



Michigan Connected and Automated Vehicle Working Group

January 29, 2020



Meeting Packet

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

Michigan Connected and Automated Vehicle Working Group



January 29, 2020

1 pm - 4 pm

FEV North America Inc.

1300 Harmon Road, Auburn Hills, 48326

Meeting Agenda

12:30 PM **Registration and Networking**

1:00 PM

Introduction and Update

Zahra Bahrani Fard, Transportation Systems Analyst, Center for Automotive Research

FEV NA Inc. Welcome Remarks

Patrick Hupperich, President and CEO, FEV NA Inc.

Siemens Chip to City

Eric Gannaway, Senior Sales Executive, Siemens Industry Inc. Mobility & ITS Division

Verizon and Mcity Partnership Overview

Anthony Magnan, Head of Emerging Vehicle Technology, Verizon

DOE'S SMART Mobility Consortium R&D Program Insights

Thomas Wallner, Manager of the Advanced Mobility Technology Laboratory, Argonne National Laboratory, Center for Transportation Research

2:20 PM **Networking Break**

2:40 PM **Hot Topics Discussion**

Frank Perry, Principal Consultant, CAV Program Manager, WSP

Update on MDOT CAV Activities

Joe Gorman, Connected Vehicle Engineer, Michigan Department of Transportation

Autonomous Vehicles and Their Implications for Powertrain

Mayank Agochiya, Managing Director, FEV Consulting, Inc.

Emerging Technology, Workforce Development

Michele Economou Ureste, Executive Director, Workforce Intelligence Network (WIN)

4:00 PM **Meeting Adjourned**

Michigan Connected and Automated Vehicle Working Group

January 29, 2020



Meeting Notes

The Winter 2020 meeting of the Michigan Connected and Automated Vehicle Working Group was held on January 29, 2020, and hosted by FEV located at 4130 Luella Ln, Auburn Hills, MI 48326.

Zahra Bahrani Fard, Transportation Systems Analyst, CAR, welcomed the Michigan CAV Working Group attendees, reviewed the meeting agenda, and mentioned noteworthy CAV (and related) news.

Patrick Hupperich, President and CEO, FEV NA Inc., also welcomed the attendees to FEV. Mr. Hupperich highlighted FEV's global business footprints in Europe, North America, and Asia, and its development capabilities in automated driving, smart drive, and powertrain. FEV is also one of the service providers for NAIAS 2020 Michigan Mobility Challenge.

Eric Gannaway, Senior Sales Executive, Siemens Industry Inc., spoke about the history of SIEMENS and its evolving role in the advanced mobility industry. Siemens intelligent traffic systems support efficient and integrated mobility solutions. Siemens solutions are demonstrated in various projects across the United States, such as NYC connected vehicle project and Wyoming DOT connected vehicle pilot.

Anthony Magnan, Head of Emerging Vehicle Technology, Verizon, presented "Verizon and Mcity Partnership Overview." Mr. Magnan highlighted the capabilities of 5G network, including speed, low latency, reliability, ability to scale, and flexibility. 5G's low latency computing enables cloud servers to run closer to endpoints, reducing latency and speeding up local processing for data-intensive applications, including autonomous vehicles. Mr. Magnan also introduced Verizon's role in Mcity Leadership Circle. In the partnership with MCity, Verizon is responsible to upgrade the existing 5G systems and also provide C-V2X solutions.

Thomas Wallner, Manager of the Advanced Mobility Technology Laboratory, Argonne National Laboratory, Center for Transportation Research, provided insights into DOE'S SMART Mobility Consortium R&D Program. The SMART Mobility Consortium is a multi-year, multi-laboratory collaborative dedicated to further the understanding of energy implications and opportunities of advanced mobility solutions. There are five research focus areas: advanced fueling infrastructure, urban science, multi-modal freight, mobility decision, and CAV. Mr. Wallner provided examples of the energy impacts of truck platooning, CAV, and smart mobility applications.

After the networking break, **Scott Shogan, VP of WSP**, started the hot topic discussion by highlighting the guiding principles of AV 4.0 issued by USDOT in January 2020. Key takeaways include 1) the document is more of an affirmation of the government position than a new policy document; 2) the AV

4.0 emphasizes on coordinating activities across the federal government; 3) focuses on promoting choices in mobility options; 4) directly addresses deceptive marketing and overstatement of capabilities; and 5) acknowledges the importance of the 5.9GHz spectrum and states USDOT's strong support for preservation for transportation safety applications. **Frank Perry, Principal Consultant, CAV Program Manager, WSP**, continued the discussion by introducing FCC Notice of Proposed Rulemaking: 5.9 GHz Spectrum Realignment. The rulemaking will have broad impacts on V2X applications, but it's likely to be postponed until after the November 2020 election.

Joe Gorman, Connected Vehicle Specialist, Michigan Department of Transportation, provided updates on MDOT's statewide CAV activities, including Updated pavement marking policy, central signal control system, 5.9 GHz band regulation, and the NAIAS 2020 Michigan Mobility Challenge progresses,

Mayank Agochiya, Managing Director, FEV Consulting, Inc., presented "Autonomous Vehicles and Their Implications for Powertrain." Mr. Agochiya highlighted outcomes of a global consumer survey about perceptions on CAV and purchasing preferences, followed by discussions on AV technology roadmaps, FEV's dynamic market model, application scenarios, and results in quantifying the impact on future mobility and powertrain.

Michele Economou Ureste, Executive Director, Workforce Intelligence Network (WIN), spoke about emerging technology and workforce development. WIN includes participants from ten Michigan community colleges and six Michigan Works! agencies. Ms. Ureste mentioned that a report on CAV skills gap analysis will be released in March 2020, which will cover employment in emerging tech sectors, available talent pool, regional strength, educational needs, and new training opportunities that community colleges could provide.

The meeting adjourned at 4:00.

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 (agenda, meeting notes, attendance, and presentation slides) from past Michigan Connected and Automated Vehicle Working Group meetings are also available on this page.

Michigan Connected and Automated Vehicle Working Group

January 29, 2020



Attendance List

First	Last	Organization
John	Abraham	Macomb County Roads
Mayank	Agochiya	FEV North America Inc
Niles	Annelin	MDOT
Zahra	Bahrani Fard	CAR
Carla	Bailo	Center for Automotive Research
Jason	Beatty	Square One Education Network
Richard F.	Beaubien, PE, PTOE	Beaubien Engineering
Frank	Billotto	DuPont
John	Catterall	AutoSteel Partnership
Jasna	Cehaja	MDOT
Curt	Chowanic	Macomb County Economic Development
Terry	Croad	City of Southfield
Ben	Cruz	Macomb Community College
Dana	Dake	MDOT
Keith	Deyer	DMA
Angela	Dragan	Bosch

First	Last	Organization
Keith	Elsej	DuPont
Brian	Esterberg	American Iron Steel Institute
Sandra	Estevez	GKN Automotive
Edgar	Faler	Center for Automotive Research
Kevin	Frayne	BraunAbility
Sterling	Frazier	Atkins
Terni	Friorelli	CAR
Christophe	Gaillard	Aisin
Eric	Gannaway	Siemens Mobility ITS
Joe	Gorman	MDOT
Neil	Gudsen	Washtenaw Community College
Murtada	Hamzawy	Block Harbour
Bradford	Herron	Cohda Wireless
Kim	Hill	HWA Analytics
Qiang	Hong	CAR
Patrick	Hupperich	FEV North America Inc
Gina	Jackson	Michigan State University
Rachel	Jones	The Road Commission For Oakland County
Adit	Joshi	Ford Motor Company
Matt	Junak	HNTB
Sean	Kelley	Mannik Smith Group
Nelson	Kelly	Macomb Community College
Dan	Kiel	Cohda Wireless
John	Krzesicki	Power Systems Research

First	Last	Organization
Scott	LaForest	Kettering University
David	Lalain	AIAG
Barb	Land	Square One Education Network
Alan	Lecz	Washtenaw Community College
Viola	Liddell	CBRE
Steven	Litz	Powerlink Systems
Anthony	Magnan	Verizon Wireless
Mike	Miller	Orion Measurement Solutions
Mahendra	Muli	dSPACE Inc
Meredith	Nelson	MDOT
Hayram	Nicacio	EDC Group LLC
Emeka	Nriagu	CAR
Parwaiz	Nur	Tyme Consulting Engineers, Inc.
Doug	Patton	Jupiter Consulting LLC
Frank	Perry	WSP
Nolan	Perry	Oak Ridge National Lab
Prajakta	Pimple	Mercedes-Benz Research & Development NA
Steven	Puuri	Michigan County Road Association
Jeff	Rehm	Cloudmade
Thierry	Rolina	Danlaw
Alan	Rudnick	Mechanical Simulation Corp
Troy	Schilling	Bosch
Colin	Schmucker	PPG
Bret	Scott	Wejo, Ltd.

First	Last	Organization
Mike	Shapiro	CAR
Scott	Shogan	WSP
Bill	Shreck	MDOT
Eric	Siniard	AT&T / Road Commission for Oakland County
Tim	Slusser	NextEnergy
Andrew	Smart	Andrew Smart Consulting LLC
Milan	Stevanovich	Detroit Chinese Business Association
Gary	Streelman	Mareli
Dale	Suich	Independent
Venki	Sundarraaj	Triz Engineering
Chris	Talwar	FEV North America Inc
Oge	Udegbumam	Tyme Consulting Engineers, Inc.
Michele	Ureste	WIN
Bill	Veenhuis	NVIDIA
Richard	Wallace	HWA Analytics
Thomas	Wallner	Argonne National Laboratory
Jeff	Warra	Intrepid Control Systems
Patrick	Weldon	Polaris Industries Inc
Andrew	Whydell	ZF Group
Richard	Williams	WAYS
Gareth	Williams	Pi Innovo
Ken	Yang	AECOM

Michigan Connected and Automated Vehicle Working Group



Presentations



Michigan Connected and Automated Vehicle Working Group

Zahra Bahrani Fard, Transportation systems Analyst, CAR

January 29, 2020

FEV North America Inc. Auburn Hills

Meeting Agenda

1:00 PM Introductions and Update

Zahra Bahrani Fard, Transportation Systems Analyst, CAR

Welcome Remarks

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Verizon

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Update on MDOT CAV Activities

Joe Gorman, Connected Vehicle Engineer, Michigan
Department of Transportation

Autonomous Vehicles and Their Implications for Powertrain

Mayank Agochiya, Managing Director, FEV Consulting, Inc

Emerging Technology Workforce Development

Michele Economou Ureste, Executive Director, Workforce
Intelligence Network (WIN)

4:00 PM Meeting Adjourned

Tour of FEV Vehicle Development Center

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



Thank you to our
hosts!

CENTER FOR AUTOMOTIVE RESEARCH

The FEV logo is rendered in a bold, red, italicized sans-serif font. The letters are thick and have a slight slant. The 'F' and 'E' are connected at the top, and the 'V' is also connected to the 'E'. The logo is positioned inside a large, light blue circular graphic that has a rough, hand-painted edge. The background of the slide is white, with a faint, light blue circular pattern in the upper right corner.

From Chip to City: The Future of Mobility

Siemens Digital Industries Software



Werner von Siemens

Founded Siemens & Halske October 12th 1847

400,000
Employees
190 Countries
290 facilities
\$115,000,000,000

Siemens Industry Inc.



