



OAKLAND

COUNTY MICHIGAN

CONNECTED VEHICLE TASK FORCE



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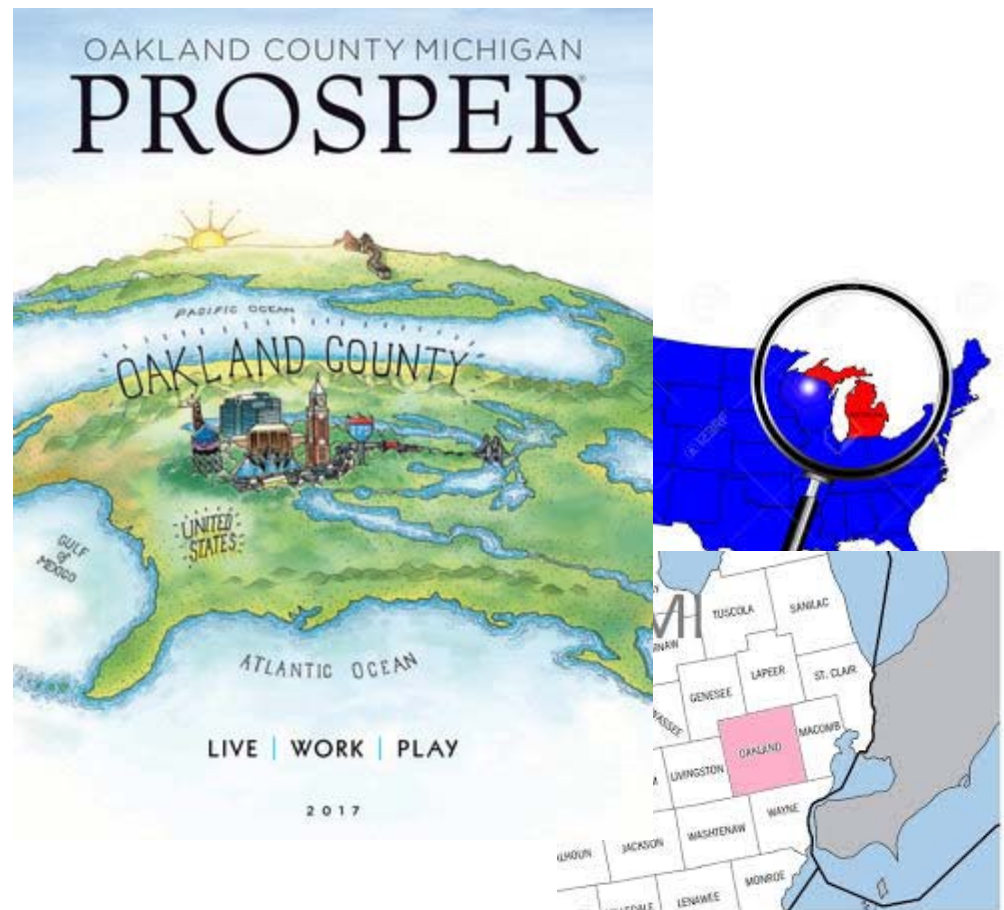
May 12, 2017

Building a Plan for Deployment

Where and Why

70% of Global Research in
the future automobile
happens in Michigan

75 of the top 100 Global
Auto Companies are in
Oakland County



AN ENVIABLE STATUS QUO

What's our story....

- ❑ 45% of Oakland County's residents 25 yrs. + have at least a Bachelor's degree
- ❑ Oakland County has nearly twice the Masters Degrees and Ph.D.'s compared to the national average
- ❑ We export more than \$14 Billion annually, ranking 13th strongest County in the U.S.
- ❑ More than 2000 Technology firms
- ❑ More than 4000 Life Science companies
- ❑ More than 2000 research facilities
- ❑ 1062 Foreign Owned Multi-National companies from 39 Countries



We are the “Motor City”



Global or North American R&D Headquarters in Michigan



Additional Auto Manufacturers with R&D Facilities in Michigan

DAIMLER



375 Automotive R&D Centers

More Than 25% of Auto Patents
1 per day for 45 years ('64-'08)

CAR

CENTER FOR AUTOMOTIVE RESEARCH



Automotive Mobility Innovation



SENATE BILL No. 998

May 25, 2016. Introduced by Senators BROWN, KOVALL, JONES, STAMAS, BRANDENBURG, HARTKE, HOLBROCK, KOSCIOT, MARLEAU, BROWN and ANANDER and referred to the Committee on Economic Development and International Development.

A bill to amend 1961 PA 234, entitled "Revised jurisdiction act of 1961," by amending section 2949b (MCL 400.2949b), as added by 2013 PA 201.

THE PEOPLE OF THE STATE OF MICHIGAN ENACT, Sec. 2949b. (1) The manufacturer of a vehicle is not liable for damages resulting from any of the following unless the defect from which the damages resulted was present in the vehicle when it was manufactured:

- (a) The conversion or attempted conversion of the vehicle into an automated motor vehicle by another person.
- (b) The installation of equipment in the vehicle by another person.

