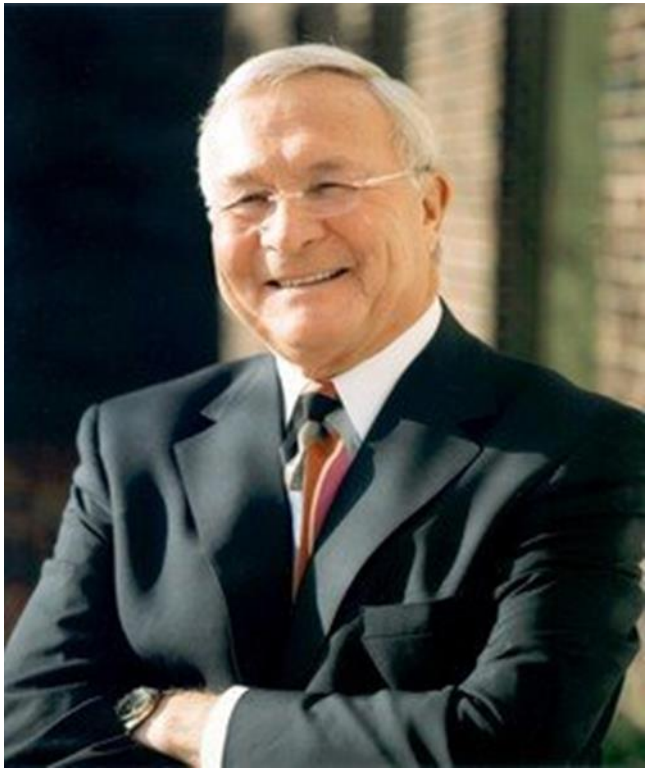
OAKLAND COUNTY MICHIGAN
CONNECTED VEHICLE TASK FORCE

BUILDING A PLAN FOR DEPLOYMENT

"Well, tonight I am delighted to announce another technology first for Oakland County. A bold leap into the future of technology and smart cars. If successful, I will be placing Oakland County on the global map as the first county in the world to initiate a countywide Connected Car Ecosystem."

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

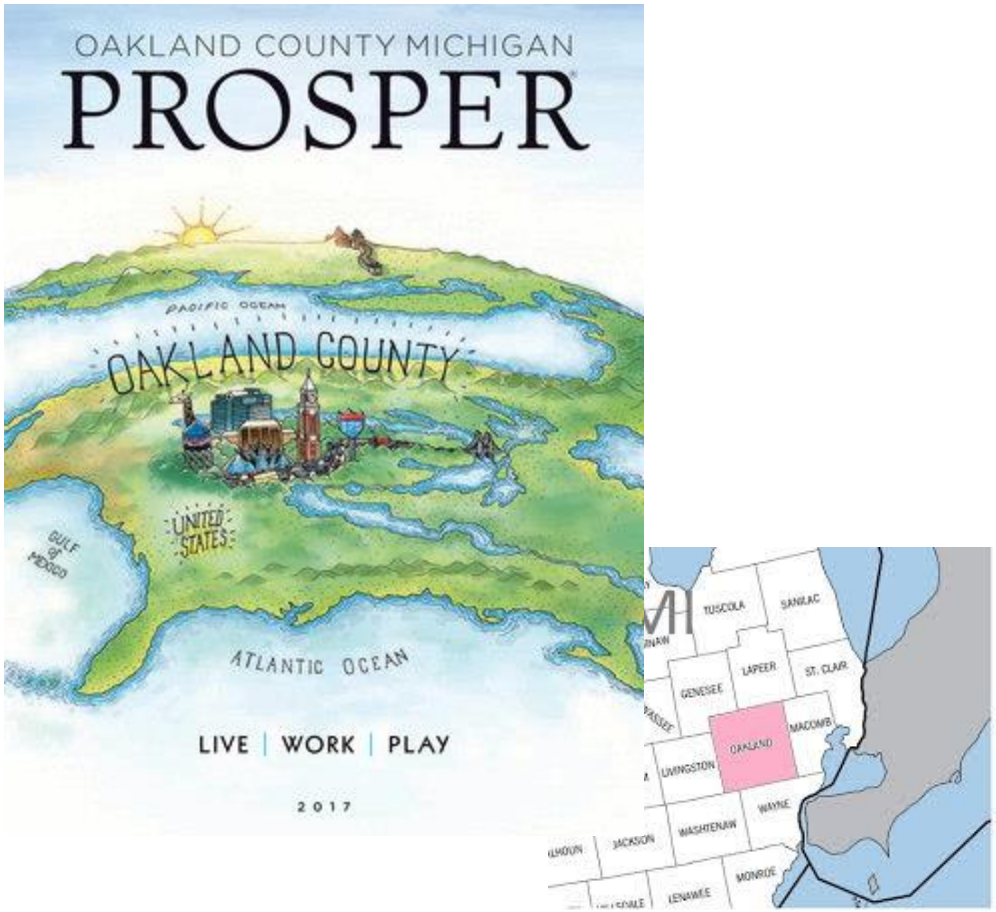
L. Brooks Patterson
State of the County 2014