- Telegraph
- Electric Trains
- Lightbulbs
- Powered the first electric street lighting
- manufacture radios, television sets, and electron microscope

By 1901

SIEMENS
Ingenuity for life

Efficient and Integrated Mobility

Siemens Intelligent Traffic Systems

Unrestricted © Siemens Industry, Inc. 2018

usa.siemens.com/intelligenttraffic

Organizational structure of the Mobility Division U.S. and Canada



Mobility Division

Marc Buncher
(CEO)

Marsha Smith
(CFO)

Business Units

Rail Automation



John Paljug Business Head
Stefan Heckrath Commercial Head

#1 US provider of signaling and control systems for worldwide mass transit and mainline rail services

Intelligent Traffic Solutions



Marcus Welz Business Head
David Buchfuehrer Commercial Head

Intelligent solutions for improving mobility on roads while also increasing safety and protecting the environment

Rail Electrification



Andreas Thon Business Head
Miriam Scheer Commercial Head

Electrification systems for traction power supply, contact lines and network control technology for mass transit and mainline rail systems as well as for industrial applications

Rolling Stock



Michael Cahill Business Head
Chris Halleus Commercial Head

Short-distance, regional and long-distance rolling stock, and product and system solutions for passenger rail transport

Customer Services



Chris Maynard Business Head
Michael Tyler Commercial Head

Services and tools for rail infrastructure and rolling stock providing support throughout the life of customer vehicles

NYC Connected Vehicle Project

For Safer Transportation

WYOMING DOT Connected Vehicle Pilot

THEA **Connected** Vehicle Pilot



Tampa, FL

Providing vehicle-to-infrastructure technology to improve safety and efficiency

- First of its kind USDOT funded V2I project in the US.
- V2I technology will enable vehicles and pedestrians to communicate with traffic infrastructure like intersections and traffic lights in real-time to reduce congestion specifically during peak rush hour in downtown Tampa.
- Technology will significantly improve safety and reduce greenhouse gas emissions.

Port of Los Angeles and Long Beach, CA

First eHighway System Demonstration in U.S.

- Siemens truck electrification technology has potential to reduce emissions and improve air quality
- One mile of Alameda St. in the City of Carson has been equipped with catenary infrastructure
- \$20,000 of fuel savings could be achieved by a California Class-8 truck driving 100,000 miles on e-highways
- 6 million tons of CO₂ in annual savings possible in Calif. alone

City of New York

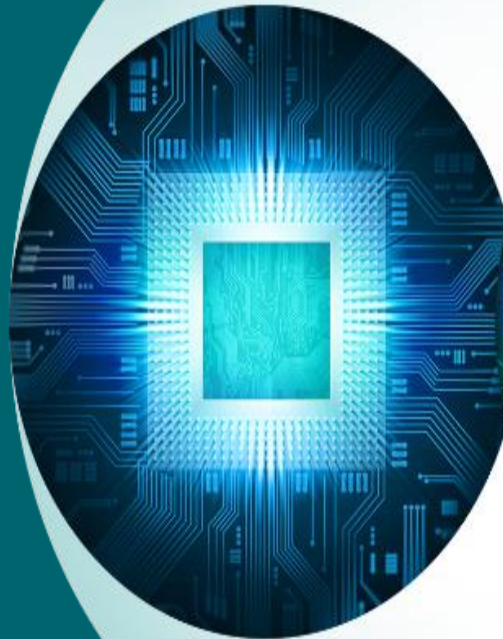
Charging infrastructure to power New York electric bus

- Holistic portfolio of eBus charging infrastructure, from grid to bus, including Medium Voltage Switchgear, High Power Chargers and vehicle onboard components.
- Experience a smoother ride with no pollution, less noise and less vibration.
- Electrical infrastructure will charge buses quickly at either end of the route, eliminating the need to send buses back to a depot or central charging location.



Autonomous and Automated System Design

Design of safe and efficient vehicle AV systems



**CUSTOM IC
DESIGN**



**AV CONTROL
SYSTEM DESIGN**



**AV SENSOR/VEHICLE
SIMULATION**



Bytemark

SIEMENS
Ingenuity for life

 **HaCon**

 **Bentley**

tassinternational
A Siemens Business

Simcenter Amesim

SIEMENS
Ingenuity for life







USDOT 4.1 Compliant
Compatible with CV production vehicles
OmniAirCertification
Future proof –SCMS compliance
WiFi/Bluetooth integrated
Collect travel times also from non-CV vehicles
LTE integrated
Fast backhaul connection without additional HW
Wide range of apps from CV pilots
Address almost any CV project in the market
Powerful dual core CPU
Allows for edge computing and future extensions
Browser based Service GUI
Reduced maintenance and reduced failure rate
Free internal slot for future extension with 5G/C-V2X module
5G/C-V2X Ready

SIEMENS

Ingenuity for life

Verizon 5G

Anthony Magnan, CVP
Head of Emerging Vehicle Technology

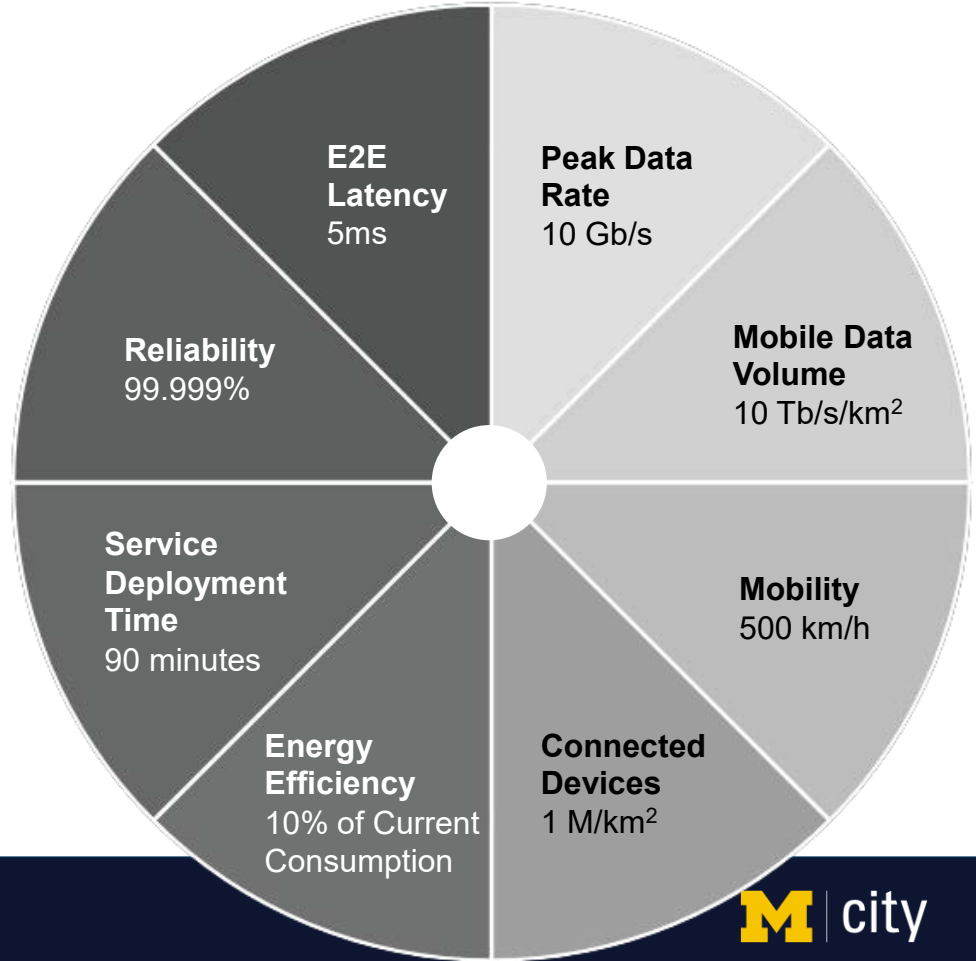
Verizon – Mcity Partnership

[Up to Speed Announcement](#)