6/28/16

SENATE BILL No. 998

SENATE BILL No. 996

ALL JONES, STAMAS, BRANDENBURG, WARREN, HARTKE, BROWN and ANANDER and referred to the International Development.

6/28/16

THE STATE OF MICHIGAN ENACT:

SECTION 1. (1) THE MANUFACTURER OF A VEHICLE IS NOT LIABLE FOR DAMAGES RESULTING FROM ANY OF THE FOLLOWING UNLESS THE DEFECT FROM WHICH THE DAMAGES RESULTED WAS PRESENT IN THE VEHICLE WHEN IT WAS MANUFACTURED:

- (a) THE CONVERSION OR ATTEMPTED CONVERSION OF THE VEHICLE INTO AN AUTOMATED MOTOR VEHICLE BY ANOTHER PERSON.
- (b) THE INSTALLATION OF EQUIPMENT IN THE VEHICLE BY ANOTHER PERSON.

6/28/16

THE PARTICIPATING PARTY IS OWNED OR CONTROLLED BY A MANUFACTURER AND IS EQUIPPED WITH

(1) AN AUTOMATED DRIVING SYSTEM.

6/28/16

SENATE BILL No. 996

SENATE BILL No. 995

JONES, STAMAS, BRANDENBURG, WARREN, HARTKE, HOLBROCK, KOSCIOT, MARLEAU, BROWN and ANANDER and referred to the International Development.

6/28/16

THE PEOPLE OF THE STATE OF MICHIGAN ENACT:

SECTION 1. (1) "AUTOMATED DRIVING SYSTEM" MEANS HARDWARE AND SOFTWARE THAT ARE COLLECTIVELY CAPABLE OF PERFORMING ALL ASPECTS OF THE DYNAMIC DRIVING TASK FOR A VEHICLE ON A PART-TIME OR FULL-TIME BASIS WITHOUT ANY SUPERVISION BY A HUMAN OPERATOR. AS USED IN THIS SUBSECTION, "DYNAMIC DRIVING TASK" MEANS ALL OF THE FOLLOWING, BUT DOES NOT INCLUDE STRATEGIC ASPECTS OF A DRIVING TASK, INCLUDING:

- (A) OPERATIONAL ASPECTS, INCLUDING, BUT NOT LIMITED TO,

6/28/16

SENATE BILL No. 997

6/28/16

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A bill to amend 1949 PA 301, entitled "Michigan vehicle code," by amending sections 2b and 401a (MCL 207.2b and 207.401a), section 2b as added by 2013 PA 231 and section 401a as amended by 2013 PA 135, and by adding section 401a.

THE PEOPLE OF THE STATE OF MICHIGAN ENACT:

Sec. 2b. (1) "AUTOMATED DRIVING SYSTEM" MEANS HARDWARE AND SOFTWARE THAT ARE COLLECTIVELY CAPABLE OF PERFORMING ALL ASPECTS OF THE DYNAMIC DRIVING TASK FOR A VEHICLE ON A PART-TIME OR FULL-TIME BASIS WITHOUT ANY SUPERVISION BY A HUMAN OPERATOR. AS USED IN THIS SUBSECTION, "DYNAMIC DRIVING TASK" MEANS ALL OF THE FOLLOWING, BUT DOES NOT INCLUDE STRATEGIC ASPECTS OF A DRIVING TASK, INCLUDING:

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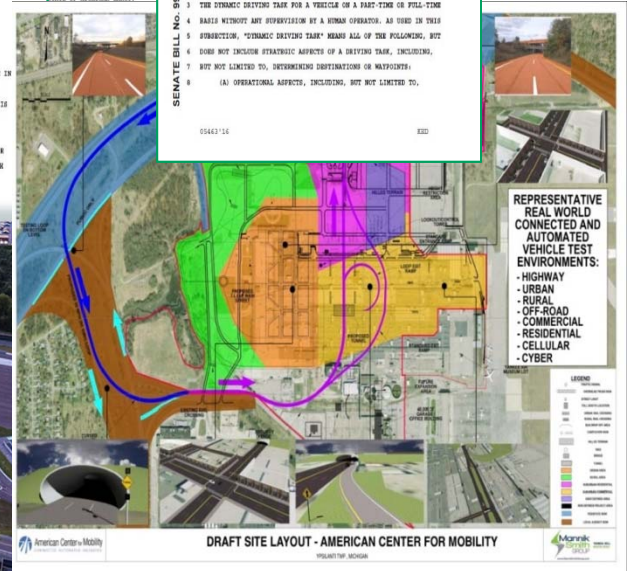
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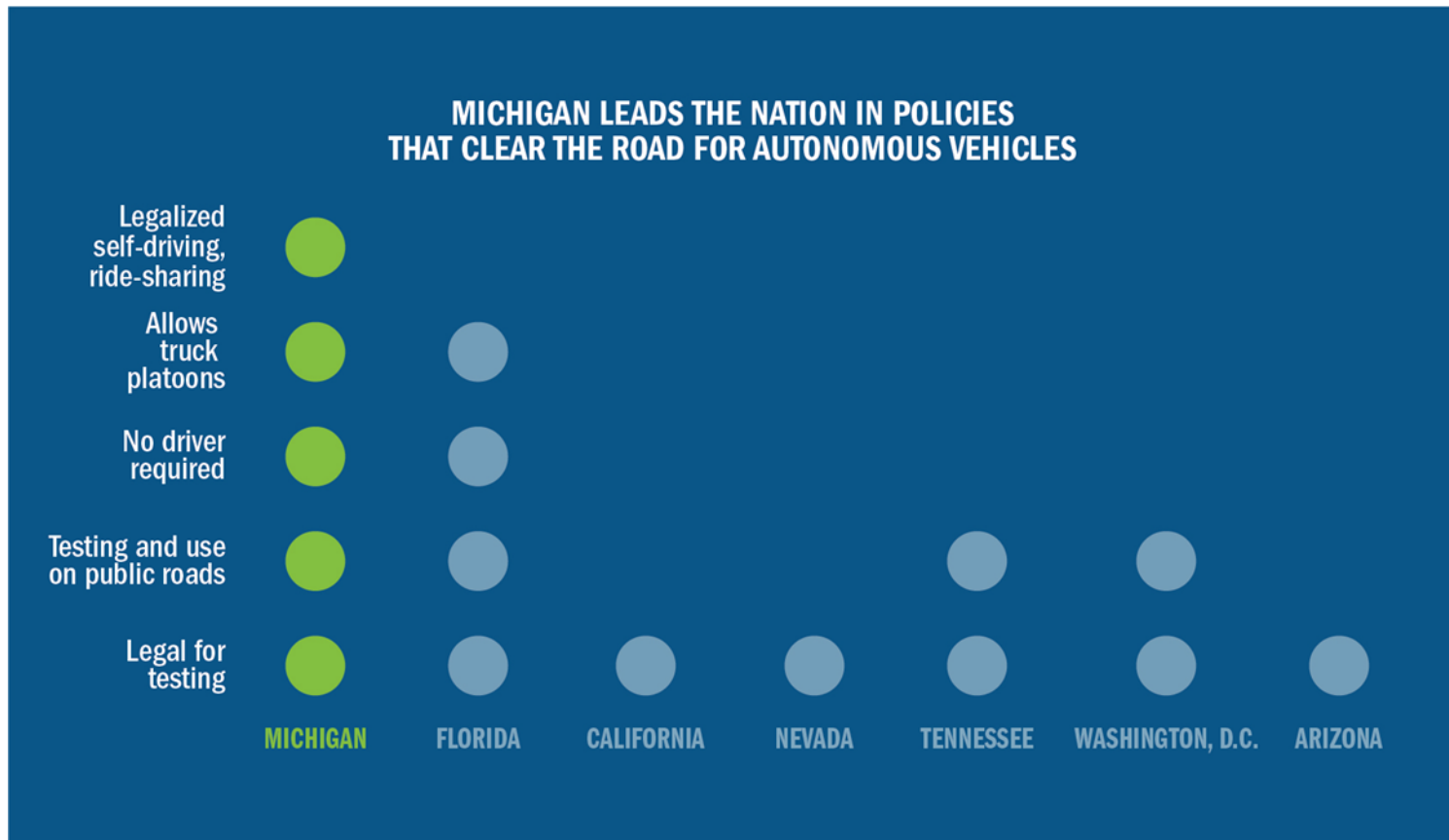
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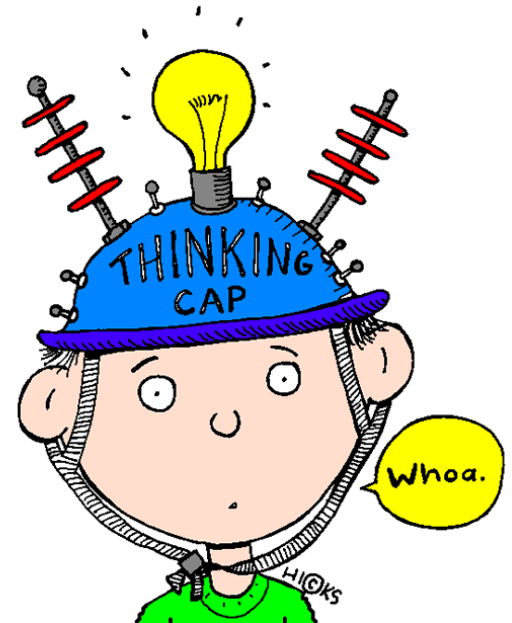
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First in the Nation



Key partners of OCCV



Oakland County Connected Vehicle Task Force



What is our charge?

