

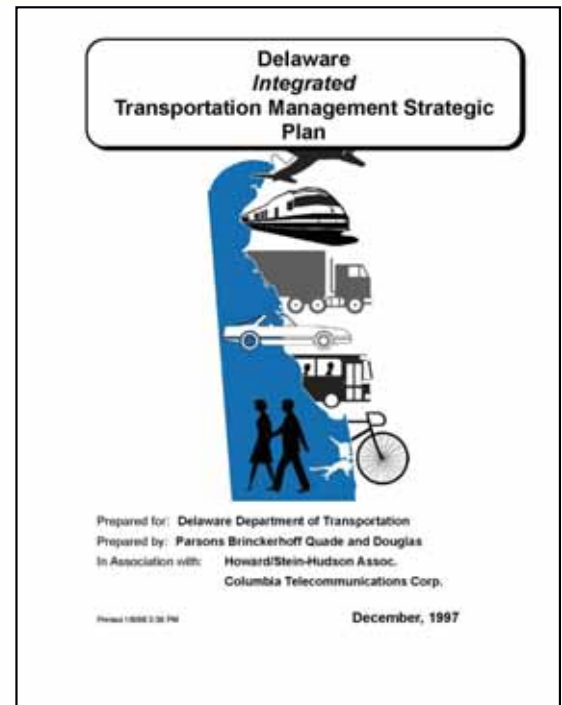
DeIDOT's Integrated Transportation Management Program and Vision for the Future