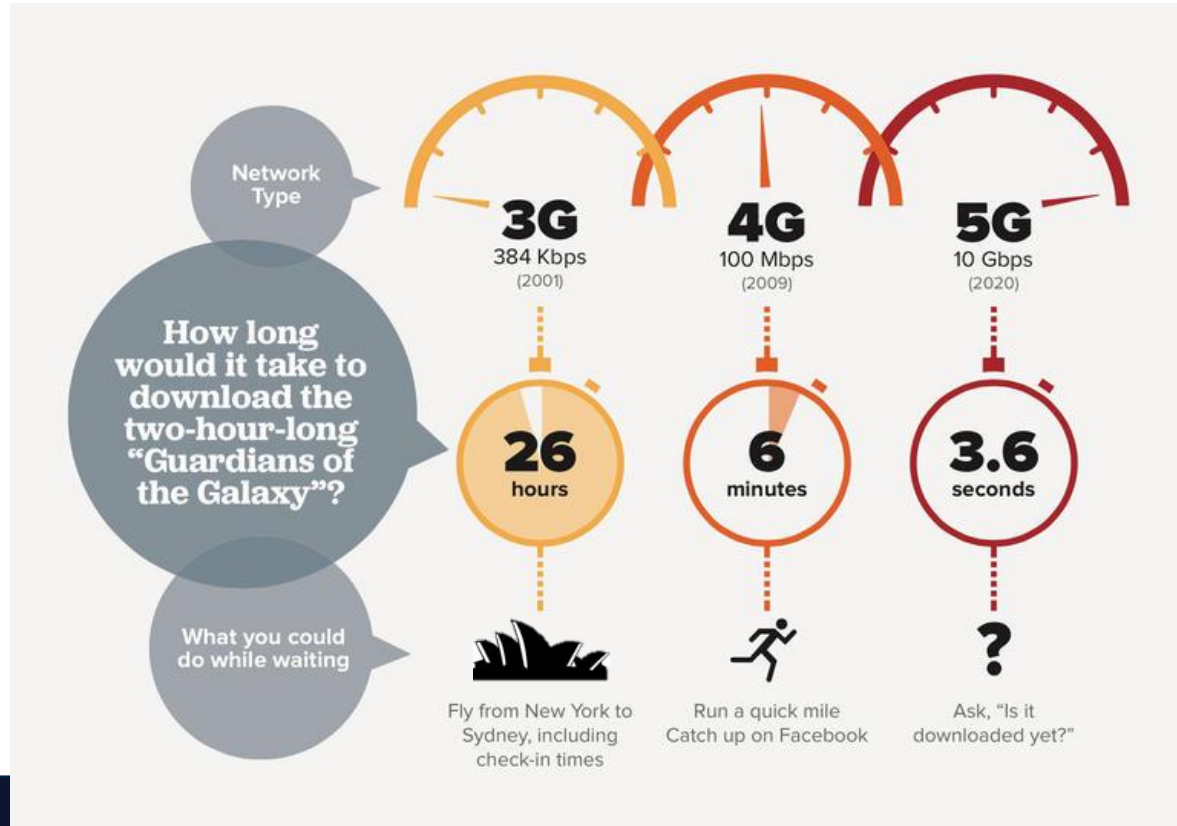
5G^v

The Eight Currencies of 5G^v

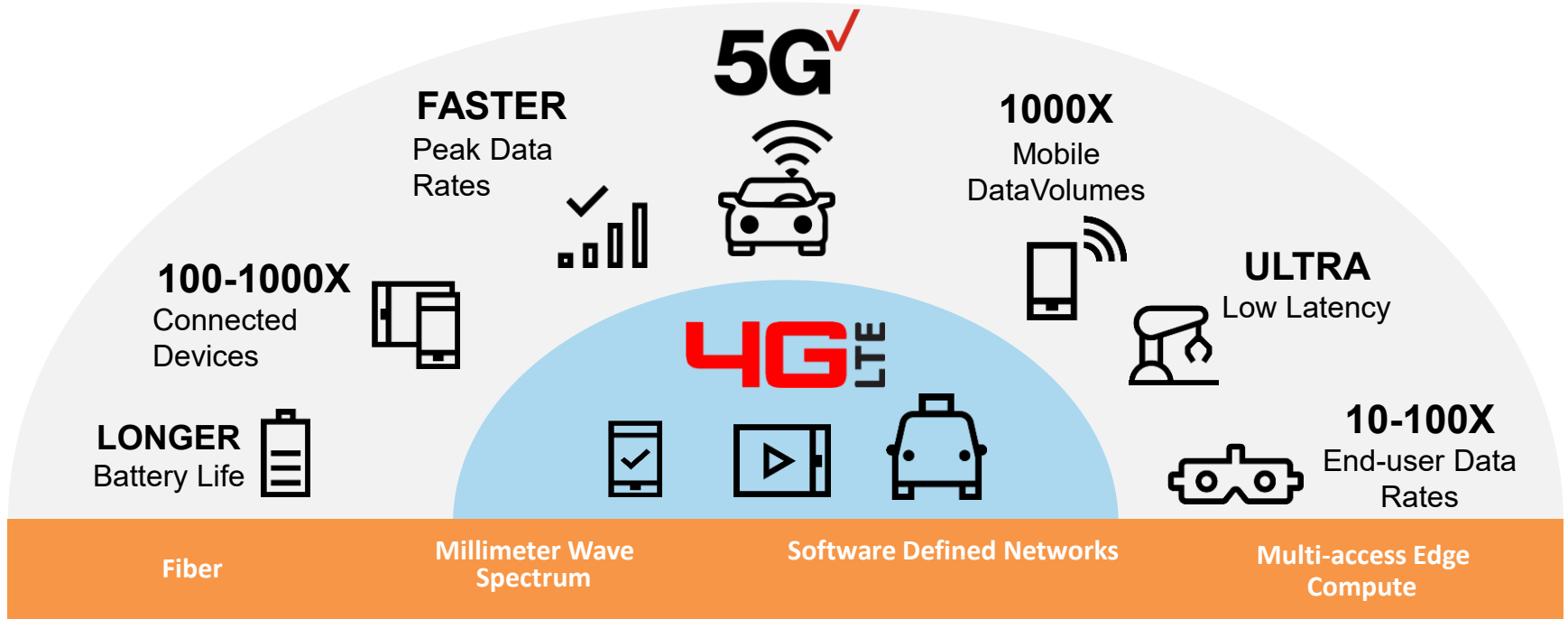
5G is the next generation of wireless technology that builds on the foundation of the 4G network.



What can it do?



5G UWB expected capabilities vs. 4G



Network Rapidly Evolving Across Several Fronts...

Density

Higher Capacity

Higher
Throughput

Virtualization

Low Latency
Computing

Scale

Network Slicing

Security

Software defined

Business
Flexibility

IOT, Media,
Mobile

We don't wait for the future. We build it.

verizon✓

5G LLC
(MEC)

Low Latency
Computing with 5G
networks



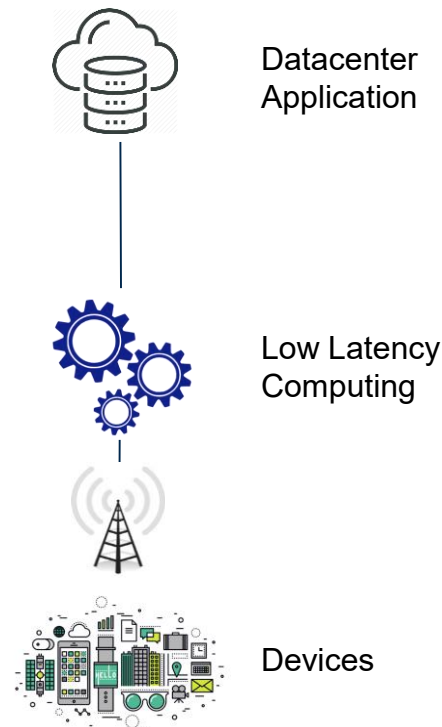
What is Low Latency Computing (LLC)?

LLC provides IT services and cloud-computing capabilities:

- Based on a virtualized platform
- The LLC framework enables applications to run closer to subscribers:
 - Reduces latency, ensures highly efficient network operation and service delivery, and offers an improved user experience
 - Used to connect and control devices remotely, analyze and provide real time provisioning and analytics

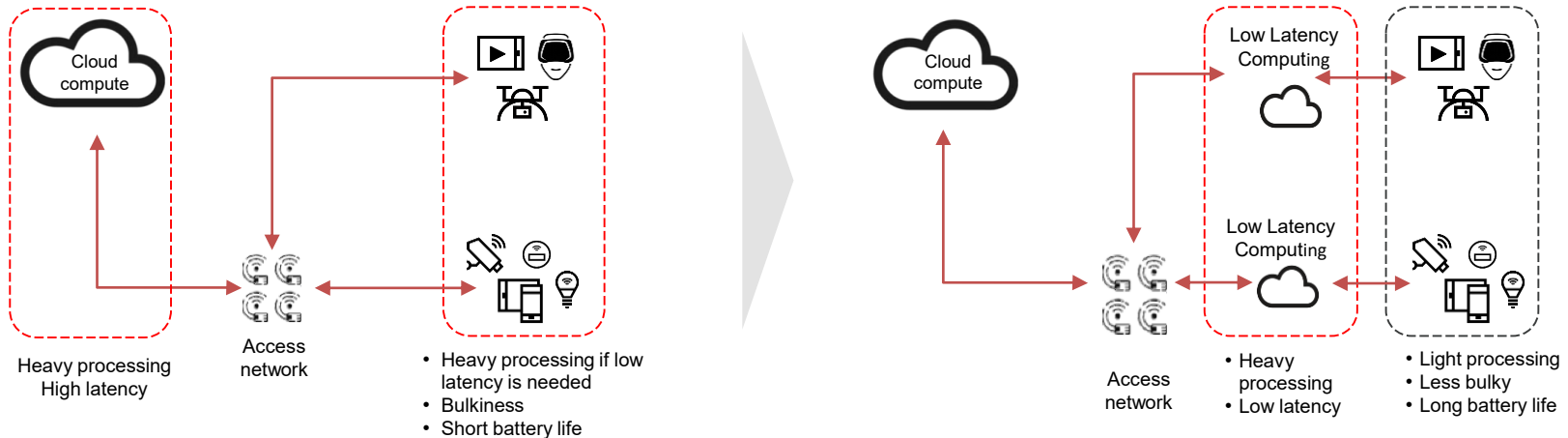
LLC servers can be located at different places within the Radio Access Network depending on technical and business requirements:

- eNodeB/gNodeB
- Cell aggregation site (C-RAN)
- Central office



Innovation and value creation at the network edge

LLC will enable cloud servers to run closer to endpoints, reducing latency and speeding local processing for data-intensive applications.



Performance

Enables ultra-low latency and high bandwidth

Context aware

Real-time access to radio network context info

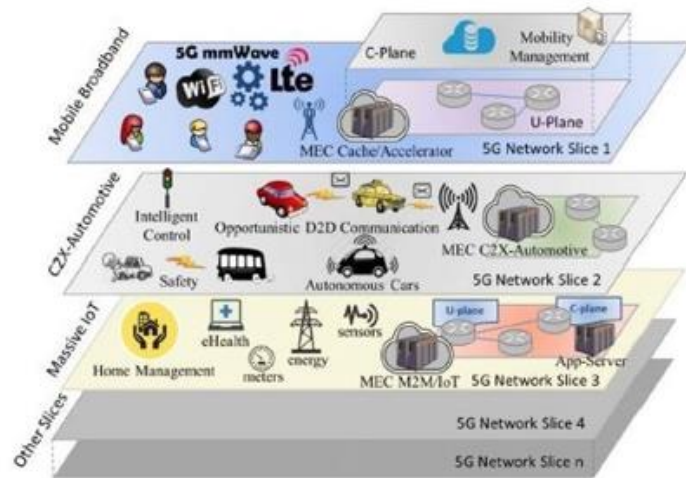
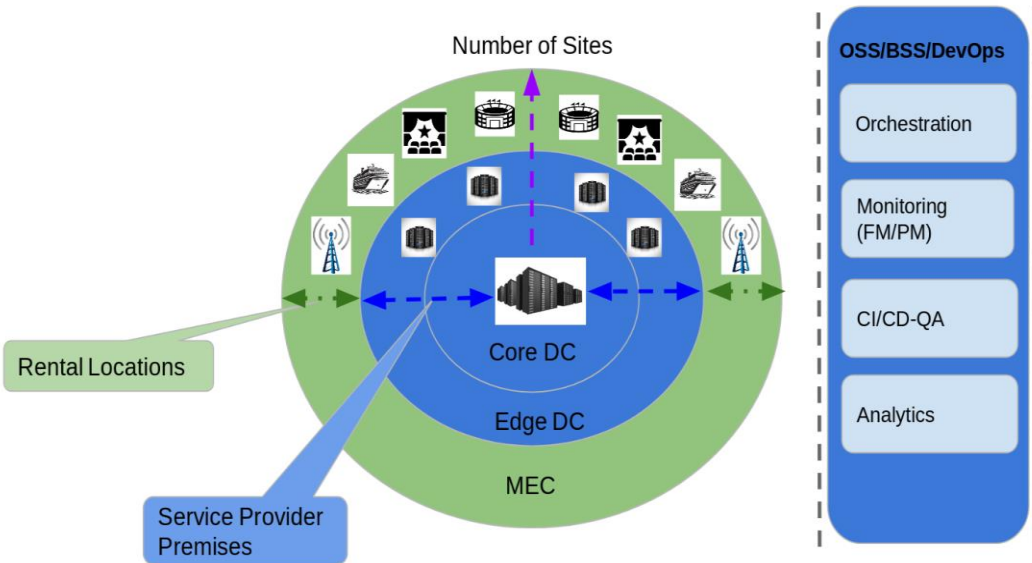
Future ready

