5.9 GHz DSRC VEHICLE-BASED ROAD AND WEATHER CONDITION APPLICATION
Cooperative Transportation Systems
Pooled Fund Study (CTS PFS)

- CTS PFS is a group of 13 state and local transportation agencies and FHWA
- Focused on research and application development to prepare agencies for the deployment of connected vehicle (CV) technology
- CTS PFS has contracted with Synesis Partners (with Parsons Brinckerhoff and NCAR) to demonstrate a 5.9 GHz DSRC vehicle-based road and weather condition application
Project Objectives

- Develop and test acquisition of weather and road condition data from DSRC-equipped agency vehicles
  - From the vehicle’s data bus
  - From supplemental devices like plows, spreaders and mobile road weather sensors
- Transmit the data to DSRC roadside equipment
- Send the data to a weather data service
- Enable storing/processing the data in WxDE/VDT
5.9 GHz DSRC

- Dedicated Short-Range Communication (DSRC) is a variant of Wi-Fi that provides high-bandwidth over short distances for mobile/vehicular units.
- Range of communications is at least 300 up to 1000 m.
- Vehicles are equipped with on-board DSRC units (OBUs) that broadcast to and receive from other OBUs and roadside units (RSUs).

(Source: USDOT)
Task 1: Messaging Requirements Development
- Based on road weather and DSRC standards

Task 2: Concept of Operations
- Consistent with Connected Vehicle Road Weather application concepts

Task 3: Applications Development
- Primarily OBU hardware and software

Task 4: Application Installation
- Operating along NYSDOT’s Long Island Expressway
Gathering road and weather data from vehicles is driven by what data vehicles can provide.

Relevant standards include:
- DSRC radios
- Communications over DSRC
- Data bus standards for light and heavy vehicles
- Messages sent over DSRC
  - Basic Safety Message
  - Probe Vehicle Data Message
CV Weather Data Elements

- CAN Bus data from the vehicle
  - Exterior lights
  - Wiper status/rate front/rear
  - Sun data
  - Rain state/rate
  - Air temp
  - Air pressure
  - Solar radiation
  - Mobile Friction

- Location/time from GPS
- Data from third-party equipment (plows and spreaders)
- Data from third-party weather sensors
Deployment Concept

- Similar to other IMO deployments
- Uses DSRC instead of cellular from vehicles to roadside
System Data Flows

Vehicle Data Translator

Weather Data Environment

System Monitor

Weather Data Aggregator

Roadside Unit

On-Board Unit

Sensor

Vehicle Data Logger

NYS INFORM

NYS CV APPLICATIONS
□ New RSUs replacing two existing units on the LIE
Physical Installation of RSU

Kapsch 2.x RSU

Savari 3.x RSU
RSU Radio Testing

- Connected DSRC testing equipment to test vehicle
- Verified DSRC coverage
  - South side of maintenance yard
    - Areas of yard blocked by buildings
  - East of site on LIE at Roosevelt Blvd
    - Decreasing road elevation improves range
  - West of site on LIE at Ranick Rd
    - Heavy tree line reduces range
  - Same coverage eastbound or westbound on LIE
RSU Radio Testing
On-board Installation

Charge Guard

Cohda MK2

DSRC/GPS Antenna

Battery +

J1939/13

J1962

Battery

CAN high

CAN low

Serial

Dickie John Terminal

Ice Sight

(Source: High Sierra Electronics)
Integration Testing to Date
Opportunities and Accomplishments

- Developing a prototype DSRC-based application supporting DOT road weather operations
- Updating the NYSDOT DSRC demonstration test bed
- Demonstrating operations that gather probe data from DOT vehicles over DSRC
- Providing a new data feed for the WxDE
Risks and Challenges Overcome

- Standardizing the DSRC implementation
  - Messaging for probe data
  - RSU configurations
  - Network configurations
  - On-board unit configurations

- Deployment and operations
  - RSU siting to reduce vehicle-to-server data latency
Status and Next Steps

- Completed Messaging Requirements and Concept of Operations
- Deployed first RSU
- Configured IPv6 backhaul network
- Finishing OBU development
- Deploy OBUs 2014Q3
- Operations through 2014Q4
- Final Report December 2014
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