Our Town
Gene Donaldson
November 2, 2016

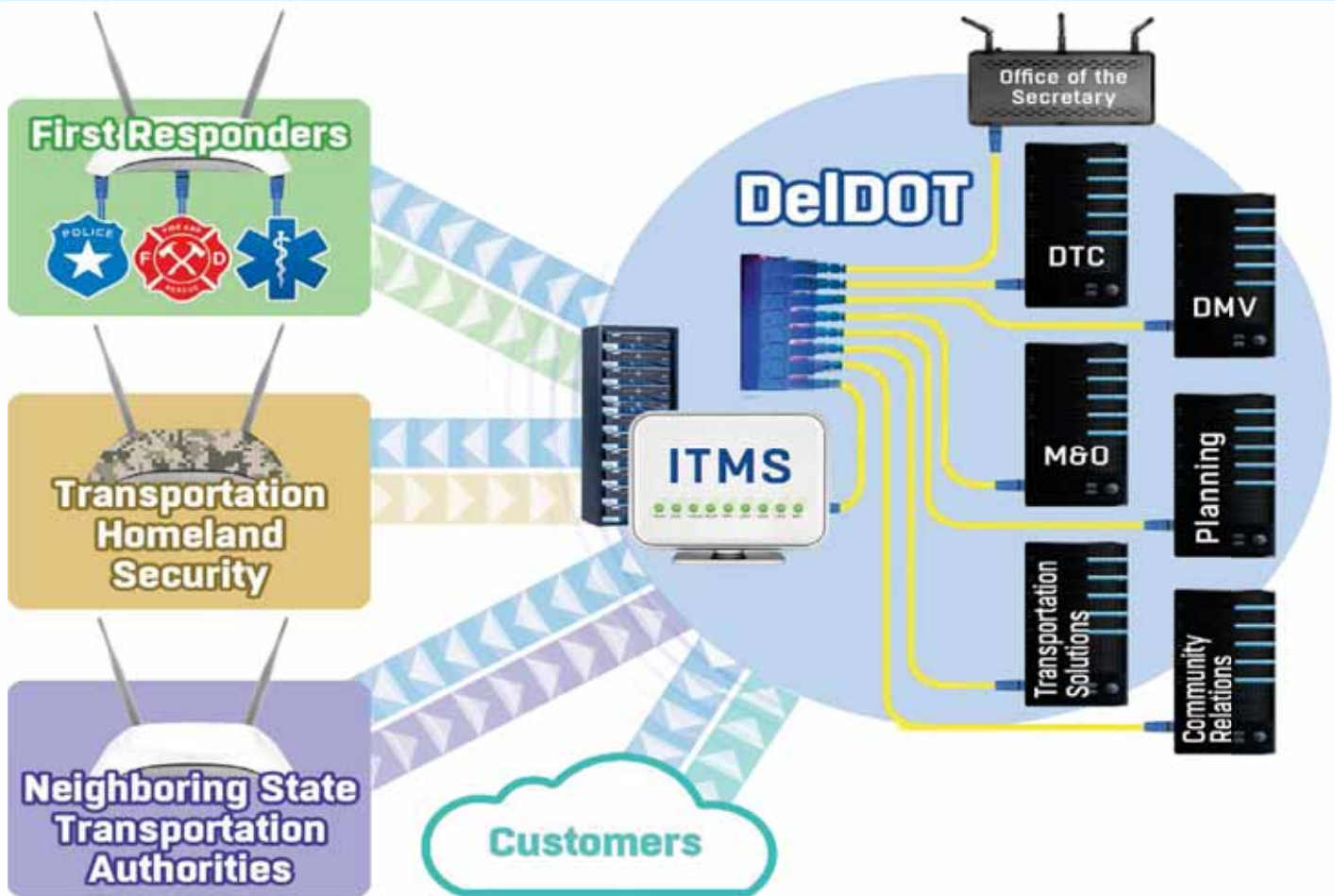


Integrated Transportation Management Strategic Plan (1997)

- Required a foundation for a shared mission and vision between all of Delaware's Transportation Management System stakeholders.
- The plan defined Delaware's Transportation Management:
 - Mission
 - Vision
 - Goals
 - Strategies for Implementation
