



MARYLAND TRANSPORTATION SYSTEMS MANAGEMENT & OPERATIONS

MPO Roundtable

→ September 13, 2019 ←

MDOT TSO
Hanover, Maryland

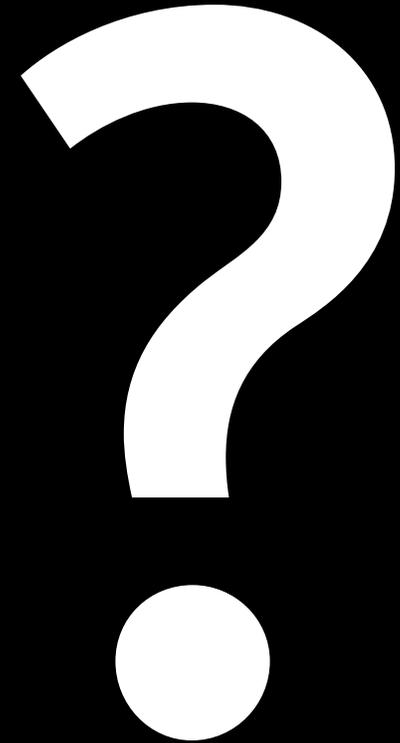
OUTLINE

- Why TSMO?
- About MDOT SHA TSMO Program
- Delivering the TSMO Program
- CAV Efforts
- Data Technology & Performance Measures
- Next Steps



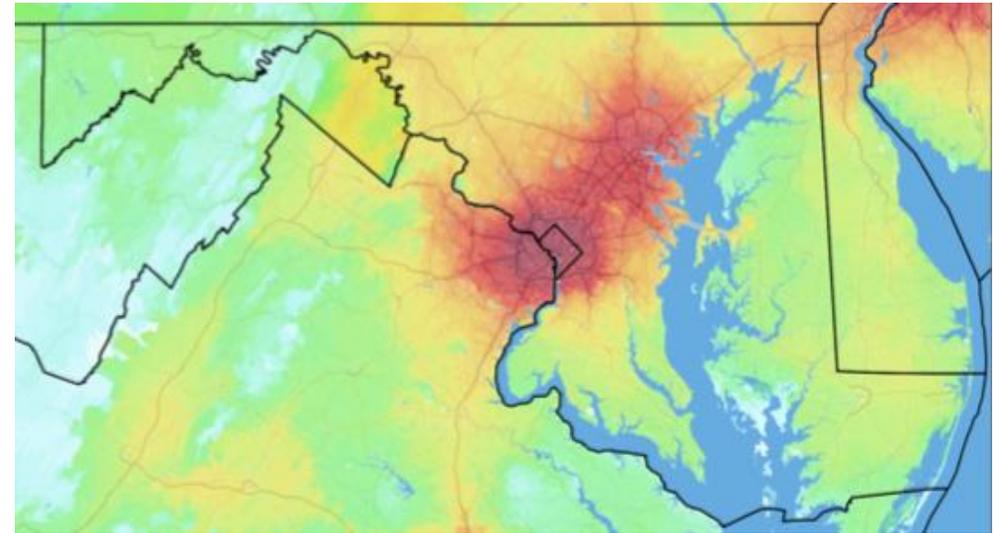


WHY TSMO

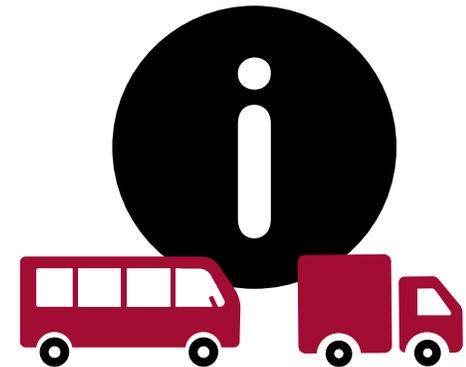


WHY TSMO IN MD? – DEMAND SIDE

- MD VMT and congestion levels at **all time high** - one of the most congested regions in US
- MD will have **1 Million more people** by 2040, which will result in **30% more VMT** and **doubling of truck VMT**
- **Customer Needs and Expectations** are changing – faster, reliable and flexible
- **Technology** is playing a huge role for travel decisions (commute, shop, other)



Need to Think Differently.

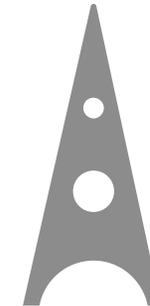
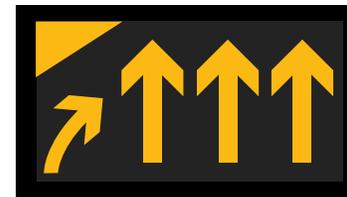


WHY TSMO IN MD? – SUPPLY SIDE

- **System operating at/over capacity**
- Over-saturated conditions lead to higher unreliability
- **Multiple priorities** (SOGR, Safety, Mobility, Capacity, Economy)
- **Technology playing a key role** – efficiency, reliability and system of systems



Focus on “Door to Door”
Customer Experience





About MDOT SHA TSMO Program

RETHINKING OUR EXISTING TRANSPORTATION SERVICES

ROADWAY WEATHER MANAGEMENT



HOMELAND SECURITY PREPAREDNESS



EMERGENCY RESPONSE



TRAFFIC INCIDENT MANAGEMENT



CONNECTED AUTOMATED VEHICLE (CAV) TECHNOLOGY



TRANSIT PRIORITY/INTEGRATION



WORK ZONE MANAGEMENT



TRAFFIC SIGNAL COORDINATION



FREEWAY ARTERIAL MANAGEMENT



ELECTRONIC PAYMENT/TOLL COLLECTION



FREIGHT MANAGEMENT



MAINTENANCE FLEET MANAGEMENT



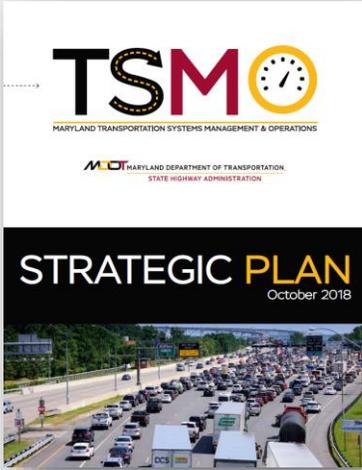
OPERATIONS

PLANNING

PERFORMANCE MEASURES

COMMUNICATIONS

MDOT SHA TSMO PROGRAM



- **Plan provides:**
Vision, Purpose, Goals, Objectives & Strategies
- **Focus on Integration:**
Institutional, Operational & Technical
- **Governance Structure:**
Executive Committee, Working Group & Task Forces