- Established by Oakland County Executive in 2014 with following mandate:
 - Build business model to acquire, implement and maintain Connected Car (WAVE) infrastructure throughout Oakland County (without taxpayer funding), and share with other public sector stakeholders
 - Achieve technical and regulatory uniformity to WAVE specifications
 - Develop a “Regional Authority” agreement among multiple jurisdictions (State, County, and Municipal)
 - Establish Oakland County as the leader in deploying connected car infrastructure technology

A big challenge

- Pinpoint the obstacles to transitioning DSRC technology from the experimental/pilot stage to the commercial stage
- Demonstrate to stakeholders that there is a sustainable business model for DSRC infrastructure deployment that is independent of taxpayer funding
- Develop regulatory framework for multi-jurisdictional consensus
- Demonstrate pre-eminence of aftermarket in achieving commercial success
 - 300 Million vehicles in current NA car park
 - 220 Million vehicles with OBD-II data port
 - 16 Million new vehicles per year (USA sales)
 - New vehicle production alone will take more than 10 years to achieve reasonable density

A really big challenge?



MDOT 310miles
RCOC 2600miles
CVT 2700miles
5610 miles

1400 Intersections



42
Jurisdictions

Two Fundamental Tracks



Organizational

Create the organizational structure of a regional deployment authority

- Define how technical specifications of deployment will be assigned and who will be in charge.
- Set an operational strategy with governing entities within the region
- Establish sources of non-traditional funding
- Encourage a role for the private sector



Technological

Design “Controlled Spectrum Sharing” methodology to enable Network Operator Control of access to WAVE service channels

- Integrate authentication of consumer devices to USDOT-defined security credentialing system
- Promote “Controlled Spectrum Sharing” as standards-compliant alternative to disruptive spectrum sharing solutions
- Find ancillary applications dependent on DSRC to stimulate “after-market” adoption

Why an authority model?

- Increase participation from infrastructure owners and operators, as well as, industry entities
- Develop a Regional CV master plan
- Develop a Regional CV operations plan
- Develop Regional deployment requirements and allocate the entity responsibilities
- Develop a Region wide data sharing and management plan
- Evaluate and support funding opportunities to increase the rate of infrastructure deployment



BIS/BMS (Multimodal Transfer)

- Collection of Public Transportation Information
- Management & Operation of Public Transportation
- Dissemination of Public Transportation Information

Multimodal Transfer Station

- Multimodal transfer service system in national level among carpool, air, and maritime traffic (TODG service) (Transport Add-on on Going anywhere)
- TAGD Operated by Minister of Land, Transport and Maritime Affairs
- Support transfer for various modes of public transportation
- Collect the operation & service information in real time by all public transportation modes
- Provide transfer info. Bus to Bus (Inter-city bus, city bus, village-shuttle bus)
- Provide transfer info. Bus to Subway
- Provide transfer info. between public transportation modes
- Collect the real time transportation mode information
- Provide the location based service within the Multimodal Transfer station
- Using VMS (Visual Message System) (VMS)
- Tested for this service at Gimpo airport in 2011

Collection of Bus Information

- Collecting real time bus operation condition by using wireless communication (DSRC/CDMA/4G)
- Bus status, Traffic situation, Incident
- Tracking real time bus location by GPS



Bus-Only Lanes (Bus Rapid Transit)

Bus Priority Signal

- When bus entering the intersection, bus priority signal turns on
- Signaling Methods
- Priority mode
- Preemption mode

Bus Management Center

- Monitoring the overall bus operating status
- Adjust and increase the interval between bus
- Bus Dispatching and Routing
- Management and Analysis the statistics about bus operating
- Providing standby assistance with other centers in adjacent cities

Bus Info. Display Equipment

- Provide bus information through LED display
- Bus No., service area and route information
- No. of passenger in the bus
- Next stop information including expected arrival time
- Transfer information between transportation modes
- Customized information for news, weather

Bus Information Terminal (user-oriented)

- Provision of Bus No., service area, route and bus info. in real time
- The information is provided to QR codes
- Verifying bus departure at each station by DSRC, CDMA, 4G
- Bus information provision in real time to mobile devices via QR code or phone app (Android, iOS)
- Free Wi-Fi service

Public Transportation Electronic Payment System

- Electronic payment system for public transportation fare
- Prepaid card, Contactless (MPC) card
- Electronic payment Traffic card, named One Card All Pass, available for all traffic mode and related services
- Bus, Subway, Taxi (taxi fare transfer)
- Parking lot and convenient facilities
- Discounted fare or no surcharge fare when transferring between modes
- Introduction in Seoul, Gyeonggi, Gwangju, Busan and etc. (Plan to be expanded nationwide by FY 2012)

OBU (On Board Unit)

- Real-time communication between Bus Information Center and OBU
- Bus operation condition, traffic situation, and incident
- Assisting in adjusting the interval between bus at each stop
- Displaying the safe speed

FTMS/ATMS

- Collection of Traffic Data
- Management & Operation of Arterial or Freeway
- Dissemination of Traffic Information

National Transport Information Center (NTIC)

- Collection and Distribution of traffic information and CCTV data
- Communication & Link the traffic data with other traffic centers based on standardized node link and the Standard for CCT Information Exchange
- Provide real time traffic information and monitor disaster across the country
- Manage ITS data & information collected nationwide and verify the observance of standards (In general, MSOT affiliated organizations conduct these jobs)