Complements NFV, aligned with architecture for 5G

Proximity

Geo-location awareness and proximity to user

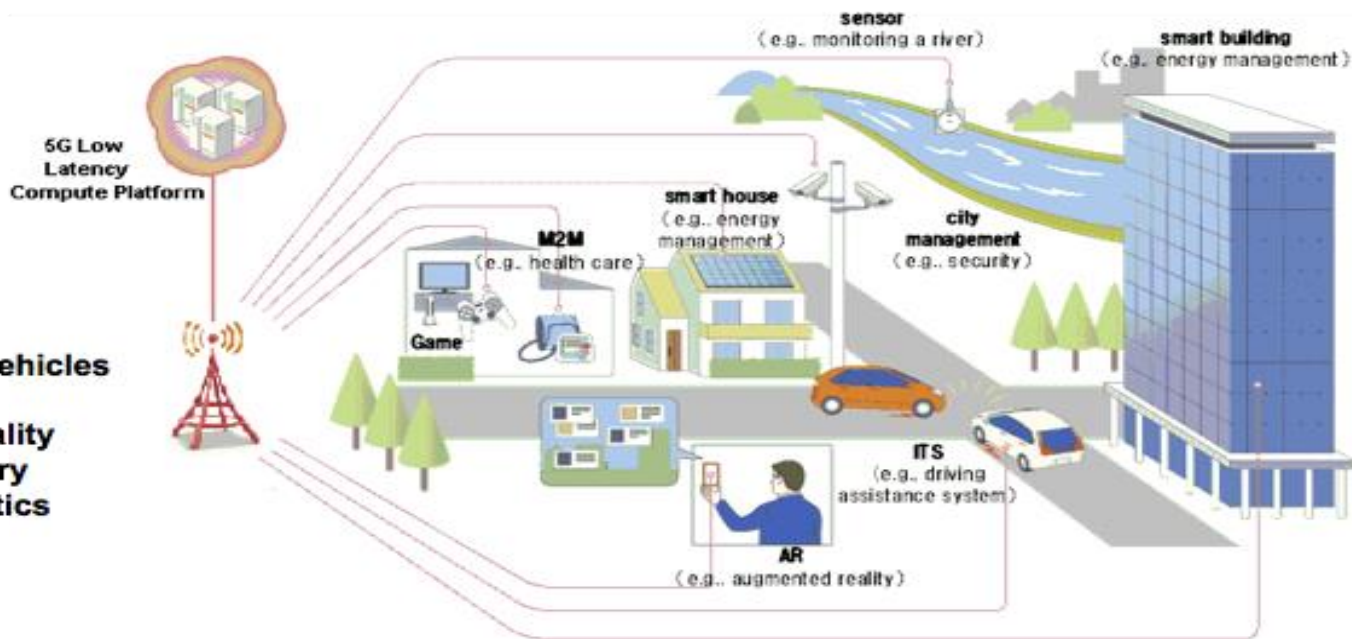
LLC = Low Latency Compute = Far Edge



Virtual Network Slices to support specific types of Application data based on QoS

Who uses 5G LLC?

- **Autonomous vehicles**
- **IoT devices**
- **Augmented reality**
- **Gaming industry**
- **Big Data analytics**
- **Robots ??**



- Low Latency Compute (LLC) offers application developers and content providers cloud-computing capabilities and an IT service environment at the edge of the network.
- LLC can deploy OpenStack or Kubernetes IaaS in less than 20 minutes
- LLC can provision bare-metal servers (Linux, Windows) to new tenants in under 5 minutes.
- LLC can schedule compute/GPU resources according to reservations system.
- Examples of LLC Tenant Applications:
 - Analytics processing, audio/video processing, augmented/virtual reality, autonomous vehicles.
 - Location-Based services to enriched complex service offerings.
 - Serving Internet-of-Things (IoT) for less uplink dependency and data aggregation.
 - Optimized content distribution and smart data caching per demand group characteristics.

An aerial photograph of a city street intersection, overlaid with a semi-transparent dark blue filter. In the foreground, a large, stylized 'M' logo is painted on the pavement. A car is driving on the road, and several people are walking on the sidewalk. In the background, there are buildings and more streets.

**MCITY:
CONNECTED & AUTOMATED
VEHICLE TECHNOLOGIES**

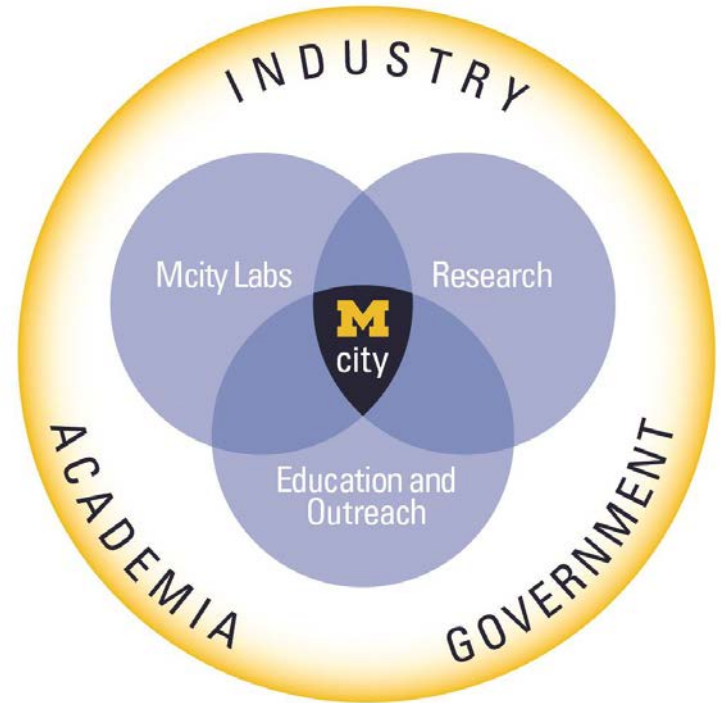


**AS A PUBLIC-PRIVATE PARTNERSHIP
WE BRING TOGETHER INDUSTRY, GOVERNMENT,
AND ACADEMIA TO ADVANCE TRANSPORTATION
SAFETY, SUSTAINABILITY, AND ACCESSIBILITY
FOR THE BENEFIT OF SOCIETY.**

WHY PUBLIC-PRIVATE PARTNERSHIP?

**If you want to go fast, go alone.
If you want to go far, go together.**

Mcity addresses questions and issues that no single entity can resolve alone.



ADDRESSING SOCIETY'S PRESSING ISSUES



SAFETY



CONGESTION



ENERGY



ACCESSIBILITY

THROUGH EMERGING TECHNOLOGIES



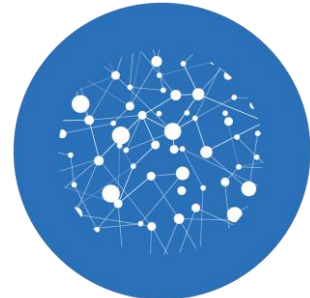
**CONNECTED
AUTOMATED
VEHICLES**



**5G / EDGE
COMPUTING**



**NEAR
REAL-TIME
DATA**



**MACHINE
VISION /
LEARNING**

AND ALL FACETS OF THE MOBILITY ECOSYSTEM



LAW



**PUBLIC
POLICY**



**URBAN
PLANNING**



**HUMAN
FACTORS**

2019 LEADERSHIP CIRCLE

ELEVEN STRONG

LEADERSHIP CIRCLE MEMBERS

TOYOTA



• APTIV •

HONDA
The Power of Dreams



ECONOLITE

DENSO



State Farm

WITH SUPPORT FROM:

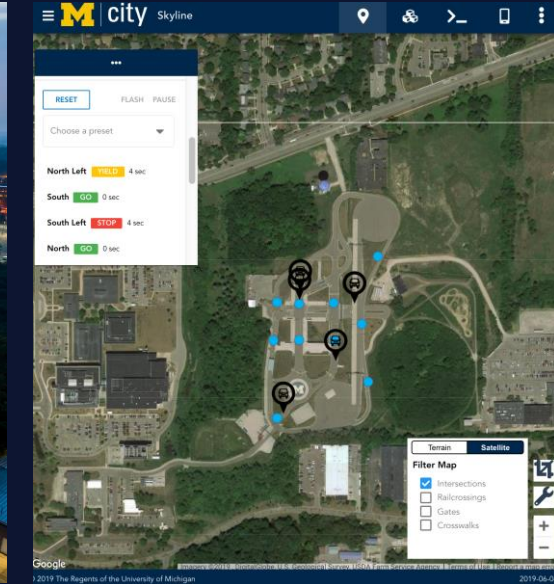


2019 AFFILIATE MEMBERS

A DIVERSE GROUP

- 3M
- Aioi Insurance Services, USA
- Aisin Group
- Analog Devices, Inc.
- BMW
- CARMERA
- Changan Automobile
- Cohda Wireless
- Covington & Burling LLP
- Daikin America, Inc.
- Danlaw, Inc.
- Deloitte Consulting LLP
- Desjardins
- Dow
- Fortive
- Goodyear Tire and Rubber Company
- Guangzhou Automobile Group, Co., LTD
- Harada Industry of America, Inc.
- Harman International Industries
- HERE
- Hitachi, Ltd.
- Iteris, Inc.
- Isuzu Technical Center of America, Inc.
- J.D. Power
- Latham & Watkins
- Lear Corporation
- Magna International, Inc.
- Marathon Petroleum Corporation
- Mechanical Simulation Corporation
- Metamoto
- Microsoft Corporation
- Mighty AI
- Miller, Canfield, Paddock, and Stone, PLC
- NAVYA
- Nexteer Automotive
- NovAtel
- OnBoard Security
- PolySync Technologies
- PPG
- Progressive Casualty Insurance
- RAB Lighting
- Realtime Technologies, Inc.
- Renesas Electronics America Inc.
- SAIC Motor Corporation Limited
- Savari Inc.
- SF Motors, Inc.
- Subaru
- Swift Navigation
- TASS International, A Siemens Business
- Velodyne
- Veoneer (formerly Autoliv)
- Visteon
- Warner, Norcross & Judd LLP
- Zenuity
- ZF

How we're helping companies develop CAV technologies



5G

MCITY TEST FACILITY

- Upgraded 5G system to 3GPP Release 15 in June 2019
- Available for test and research applications now
- C-V2X expected this quarter

5G[✓] Ultra Wideband



Digital Twins

Billions and billions

carsIM
MECHANICAL SIMULATION.

 **MathWorks**[®]


AVSIMULATION

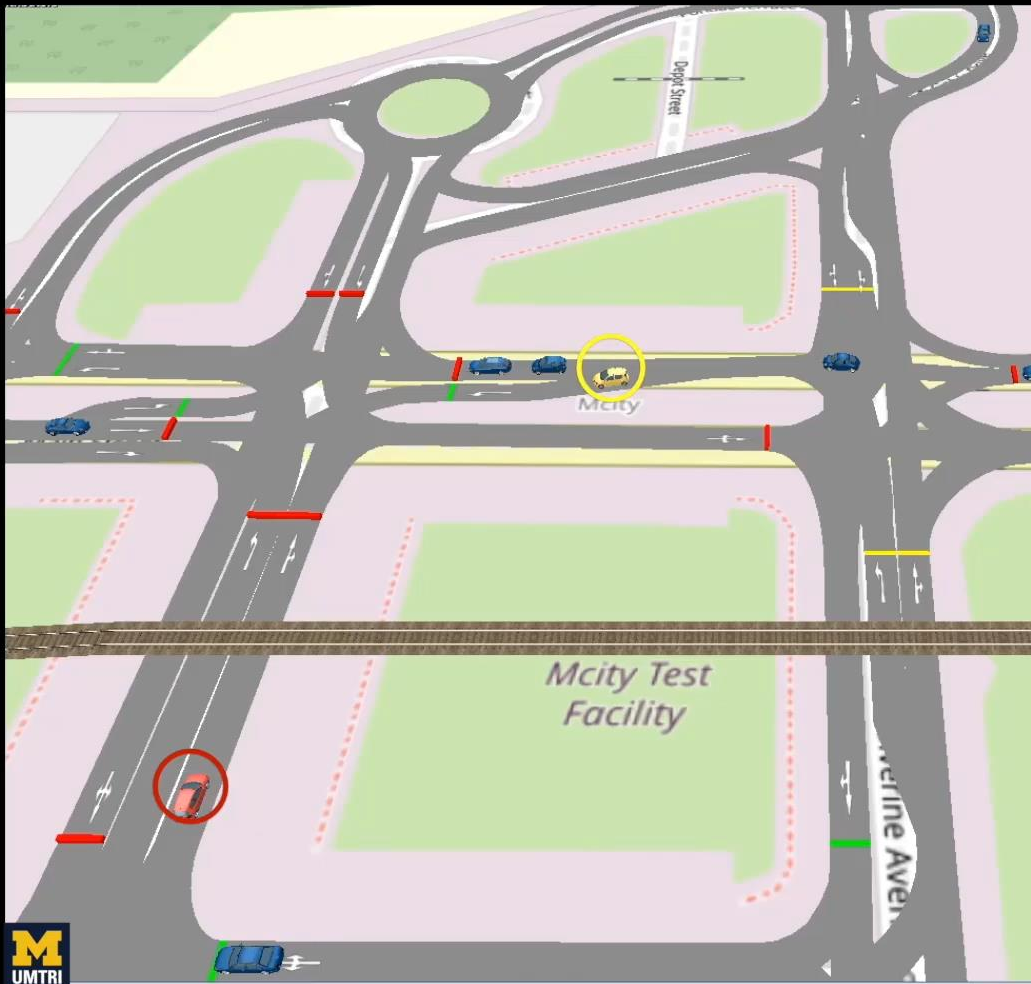
 **metamoto**

 **RIGHTHOOK**

ANSYS[®]