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

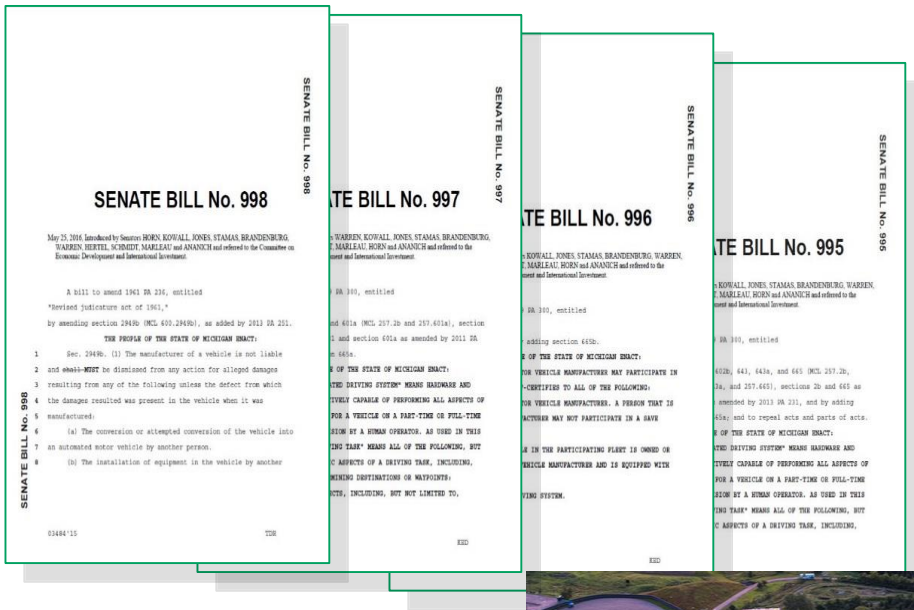


AN ENVIABLE STATUS QUO

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

Automotive Mobility Innovation



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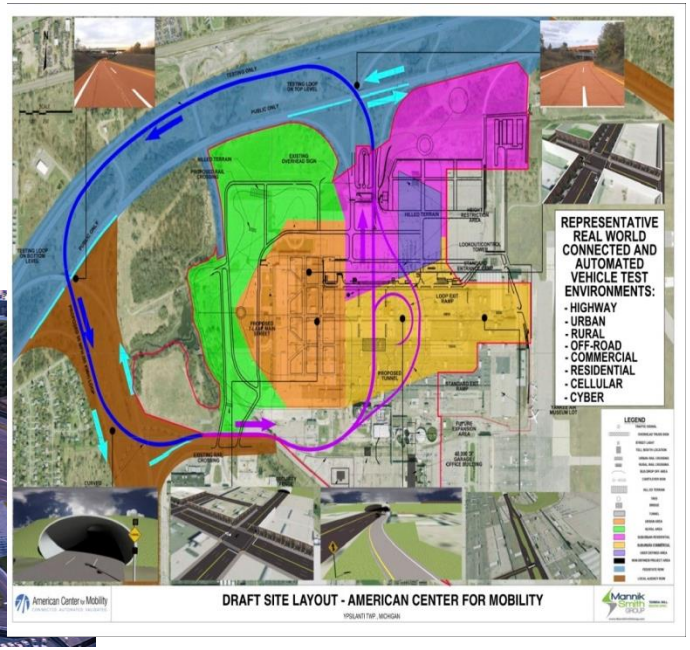
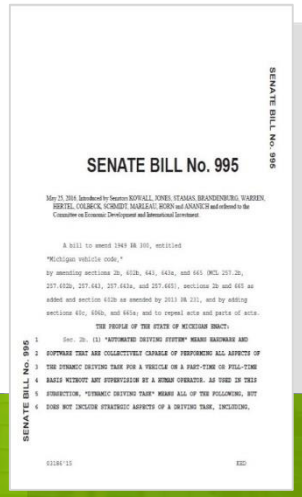




SENATE BILL No. 995

May 25, 2016 Introduced by Senators KOWALL, JONES, STAMAS, BRANDENBURG, WARREN, BERTEL, COLBECK, SCHMIDT, MARLEAU, HORN and ANANICH and referred to the Committee on Economic Development and International Investment.

A bill to amend 1949 PA 300, entitled

"Michigan vehicle code,"

by amending sections 2b, 602b, 643, 643a, and 665 (MCL 257.2b, 257.602b, 257.643, 257.643a, and 257.665), sections 2b and 665 as added and section 602b as amended by 2013 PA 231, and by adding sections 40c, 606b, and 665a; and to repeal acts and parts of acts.

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,

SENATE BILL No. 995

03186'15 EED

Public Act No. 332

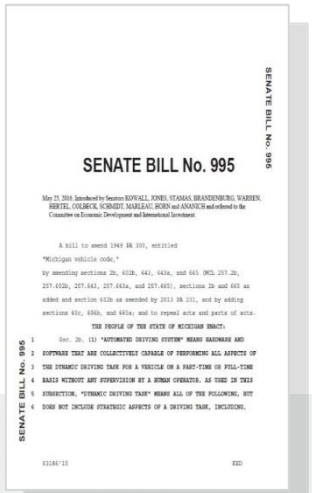
Mike Kowall (R-White Lake), Primary Sponsor

Putting AV's on the Road

Eliminates "test only" restriction

Allows driverless operation on public roads at any time

OAKLAND COUNTY MICHIGAN



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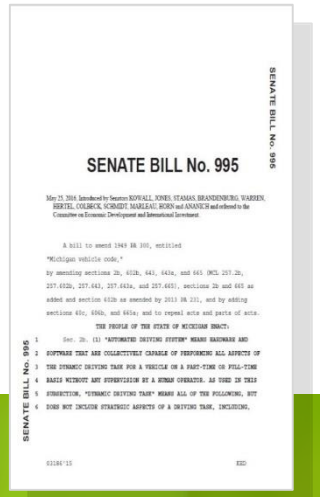
Open for Transport

Platooning of commercial vehicles

Supporting the military, large shipping or logistics companies

OAKLAND COUNTY MICHIGAN



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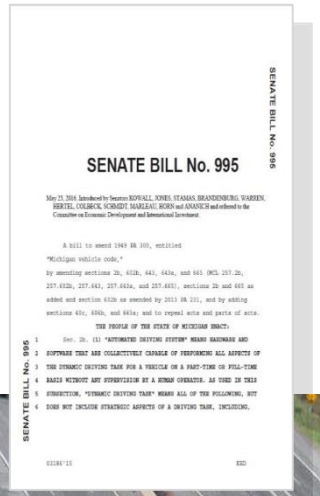
A New Way to Ride

