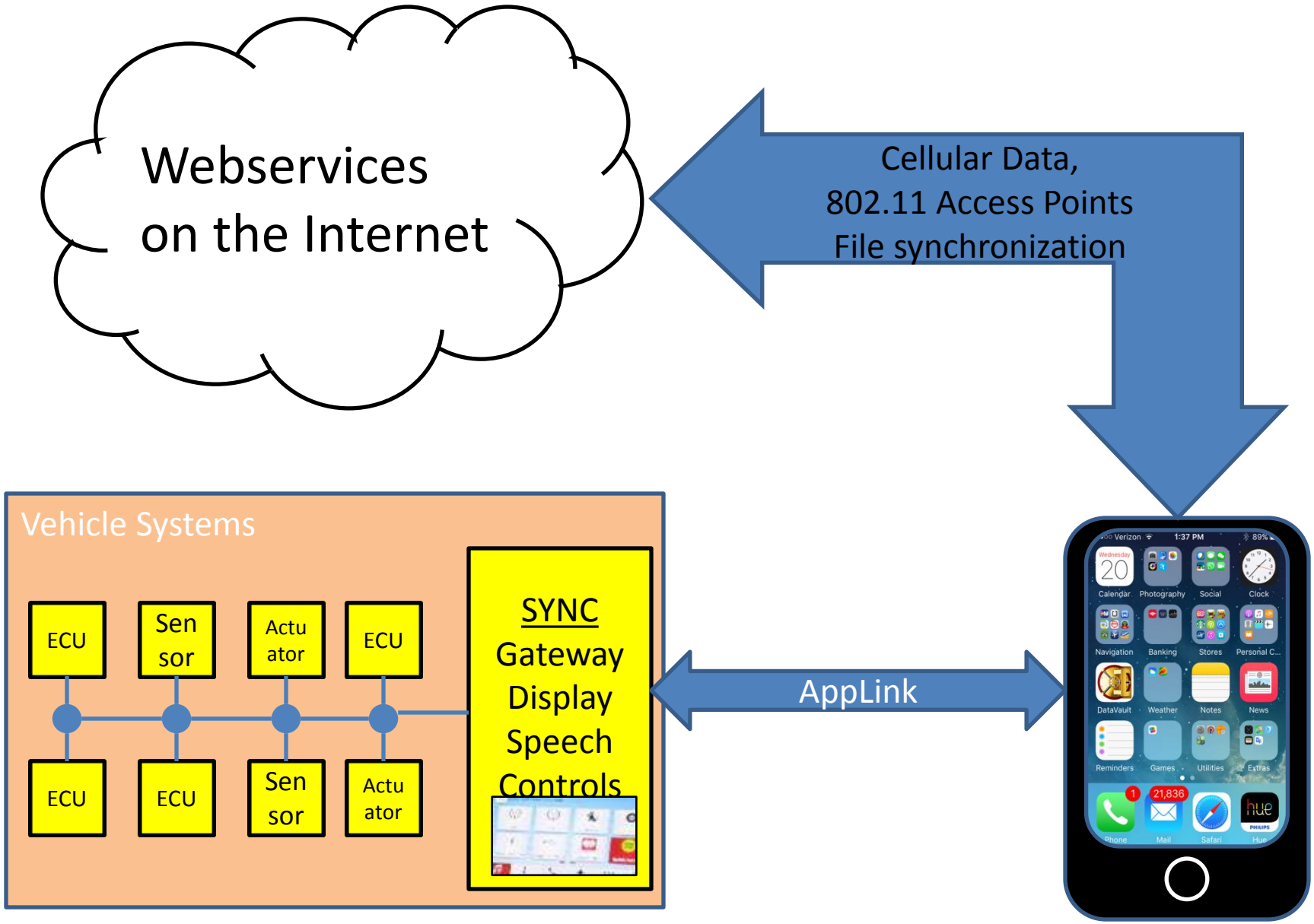
What is Applink/Smart Device Link?