GOAL 1



**BUSINESS PROCESSES
& COLLABORATION**

GOAL 2



SYSTEMS & TECHNOLOGY

GOAL 3



**DATA, ANALYSIS &
PERFORMANCE MANAGEMENT**

GOAL 4

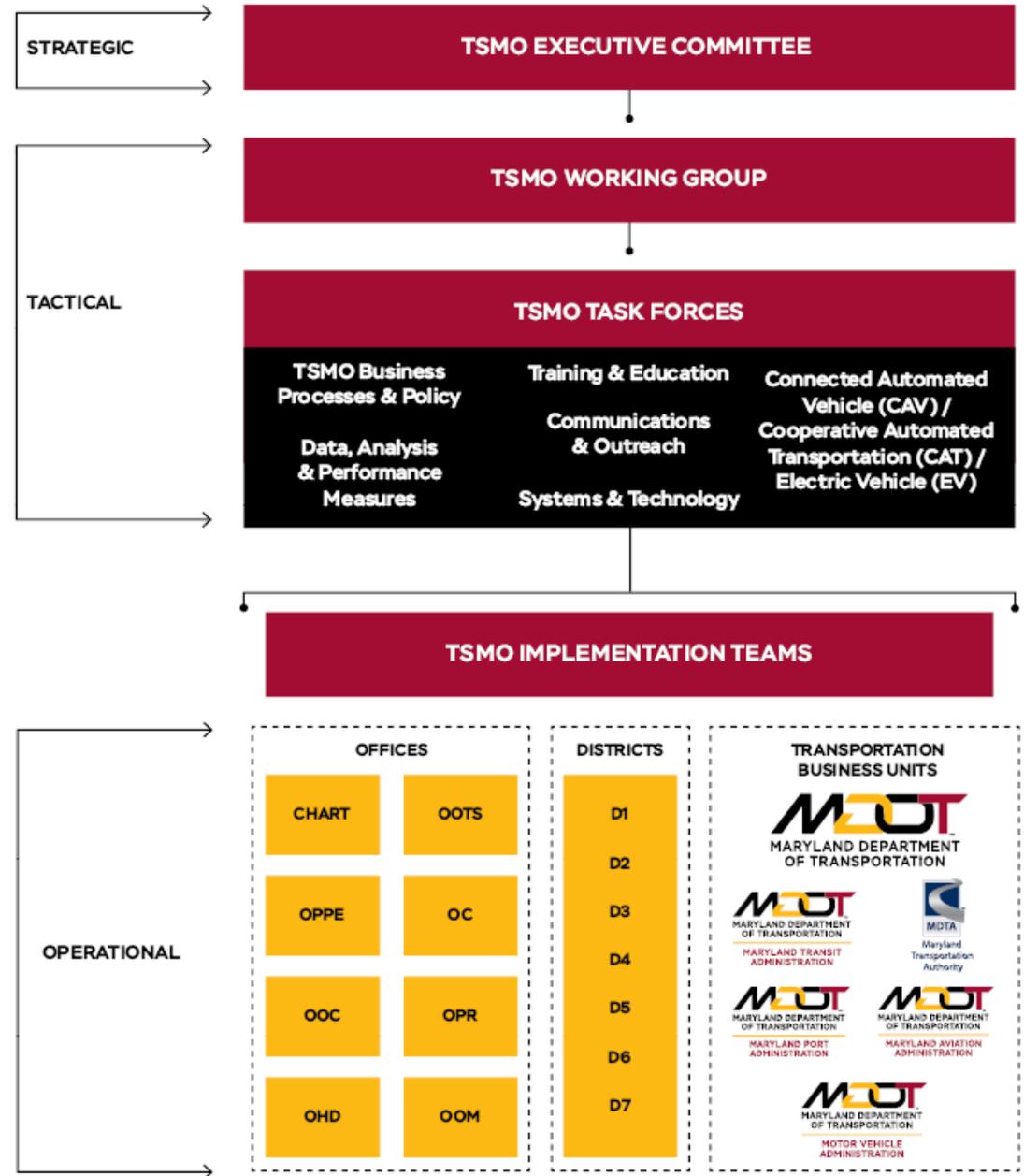


**CUSTOMER EXPERIENCE
& ENGAGEMENT**

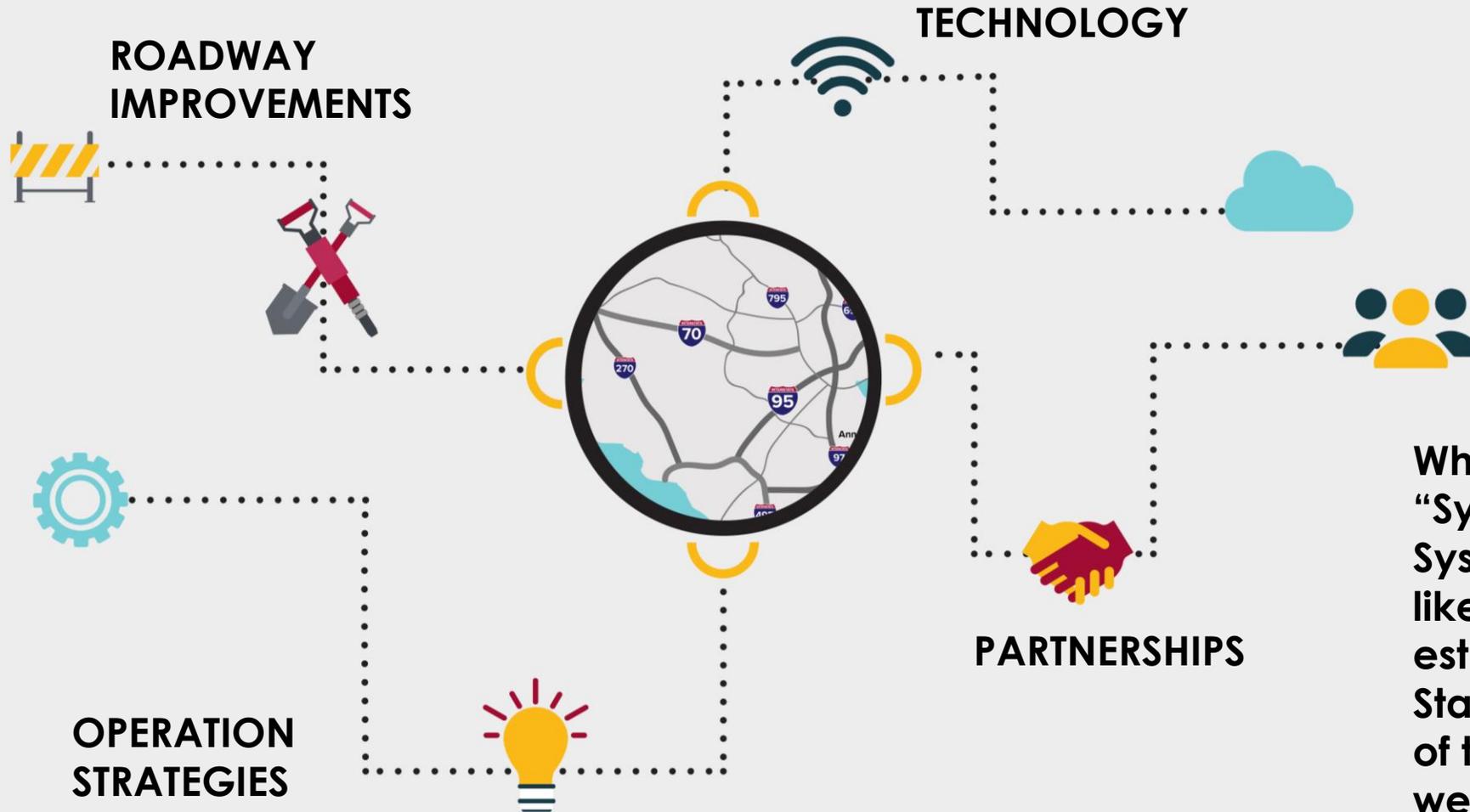
TSMO ORGANIZATIONAL STRUCTURE

- TSMO Executive Committee provides Strategic Direction and governance
- TSMO Working group develops the Action Plan in coordination with various Offices and Districts
- TSMO & CAV Deputy Director in the Office of CHART and ITS Development oversees the TSMO Program Implementation

DECISION PARADIGM

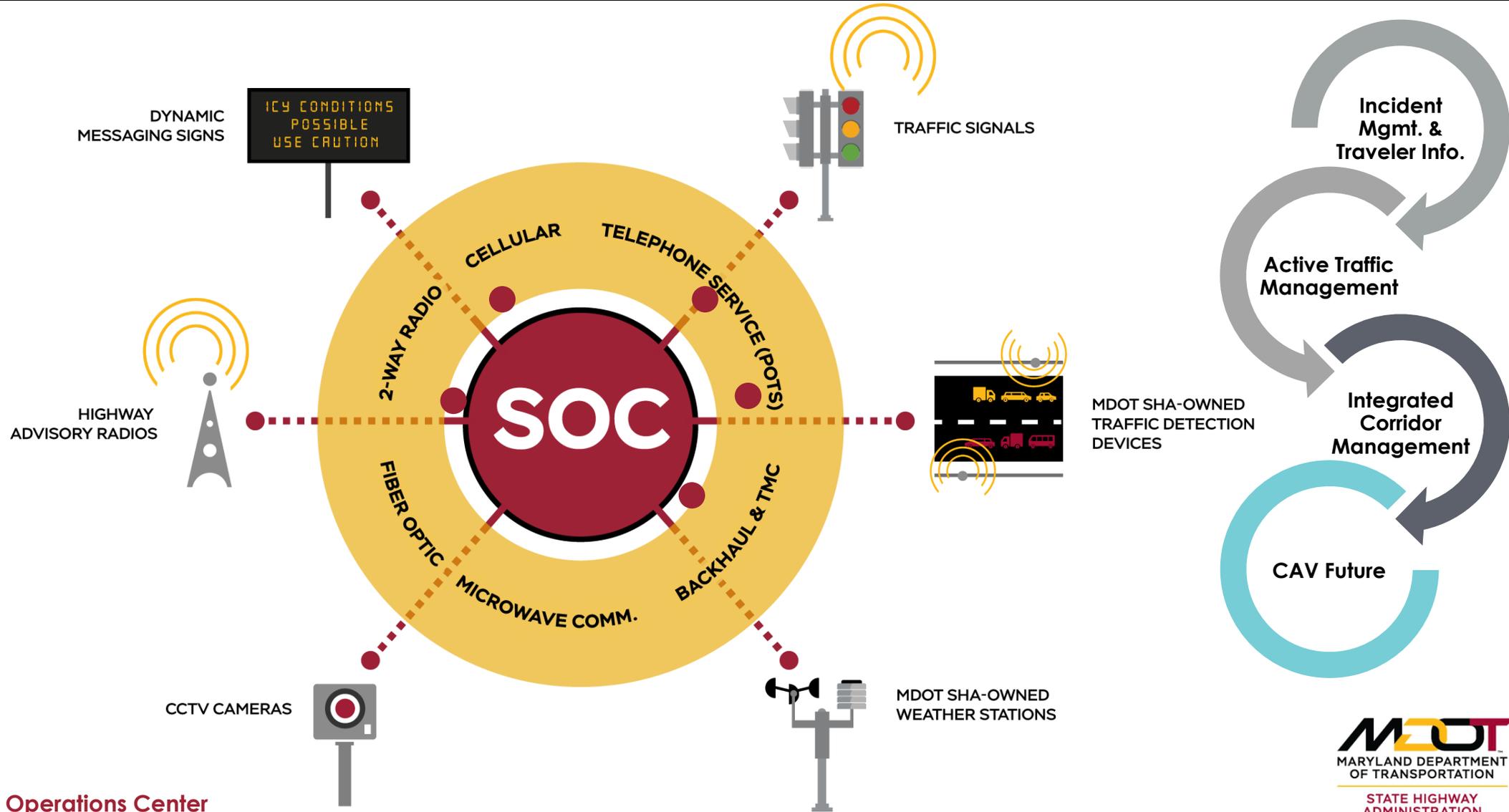


BUILDING A SYSTEM OF SYSTEMS



What does the “System of Systems” look like? Need to establish a Statewide vision of the services we want to offer to our customers.