- Defined a Statewide Transportation Management Program managed from a central transportation management center (TMC).



DeIDOT ITMS



Why ITMS?

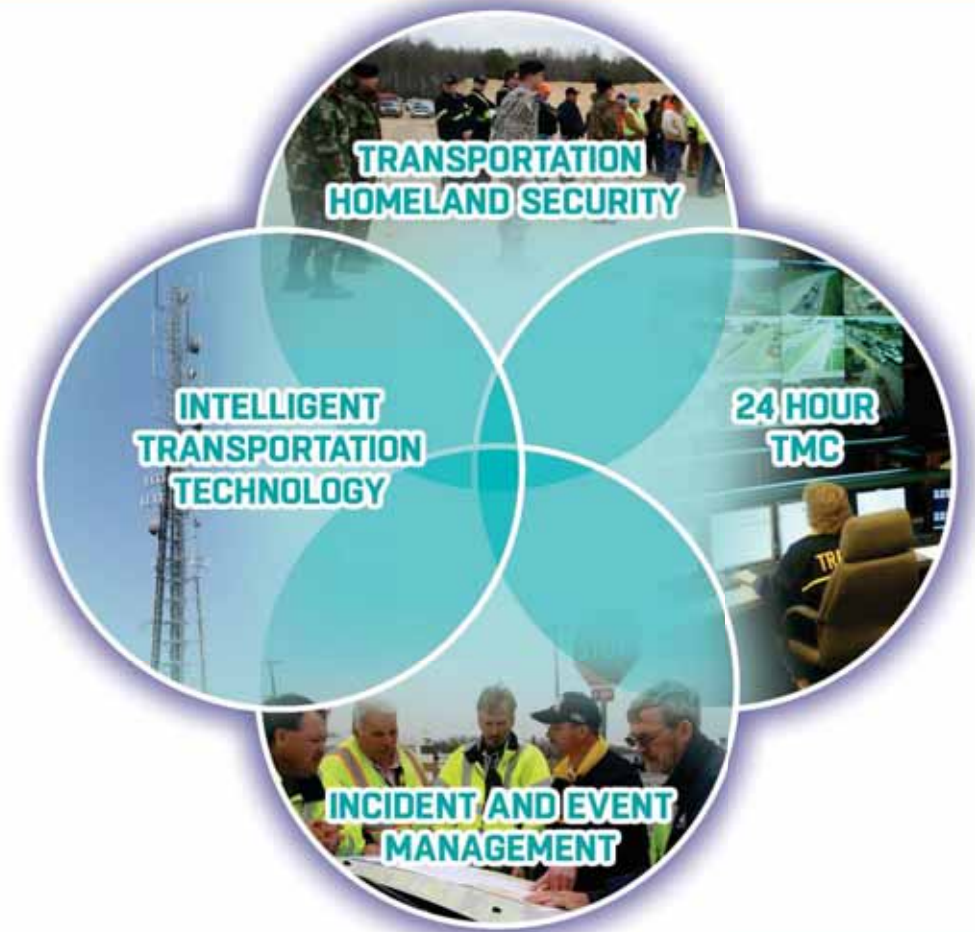
- Why does transportation management make sense?
 - Make the most of the transportation system
 - Increased Safety
 - Ease of Implementation
 - Customer Experience
 - Innovation
 - Flexibility
 - Affordable
 - Positions us for the future

