Blue Rhubarb
ADVANCED GROWTH CONSULTANTS

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ITS AMERICA

ITS Carolinas 2017/2018
Annual Meeting

THE ECONOMICS OF DEPLOYMENT

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CEO and Founder Blue Rhubarb

Where and Why

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

75 of the top 100 Global Auto Companies

2200 + Mobility Based Research and Development Centers

We are the "Motor City"

Global or North American R&D Headquarters in Michigan

CHRYSLER · 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.

375 Automotive R&D Centers

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

CAR
CENTER FOR AUTOMOTIVE RESEARCH

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Automotive Mobility Innovation

First in the Nation
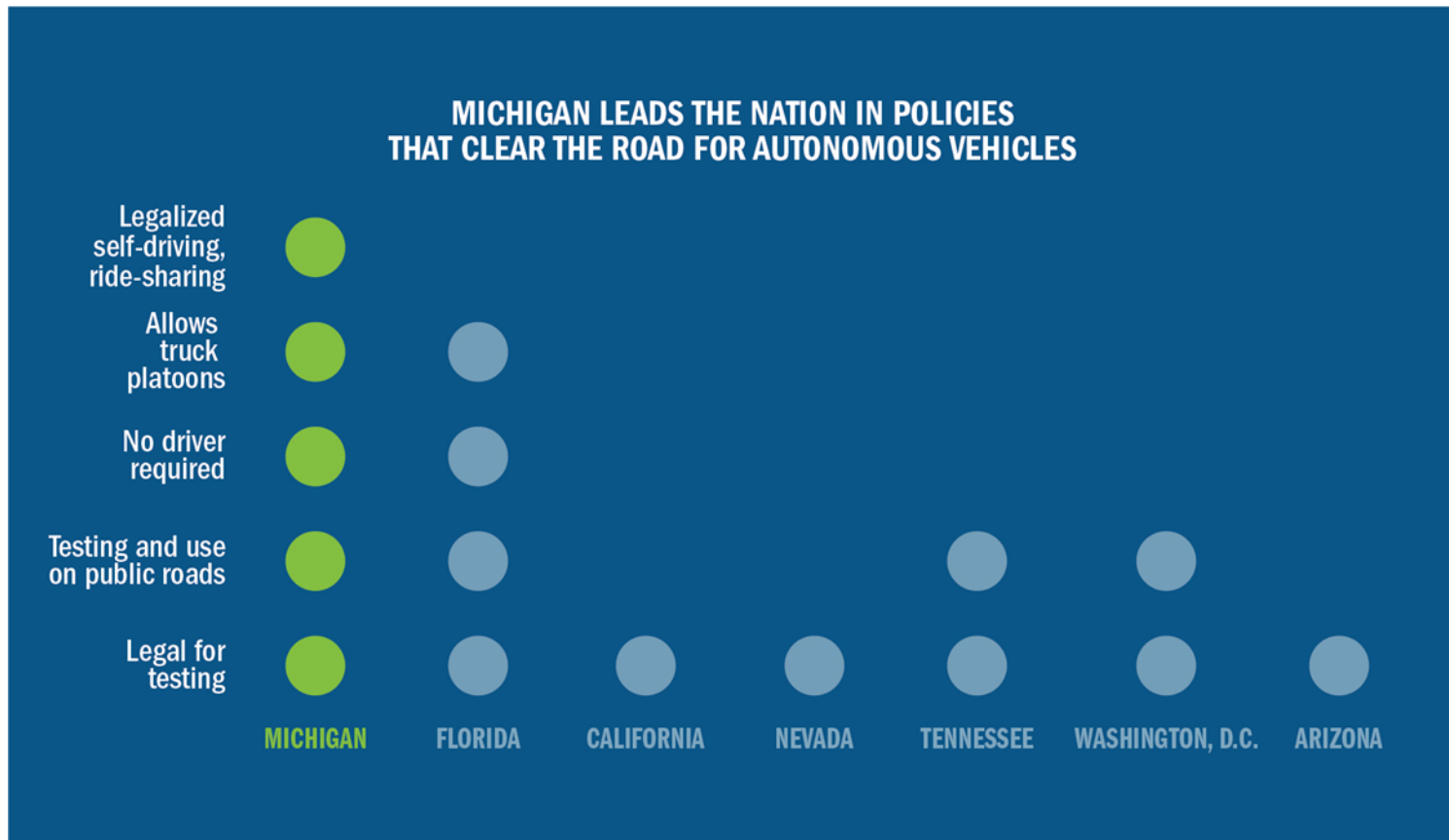
MICHIGAN LEADS THE NATION IN POLICIES
THAT CLEAR THE ROAD FOR AUTONOMOUS VEHICLES