 **rFpro**

tass^{international}
A Siemens Business



11 | 12 mph

0cm
0.8d
r520m

0.0m
0mph
0.0s

18deg
T24|B13
D-Left

2573-7
17 s
25.0m/s

PAUSE



11 | 10
mph

15cm
-1.0d
r937m

0.0m
0mph
0.0s

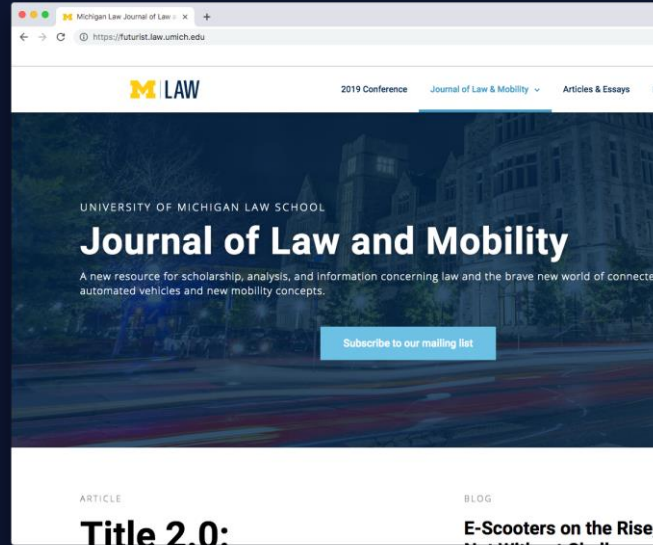


5deg
T15|B19
D-

2576-6
7 s
25.0m/s

X-94.7m
Y26.9m

How we're helping society adopt these technologies in a beneficial way





References and Sources

1. Tentative 3GPP timeline for 5G, http://www.3gpp.org/news-events/3gpp-news/1674-timeline_5g
2. RWS-150036, Industry Vision and Schedule for the New Radio Part of the Next Generation Radio Technology, 09/18/2015
3. RP-161154, Proposal for 5G-NR schedule adjustment and further definition, 6/16/2016
4. RP-170741, Way Forward on the overall 5G-NR eMBB workplan, 03/2017

Other Sources

5G Vision - 5GPPP, <https://5g-ppp.eu/wp-content/uploads/2015/02/5G-Vision-Brochure-v1.pdf>

5G Timescales & Timelines, <http://www.radio-electronics.com/info/cellular/telecomms/5g-mobile-cellular/timescales-timeline.php>

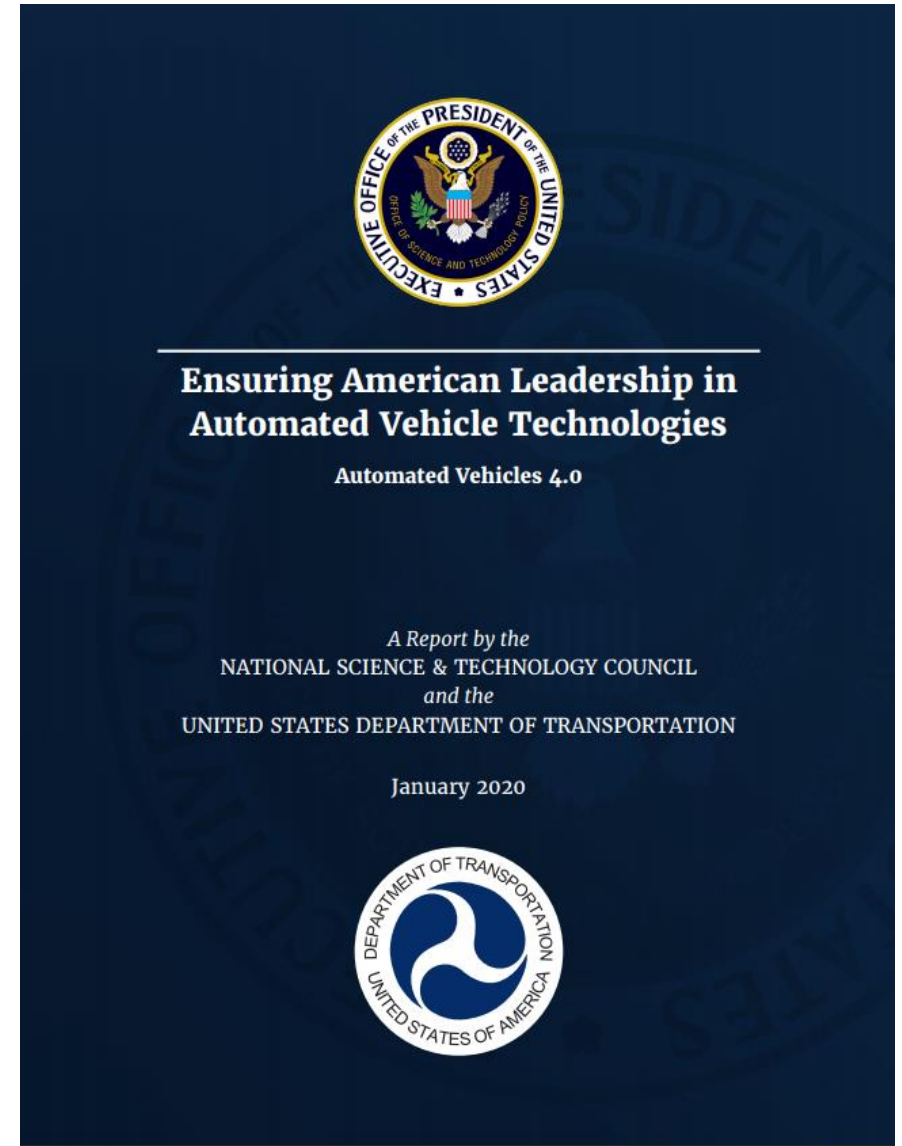
**Thank
you.**

Michigan CAV Working Group Hot Topics Discussion

January 29, 2020

USDOT's AV 4.0

- ***Ensuring America's Leadership in Automated Vehicle Technologies: Automated Vehicles 4.0***
 - Issued in January 2020 (announced at CES)
 - Billed as more joint effort between White House (National Science & Technology Council) and USDOT
 - Principle update focus: align U.S. Government to ensure standardized Federal approach to AVs



Comparison of Guiding Principles

AV 3.0

- We will prioritize safety
- We will remain technology neutral
- We will modernize regulations
- We will encourage a consistent regulatory and operational environment
- We will prepare proactively for automation
- We will protect and enhance the freedoms enjoyed by Americans

AV 4.0

- **Protect Users and Communities**
 - Prioritize Safety
 - Emphasize Security and Cybersecurity
 - Ensure Privacy and Data Security
 - Enhance Mobility and Accessibility
- **Promote Efficient Markets**
 - Remain Technology Neutral
 - Protect American Innovation and Creativity
 - Modernize Regulations
- **Facilitate Coordinated Efforts**
 - Promote Consistent Standards and Policies
 - Ensure a Consistent Federal Approach
 - Improve Transportation System-Level Effects

1. Prioritize Safety

- Address safety risks
- Enhance life-saving potential
- Strengthen public confidence
- Enforce existing laws to ensure no deceptive claims

2. Emphasize Security and Cybersecurity

- Safeguard against threats to security and public safety
- Work with industry to ensure prevention, mitigation and investigation of crimes and security threats
- Safeguard privacy rights, civil rights and civil liberties
- Develop and promote physical and cybersecurity standards

3. Ensure Privacy and Data Security

- Risk-based approach to data security and privacy
- Protect driver, passenger and third-party data

4. Enhance Mobility and Accessibility

- Ensure freedom for Americans to drive their own vehicles
- Approach envisioned mixed-fleet environment
- Protect ability for consumers to make mobility choices that best meet their needs
- Support additional options for accessing goods and services, allowing individuals to live and work in places that fit their families' needs
- Expand access to mobility for all people, including those with disabilities and older Americans

5. Remain Technology Neutral

- Adopt flexible technology-neutral policies
- Allow the public – not the Federal Government or foreign governments – decide the best solutions

6. Protect American Innovation and Creativity

- Advance pro-growth policies
- Protect economic prosperity and innovative competitiveness
- Protect and enforce intellectual property rights

7. Modernize Regulations

- Modernize or eliminate outdated regulations that impede development of AVs
- Promote consistent regulations across jurisdictions for seamless national/international operation
- Seek rules that are performance-based and as non-prescriptive as possible

8. Promote Consistent Standards and Policies

- Advocate for voluntary consensus standards and evidence-based and data-driven regulations
- Seek harmonization of technical standards and regulatory policies with international partners

9. Ensure a Consistent Federal Approach

- Proactively facilitate coordination of AV research, regulations and policies across the Federal Government
- Ensure Federal dollars used comply with Buy American

10. Improve Transportation System-Level Effects

- Focus on opportunities to improve transportation system-level performance
- Avoid negative transportation system-level effects from AV technologies

USDOT AV 4.0 Key Takeaways

- More of an affirmation of the government position than a new policy document
- Greatly increased emphasis on coordinating activities across Federal Government
- Focus on promoting choices in mobility options
- Directly addresses deceptive marketing and overstatement of capabilities
- Acknowledges the importance of the 5.9GHz spectrum and states USDOT's strong support for preservation for transportation safety applications

FCC Notice of Proposed Rulemaking

5.9 GHz Spectrum
Realignment

Framework of FCC Spectrum Realignment Proposal

- **45 MHz:** Reallocate unlicensed WiFi
- **20 MHz:** Reallocate to transportation applications using C-V2X
- **10 MHz:** Will remain DSRC or be reallocated to C-V2X

NPRM Process

- Vote to advance NPRM passed in December
- Will be published in the Federal Register shortly
 - 30-day comment period once published
 - 30-day reply period following the close of comments
- Unknown amount of time to generate official order after close of official comment process
- Once order is adopted, still potential for appeals and litigation

Key Concerns for Transportation Safety Community

- Potential for signal spillover of unlicensed WiFi into the remaining 30 MHz V2X band
- Unknown the impact of moving existing deployments to other channels/limited channels
- Lack of clarity on use of the 30 MHz for V2X – technology-agnostic, or attempt to separate DSRC and C-V2X bands?