DeIDOT Integrated Transportation Management

- Collaborative Approach
 - Maximize the safety and efficiency of the system
 - TMC collocated with the Delaware Emergency Management Agency (DEMA) and Delaware State Police (DSP)
 - Aids in interagency communications



DeIDOT Integrated Transportation Management

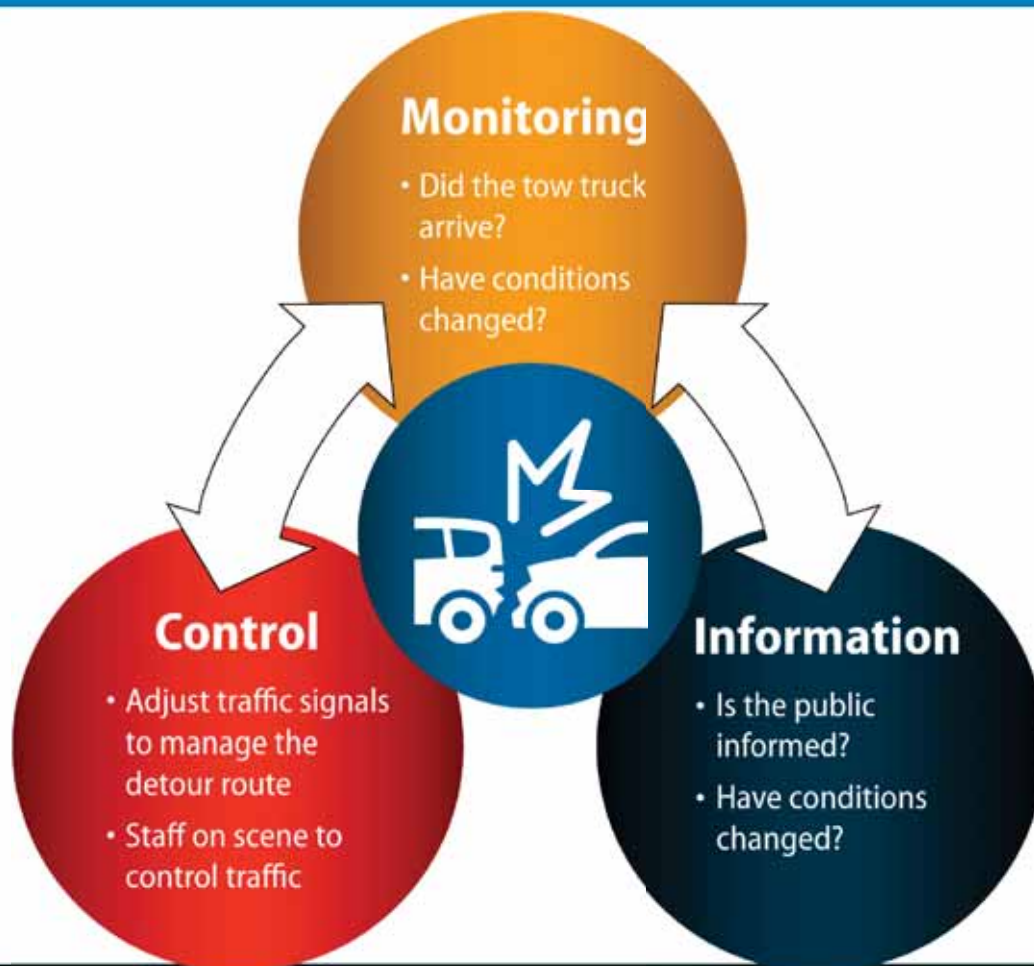


Transportation Management Center (TMC)

- The TMC is a 24/7 statewide operation
- #1 Critical facility for DeIDOT's operations
- Brick and mortar center as well as the symbolic center of ITMS
- Handled 43,663 calls in 2015
 - Debris on the road
 - Dark traffic signals
 - Traffic incident support
 - Major weather events



The TMC Performs Three Critical Functions



Transportation System Monitoring

- Statewide Electronic Monitoring Network Fixed and Portable:
 - Video Monitoring System
 - Roadway Weather Information System (RWIS)
 - Signal System Loop Detectors
 - Microwave (Radar) Detection on Freeways
 - Automated Traffic Recorders statewide
 - Bluetooth Detection
 - Hydrology Monitoring
 - Near real-time road status
 - Leveraging existing ITMS spatial data - GIS



Monitoring System Requirements

Traffic

- Traffic Volume
- Occupancy (Delay)
- Speed
- Classification
- Travel Time
- Origin and Destination

- 
- Real-time
 - Predictive

Weather

- Air Temperature
- Barometric Pressure
- Relative Humidity
- Precipitation Type & Volume
- Pavement Temperature
- Subsurface Temperature
- Pavement Surface Dry, Wet, Ice
- Stream & River Depth and Velocity
- Tide Height

Real-Time Traveler Information

- **WTMC 1380 AM – pri license**

- Synchronized Repeat installed statewide

- **Real Time Web Site**

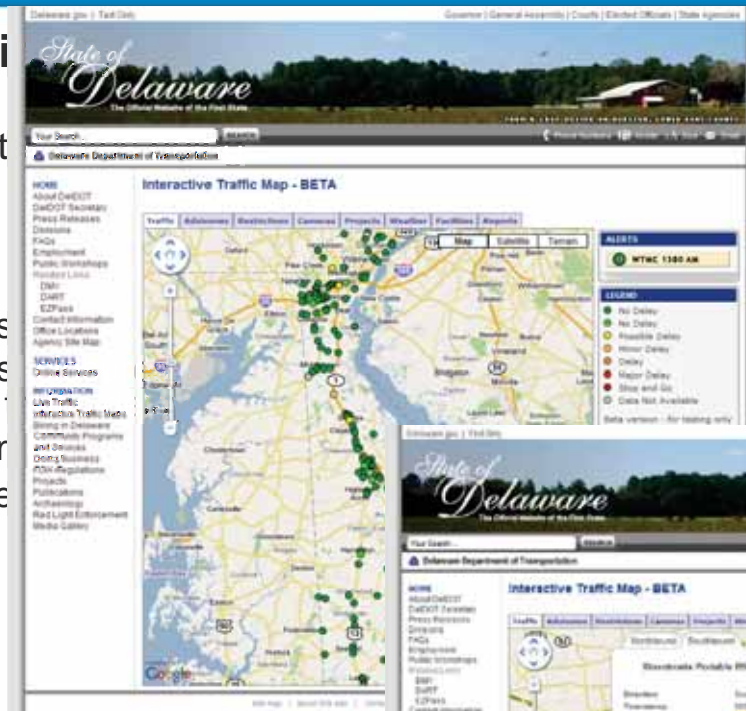
- <http://www.deldot.gov>
- Interactive Traffic Maps
 - Incidents, cameras, roadway weather, etc.
 - Freeway Travel Time
- <http://deldot.gov/mobile>
- Live Traffic Cameras
- WTMC 1380 AM