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Key partners
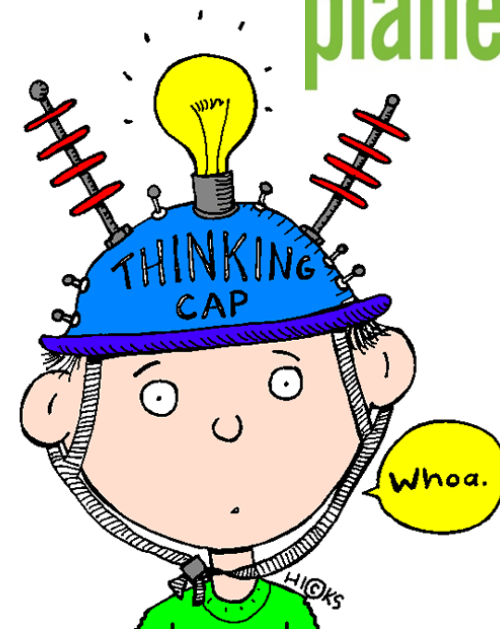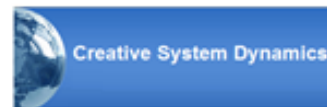
A big challenge

- A mountain of obstacles to transition technology from the experimental/pilot stage to the commercial stage
- Traditional road funding methods require years of staging and planning
- No current regulatory framework for multi-jurisdictional consensus
- The telecommunications industry is begging for the 5.9Ghz bandwidth reserved for transportation
- Can you convince the aftermarket to participate
  - 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

A really big challenge

MDOT   310miles
RCOC   2600miles
CVT   2700miles

5610 miles

1400 Intersections

42 Jurisdictions

BIS/BMS (Multimodal Transfer)

FTMS/ATMS

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

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

Multimodal Transfer Station

- Multimodal transfer service system in national level among surface, air, and maritime traffic(TAGO service : Transport Advice on Going anywhere)
- TAGO Operated by Minister of Land, Transport and Maritime Affairs
- Support transfer between modes of public transportation
- Collect the operation & service information in real time by all public transportation modes
- Provide transfer Info. Bus to Bus (Intercity 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 Wi-Fi Position System (WPS)
- Test-bed for this service at Gimpo airport in 2011

Collection of Bus Information

- Collecting Real time Bus operation condition by using wireless communication(DSRC/CDMA/AP)
  - Bus status, Traffic situation, Incidents
  - 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
  - Pre-emption mode

Bus Management Center

- Monitoring the overall buses operating status
- Adjust and manage the interval between bus
- Bus Dispatching and Allocating
- Management and Analysis the statistics about bus operation
- Providing Intercity buses service with other centers in adjacent cities

Bus Information Terminal
(user-oriented)

- Provide at Bus No., service area, routes and bus location in real time
- This information is provided in QR code, etc.
- Verifying bus departure at each stop using DSRC, CDMA, RF, AP
- Bus Information provision in real time to Nomadic device such as smart phone and internet
- Free Wi-Fi service