Smart IC

- Connect urban road and national highway with the network on expressway
- Safe for Entry and Exit of expressway by using S&B QoS DSRC communication
- When parking (stop) on expressway, vehicle make a detour
- Self-serve toll function as a transfer station for public transportation

CCTV Incident Detection System

- Automatic detection of traffic incident by using CCTV camera
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TMS

Tunnels

Real-time traffic information

VMS

V2V service

V2I service

VDS

DSRC RSE

LCS

CCTV

TCS

ETCS (Hi-Pass)

ATMS/FTMS Center

Parking Information System

Real-time traffic information

DSRC RSE

V2I service

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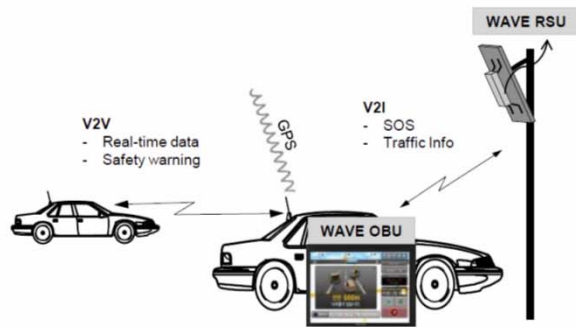
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ETCS (Hi-Pass)

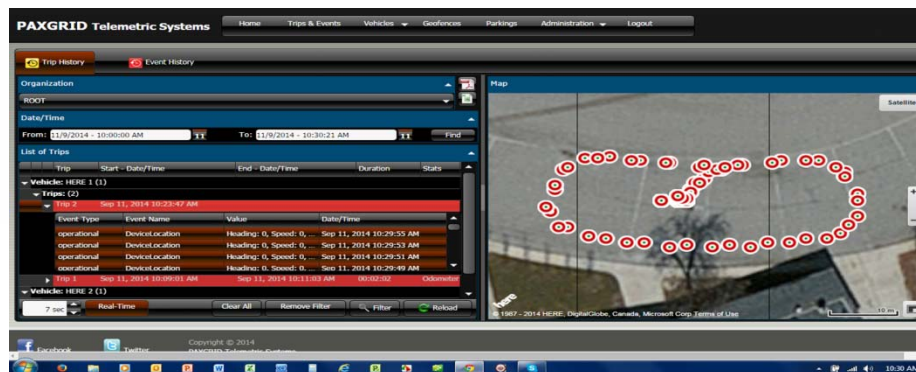
Using what exists

Communication Technology

❑ Wireless Access in Vehicular Environment (WAVE)