Impacts of FCC Notice of Proposed Rulemaking

5.9 GHz Spectrum Realignment

FCC Licensing

An FCC License is required to operate a DSRC RSU.

The channels the RSU will operate on (i.e. 178 [CCH], 172 [Safety], and the other Service Channel [SCH]) are part of the application

C-V2X requires an Experimental FCC License

OBUs do not require an FCC License

~ September 2019, the FCC stopped granting DSRC Licenses

FCC Licensing

As of December 2019, FCC will only grant DSRC Licenses for Channel 180 (Change due to NPRM)

C-V2X requires an Experimental FCC License (no change)

OBU's do not require an FCC License (no change)

Existing DSRC Deployments

- Existing DSRC deployments should have 18 to 24 months to react to the new usage of the 5.9 GHz band **once the Order is final**.
 - FCC, likely, will NOT mandate that DSRC devices be shut down
 - Manufacturers of Unlicensed devices will need to update or develop new products to operate in the newly unlicensed band
 - Once the products are developed they will need to be certified by a 3rd party assessment, typically the WiFi Alliance or Bluetooth SIG
 - Once certified, the first products are likely to be indoor residential (home) or commercial (office).
 - Indoor devices will, more than likely, not affect outdoor DSRC corridors,

This should provide agencies sufficient time to determine their best course of action.

No need to Panic....yet...

Options

Option 1: Replace DSRC devices with C-V2X Devices

Risks:

1. C-V2X still in development
2. Potential lack of available HW: C-V2X devices are not as prevalent as DSRC
3. C-V2X RSUs require an experimental FCC License

Options

Option 2: Assuming DSRC is able to operate on channel 180:

A. Reconfigure existing DSRC RSUs and OBUs to operate only on channel 180

Risk:

1. Channel 180 may go to C-V2X
2. Not tested; unknown how devices/system will react to using only channel 180

B. Reconfigure RSUs to broadcast on Chan 180 and listen on 172

- OBUs continue to broadcast BSMs on Chan 172 and use Chan 180 for communication w/RSUs

Risks:

1. Will have to address OBUs in the future
2. Channel 180 may go to C-V2X
3. Not tested, unknown how devices/system will react to using only channel 180

Options

Option 3: Do nothing and accept the potential interference from unlicensed devices (in 18 to 24 months from Order)

Questions?

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MICHIGAN DEPARTMENT OF TRANSPORTATION

Statewide CAV Program Update

CAV WG 2020 | January 29th, 2020



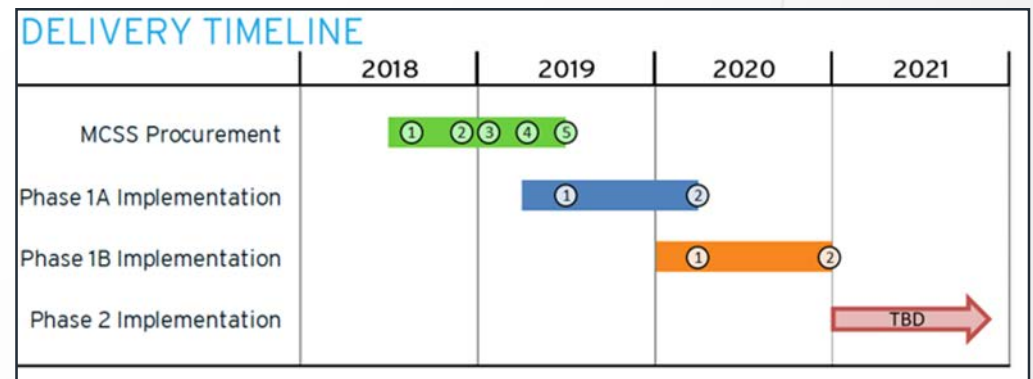
Updated Pavement Marking Policy

- Increasing width of lane lines on freeways from 4 – 6 inches
 - To support increasing use of lane departure warning and lane keeping technologies
- On and off ramp dotted line extensions included in the annual contract
 - Guide both vehicles and drivers to stay in their lane with traversing the freeway
- Both changes will be included in 2021 construction program



Central Signal Control System

- Provide active and remote traffic signal monitoring
- Streamline the management of a critical asset
- Prepare for the future of traffic signal management



5.9 GHz Band Regulation

- NPRM adopted by FCC on December 12th, 2019
- Working with:
 - MDOT
 - AASHTO
 - ITS America
 - State legislative representation



The \$8M Michigan Mobility Challenge

- \$8 million to fund multiple innovative pilot transportation projects of varying sizes that can solve mobility gaps for seniors, persons with disabilities and veterans in urban, rural and suburban communities throughout the state of Michigan.
- A collaborative effort that includes the Michigan Department of Transportation (MDOT), PlanetM/MEDC, the Michigan Department of Health and Human Services, the Michigan Veterans Affairs Agency, The Bureau of Services for Blind Persons, and the Michigan Department of Civil Rights – Division on Deaf, Deafblind, and Hard of Hearing.
- https://www.michigan.gov/mdot/0,4616,7-151-9621_17216_86614---,00.html



NAIAS 2020
**Michigan
Mobility
Challenge**



Background

Issued by MDOT, PlanetM (MEDC) and Governor's Office

Solicited proposals for two Automated Vehicle demonstrations



AIRPORT SHUTTLE



DOWNTOWN DETROIT CIRCULATOR





AIRPORT
SHUTTLE

The Challenge

Provide AV services for select media between DTW and Downtown

TECHNOLOGY

- Minimum Level 3 AV services
- Safety driver/liaison required in vehicle

RIDERS

NAIAS media and invited attendees

OPERATIONAL DATES

NAIAS Media/Press Preview

FEATURES

In-vehicle experience



The Challenge

Provide AV services for NAIAS attendees within predefined boundaries

TECHNOLOGY

- SAE Level 3+ AV services
- Safety driver/liason required in vehicle

RIDERS

Public/NAIAS attendees

FEATURES

In-vehicle experience

OPERATIONAL DATES

Preview and Public Days (2 weeks)

SERVICE OPTIONS

- Multiple providers and vehicles
- Fixed-route
- On demand

Communications

Talent

Research

Infrastructure

Applications

Data

Vehicles



Michigan is Open for Business for CV Partnership Opportunities

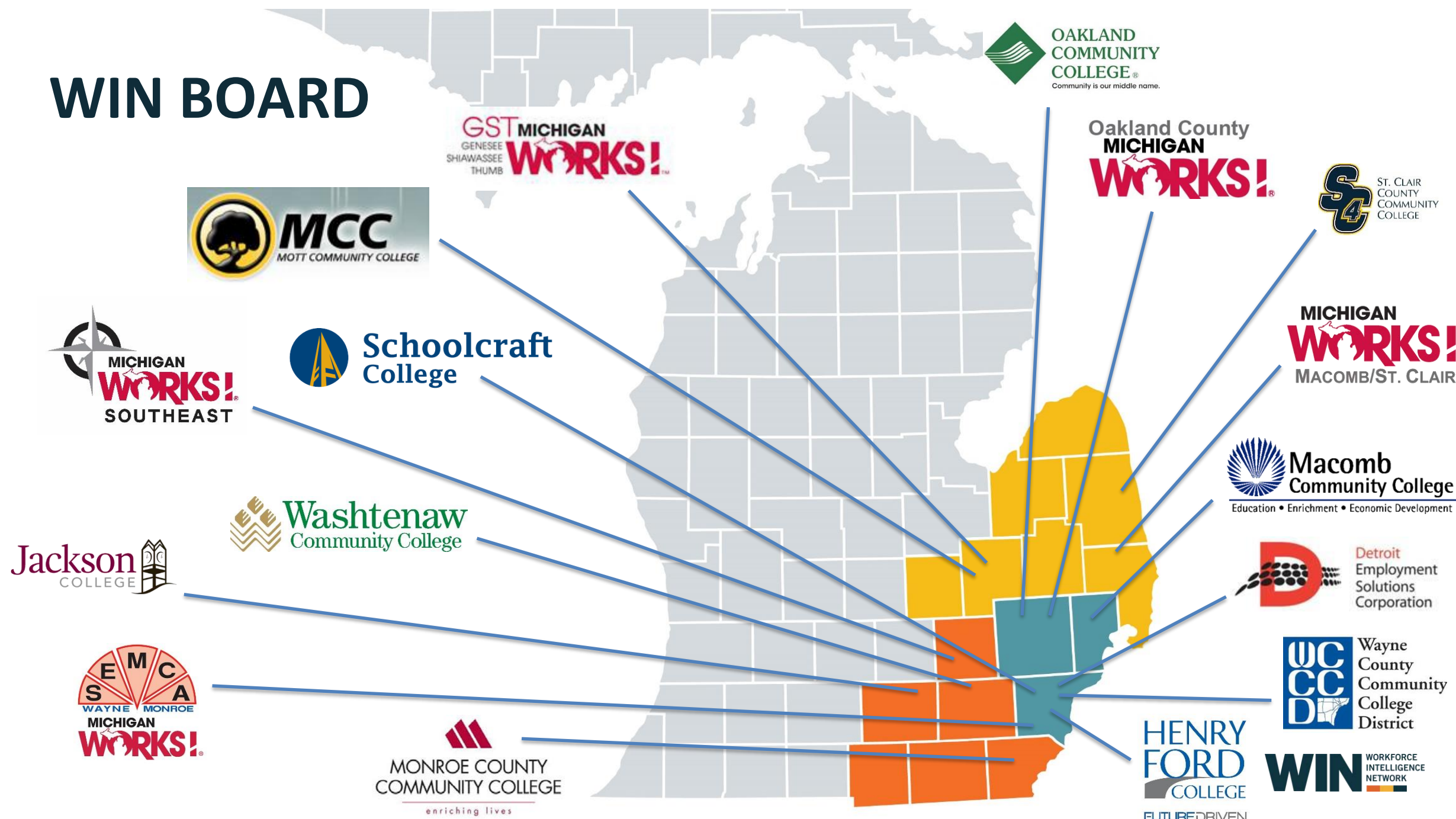
DATA. ENGAGEMENT. SOLUTIONS.

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Community is our middle name.

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MICHIGAN WORKS!

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ST. CLAIR COUNTY COMMUNITY COLLEGE

MICHIGAN WORKS!
MACOMB/ST. CLAIR

Macomb Community College
Education • Enrichment • Economic Development

D Detroit Employment Solutions Corporation

WCCCD Wayne County Community College District

HENRY FORD COLLEGE
FUTUREDRIVEN

WIN WORKFORCE INTELLIGENCE NETWORK

MONROE COUNTY COMMUNITY COLLEGE
enriching lives

Washtenaw Community College

Schoolcraft College

MCC MOTT COMMUNITY COLLEGE

MICHIGAN WORKS!
SOUTHEAST

Jackson COLLEGE

SEMCA
WAYNE MONROE
MICHIGAN WORKS!