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
  - Option of Multiple parties (like news, weather)

Public Transportation Electronic Payment System

- Electronic payment system for public transportation fare (pre or post paid card, Contact or Contactless, NFC type)
- Electronic payment Traffic card, named One Card All Pass, available for all traffic mode and related services
  - Bus, Subway, Taxi (Usable when transfer)
  - Parking lot and convenient facilities
- Discounted fare or no surcharge fare when transferring between modes
- Introduced in Seoul, Gyeonggi, Gwang-ju, 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 indicents
- Assisting in adjusting the interval between previous and next stops
- Displaying the safe speed

27. TO SEOUL

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 C2C 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, MOLIT affiliated organizations conduct these jobs)

Smart IC

- Connect urban road and national highway with the Interchange on expressway
- Gate for Entry and Exit of expressway by using 5.8 GHz DSRC communication
- When incidents happen on expressway, vehicle make a detour
- Rent area has function as a transfer station for public transportation

CCTV Incident Detection System

V2V service

- Information sharing between vehicles based on WAVE/DSRC
- Traffic Incident (work, accident, etc.) information is shared between the vehicles
- Realization through Smart Highway Project
  - Demonstration at Busan ITS world Congress in 2010
  - Test driving at Yeo-ju experimental Road, Test-bed

V2I service

- Collection and provision of real time traffic information between RSE and OBU based on 5.8GHz DSRC communication
- Provide the traffic information by a provision active
- Provide information on incident location, work zone, etc. ahead
- Support digital map, image, voice and text

Parking Information System

- Estimate occupied parking space by using sensors (Open area: buried-type, within the building: infrared, etc.)
- Estimate the available parking space by counting entering/exiting vehicles, occupied space
- Parking guide, using Parking Guidance System based on result in estimating the occupied parking space
- Collect parking location information

ATMS/FTMS Center

- Collection and Dissemination of traffic information and CCTV data in urban, rural and national highway
  - ATMS : Parking Info., Public transportation Info, Traffic Information service & Management of urban traffic
  - FTMS : Monitoring overall situation on expressway, bridges and tunnel
- Traffic data collection and provision based on standardized node link
- VDS(image, loop, radar) and Probe information based on DSRC
- Sharing the information of traffic condition and incidents with other regional traffic centers, FTMS Centers, NTIC, Emergency operation centers (based on standardized node-link and the Standard for C2C Information Exchange)

ETCS (Hi-Pass)

- Non-stop, Electronic Toll Collection System based on 5.8GHz DSRC
- Dual(integrated) antenna available for both IR and RF
- Card type : Pre or postpaid, Contact/Contactless

TTMS

Tunnel

VMS

VDS

VDS

DSRC RSE

LCS

CCTV

DSRC RSE

TCS

CCTV

expressway

Some Key findings

- GOVERNMENT IS AT RISK OF LOSING CONTROL

- IT IS A PITFALL TO TRY AND "BUNDLE" EXISTING TECHNOLOGY

- WAVE STANDARDS CONSTITUTE A ROBUST, OPEN ARCHITECTURE PLATFORM

- DSRC WORKS AND IS TESTED

- INNOVATION REQUIRES A SKILLED WORKFORCE

- THE CHALLENGE IS NOT THE TECHNOLOGY

- THE BUSINESS CASE STARTS IN THE AFTERMARKET

- THERE MUST BE BOTH AN ORGANIZATIONAL AND TECHNOLOGICAL SOLUTION CONCURRENTLY

Business Model Foundation

➢ Build a 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)

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 →

Advocate a "Controlled Spectrum Sharing" (CSS) policy to require that Network Operators maintain real-time dynamic control, at the individual RSU level, of which DSRC service channels are allocated, to IPv6 communications, and advertised as such to OBUs.

Promote a framework in which authentication of consumer devices is tied to the USDOT-defined Security Credential and Management System.