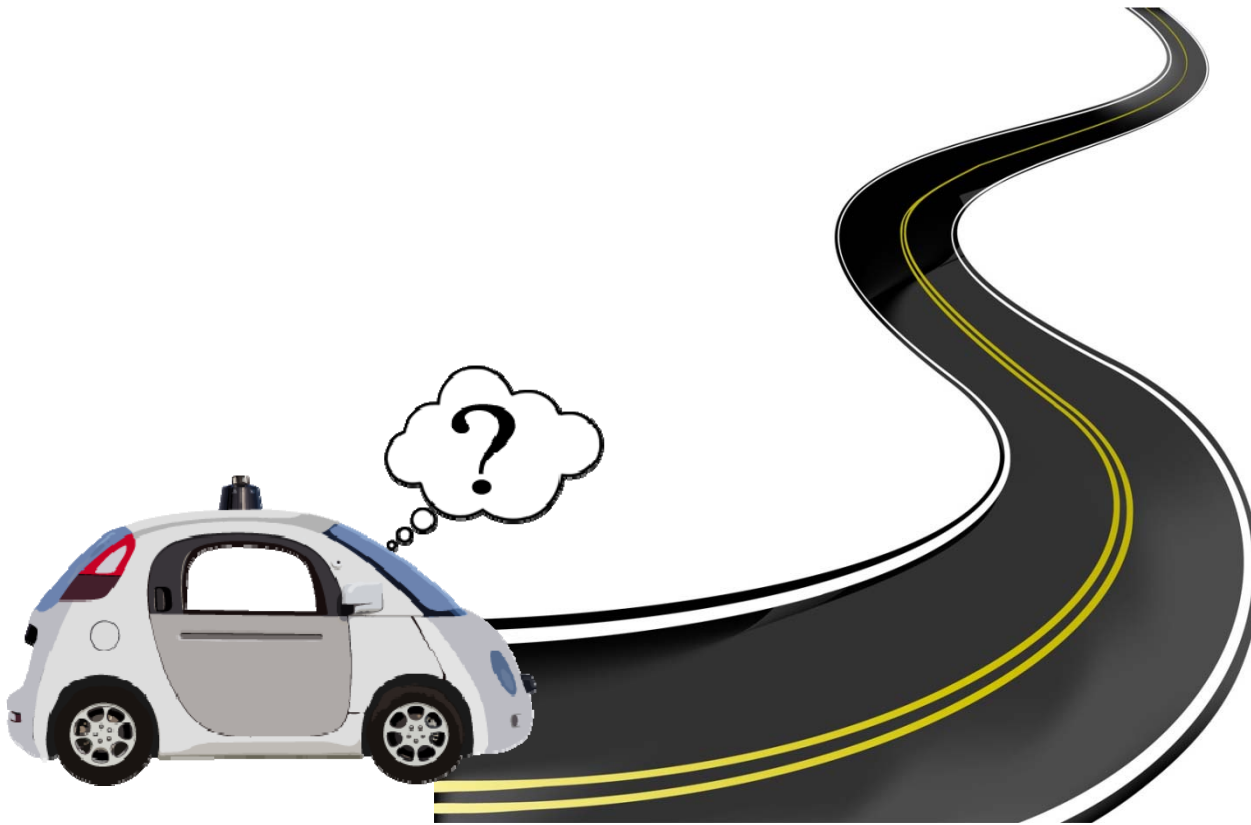
<Components>



Multiple-Lane Tolling System



We were on the wrong road



Simplify and Succeed

- ROW is not dirt and concrete but airspace
- DSRC is available and works
- BSM Data can be prioritized
- Excess bandwidth in the service channels is the opportunity

Build a DSRC network on an open architecture platform allowing a smart phone to communicate through an OBU to an RSU, and that's it.... For now



Controlled Spectrum Sharing

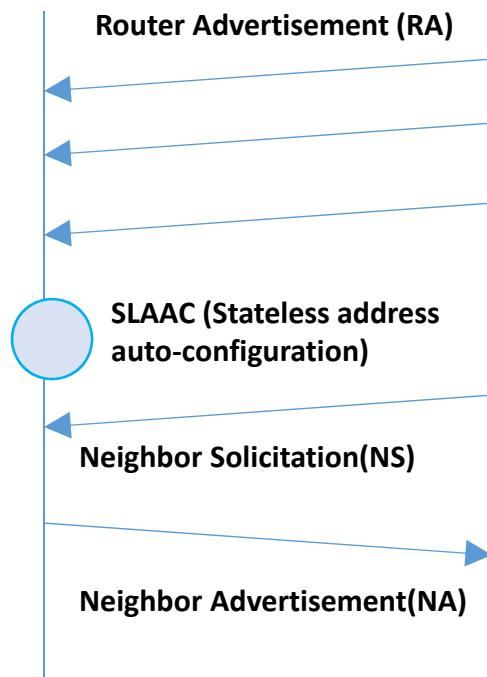
- Enable DSRC “Infrastructure Authorities” and associated “Network Operators” to dynamically control access to service channels for the delivery of mobile internet services subject to the prioritization of safety and mobility applications on these channels in a manner that can not be compromised, and are implemented via WAVE Service announcements
- To provide DSRC “Infrastructure Authorities” and associated “Network Operators” the tools to finance infrastructure deployment and operation (if desired) in a manner that is compliant with existing FCC licensing rules and IEEE/SAE specs for WAVE).
 - Accelerate infrastructure investment decisions by local road management authorities
 - Create ecosystems to drive development of new value propositions for consumer aftermarket adoption of DSRC technology
 - Encourage OEMs to follow GM’s lead in bringing V2V to market in advance of National Highway Traffic Safety Administration (NHTSA) mandate