Automated vehicle networks connected to consumers

Creates array of travel options for consumers

OAKLAND COUNTY MICHIGAN



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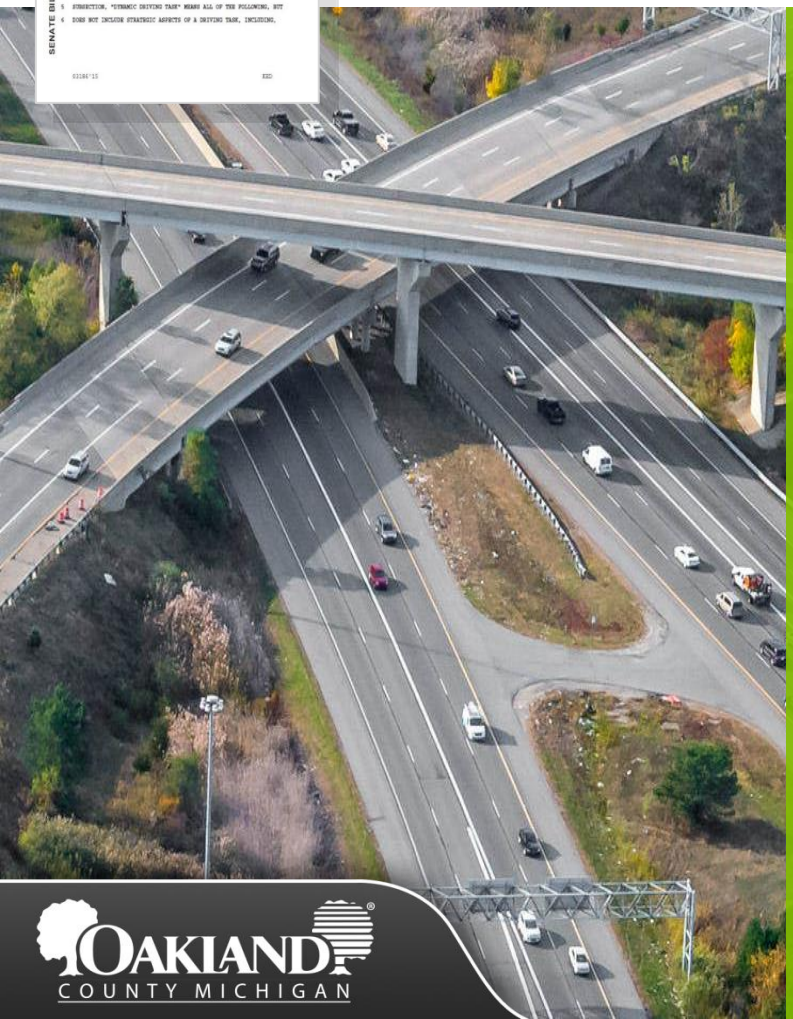


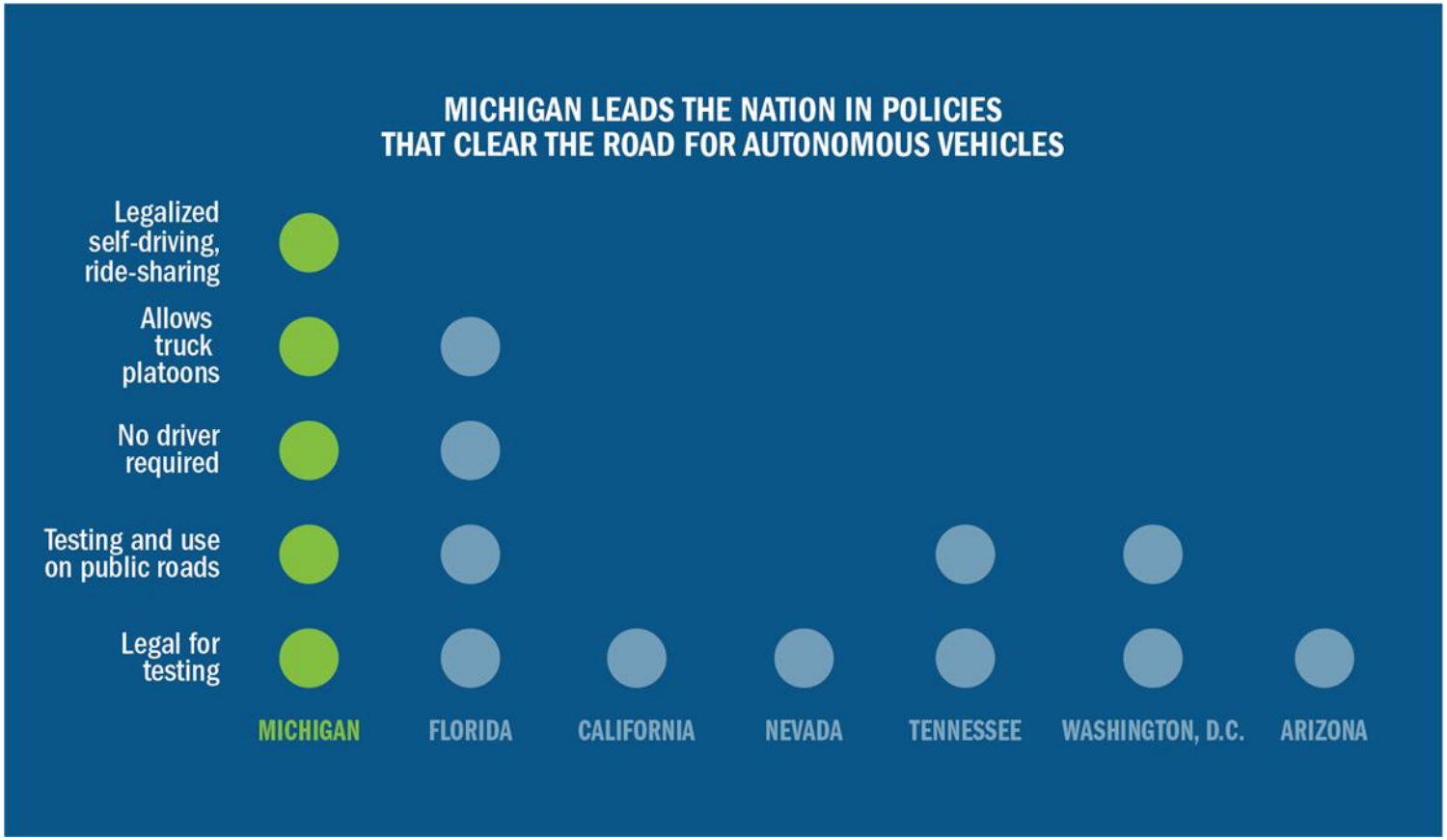
State of Michigan Support

Council on Future Mobility reports to the legislature annually; recommends new laws or revisions are needed