AppLink SDK: Mostly the same as Smart Device Link (SDL), but with Ford proprietary extensions

SDL SDK: A subset of Applink, but open source maintained by GENIVI Alliance so developers can make their own extensions



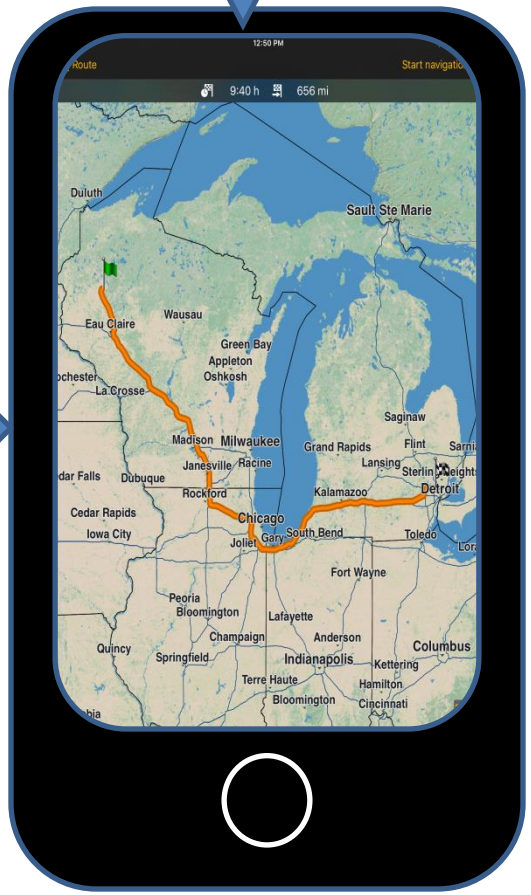
The SYNC interface can also facilitate interaction between web services and the vehicle bus



A navigation mobile app can be linked to the vehicle human-machine interface

Routing Webservices on the Internet

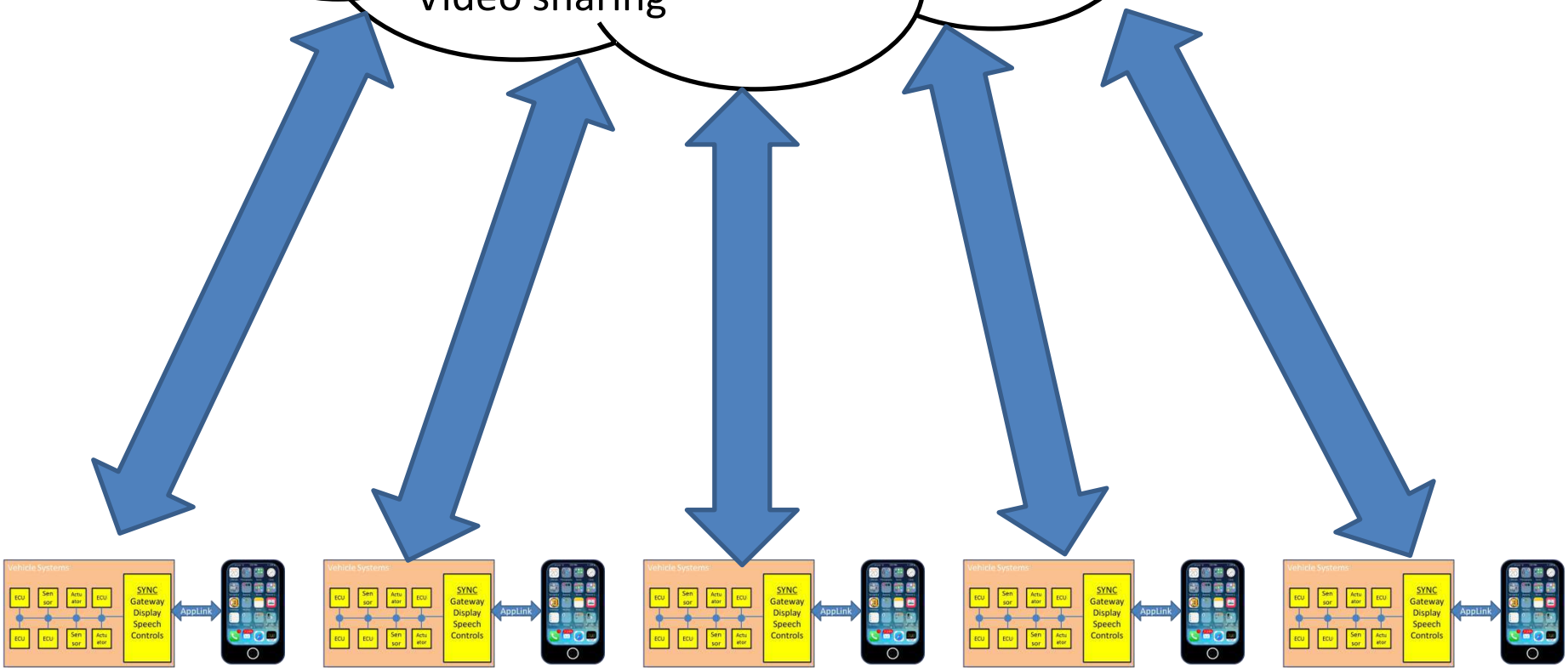
Projection of Cellphone display onto center-stack