Promote "Controlled Spectrum Sharing" as a 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
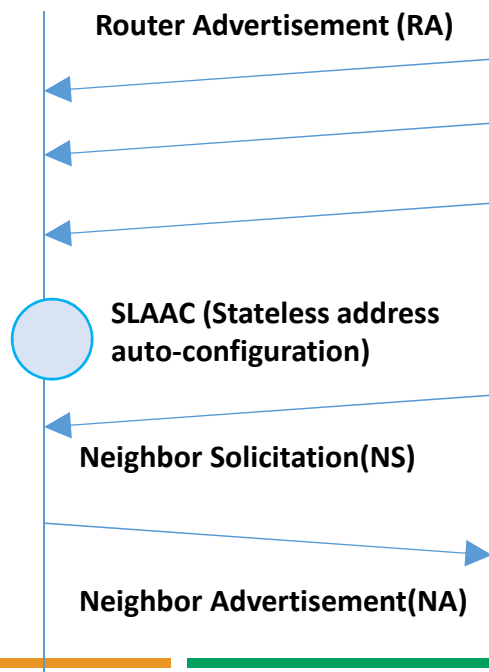- Evaluate and support funding opportunities to increase the rate of infrastructure deployment
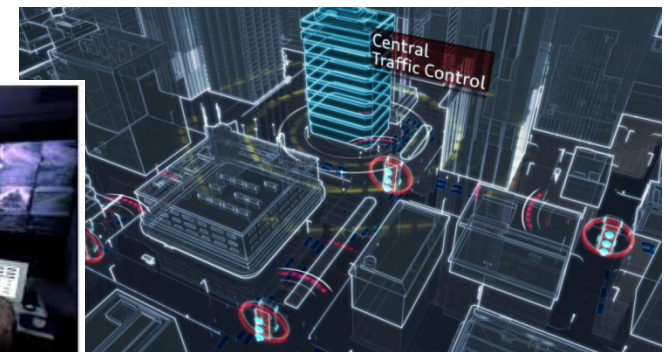
Pay for it all through Controlled Spectrum Sharing

- 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
- 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

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A Possible Solution
Use an OBU as a router

Consumer Device

WiFiDirect

OBU

Router Advertisement (RA)

SLAAC (Stateless address auto-configuration)