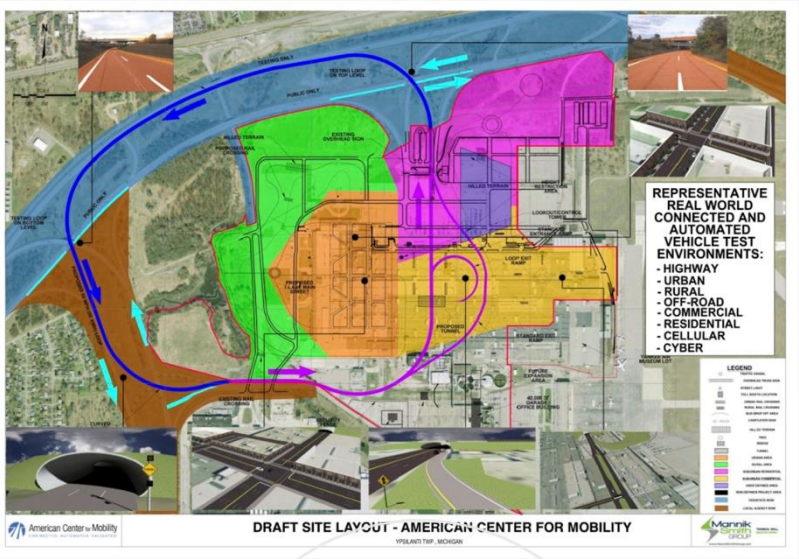
What new policies would help enhance safety, mobility and the state's economy through this technology

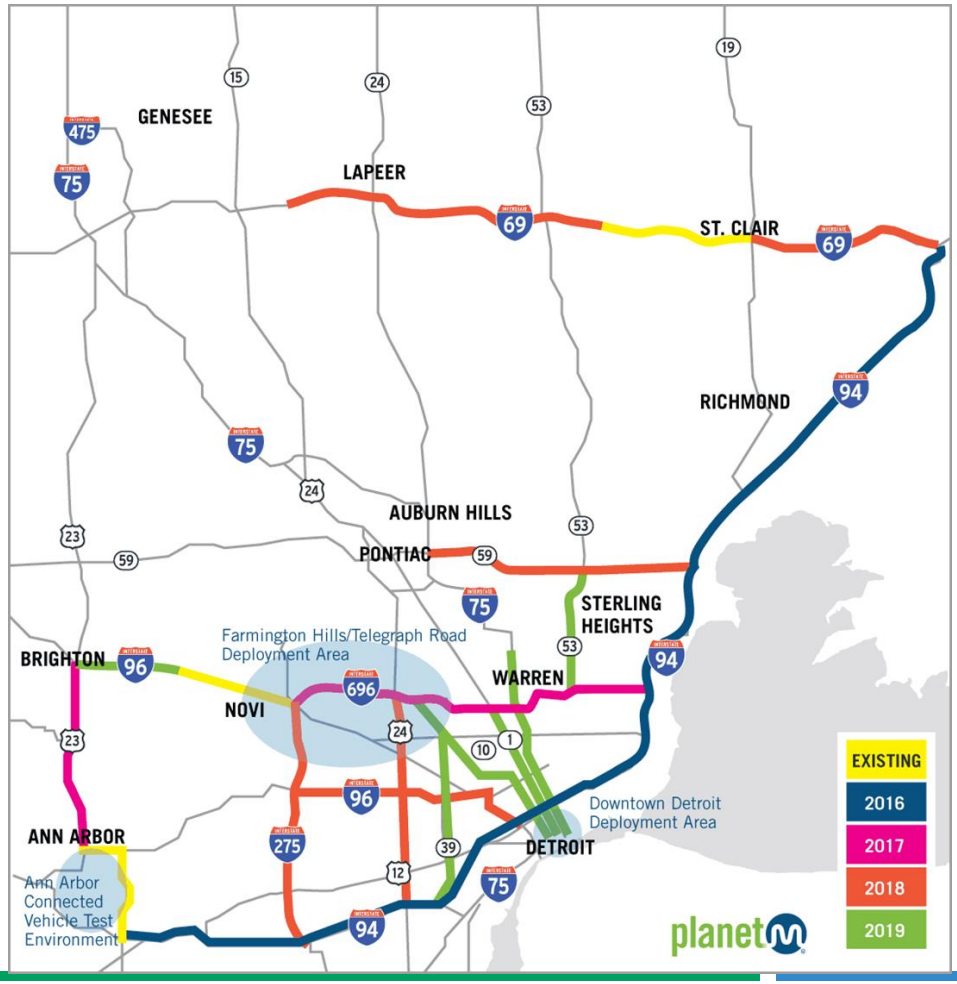
OAKLAND COUNTY MICHIGAN

First in the Nation



Leading the way forward





What is our charge?