MDOT SHA DIGITAL/ ITS INFRASTRUCTURE





HOW DO WE
GET THERE

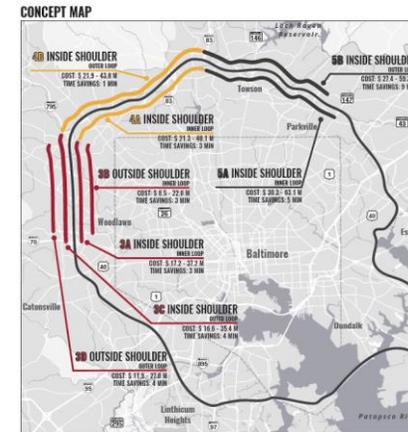
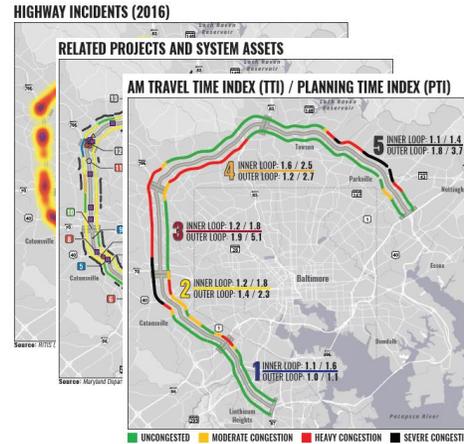


Delivering the TSMO
Program

LEVERAGING MAJOR TSMO PROJECTS



FORMALIZING A TSMO MASTER PLAN



Identify Statewide Priority

- Safety
- Mobility
- Reliability
- Asset Management

TSMO Corridor Screening

- Traffic Conditions
- Safety/ Incidents
- Asset Conditions
- Programmed Activities
- Environmental

TSMO Corridor Analysis

- Potential Strategies
- Traffic Analysis
- User Benefits
- Risks/ Opportunities
- Recommendation

Recommendation



MAJOR TSMO STRATEGIES



ROADWAY WEATHER MANAGEMENT



SMART TRAFFIC SIGNALS



WORK ZONE MANAGEMENT



RAMP METERING



TRUCK PARKING



HARD SHOULDER RUNNING



CAV TECHNOLOGY DEPLOYMENTS

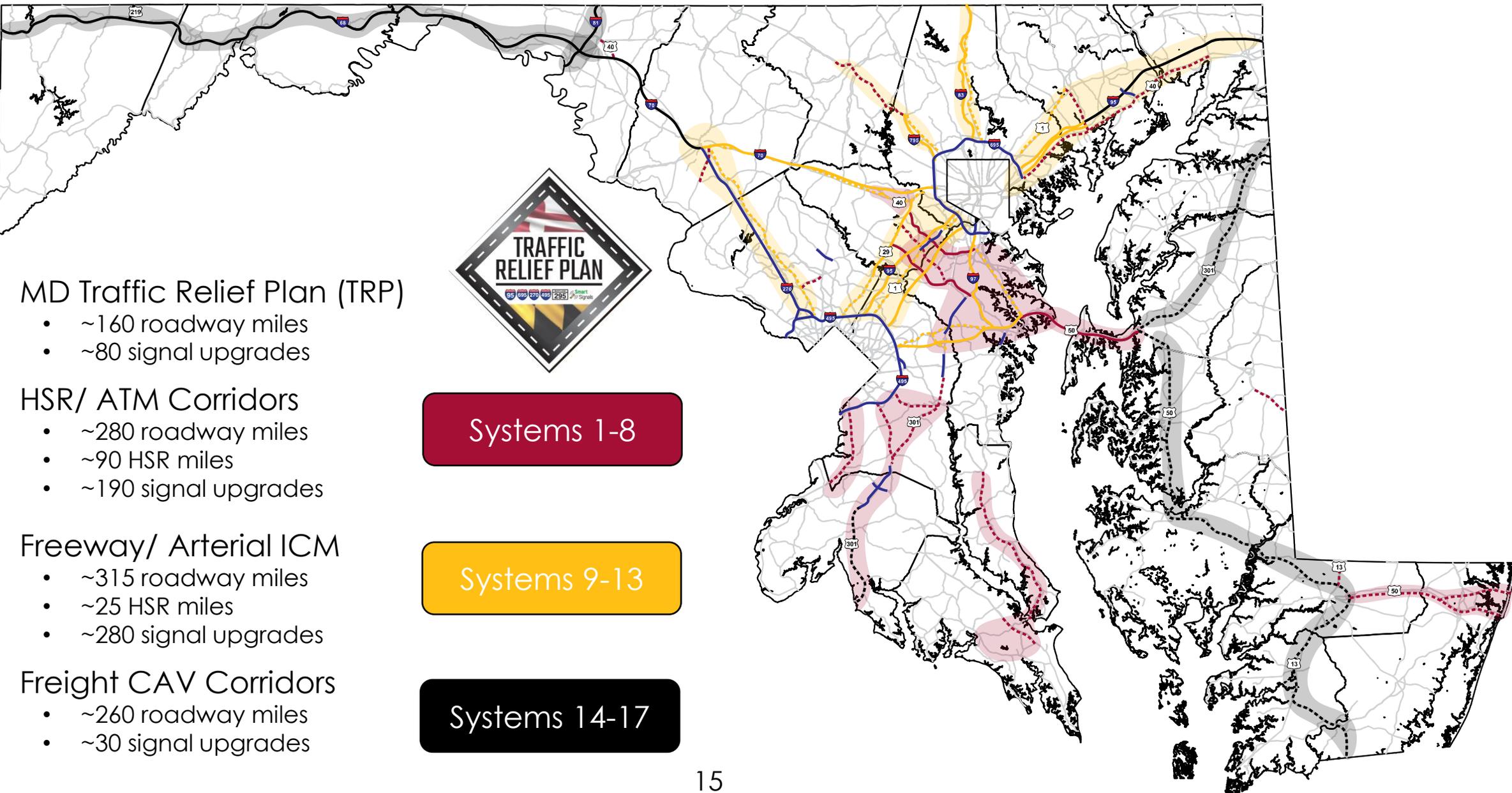


INTEGRATED FREEWAY-ARTERIAL OPS



CROWD SOURCING FOR OPS

BUILDING A SYSTEM OF SYSTEMS WITH TSMO



- MD Traffic Relief Plan (TRP)

- ~160 roadway miles
- ~80 signal upgrades

- HSR/ ATM Corridors

- ~280 roadway miles
- ~90 HSR miles
- ~190 signal upgrades

- Freeway/ Arterial ICM

- ~315 roadway miles
- ~25 HSR miles
- ~280 signal upgrades

- Freight CAV Corridors

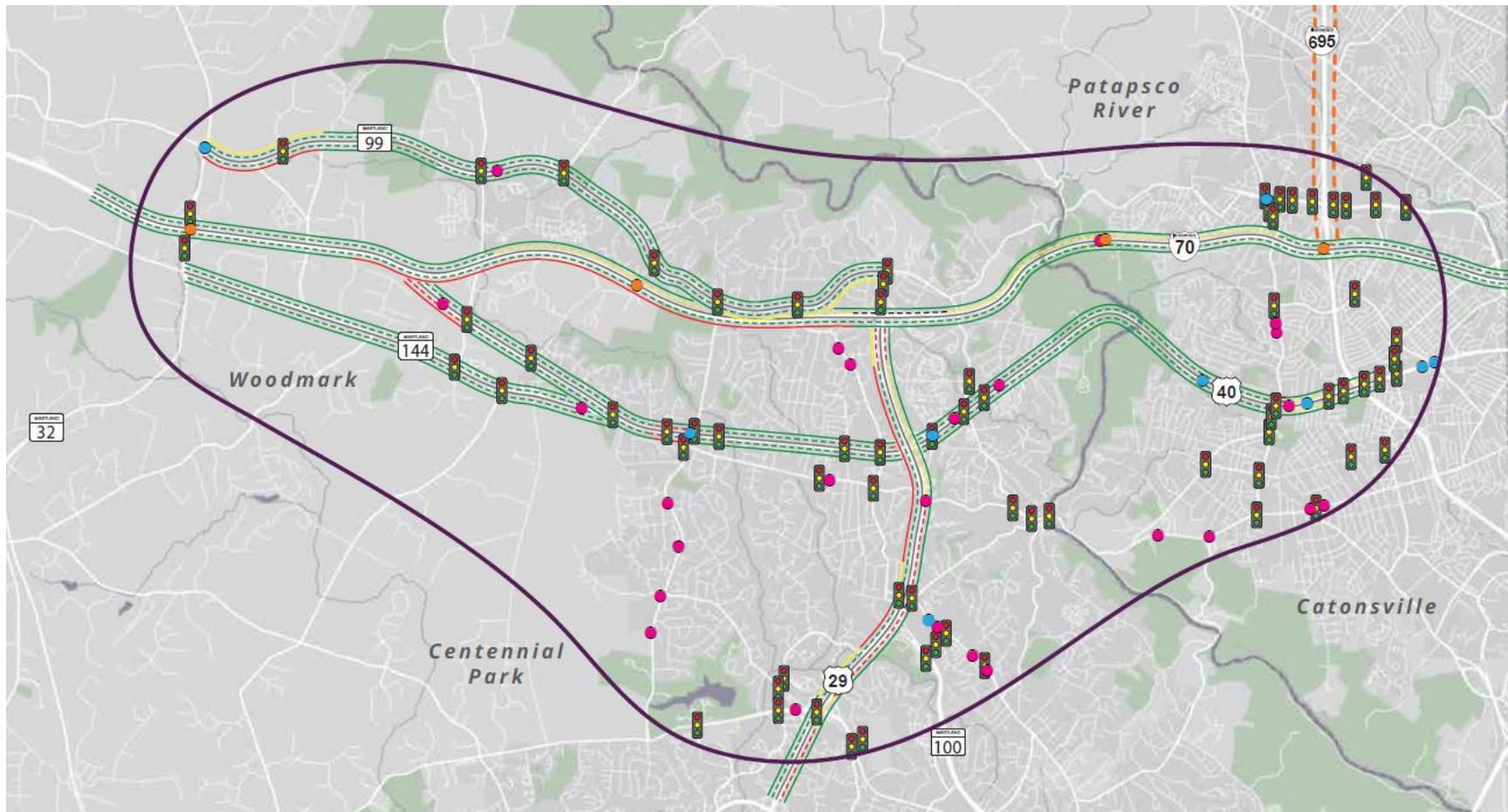
- ~260 roadway miles
- ~30 signal upgrades