Neighbor Solicitation(NS)
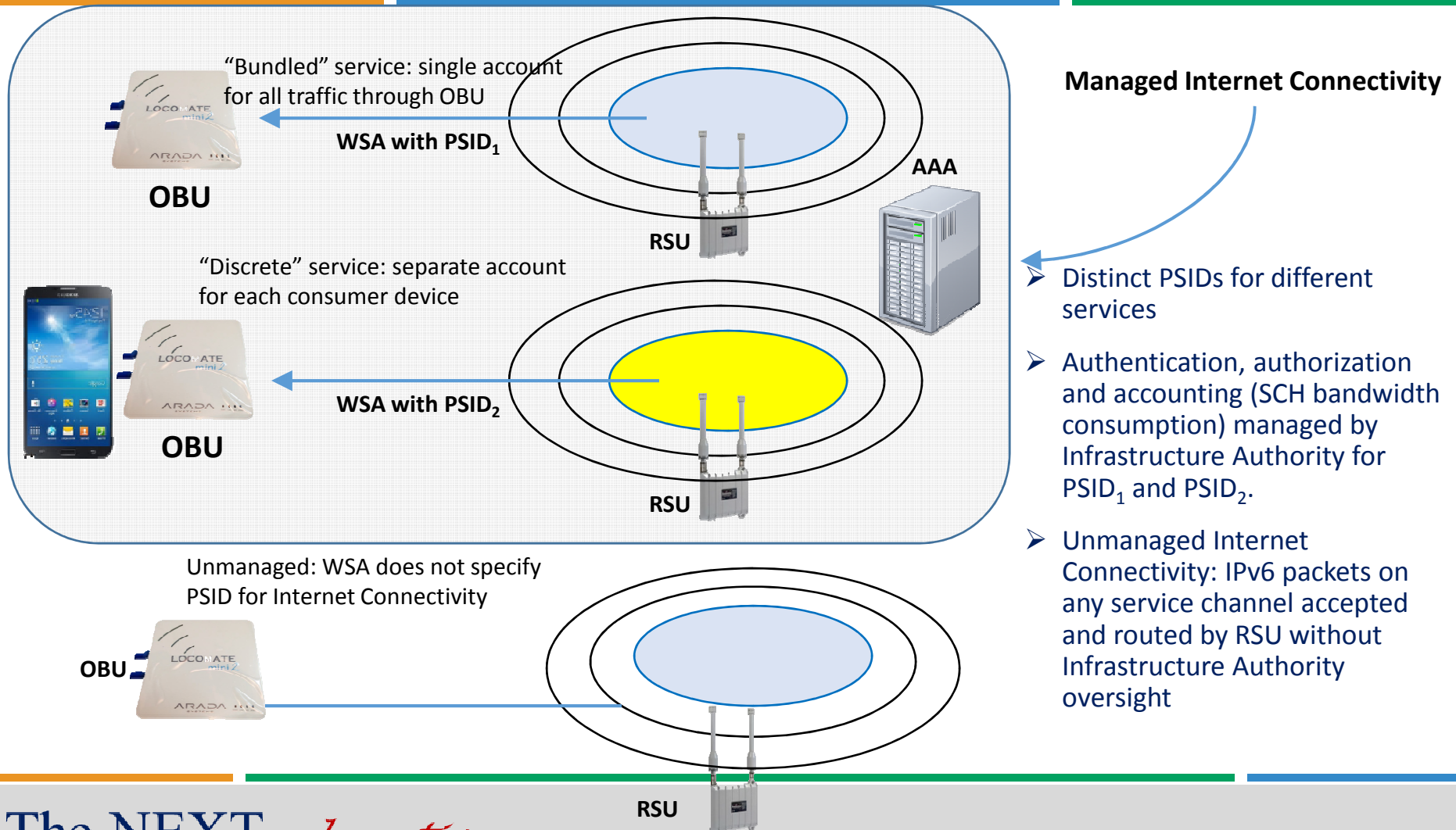
Neighbor Advertisement(NA)

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

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A Possible Solution
Service offerings subject to policy

"Bundled" service: single account for all traffic through OBU

WSA with PSID$_1$

OBU

RSU

AAA

"Discrete" service: separate account for each consumer device

WSA with PSID$_2$

OBU

RSU

Unmanaged: WSA does not specify PSID for Internet Connectivity

OBU

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

Prove it

ITS WORLD CONGRESS 2017
Montréal | OCTOBER 29 - NOVEMBER 2

Simplify

- 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

And Succeed

➢ The Infrastructure Authority model (currently including MDOT, County, Road Commission and Municipalities) is 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 access to service channel bandwidth and delivery of consumer based services in the vehicle.

➢ The 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

Who's Paying?

- Real-time data feed to
  - Traffic management centres (TMCs)
  - Directly to Traffic Signal Controllers
- Real-time data feed to Advanced Traveller Information Systems (ATIS):road navigation assistance, advisories, etc.
- Fees for issuance/distribution of digital certificates used to authenticate vehicles by type.
  - prioritization for emergency vehicles at signalized intersections
  - Extended green phase for surface transit, freight vehicles
  - Development of new communications-based interaction between roadside and autonomous vehicles
- Electronic tolling:
  - All freeway lanes
  - High occupancy toll (HOT) lanes
  - "Eco-lanes" (preferential treatment for zero-emissions vehicles)
  - AV lanes (allows cities to "design" for autonomous vehicles without pouring concrete)

What's Next?