High-latency vehicle-to-vehicle communication is supported in the connected vehicle vision

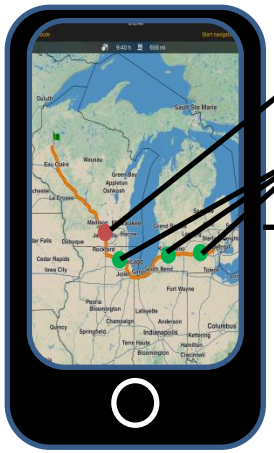
Social Network services:

- Online chat and social networking
- Text sharing
- Location Sharing
- Audio sharing
- Photo share
- Video sharing



Cars

Location sharing with apps like Glympse® exemplify low-latency one to many vehicle to vehicle communication



My Location

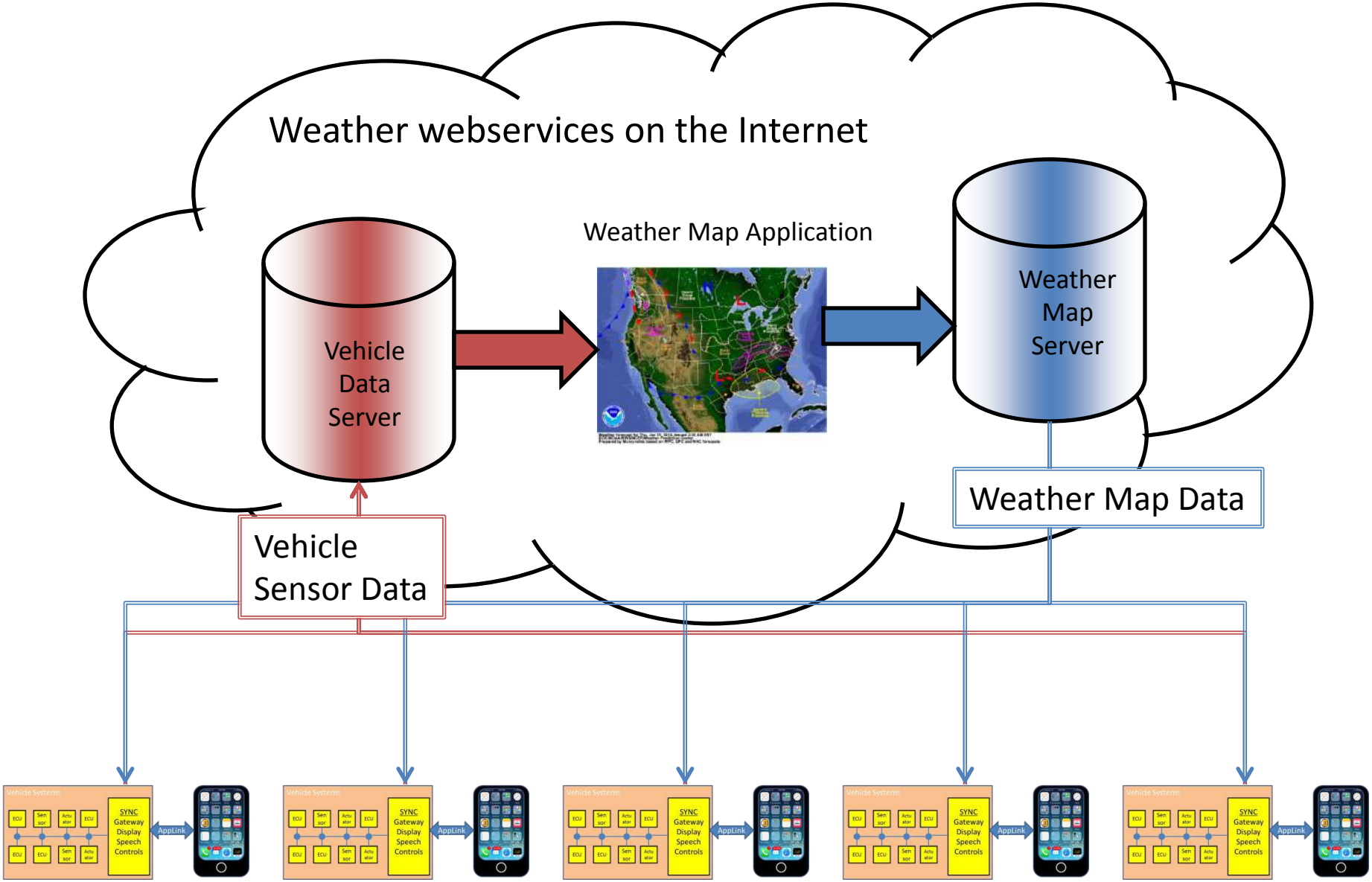
My Friend's Locations

Social Network services:

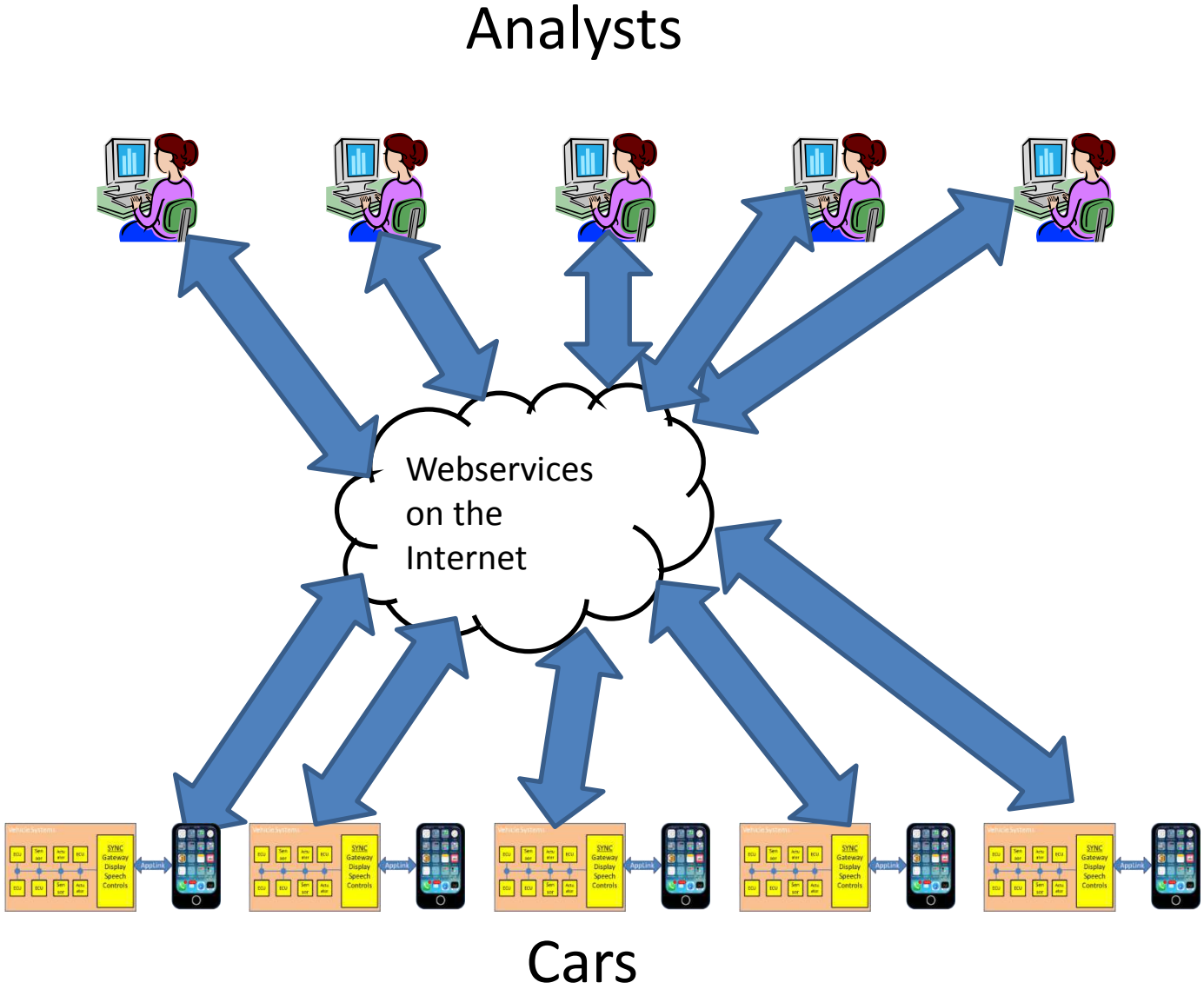
- Location Sharing

Not a friend

Weather services are potential crowdsourcing application



Supporting Analytics



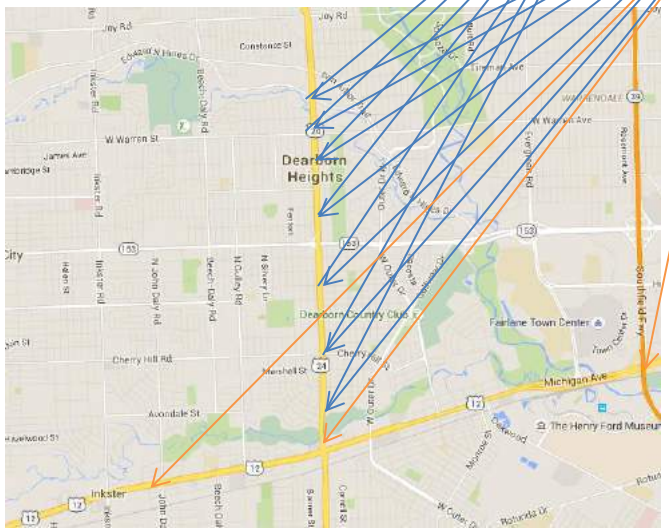
Ford Motor Company (2016)

Dynamic traffic control is an example of data collection and analytics

Traffic Information Data base

Vehicles Transmit Data from the vehicle network

- Location, Direction, Speed, Time
- Expected route
- Range to next vehicle
- Number of vehicles in the next lane
- Images from lane assist
- Etc.



