

Connect Vehicle Pilot Success in Ottawa

Eco Drive I2V Proof of Concept Project

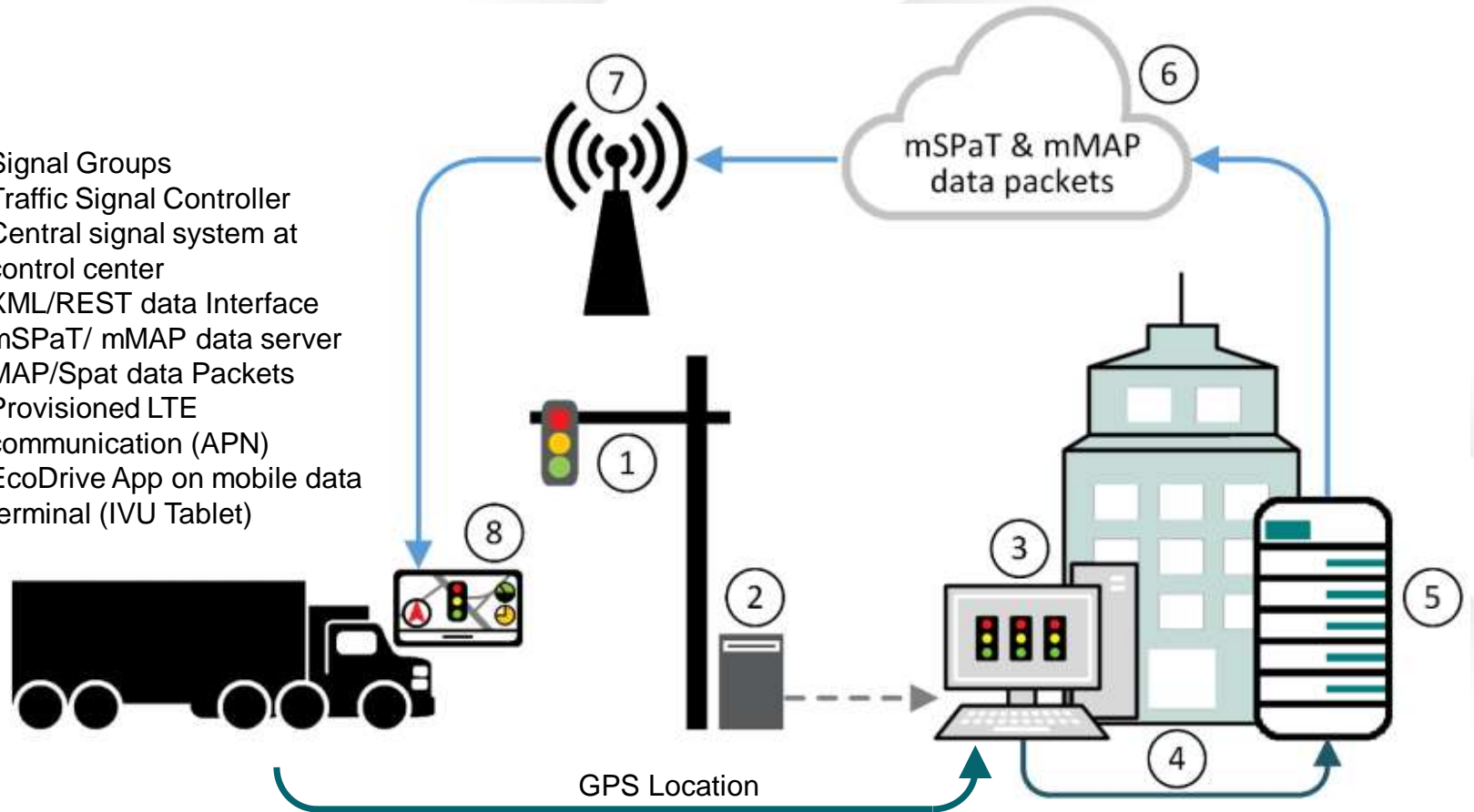
Andy Thompson / Greg Kent, P.Eng
Thompson Technologies / City of Ottawa

Overview

- A Clean Transportation, Connected Vehicle project
 - Federal and Provincial funded program
- Proof of Concept Initiative
 - Environmental and Economic benefits via I2V technology
 - Urban Freight Movement Environment
 - US DOT/FHWA GlidePath Project framework application
 - Scalable
- Joint partnership - \$300k
 - Transport Canada / MTO / City of Ottawa

I2V Connection

1. Signal Groups
2. Traffic Signal Controller
3. Central signal system at control center
4. XML/REST data Interface
5. mSPaT/ mMAP data server
6. MAP/Spat data Packets
7. Provisioned LTE communication (APN)
8. EcoDrive App on mobile data terminal (IVU Tablet)



Communication
Protocols & Standards

XML/REST Interface

SAE J2735

EcoDrive I2V CV Project

Corridor

- Arterial Road – 4 Lane Div.
- 5.75 km
- 12 traffic signals- actuated
- Signals 200m – 1,250m apart
- 60km – 80km
- Trucks 1000-2000/day (4%)