OAKLAND
COUNTY MICHIGAN

OAKLAND COUNTY EXECUTIVE L
(248) 858-0011 |

COMPLIANCE OFFICE
PURCHASING

SOLICITATION FORM

t Information:

d County Purchasing Division
g 41 West - Lower Level
ontiac Lake Road
ford, MI 48328

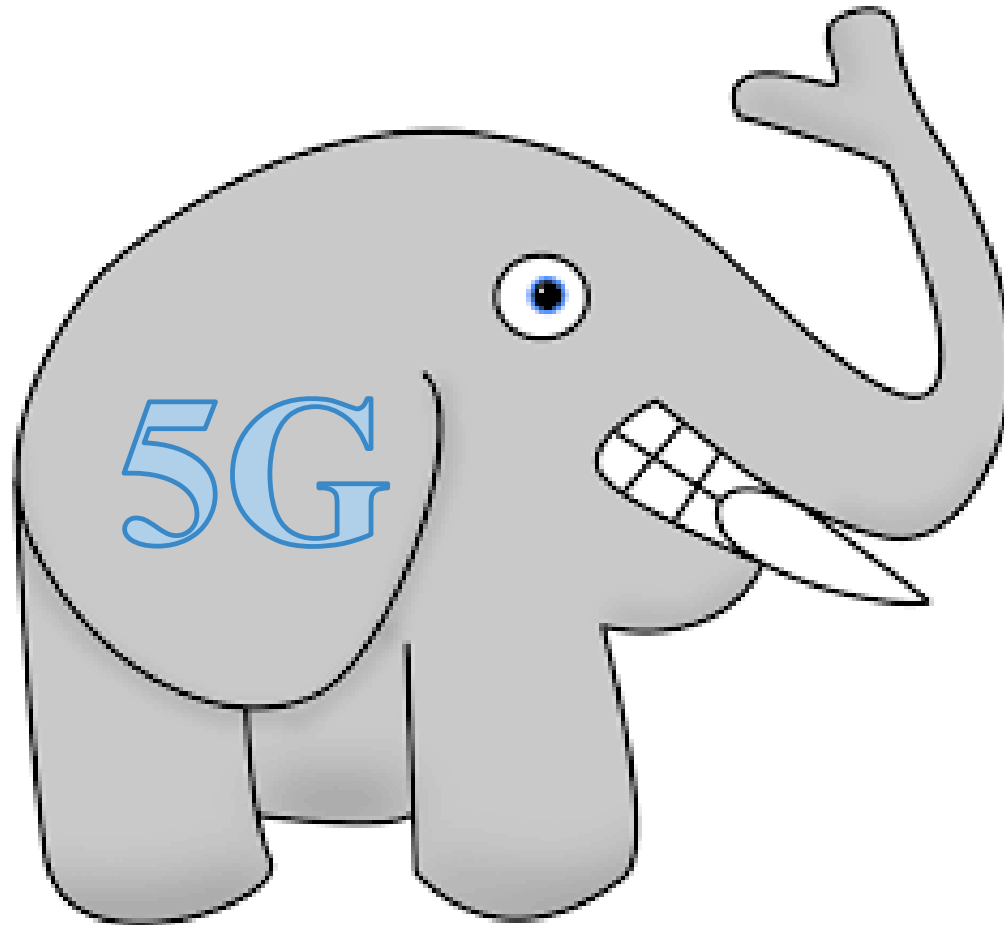| Buyer: | Guzzy, Scott N |
Phone:	(248)858-5484
Fax:	(248)858-1677
Email:	guzzys@oakgov.com

ation Event ID: 004164 | Response Due: 1/9/2018 | By: 2:00 PM

Hard Copy: ⦿   Online: ◯   Online or Hard Copy: ◯

Event Title: RFP for DSRC Pilot Connected Autonomous Vehicle Network

Category Codes: 8200000

The Elephant….

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"?

Thanks!

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