Systems 1-8

Systems 9-13

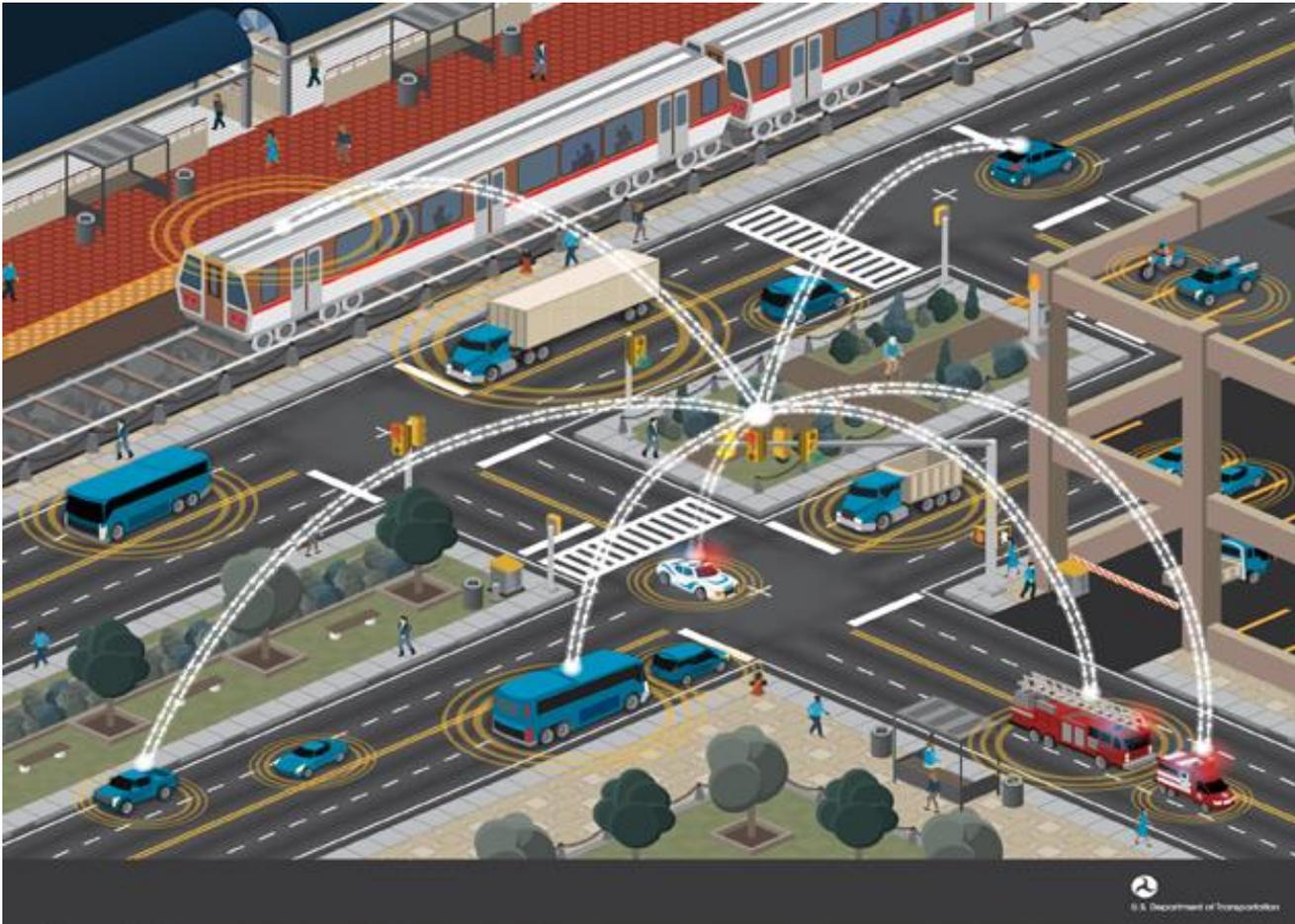
Systems 14-17

RETHINKING PROJECTS AS SYSTEMS



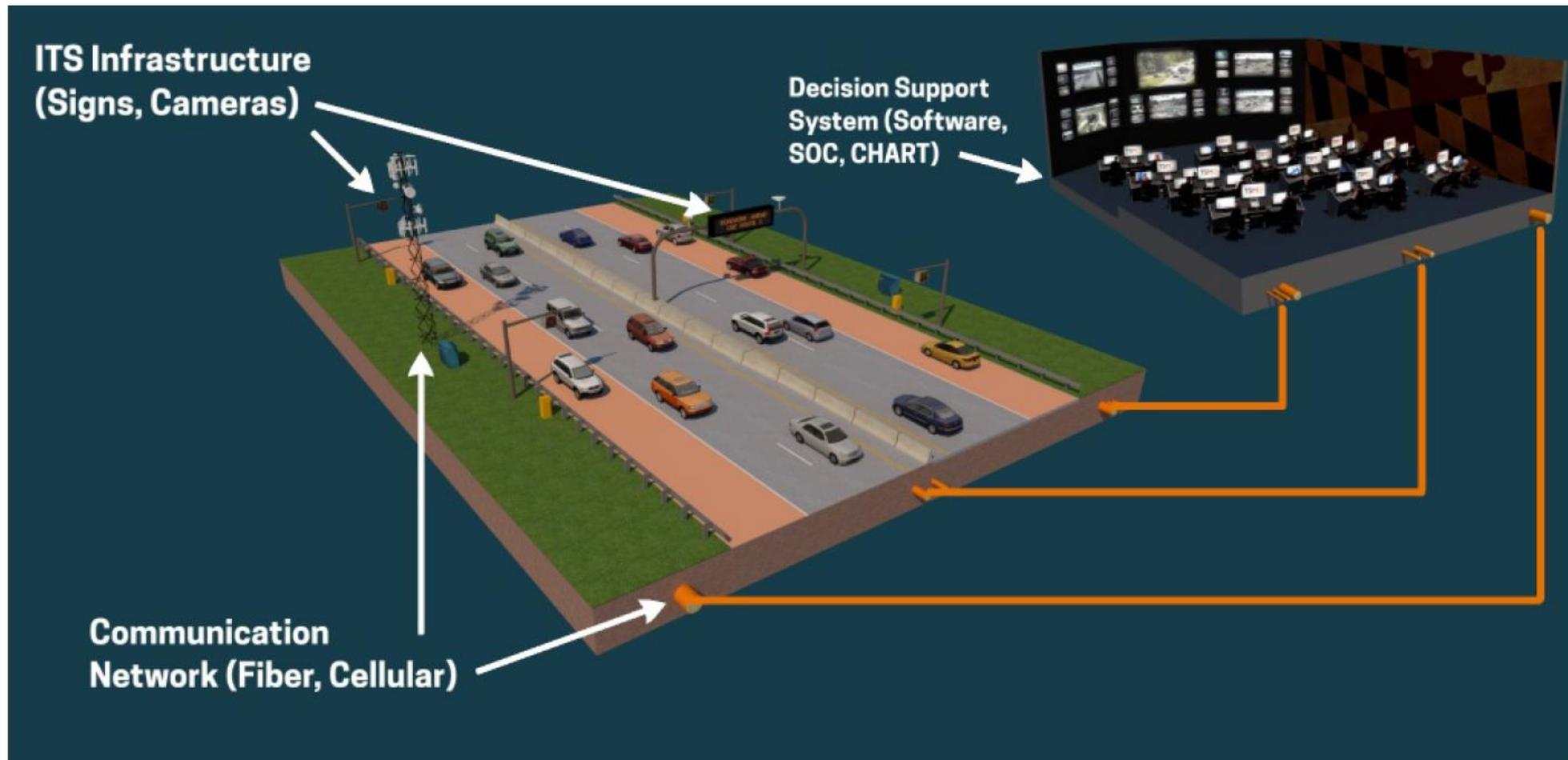
- Changes to scoping/project development process
- Consider TSMO strategies in whole or in part
- Thinking beyond traditional boundaries
- Looking at recurring & non-recurring congestion