Technology Description – OBU as a Router



Consumer Device

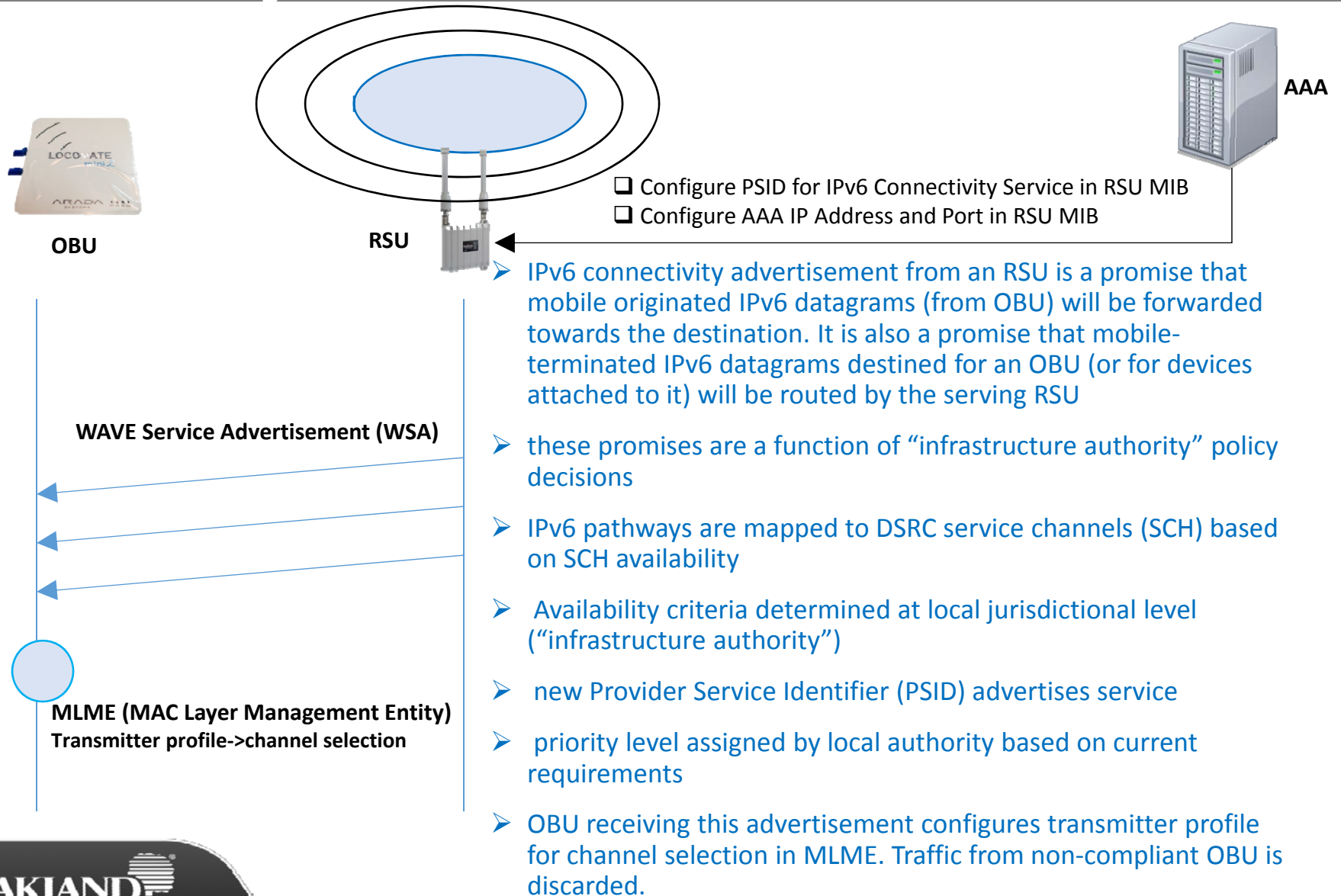
OBU



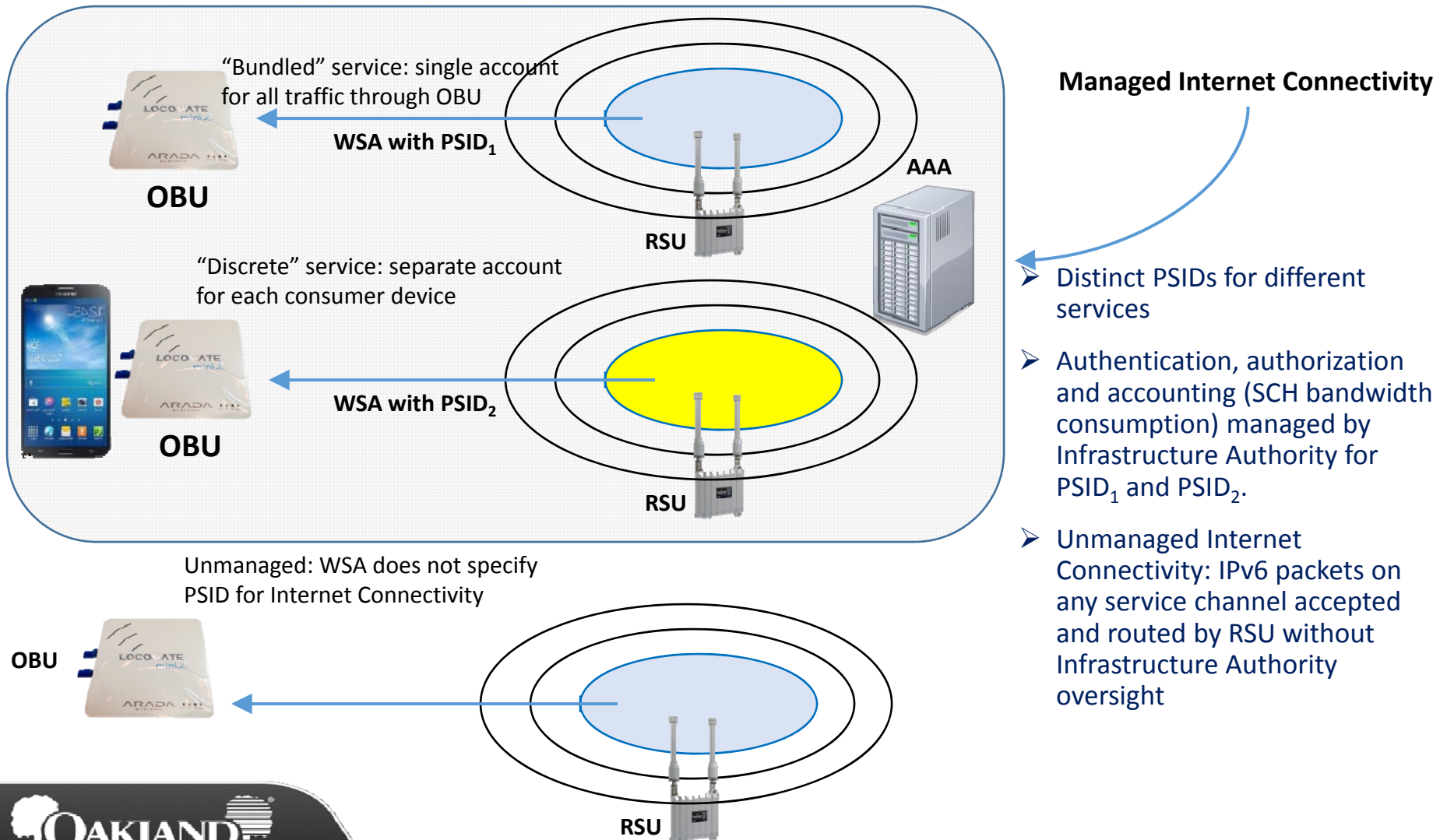
Every IPv6-enabled device can be a router