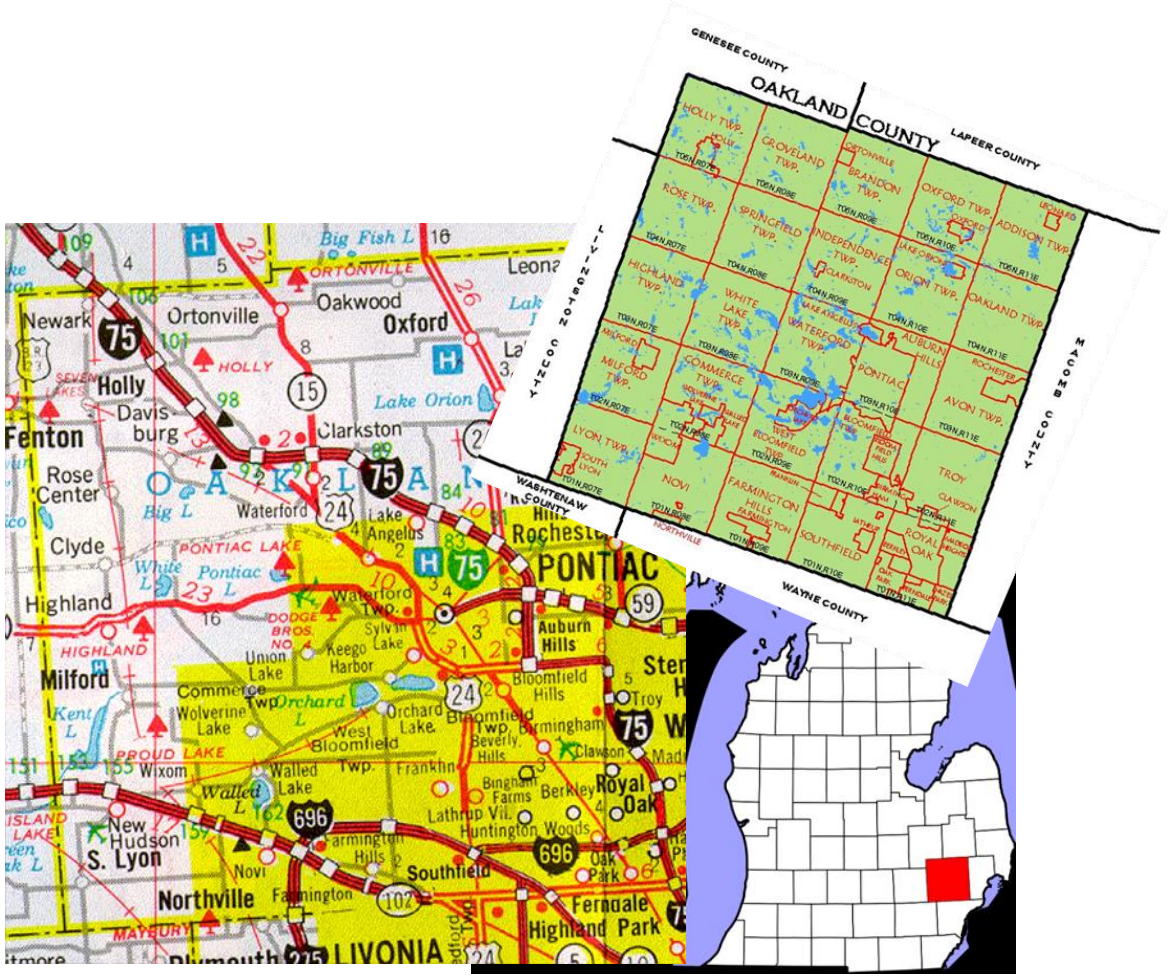
- Established by Oakland County Executive in 2014 with following mandate:
  - Build business model to acquire, implement and maintain Connected Car (WAVE) infrastructure throughout Oakland County (without taxpayer funding), and share with other public sector stakeholders
  - Achieve technical and regulatory 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

What is our challenge?

MDOT 310miles
RCOC 2600miles
CVT 2700miles

5610 miles

1400 Intersections



A much bigger 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-ll data port
  - 16 Million new vehicles per year (USA sales)
    - New vehicle production alone will take more than 10 years to achieve reasonable density

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

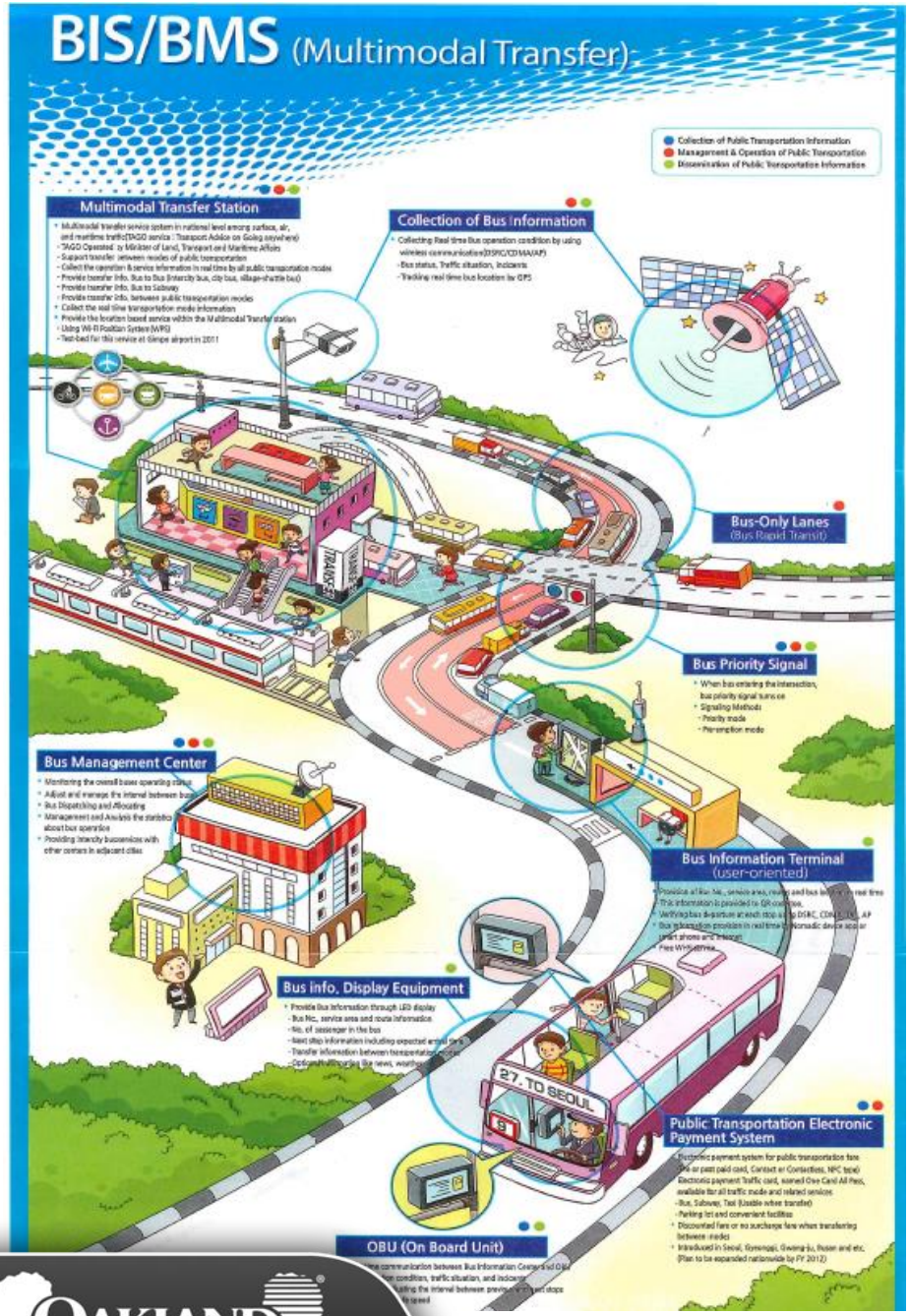
Design "Controlled Spectrum Sharing" methodology to enable Network Operator Control of access to WAVE service channels