GST MICHIGAN WORKS!
GENEESE SHIAWASSEE THUMB

CAV Emerging Tech Skills Gap Analysis Report

In late 2018, Ralph C. Wilson Jr. Foundation approved a study to provide an update on the previously created Cybersecurity and CAV Skills Gap Analysis reports with current data (including Western NY, Southeast Michigan and the United States) and emphasis on addressing the recommendations made in the first reports.

Study focuses on:

- Establishing an updated occupations list related to emerging technology industries
- Employment in emerging technology occupational sub-groups with projections 10 years into the future
- Demographics of emerging technology occupation-related workers including age, gender, and race
- Wages of emerging technology occupation-related workers

Asset Mapping and Social Network Analysis

ASSET MAPPING

- Who is working in this space?
- What are our strengths?

SOCIAL NETWORK ANALYSIS

Awareness:

- How likely is it that information will spread throughout the network?

Influencers and Connectors:

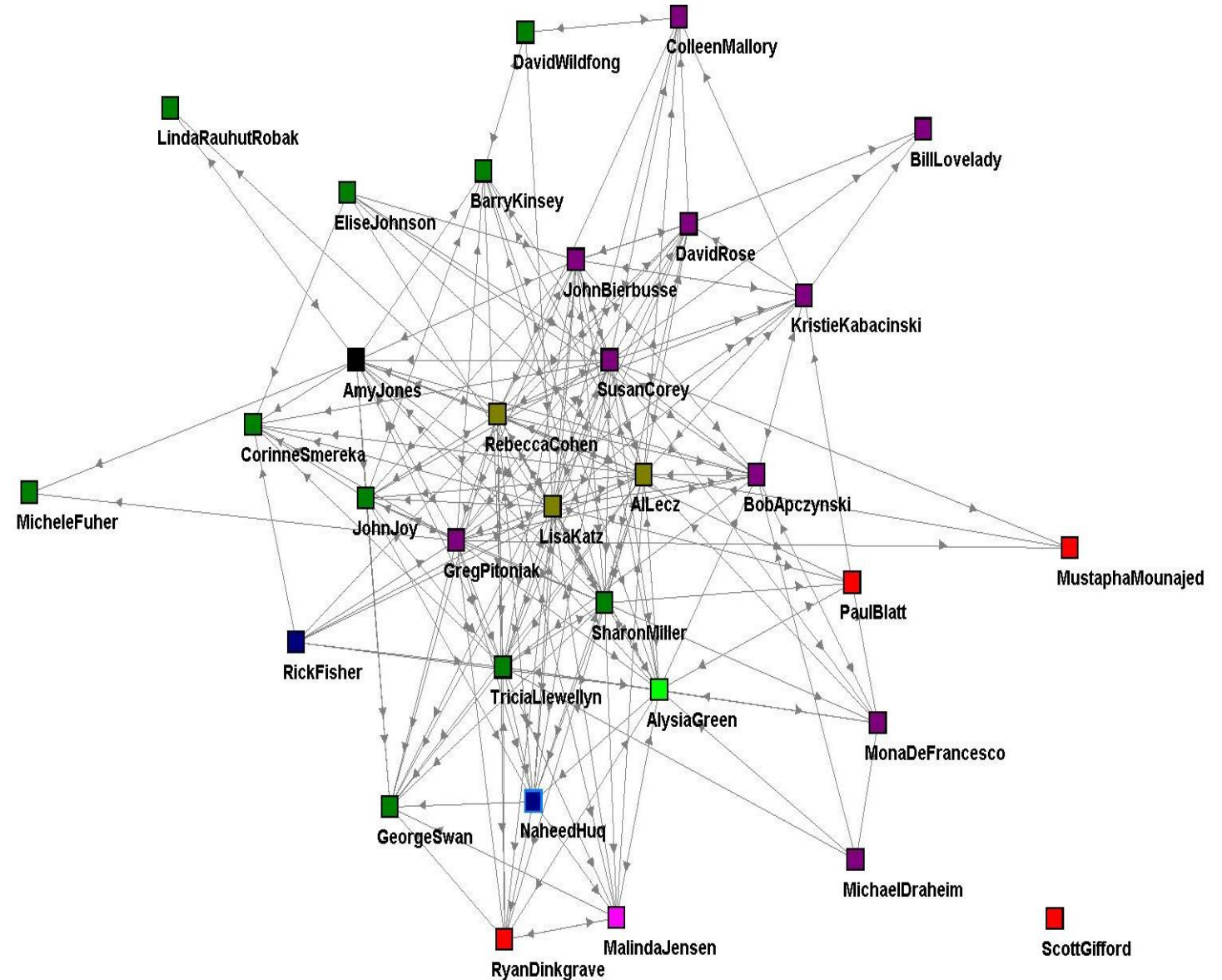
- Who do people look to?
- How connected are parts of the network?

Integration:

- What is the overall network health?
- Who are network leaders?

Resilience:

- How dependent is the network on a few individuals?



CAV Emerging Tech Skills Gap Analysis: Purpose and Goals

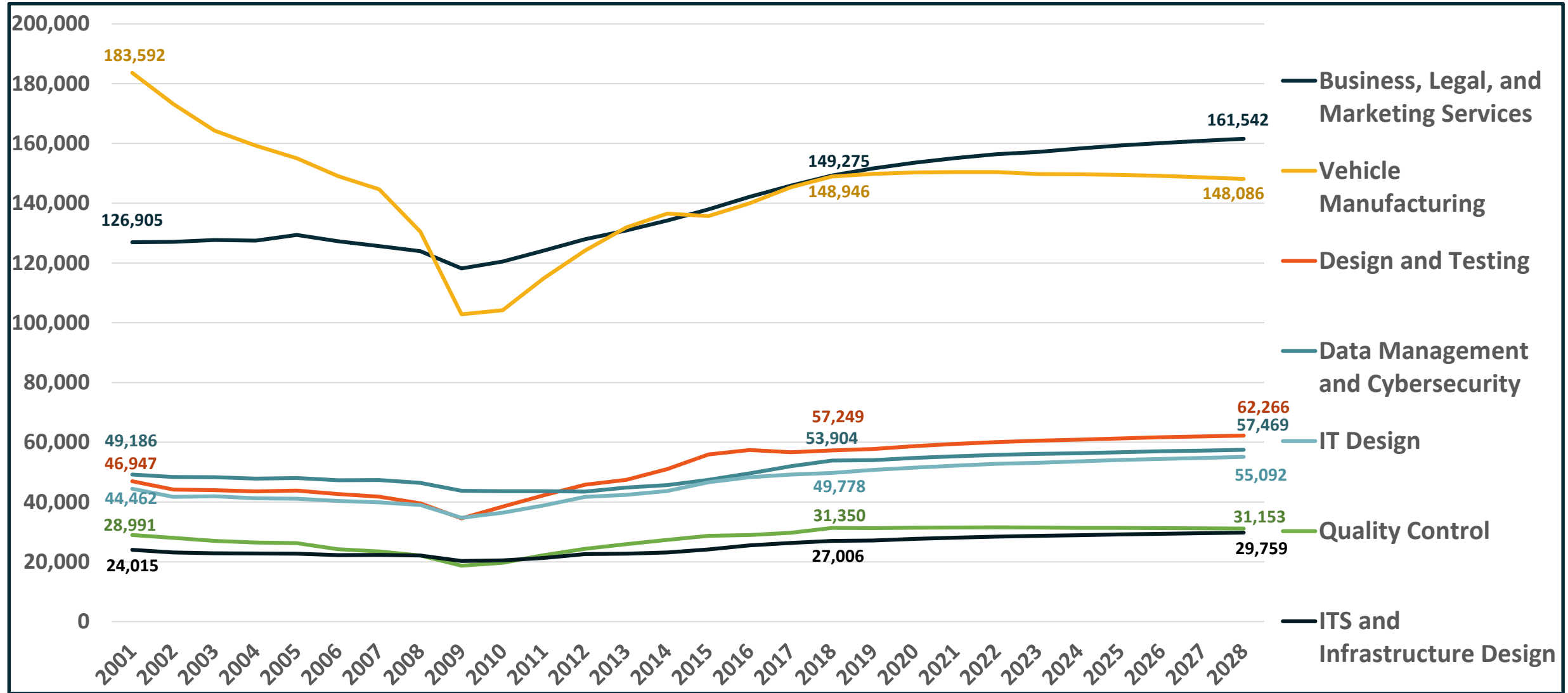
1. Measure impact of existing CAV workforce, size of available talent pool, and regional strengths
2. Utilize real-time demand to identify increasing skill needs and potential training solutions for continued CAV development in SEMICH
3. Determine available opportunities for middle-skill workers
4. Examine relationship between CAV and other emerging technology such as cybersecurity and industrial automation

CAV Emerging Tech Skills Gap Analysis

Release Scheduled: March 2020 at www.winintelligence.org

- CAV Workforce is broken up into seven distinct subgroups:
 - Design and Testing
 - IT Design
 - Vehicle Manufacturing
 - Data Management and Cybersecurity
 - Quality Control
 - ITS and Infrastructure Design
 - Business, Legal, and Marketing Services