- using IPv6 Neighbor Discovery mechanisms, any OBU becomes an “access point” (“hotspot”) for consumer devices in the car (Smartphones or tablets)
- preferred interface between OBU and consumer device(s) is WiFiPeertoPeer (WiFiDirect)
- Consumer device self-configures its address on the network

Technology Description – IPv6 Connectivity Service



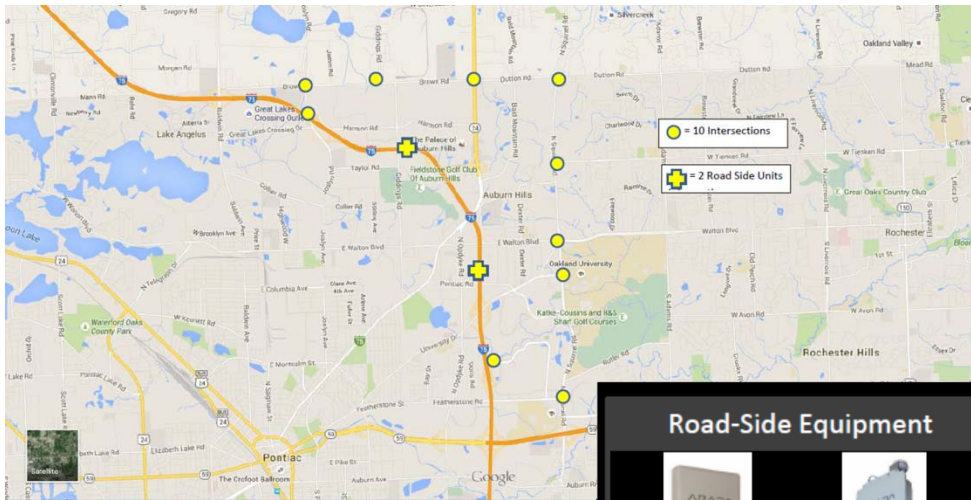
Technology Description – Service Offerings Subject to Policy Choice per RSU



Progress

- OCCV Task Force believes that our Infrastructure authority agreement (includes MDOT, County, Road Commission and Municipalities) has the potential to be a template for other jurisdictions (NA & EU)
- The OCCV proposed Controlled spectrum sharing architecture, is compliant with IEEE 1609.x, 802.11p and SAE J-2735 and allows for delivery of mobile Internet services to consumer non-DSRC devices in the vehicle. We believe that this strategy has the potential to also be a major revenue source for infrastructure financing.
- Proposed “controlled spectrum sharing” solution is a better alternative to “detect and vacate” and “re-channelization” schemes, because it does not require any changes to IEEE or SAE standards. To date, the OCCV strategy for “Controlled Spectrum Sharing” is the only proposal that is compliant with all existing standards

What's next?



Move from testing to validation

Road-Side Equipment



Deployed in 16+ municipal and test bed deployments throughout North America, Europe, and Asia

On-Board Units



Embedded OEM and Aftermarket design concepts

Applications

Intersection Assist Example



- Emergency Electronic Brake Lights
- Forward Collision Warning
- Blind Spot Warning / Lane Change Warning
- Do Not Pass Warning
- Intersection Movement Assist
- Left Turn Assist

Application software for vehicle-to-vehicle and vehicle-to-infrastructure (Android & IOS Available)

Prove it

Deploy a four intersection live DSRC network, completing a proof of concept that service channels can be shared; allowing market and OEM based consumer applications to be layered into service channel messaging



ITS WORLD CONGRESS 2017
Montréal | OCTOBER 29 - NOVEMBER 2

Are we right?



If this was your only route to work and the left lane was for “connected” cars only, how much would you pay to be “connected”?

Oakland County Connected Vehicle Task Force

Chair Fred Nader - fredrn@netcsd.com

Co-Chair Matthew Gibb - gibbm@oakgov.com

Thanks!

Matthew Gibb

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