- 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 and 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)

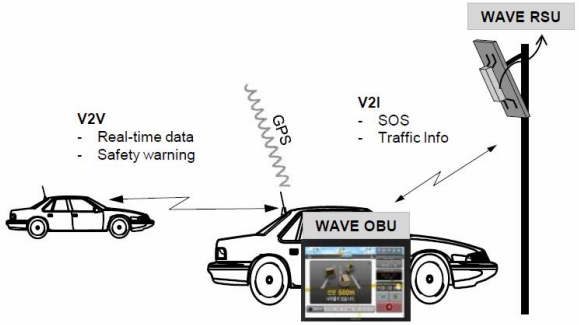


FTMS/ATMS

Using what exists

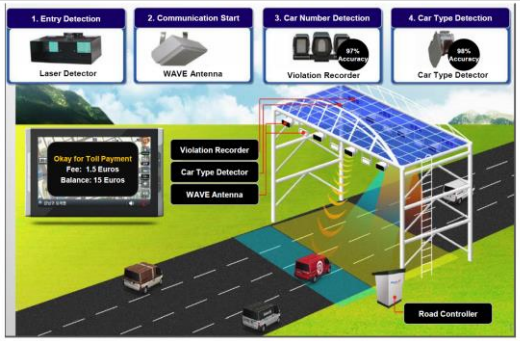
Communication Technology

❑ Wireless Access in Vehicular Environment (WAVE)



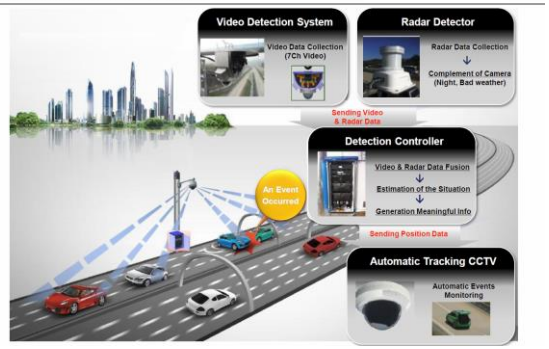
<Components>

Multiple-Lane Tolling System

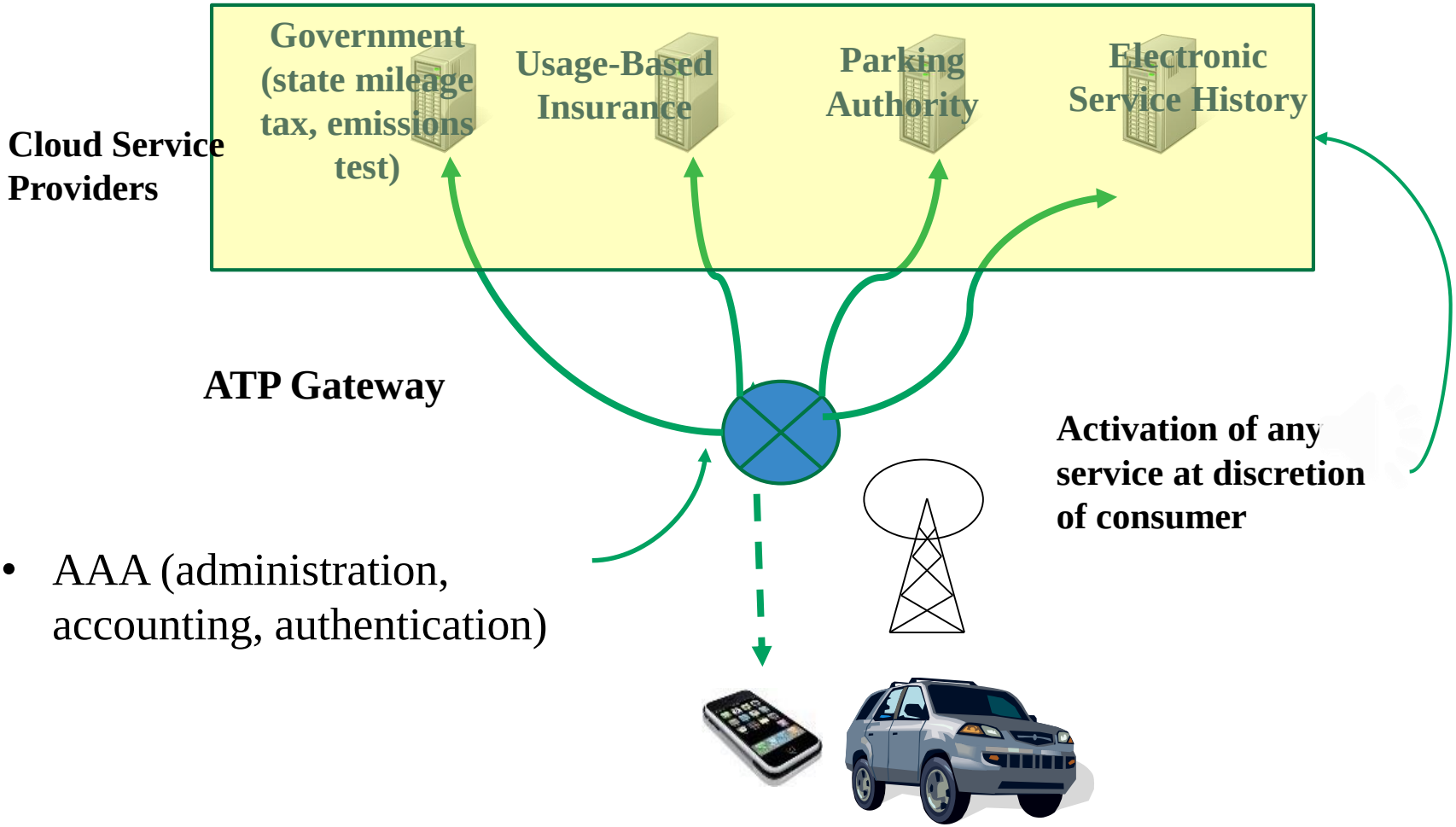


- Providing Safety & Mobility Services using bi-directional communication between Vehicle and/or Infrastructure
- Frequency Band: 5.855 ~ 5.925 GHz
- Transmission Range: ~ 500 m
- Date Rate: 6~27 Mbps