- **Twitter, Facebook**

- **Smartphone Application**



- **Electronic Changeable Message Signs**



Control

- Real-time traffic control system to proactively manage transportation
- Traffic Signals
 - State-of-the-art traffic signal software
 - Integrates with other data systems like traffic monitoring, incident management, and transit operations
 - Remote connectivity to signals

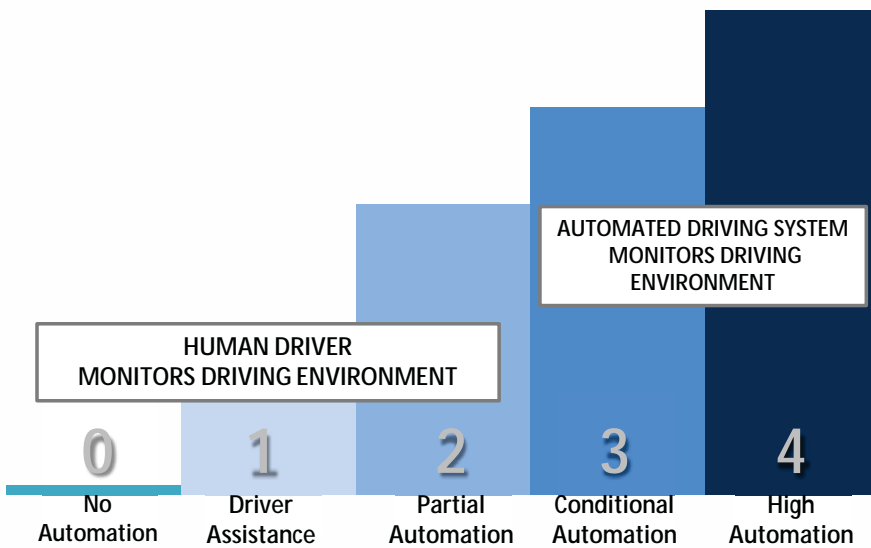


Connected/Automated Vehicles Overview

- Connected and Automated Vehicles (CAV) are vehicles that utilize technology to communicate with other vehicles, the built environment, and the outside world
- Purpose
 - Reduce crashes resulting from driver error
 - Increase mobility
 - Reduce vehicle emissions
- Applications
 - Automated Driving Vehicles
 - Vehicle-to-Vehicle Communications (V2V)
 - Vehicle-to-Infrastructure Interaction (V2I)
 - Fully-connected/interactive travelers (V2X)
- CAV is the next phase of ITMS!

Automated Driving Vehicles

NHTSA Identifies 5 Levels of Vehicle Automation:



- TESLA Auto-Pilot = Level 2.5
- GoogleCar aims to achieve full Level 4 Functionalities