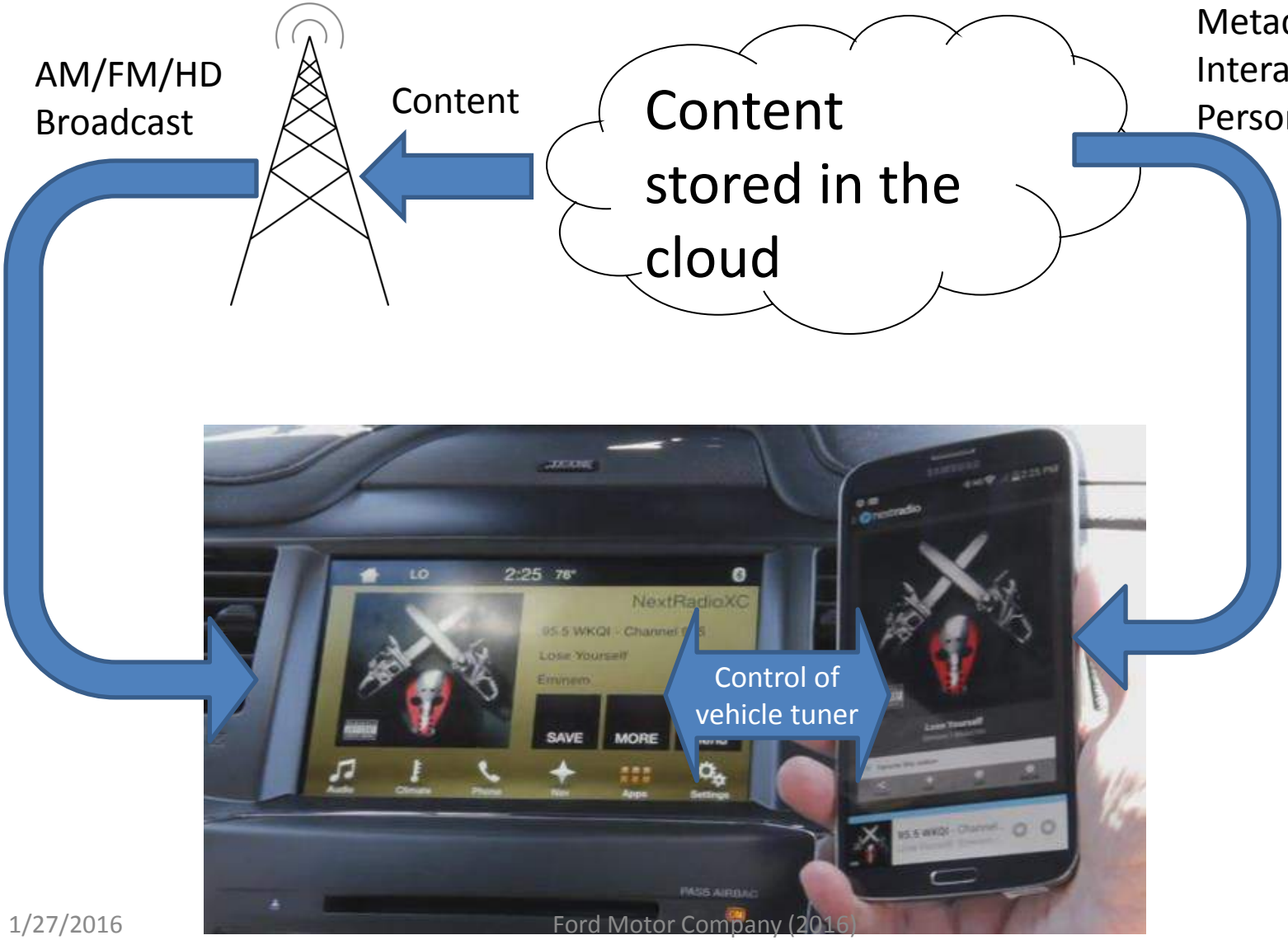
Traffic information database transmits

- Predictive travel time for route guidance
- Predictive energy consumption
- Predictive drive quality
- Parking information