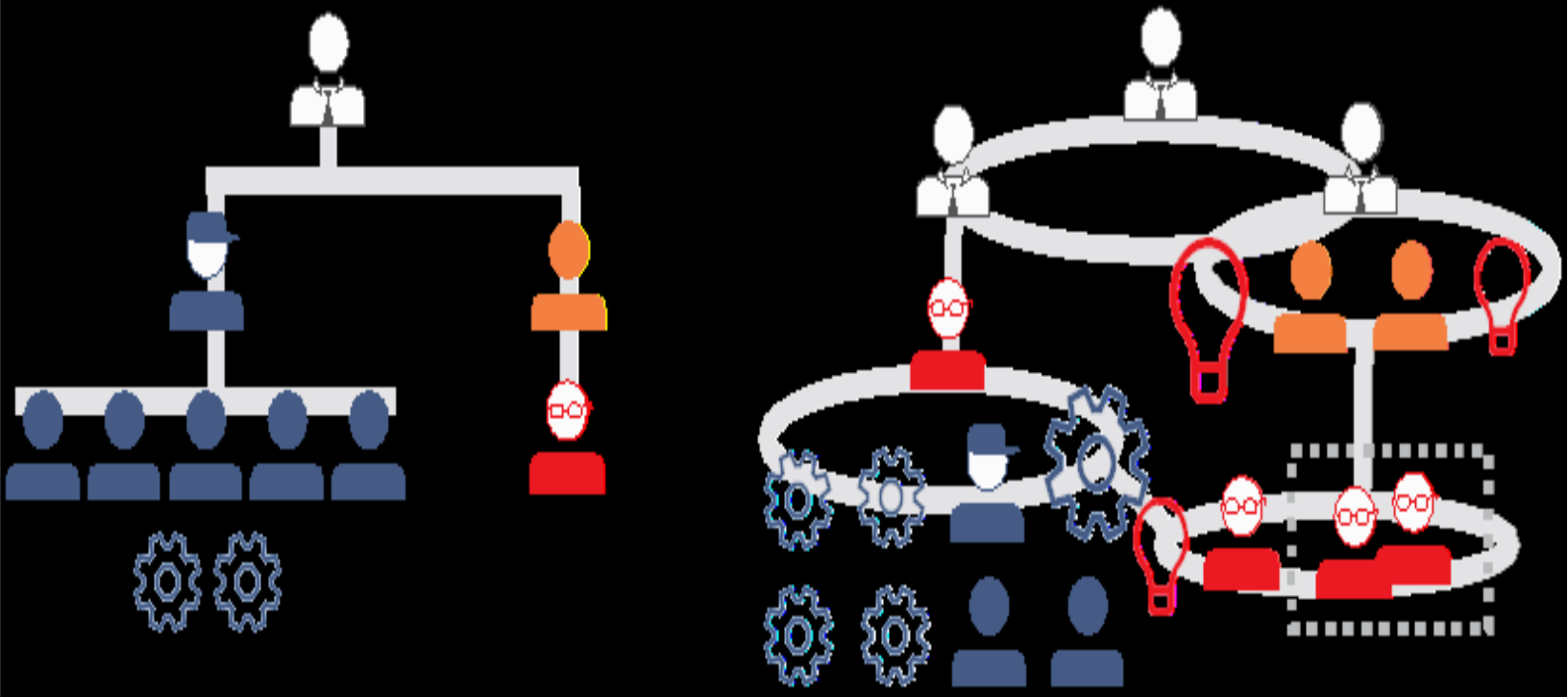
CAV-Related Employment by Subgroup



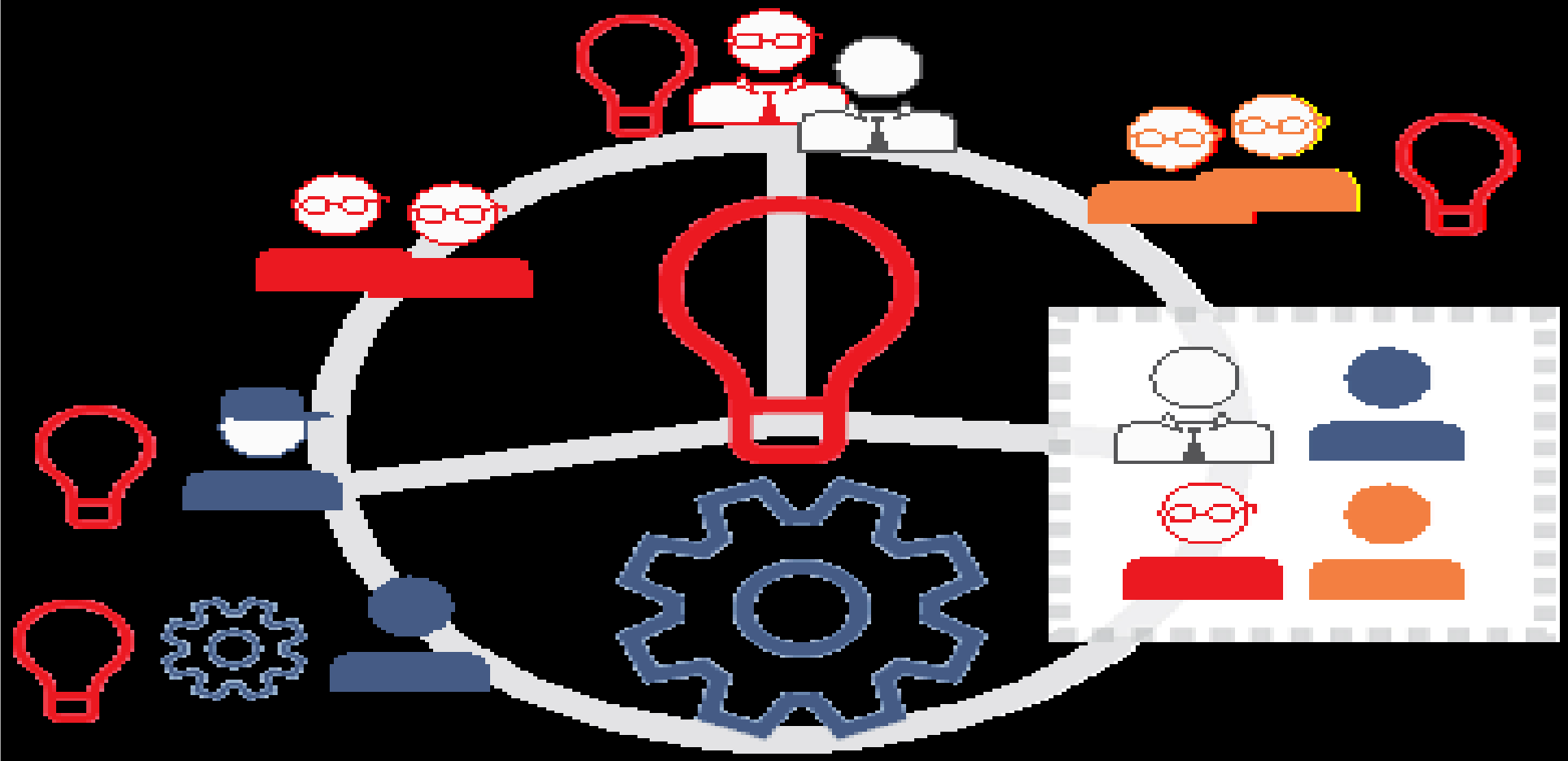
The Future of Work Study – Calvin University and Talent 2025

- The evolution of learning intensive organizations and the org chart
- Automation poses quantifiable risk to existing occupations
- Automation risk variation by occupation and state over 20 years
- Risks are declining in foreseeable ways (finding)
- Importance of soft skills by occupation and state, 1999-2018
- Leadership principles for learning communities

The Future of Work Study – Org Chart Shift from Labor to Skills Intensive (Team Centric)



The Future of Work Study – Learning Intensive Organization Chart



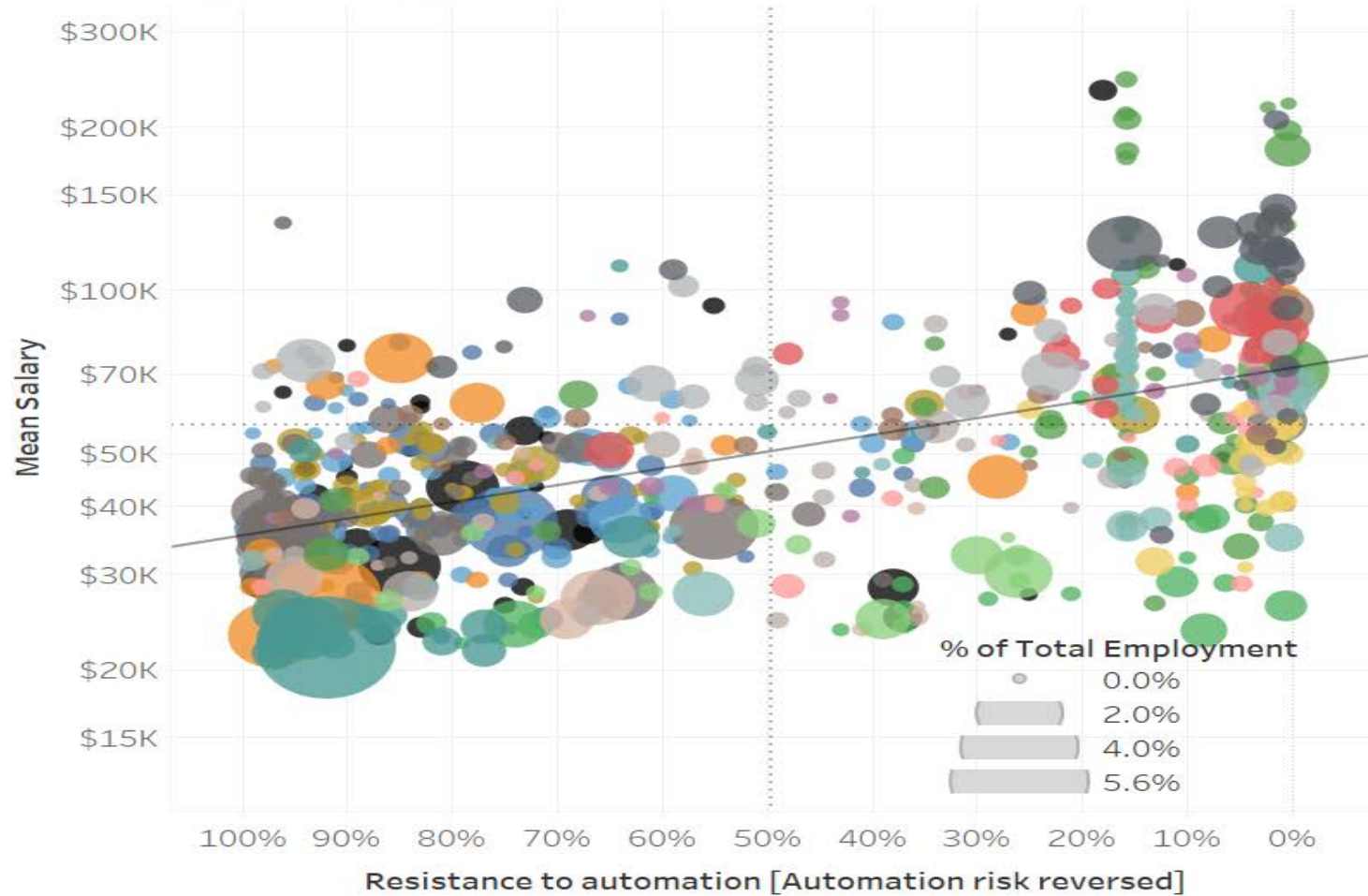
The Future of Work Study – The Tableau

- Combined Bureau of Labor Statistics (BLS) data by occupation, state, and year for 1999 to 2018 and established “crosswalks” to match SOC codes with BLS data
- **Automation risk is invariant over time and across states** within specific occupations
- Aggregate automation risk is weighted by total employment
- Aggregate risk changes only by shifting employment among occupations

Talent 2025 Core Project Team meeting, September 6, 2019: Part 1. Automation risks

Management pays, but community service has the lowest risk.	Risk varies widely within occupational groups	Michigan ranked 22nd in 2018 with 58% automation risk	The top 3 for low risk are MA, MD, and CT	The bottom 3 (top for high risk) are NV, SD, and AL.	Office/admin and food prep/serving have the most jobs at risk in MI.	Michigan's largest low-risk sectors are in health and finance.	Michigan tracks the national average weighted risk	Top 3 low-risk states start...
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Average earnings by automation risk, Michigan, 2018
Occupations at upper right pay more and have lower risk of automation.



State: Michigan
Year: 2018
 Show history

- Select a level of detail: Occupations
- Occupation header selections:
- 11 Management Occupations
 - 13 Business and Financial Operation..
 - 15 Computer and mathematical scie..
 - 17 Architecture and Engineering Oc..
 - 19 Life, Physical, and Social Science ..
 - 21 Community and Social Services O..
 - 23 Legal Occupations
 - 25 Education, Training, and Library ..
 - 27 Arts, Design, Entertainment, Spo..
 - 29 Healthcare Practitioners and Tec..
 - 31 Healthcare Support Occupations
 - 33 Protective Service Occupations
 - 35 Food Preparation and Serving Re..
 - 37 Building and Grounds Cleaning a..
 - 39 Personal Care and Service Occup..
 - 41 Sales and Related Occupations
 - 43 Office and Administrative Suppo..
 - 45 Farming, Fishing, and Forestry O..
 - 47 Construction and Extraction Occ..
 - 49 Installation, Maintenance, and R..
 - 51 Production Occupations

Thank You & Contact Information

EMERGING TECHNOLOGY STUDY

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