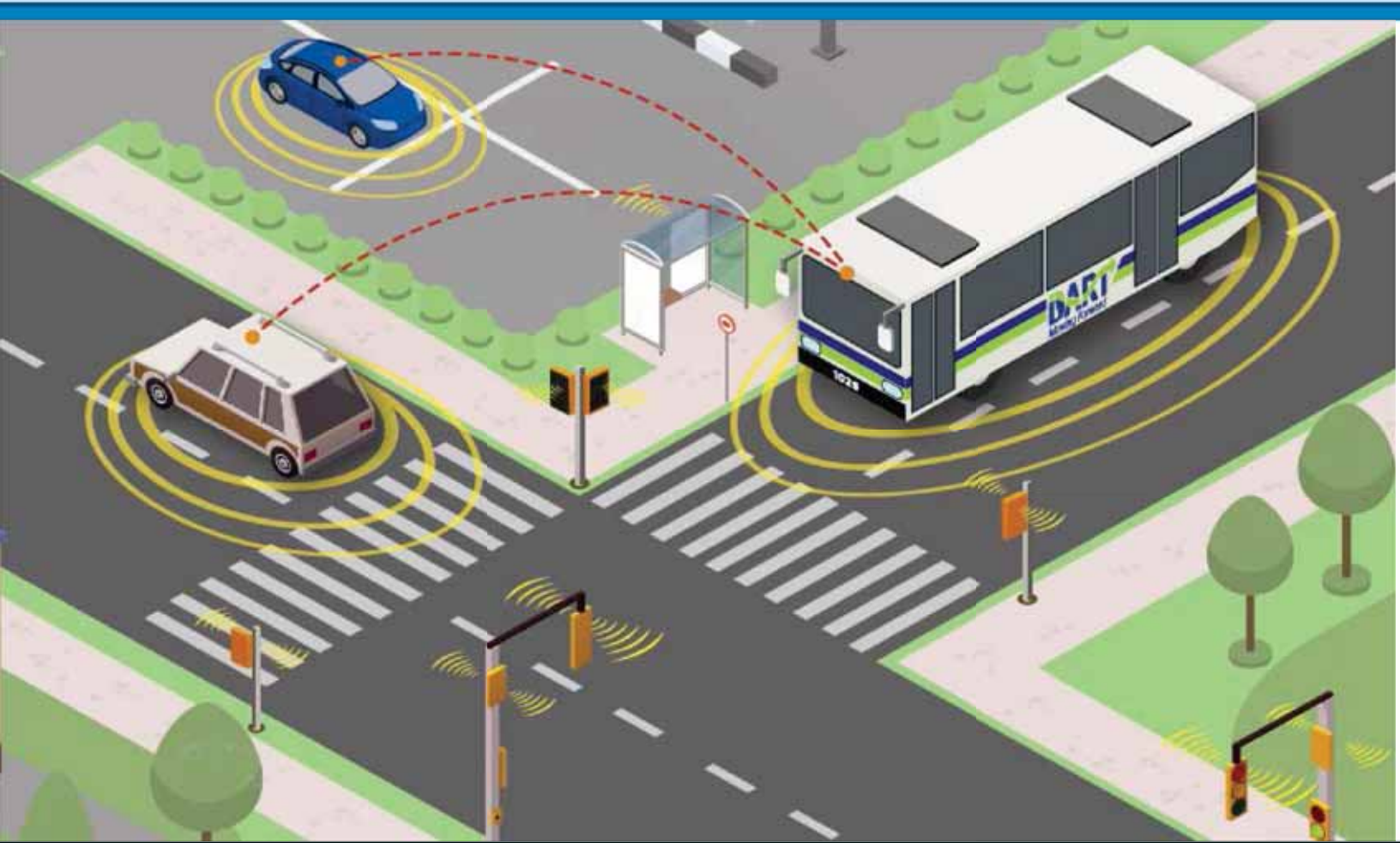


Source: Consumer Reports



Source: Google

Vehicle to Vehicle (V2V) Communication



Vehicle to Infrastructure (V2I) Interaction



Fully Connected/Interactive Travelers (V2X)



General Timeline



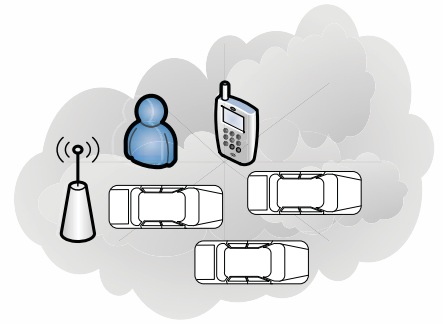
What Can We Leverage?