RETHINKING PROJECT DEVELOPMENT



- Ways to mainstreaming TSMO projects:
 - Major Projects (Include TSMO Strategies, ITS Infrastructure in scope)
 - Rethink System Preservation Projects
 - Develop TSMO-Operational technology Projects (ITS/Software/ Communications)

OPERATIONAL TECHNOLOGY PROJECTS



- Rethinking Technology Deployments by combining ITS and IT Systems

FROM SYSTEM TO PROJECTS

Statewide Master Plan

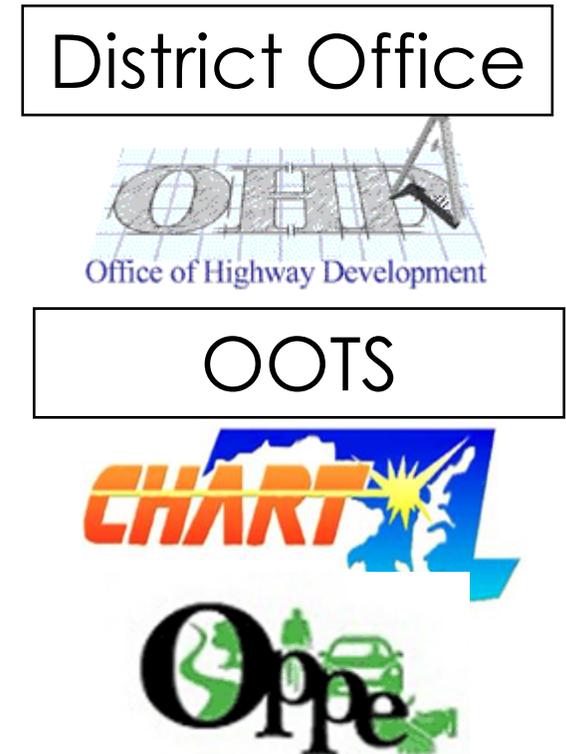


ConOps

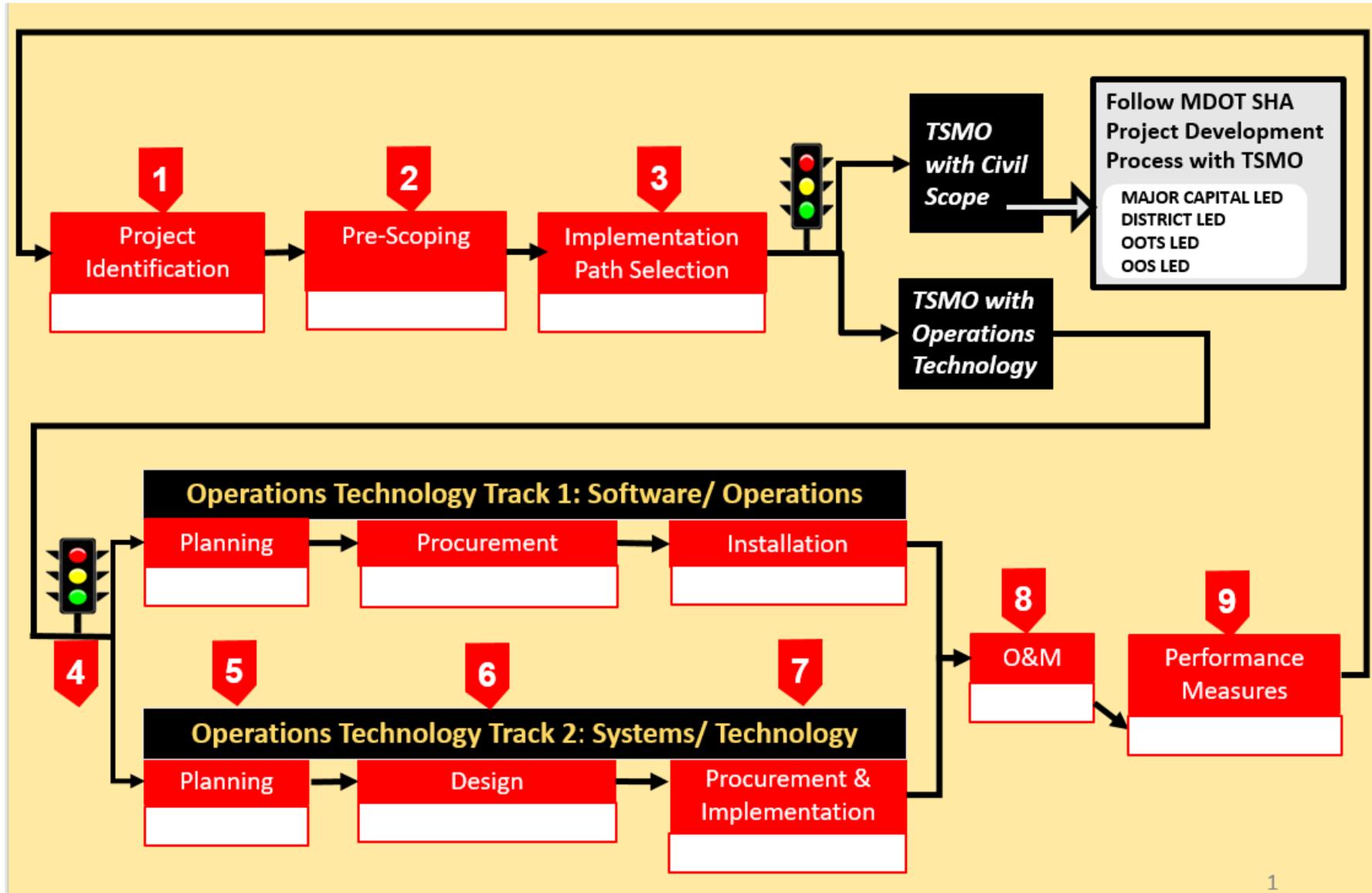
Identification of Projects



Assigning Project Lead



DELIVERING TSMO PROJECTS



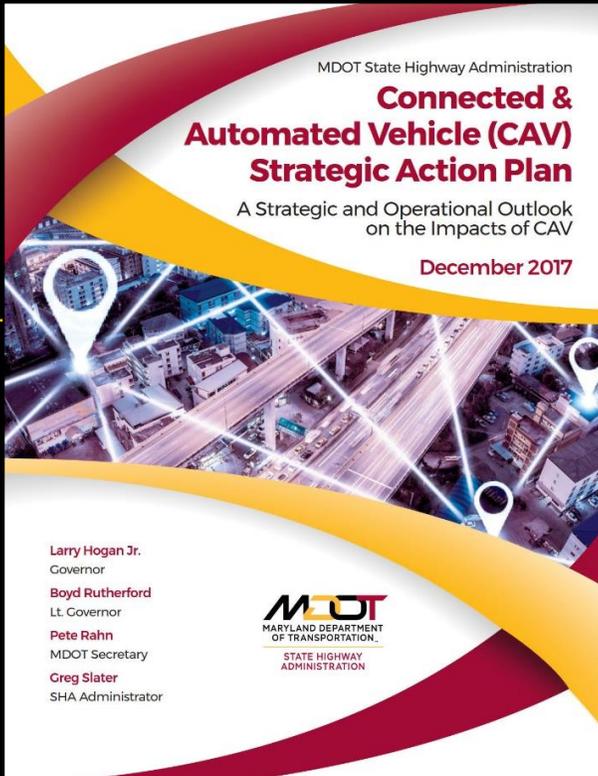
TSMO FUNDING AND PROCUREMENT



- Delivery/Procurement Strategies
 - Areawide/corridor specific operations
 - Performance based service contracts
 - P3/Resource-sharing opportunities



SHRP2 LO5



CONNECTED AND AUTOMATED VEHICLES (CAV) Program Efforts

CONNECTED & AUTOMATED VEHICLES (CAV)

WHAT ARE CAV's?

CONNECTED VEHICLES & AUTOMATED VEHICLES BELONG TOGETHER...

CONNECTED VEHICLES

Connected vehicle technologies allow vehicles to communicate with each other and the world around them.



AUTOMATED VEHICLES

A fully autonomous vehicle does not require a human driver, as they are computer-driven.