Automatic Events Detection System



Revenue creativity



- AAA (administration, accounting, authentication)

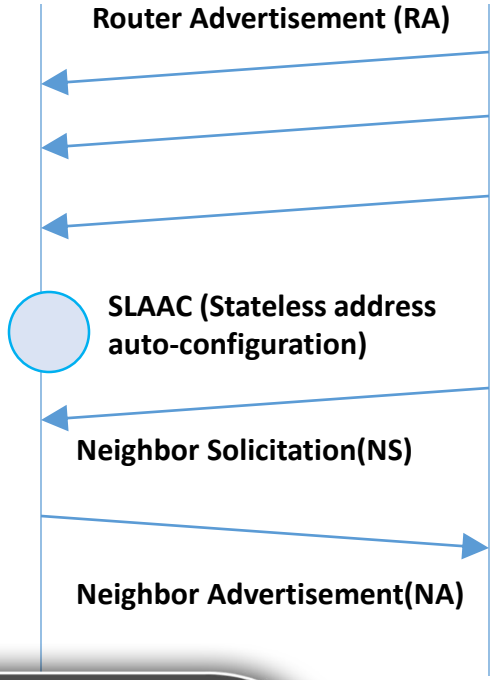
Controlled Spectrum Sharing

- 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

WiFiDirect

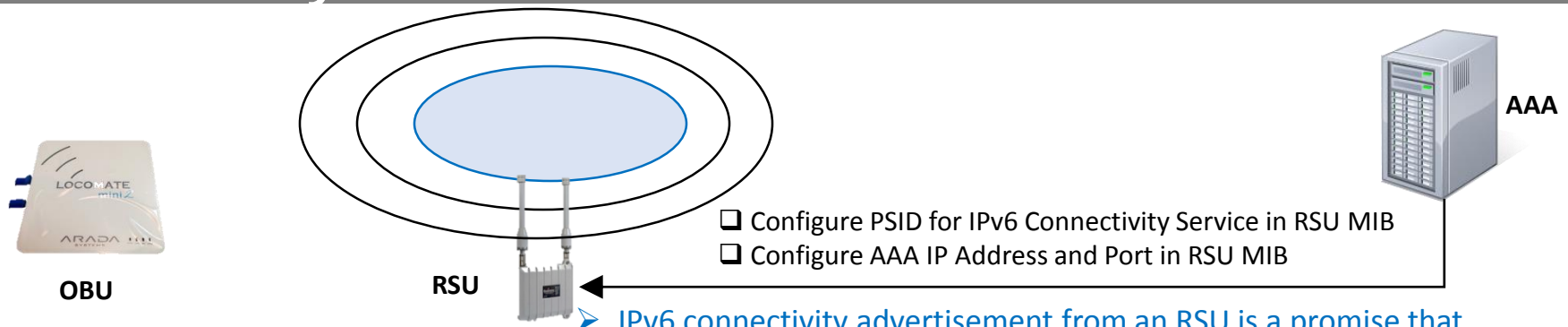
Consumer Device **OBU**



Every IPv6-enabled device can be a router

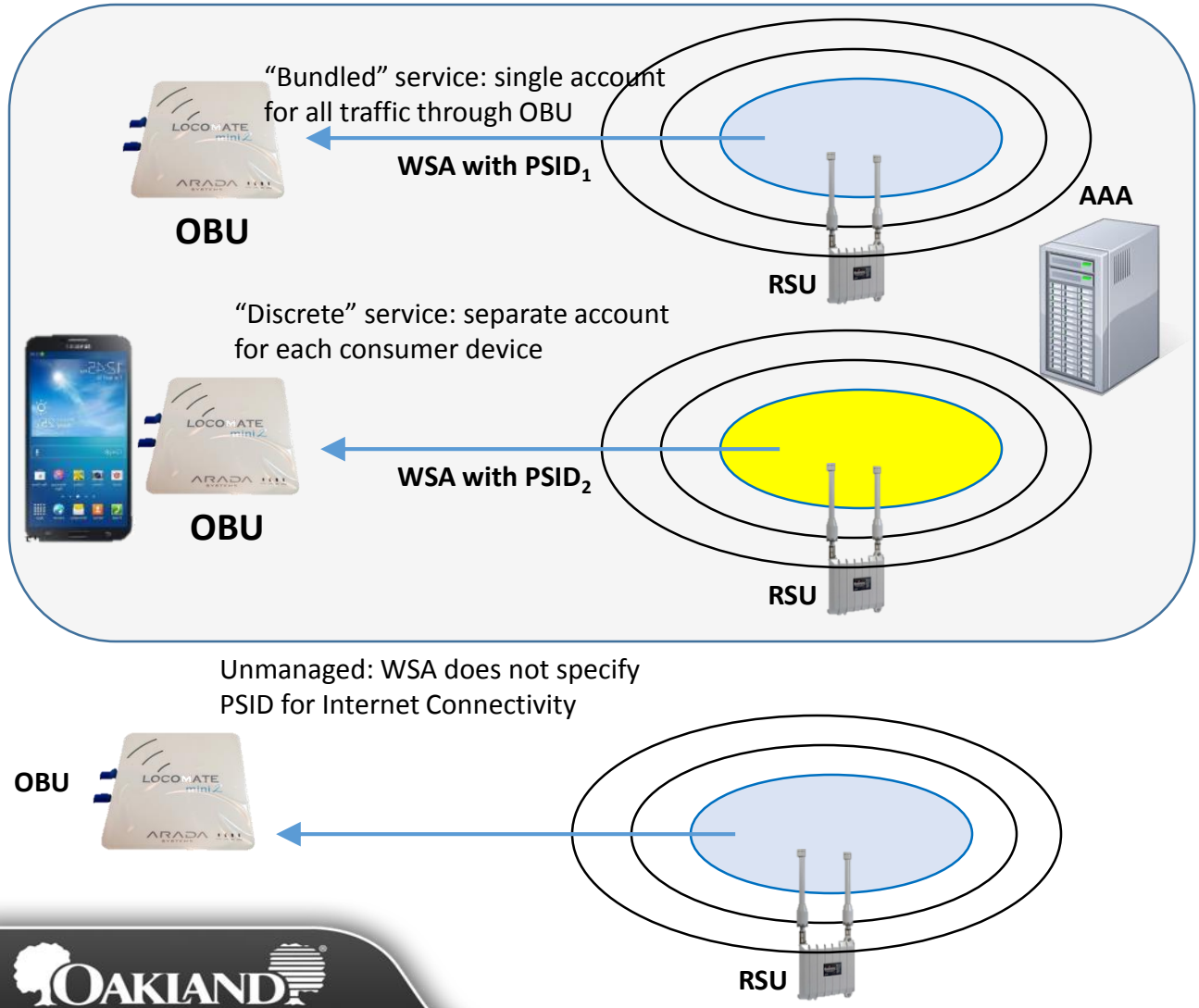
- using IPv6 Neighbor Discovery mechanisms, any OBU becomes an “access point” (“hotspot”) for consumer devices in the car (Smartphones or tablets)
- preferred interface between OBU and consumer device(s) is WiFiPeertoPeer (WiFiDirect)
- Consumer device self-configures its address on the network