- Existing Telecommunications Network
 - Network Master Plan recently updated to incorporate future V2I connections
- Existing Delaware Transit Corporation Integration
- Existing Traffic Signal and ITS Device Integration into TMC
- Mobile App
 - Interim stopgap between full V2I deployment
 - Text-to-Voice Enhancements
 - Mobile Devices as Probes
 - Direct communications with TMC

DeIDOT Timeline

- 2016 – 5.9 GHz spectrum license issued
- 2016 – 4.9 GHz wireless Phase I (Dover)
- 2017 – AI Project (Newark)
- 2017 – SPaT Challenge (Smyrna)
- 2017 +
 - Additional deployment of roadside units (RSU) and onboard units (OBU)

V2I Networking Concept



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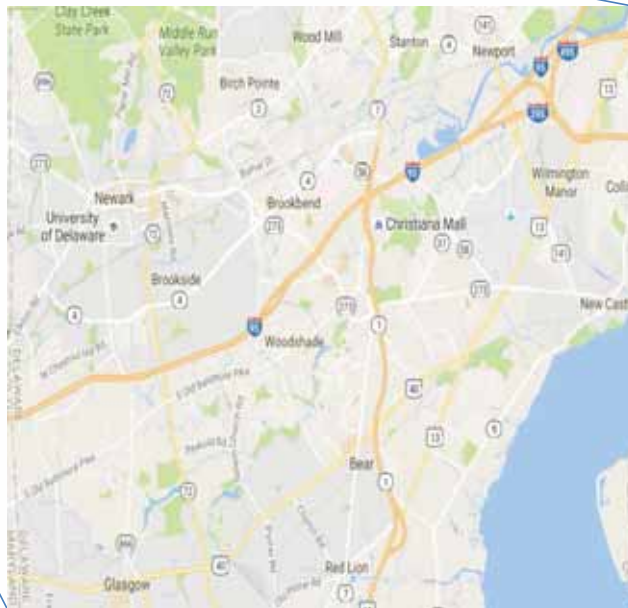
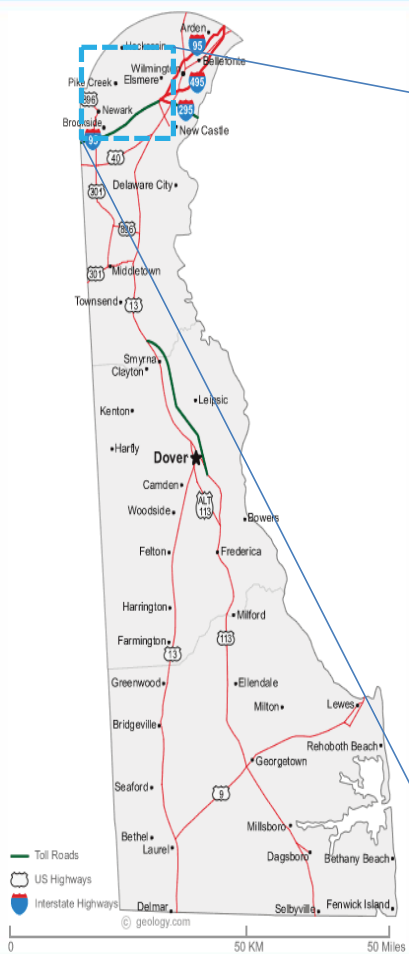


Delaware Artificial Intelligence (AI) Project

- If a network is too large, or too many cases, with a huge amount of data coming in (especially when CV data is available), human brains cannot process the data and make comprehensive, timely decisions.
- Build a computer/AI based tool, which can enhance operations and build a foundation which can support automating or semi-automating TMC operations in the near future.



The Project Covered Area



- It is the corridor of I-95 from DC to NYC, with parallel arterial US-40
- Wilmington and Newark, the state's largest cities, are clustered here
- This corridor has high incident rate: on average 10~15 crashes /accidents each quarter
- The test bed area includes 8 miles of I-95 freeway, 43 miles of state highway with 98 signalized intersections
- key roadway segments include I-95, US 13, US 40, DE 4, DE 7, DE 72, DE 273, DE 896 and Old Baltimore Pike

How is DeIDOT Positioned?