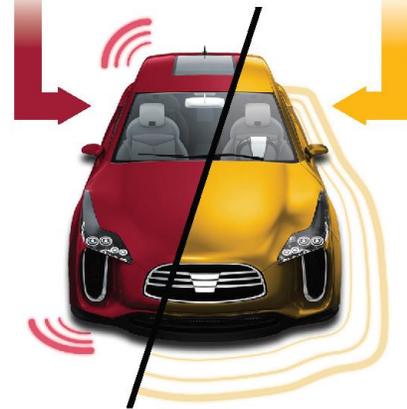
Traffic signal phase state & change



Vehicle platooning



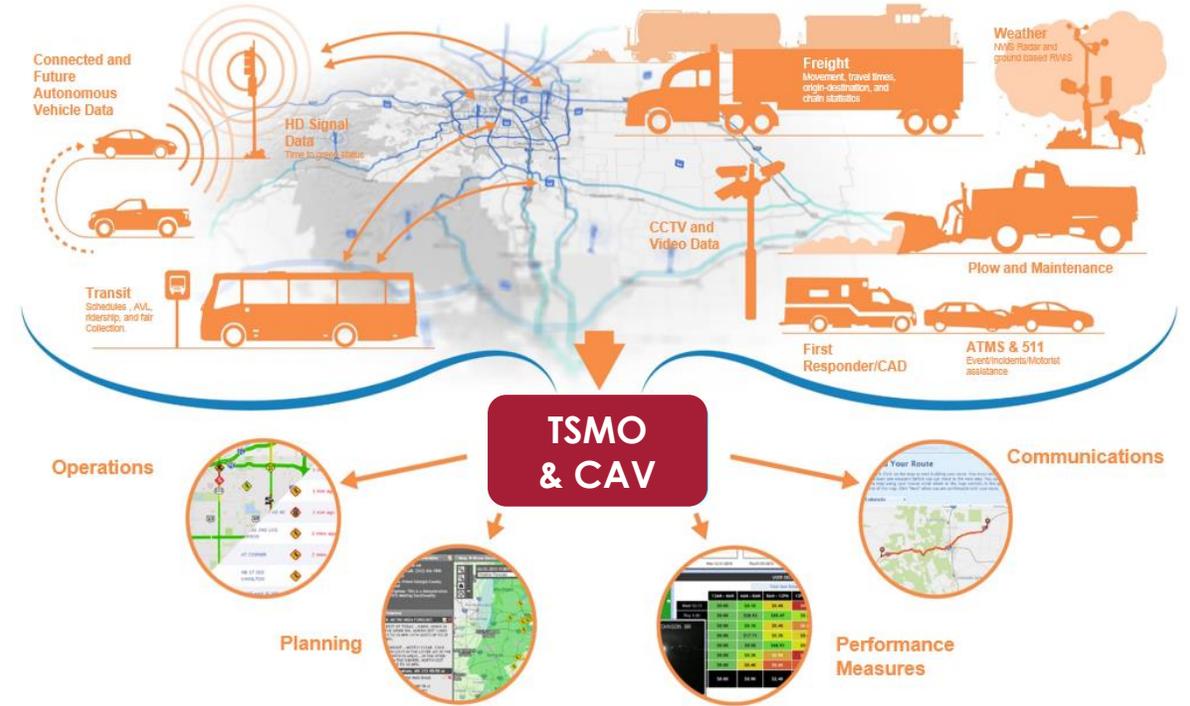
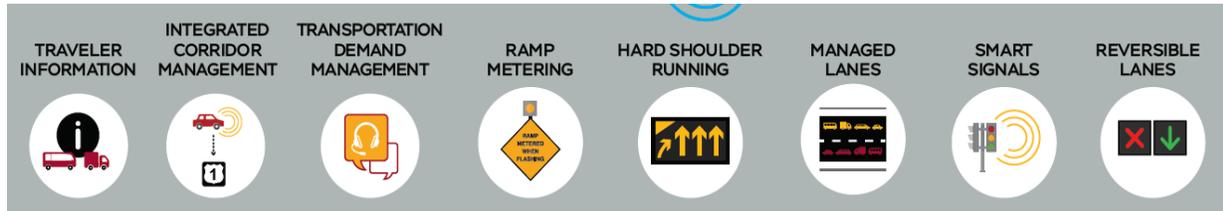
Advanced traffic management



Identification of hazards out of the view of sensor systems

CONNECTED AUTOMATED VEHICLES

When CV is combined with AV, the vehicle becomes a CAV capable of "talking" to other vehicles, intelligent roadside equipment, and mobile devices.



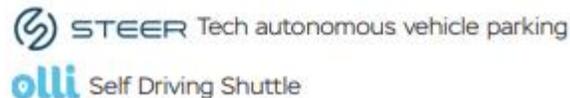
2018 CAV PROGRESS

SUPPORTING CAV TESTING WITHIN THE STATE

Office of Planning and Preliminary Engineering developed and maintains the **Maryland Locations for Enabling Testing Sites (LETS)** web mapping application.



Facilitated CAV testing on MDOT SHA facilities including:



ORGANIZATIONAL MANAGEMENT OF CAV



New Deputy Director for TSMO & CAV and New Communications Division within the Office of CHART.

MDOT SHA CAV Working Group co-chaired by CHART and OPPE with representatives from various Offices and Districts.

PLANNING TOOLS AND MATERIALS RELATED TO CAVS

Developed interactive **CAV Public Policy in the US Story Map** to track monthly legislative actions related to CAV across the country.



TRAINING INITIATIVES

MDOT SHA co-hosted the FHWA **Connected Vehicle 201 training**.



MDOT SHA co-hosted the FHWA **Introduction to ARC-IT Architecture** workshop.

US-1 INNOVATIVE TECHNOLOGY DEPLOYMENT CORRIDOR

Completed a **comprehensive requirements document** for a proposed connected vehicle pilot project along US-1 with recommended ITS solutions to support incident and traffic management.

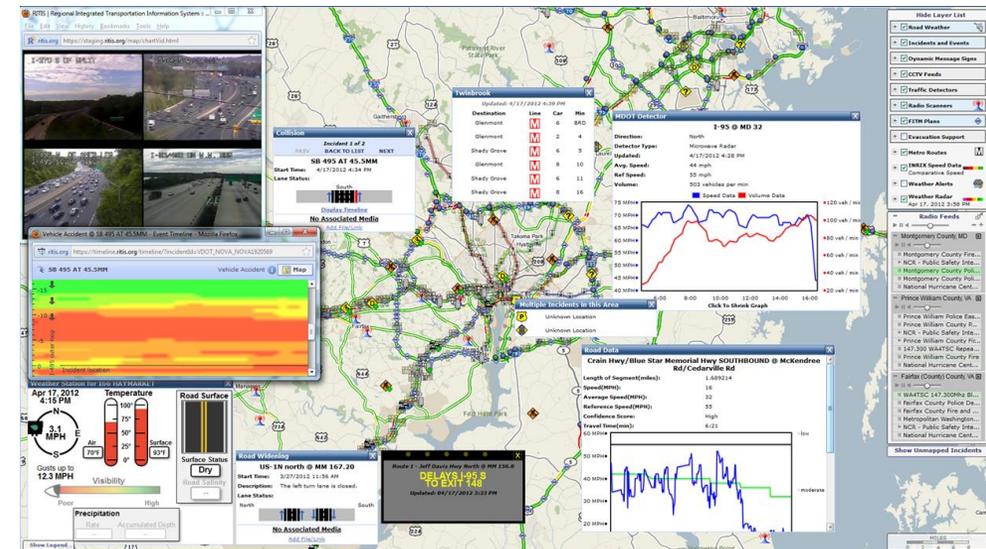
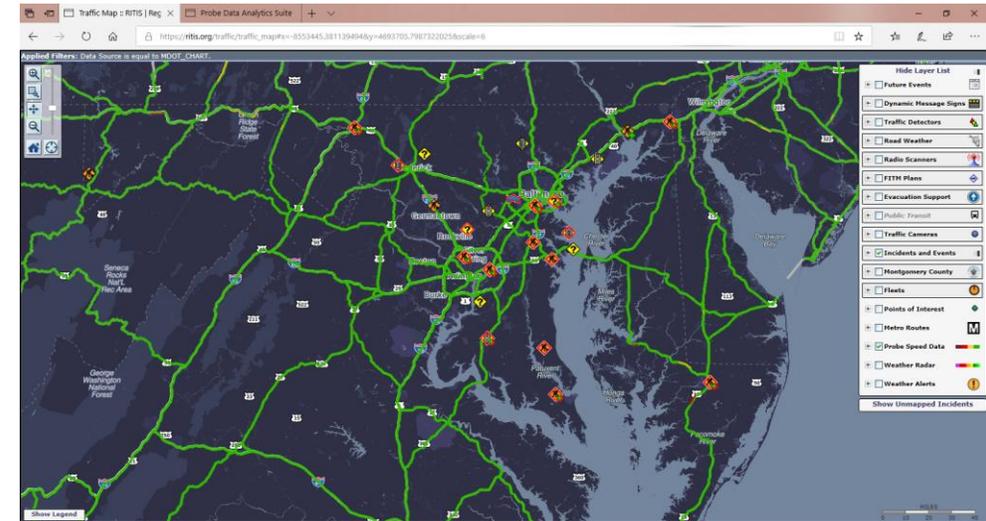
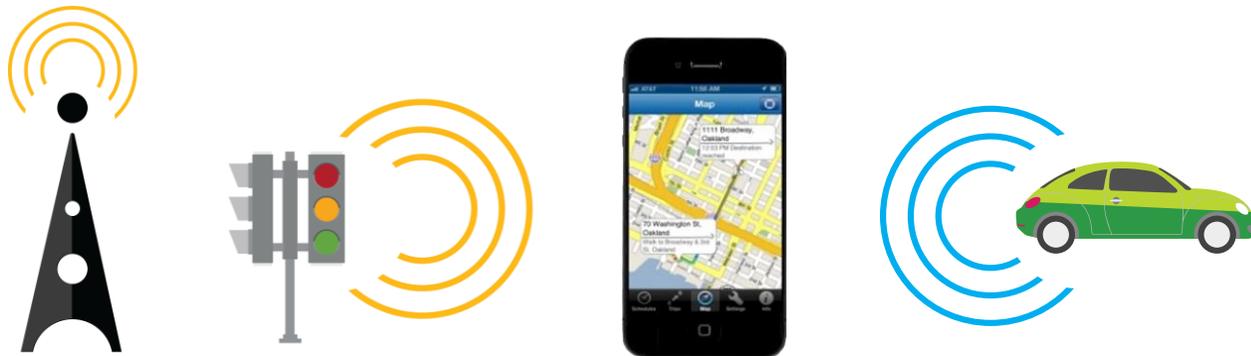