Technology Description – IPv6 Connectivity Service



- IPv6 connectivity advertisement from an RSU is a promise that mobile originated IPv6 datagrams (from OBU) will be forwarded towards the destination. It is also a promise that mobile-terminated IPv6 datagrams destined for an OBU (or for devices attached to it) will be routed by the serving RSU
- these promises are a function of "infrastructure authority" policy decisions
- IPv6 pathways are mapped to DSRC service channels (SCH) based on SCH availability
- Availability criteria determined at local jurisdictional level ("infrastructure authority")
- new Provider Service Identifier (PSID) advertises service
- priority level assigned by local authority based on current requirements
- OBU receiving this advertisement configures transmitter profile for channel selection in MLME. Traffic from non-compliant OBU is discarded.

Technology Description – Service Offerings Subject to Policy Choice per RSU



Managed Internet Connectivity

- Distinct PSIDs for different services
- Authentication, authorization and accounting (SCH bandwidth consumption) managed by Infrastructure Authority for $PSID_1$ and $PSID_2$.
- Unmanaged Internet Connectivity: IPv6 packets on any service channel accepted and routed by RSU without Infrastructure Authority oversight

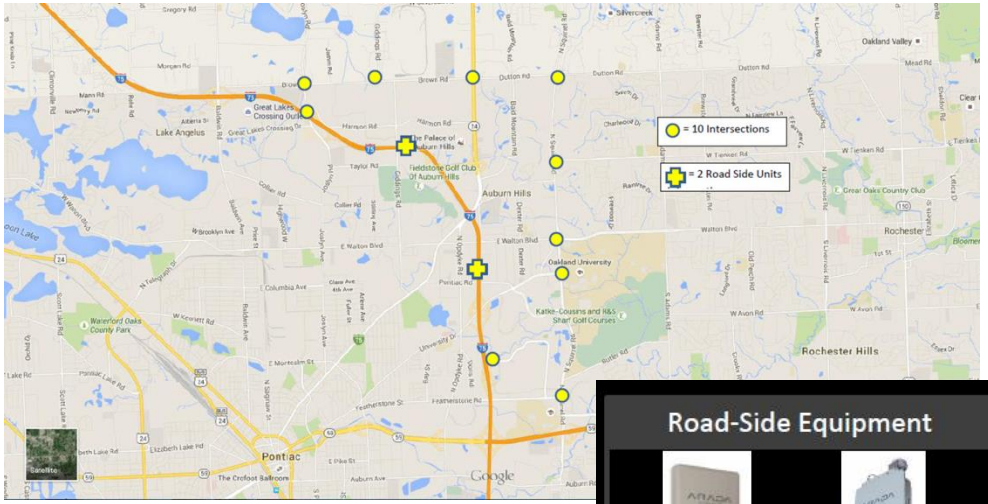
Progress

- 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)

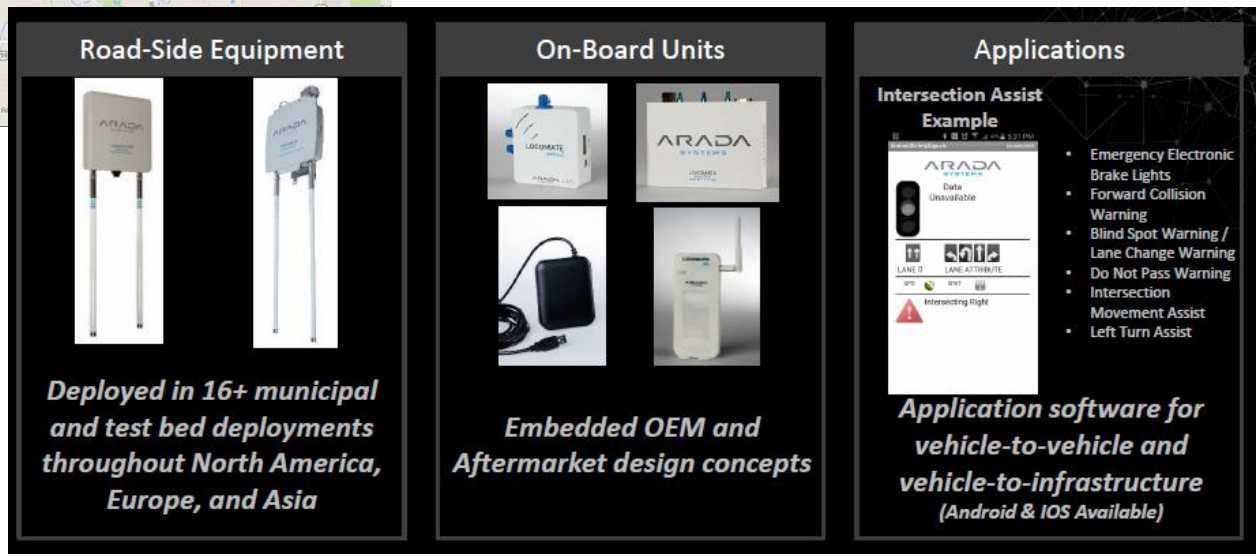
- The OCCV proposed Controlled spectrum sharing architecture, is compliant with IEEE 1609.x, 802.11p and SAE J-2735 and allows for delivery of mobile Internet services to consumer non-DSRC devices in the vehicle. We believe that this strategy has the potential to also be a major revenue source for infrastructure 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



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 safety 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

Deputy County Executive

Economic Development and Community Affairs

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