- DeIDOT's anticipated role is primarily in the V2I space with V2V applications within DeIDOT/DART vehicles
- Participating in AASHTO/ITS America V2I Deployment Coalition and AASHTO HAV Guidance Working Group
- Participating in I-95 Corridor Coalition Connected/Autonomous Vehicle Executive Leadership Team
- Robust Integrated Transportation Management System (ITMS) Deployment – This is the next phase!



www.deldot.gov/information/pubs_forms/brochures/pdf/CAV_brochure.pdf

DeIDOT's UAV Program



UAV Federal Requirements

August 29, 2016 the FAA small Unmanned Aircraft System (UAS) rule went into effect.

The small UAS rule adds a new part 107 to Title 14 Code of Federal Regulations (14 CFR) to allow for routine civil operation of small UAS in the National Airspace System (NAS) and provide safety rules for those operations.

All commercial small UAS operators are required by law to have a Remote Pilots license. In order to obtain a Remote Pilot license, you must complete an Aeronautical Knowledge test at an FAA certified testing center.

Government entities or organizations may also fly under the small UAS rule – they must follow all rules under 14 CFR part 107, including aircraft and pilot requirements.

FAA requirements for agencies to fly UAVs in the NAS is that only a written exam is required; there is no practical flying exam.

To address this concern various public agencies in Delaware have formed a UAS Steering committee to develop standards to ensure best practices for safety and program maintenance.

DeIDOT Pilot Qualification

All pilots are encouraged to complete an in-house UAV Ground School then pass the FAA Aeronautical Knowledge exam.

Once an individual has passed the Aeronautical Knowledge test then they can apply to the FAA for a remote pilot certificate.

DeIDOT Requirements

Once the pilot has a FAA remote pilot certificate they will have to attend a Pilot Qualification course that teaches basic UAV flying maneuvers for their particular aircraft.

Before the pilot can have their training records signed off as a DeIDOT Certified UAV pilot they will need to show their ability to fly ten basic maneuvers.

UAV Pilots will have to take a re-exam every 24 months - FAA

UAV Pilots will be required to fly 3 flights within a 60 day period for proficiency - DeIDOT

DeIDOT UAV Operational Policy

DeIDOT has implemented a UAV Operating Policy for flying UAVs that identifies;

- 1) Program Oversight along with Operational Directives,
- 2) Division Participation,
- 3) Equipment,
- 4) Training & Certification,
- 5) and Flight Planning & Operations.

All UAV missions whether they are flown by DeIDOT or a hired contractor, if flying on a DeIDOT project require a pre-flight plan to be filed with the TMC in advance of the mission.

The policy requires a two-manned approach with a pilot and visual observer for each flight, the FAA 107 rule only requires a pilot.

DeIDOT currently has 3 DJI Inspire Pro aircraft; all of them have been registered with the FAA.

Potential Uses

- 
- **University Research and Operator Training Programs**
 - **Agriculture**
 - **Environmental Inventories**
 - **Aerial Observation and Infrastructure Inspection such as:**
 - **Bridges**
 - **Utilities**
 - **Communications Towers**
 - **Pipelines**
 - **Landfills**
 - **Open Mines and Quarries**
 - **Raw Material Stockpiles**
 - **3-D Mapping**
 - **Law Enforcement**
 - **Firefighting**
 - **Emergency Medical Care**
 - **Cinematography**
 - **News Gathering**
 - **Sporting Events**
 - **Professional Drone Racing**
 - **Hobbyists and Recreation**
 - **UAS Manufacturing**
 - **The Development of Safety Enhanced Drone Parks for Public Recreation**

Questions?

For More Information:

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www.deldot.gov

www.deldot.gov/information/pubs_forms/brochures/pdf/CAV_brochure.pdf