DATA
TECHNOLOGY
&
PERFORMANCE
MEASURES

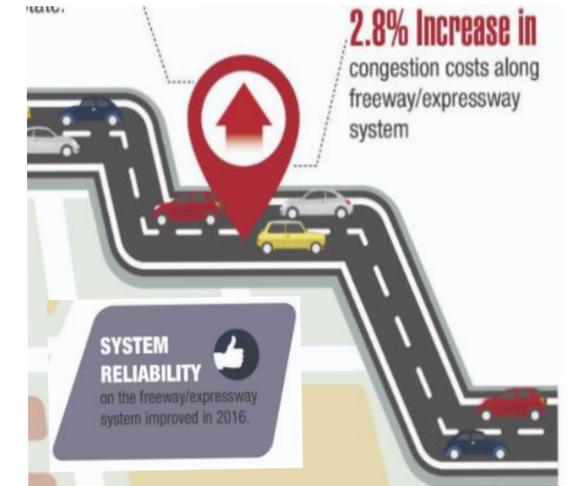
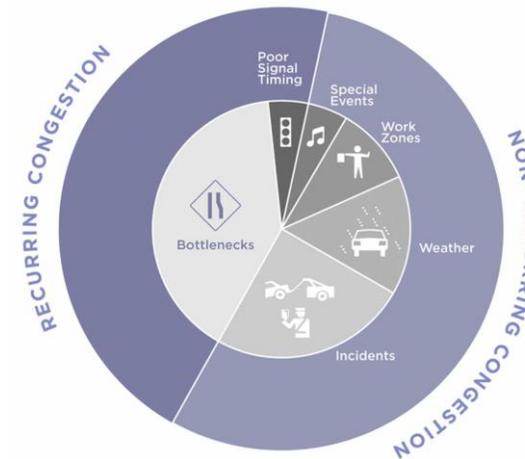
DATA TECHNOLOGY TO SUPPORT TSMO

- Real time applications
- Archived data applications
- Combination of in-house tools and UMD CATT Lab RITIS
- MDOT Common Operating Picture
- **Big Data and Crowd Sourced Data Applications**

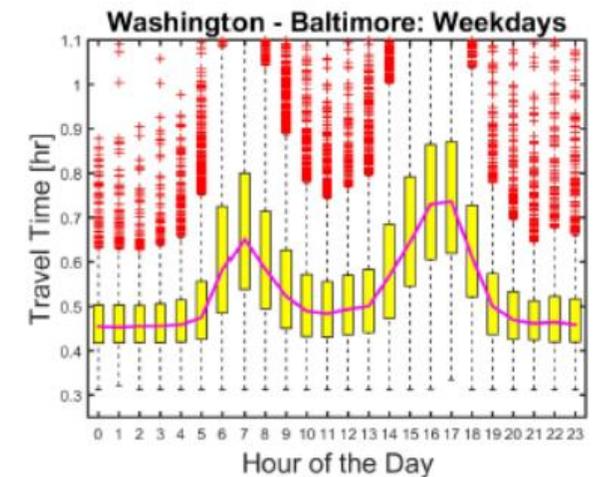
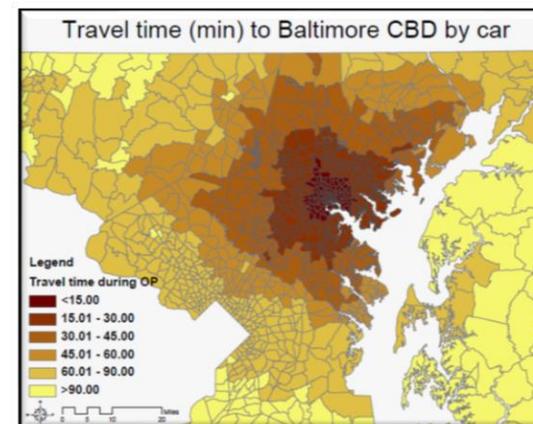


TSMO PERFORMANCE MEASURES

- Congestion & Reliability (Segment Level/Trip Level)
- Accessibility/Connectivity
- Market Segments (businesses, commodity flows)
- Freight Fluidity (supply chains)
- Economic Metrics

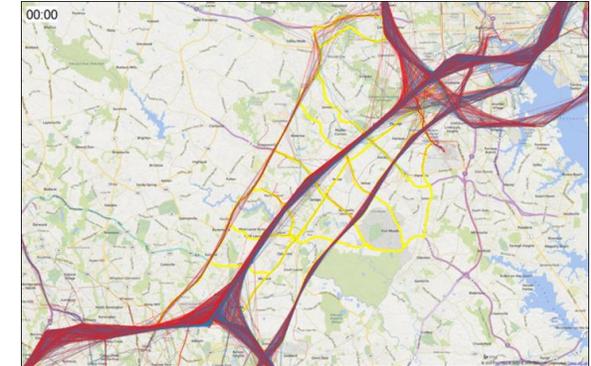
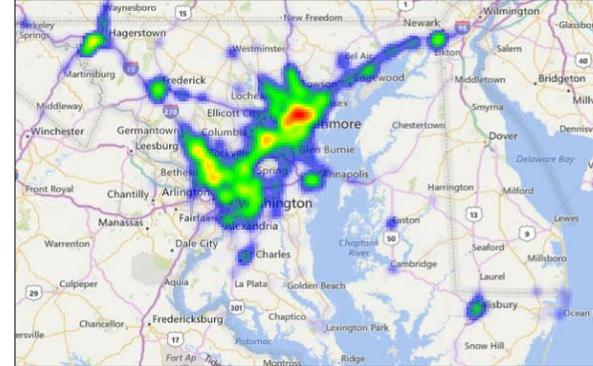
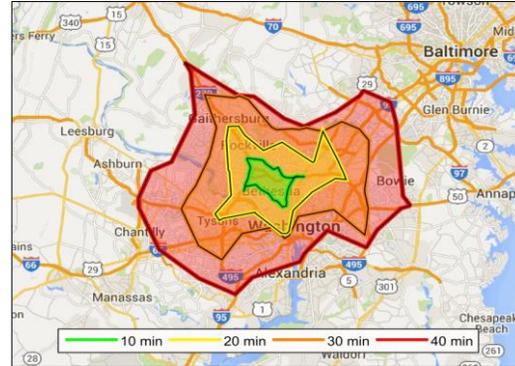
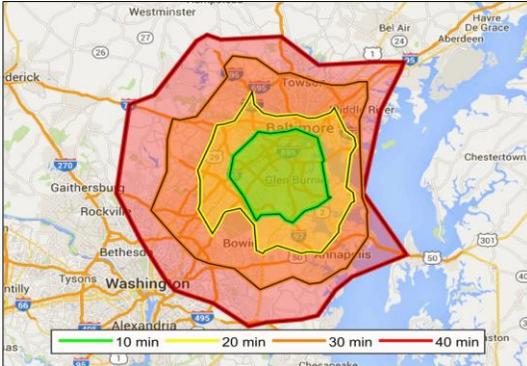


9:00 AM	9:15 AM	9:30 AM	9:45 AM	10:00 AM	10:15 AM	10:30 AM	10:45 AM	11:00 AM	11:15 AM	11:30 AM
100	100	97.43	93.92	90.81	96.49	97.19	97.79	94.27	97.54	98.01
100	100	100	93.94	100	99.64	99.39	100	89.82	96.24	97.7
13.46	13.97	15.2	14.27	17.08	15.67	19.42	33.45	55.32	94.97	89.24
18.79	13.46	15.07	12.24	11.82	17.33	37.21	32.85	29.45	93.27	89.33
19.08	20.52	21.74	19.41	19.48	21.83	29.45	38.3	33.2	80.78	94.51
35.9	25.77	31.92	37.05	46.85	53.46	65.77	63.33	52.82	90.77	94.74
38.21	40.77	30.9	49.23	62.31	63.33	75.64	75.26	63.46	92.82	96.67
57.82	54.1	49.1	46.54	76.28	100	100	97.69	91.79	100	100
68.89	45.97	42.78	60.97	77.92	100	99.17	95.69	95.42	100	98.41