Traffic information database transmits

- Signal light timing strategies

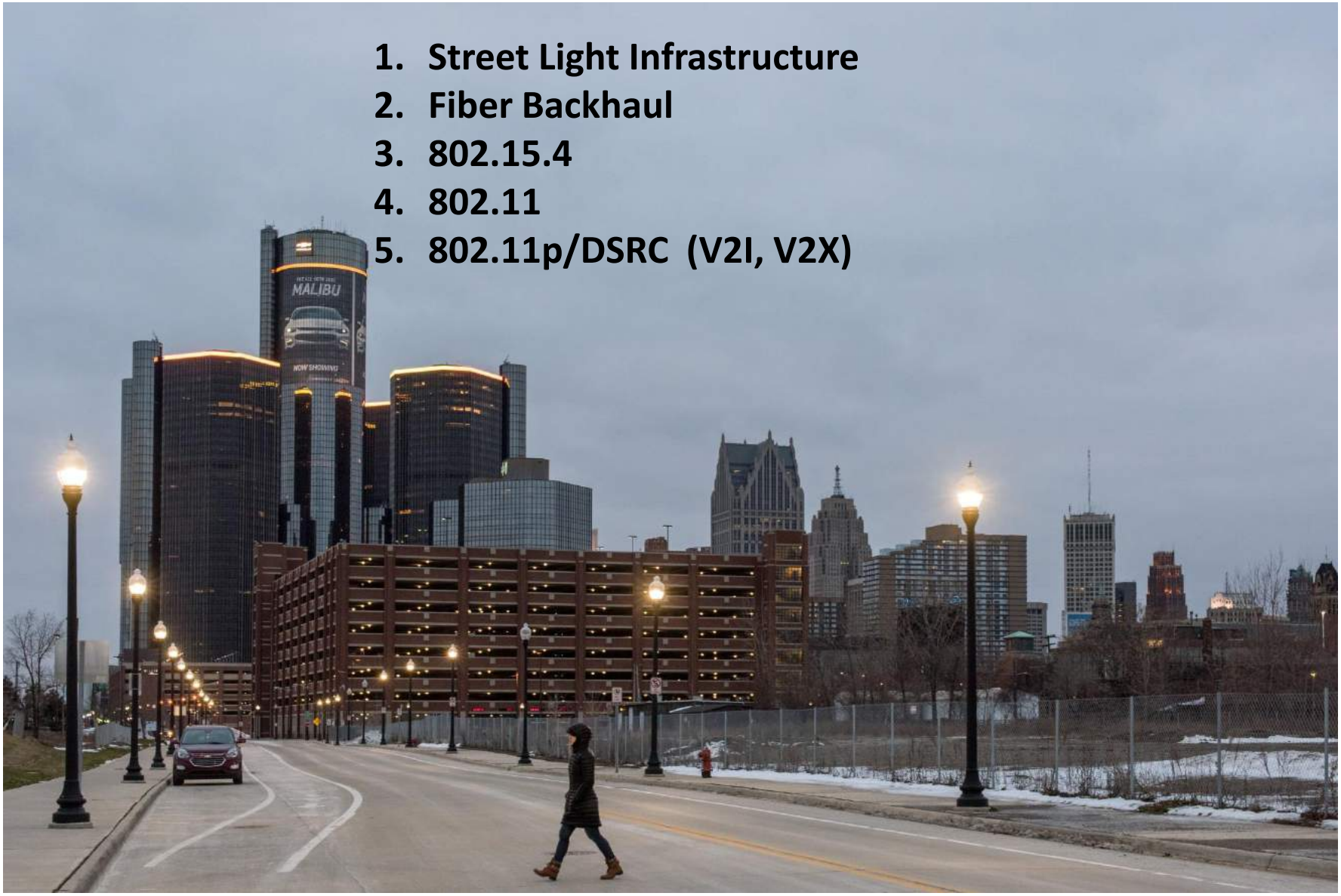
Hybrid Radio

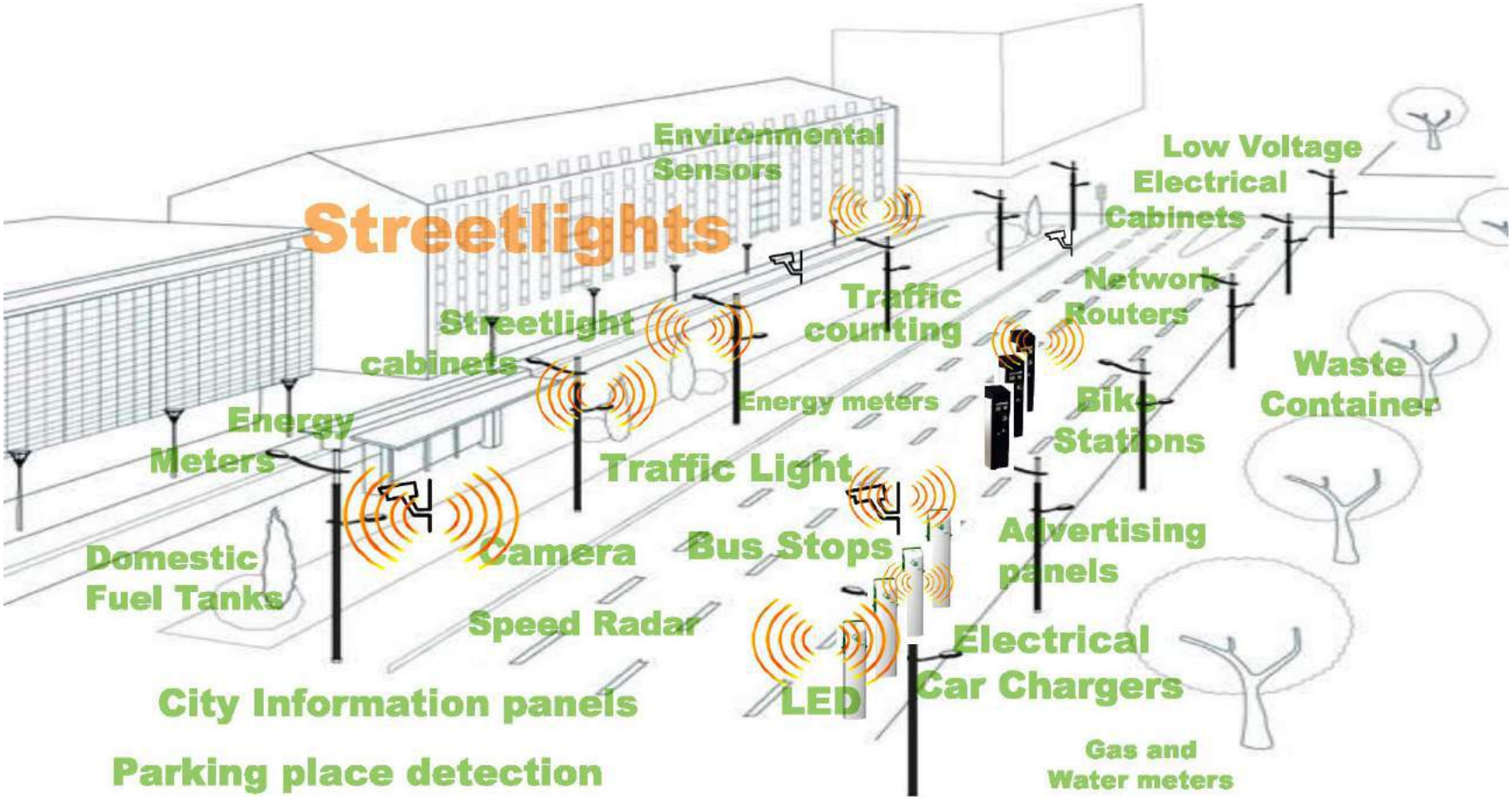


Ford Motor Company (2016)

Public Lighting Authority

Installing Entirely New “Highway” Citywide



1. Street Light Infrastructure
2. Fiber Backhaul
3. 802.15.4
4. 802.11
5. 802.11p/DSRC (V2I, V2X)

Capabilities