O/D TRAJECTORY DATA UTILIZATION EXPERIENCE

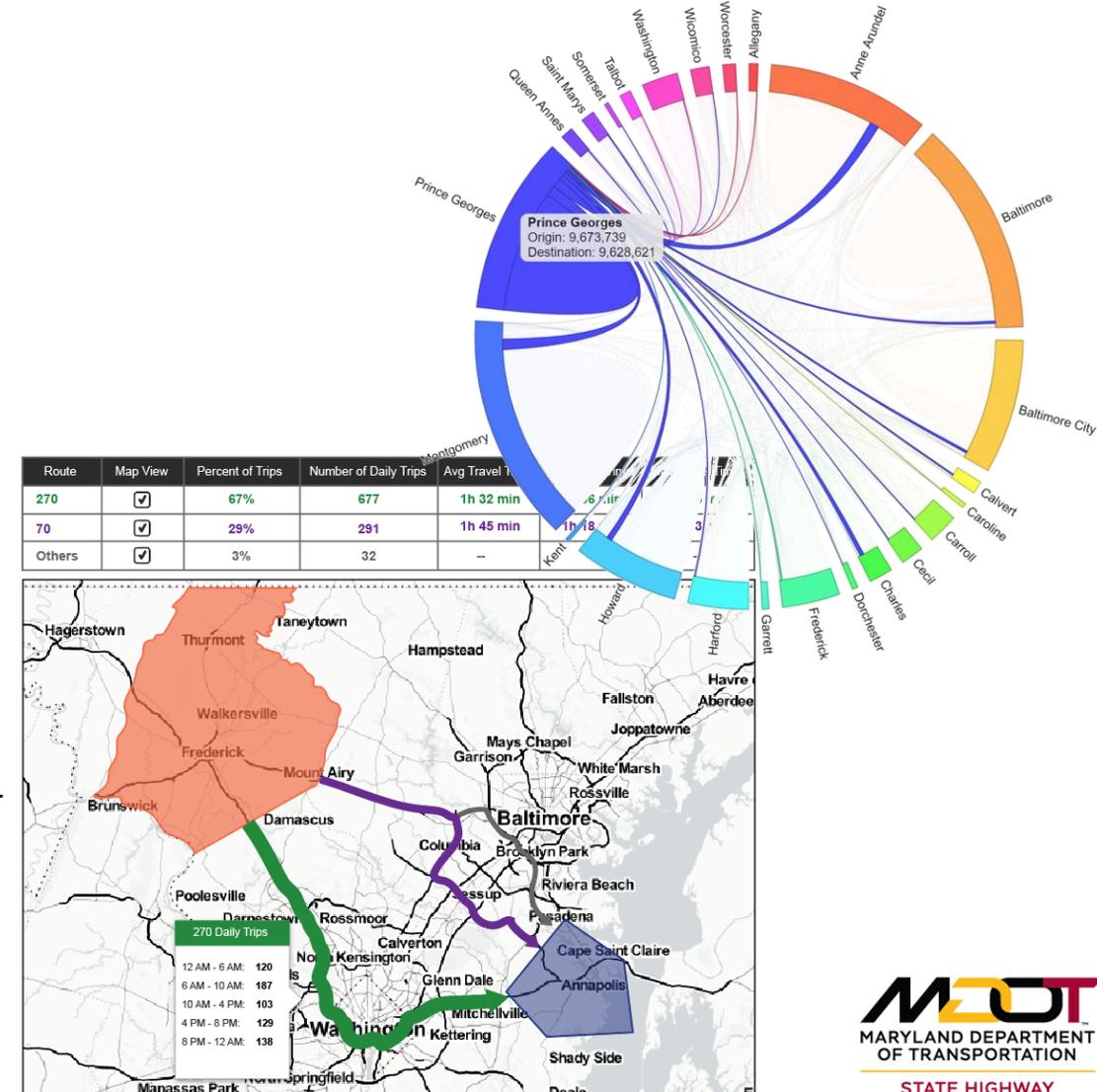
ACTIVITY ZONES, TRAVEL TIME CONTOURS, ACCESSIBILITY MAPS



- Heat map of trip origins reveals main trip generators
- Trips from activity zones are used to derive isochrones
- Compute trip-based performance measures
- Determine distribution of traffic along major routes
- Estimate turning movements at major intersections

OTHER PLANNED/FUTURE MARYLAND TSMO USE-CASES

- Understanding the impacts on traveler information strategies to encourage alternate routes
- **Analyzing how certain types of events impact route choice**
- **Understanding the impact of work zones on arterial congestion**
- Understanding how variable rate tolling can impact routes taken (and the impact on arterials)
- **Evacuation planning and analysis (AARs)**
- Trajectory data for arterial performance monitoring and ATSPM.
- Estimate O-D matrices (state, county, zip code, TAZ) for planning purposes
- Validate statewide travel demand models



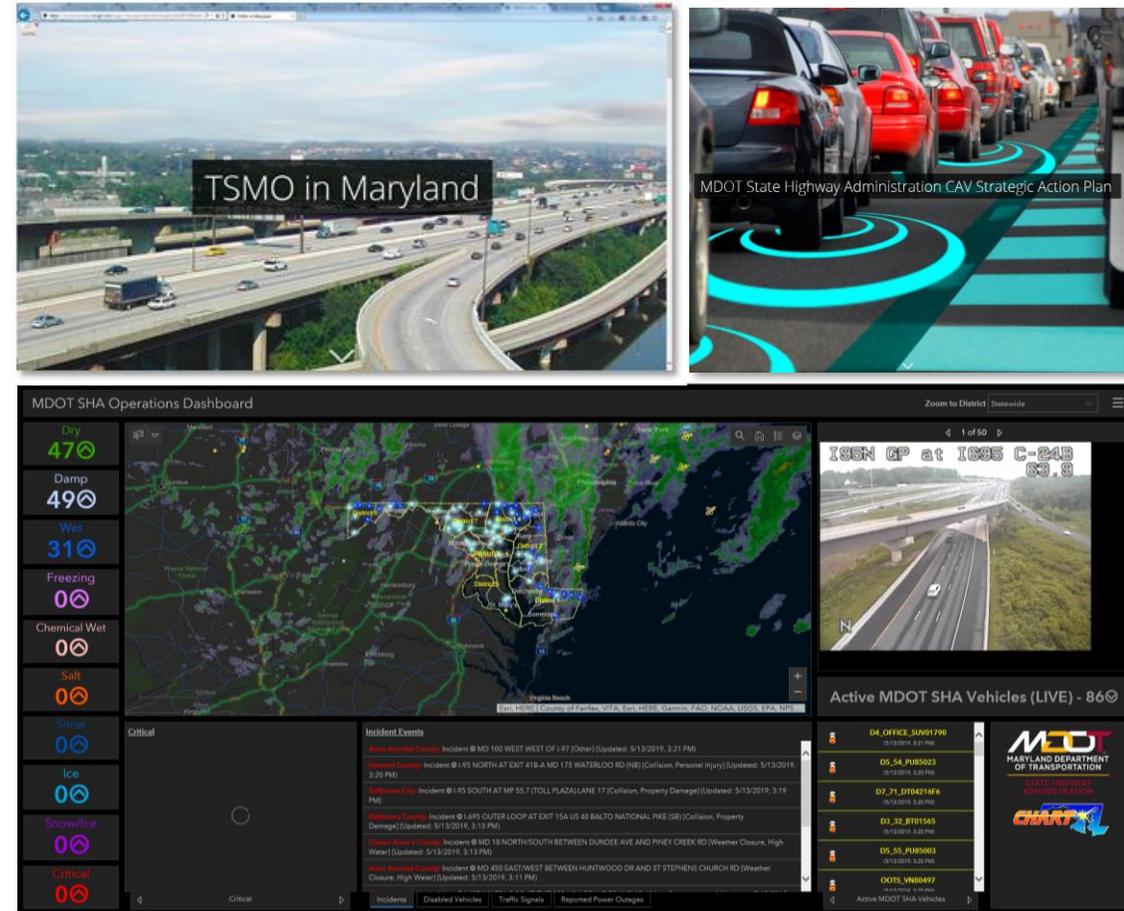


WHAT'S NEXT
FOR US



NEXT STEPS – SYSTEMS & TECHNOLOGY

- Develop/refine Concept of Operations for various regions
- Telecommunications Plan
- Start technology readiness assessment for ATM, ICM and CAV
- Opportunities to improve O&M through newer technologies
- Crowd sourcing, working with locals for data/information sharing – road closures, work zones, utility work, etc.
- Data exchange – workshops, training, brainstorming sessions



TSMO AWARENESS, EDUCATION, TRAINING/ COMMUNICATIONS & OUTREACH

- MDOT SHA Internet Website
- MDOT TSMO SharePoint (Internal)
- TSMO University
- GIS Story Maps
- Newsletters, Brochures, TSMO Articles, etc.



MDOT SHA TSMO Story Map



CAV Strategic Action Plan Story Map



MDOT Freight Story Map



MDOT SHA Mobility Performance



MDOT SHA Winter Operations

THINKING DIFFERENTLY



MDOT SHA'S 4 PRIORITIES

COMMUNICATION
MDOT SHA is telling our story and putting context and perspective in our mission and vision – helping people, staying committed to highway solutions and projects and delivering people to life's opportunities.

INNOVATION
Our mission at MDOT SHA is to embrace the power of innovation by harnessing change and providing real, impactful results to deliver the best possible product to our customers.

MODERNIZATION
Our goal at MDOT SHA is to build upon what is already great here: modernizing to realize greater service, safety and efficiency for our customers. MDOT SHA is ready now to face tomorrow's transportation business needs and challenges.

CUSTOMER EXPERIENCE
We are the customer experience. By embarking on a new, bold commitment to customer service one project and citizen interaction at a time, we're bringing positive change to the people of Maryland.

MDOT MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

- TSMO provides a new perspective - using existing approaches combined with technology to meet the challenges of building a **Systems of Systems**
- TSMO addresses all four of MDOT SHA's Priorities, with a focus on Customer Experience
- Renewed partnerships and collaboration with industries and stakeholders for transportation of tomorrow
- **ARE YOU READY FOR THIS JOURNEY WITH US?**

THANK YOU!

CONTACT INFORMATION

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