Land Use

- Residential (reverse frontage)
- Commercial
- Light industrial
- Airport

Fleet

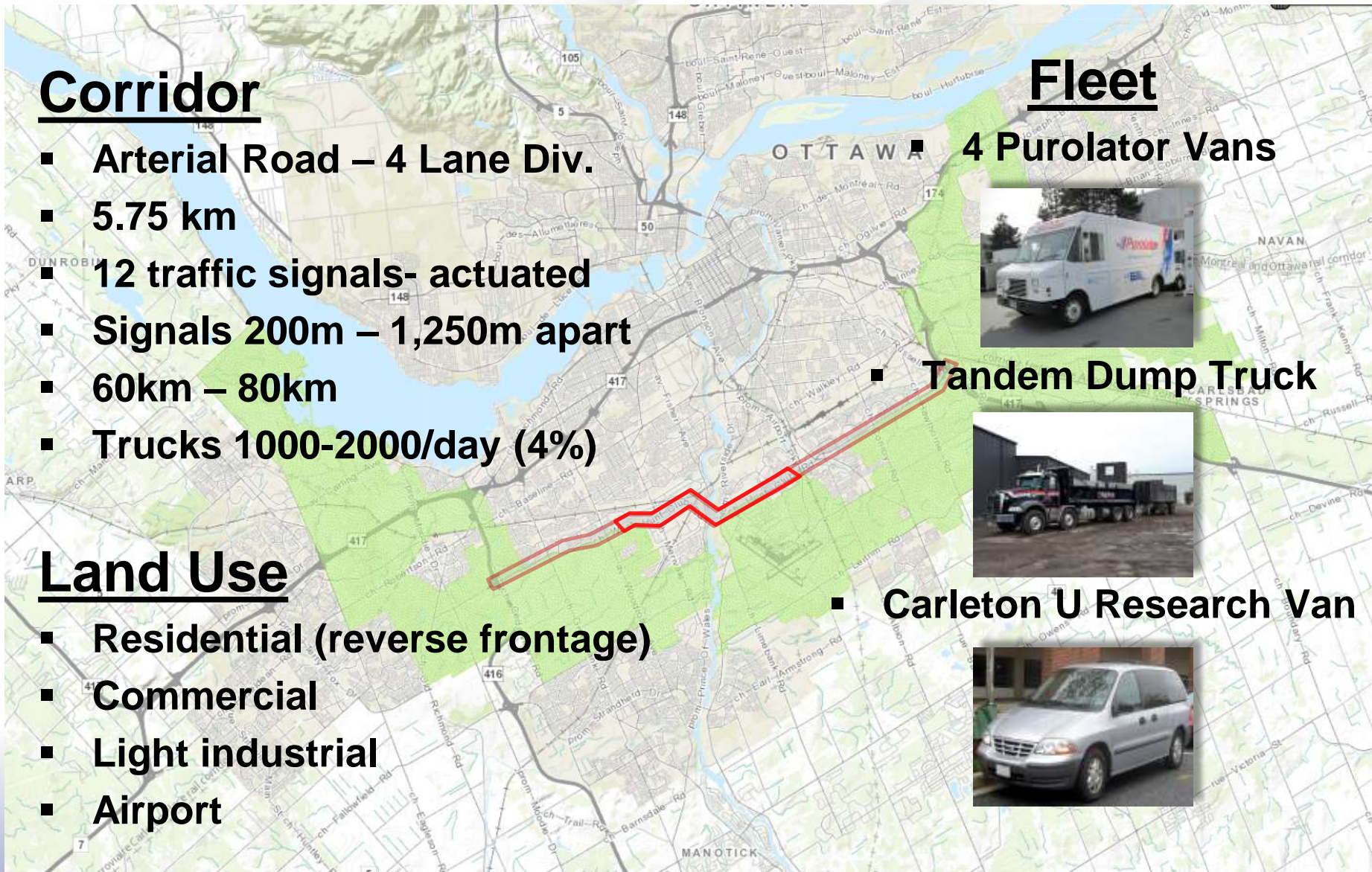
4 Purolator Vans



Tandem Dump Truck



Carleton U Research Van



Results and Findings

- Proof of Concept was verified
 - Reliable real time data shared between infrastructure and vehicle
 - Economic and environmental benefits realized
- Sample results
 - Crepin Dump Truck (no load) : 8.53% fuel reduction
 - Purolator Vans : 16.2% fuel cost reduction
 - Carleton Van : 9.47% reduction in CO2
- System had limitations when vehicles were traveling in congestion where average speeds were 25 km/h or lower.

How we got Here

FHWA GlidePath Project

Framework

- Closed private road test facility
- One traffic signal, one vehicle
- GPS locator
- Fixed time phasing
- Simple intersection layout
- DSRC Communication
- SPaT/MAP data sharing
- IVU with driver information / vehicle control information

BACKGROUND

The Federal Highway Administration's testing facility, along with its partners, has successfully implemented and demonstrated the application of Eco GlidePath at a signalized intersection on the converted Loop 405, former Fort Hood Highway, Research Center. The on-board software application dynamically communicates with traffic signals at intelligent intersections and provides a moving vehicle's positioning and destination speed to an on-board display.

CONCEPTUAL FRAMEWORK

From our field tests were conducted at the FHWA with a single vehicle at a single intersection containing no traffic. Results show that the V2X-capable allowed the vehicle to communicate with the traffic signals at the approach to the intersection.

OBJECTIVE: Demonstrate essential performance of a vehicle approaching and receiving a signalized intersection.

DATA:

- Vehicle location (distance to intersection)
- Vehicle speed
- Signal Phase and Timing (SPaT) and MAP Messages
- Sensor/Communication/Control
- Measurement: acceleration, deceleration, jerk, etc.

RESULTS:

- Speed Trajectory
- Target Speed Approach (m/s)
- Fuel Consumption/Distance Parameters to minimize fuel consumption without "See" SURE by passenger driver

Vehicle Type	Speed (m/s)	Fuel Consumption (L/100km)
CV	21.4	18.4
CV	24.2	14.2
CV	27.0	12.8
CV	30.0	12.8
CV	33.0	12.8
CV	36.0	12.8
CV	39.0	12.8
CV	42.0	12.8

MOVING FORWARD

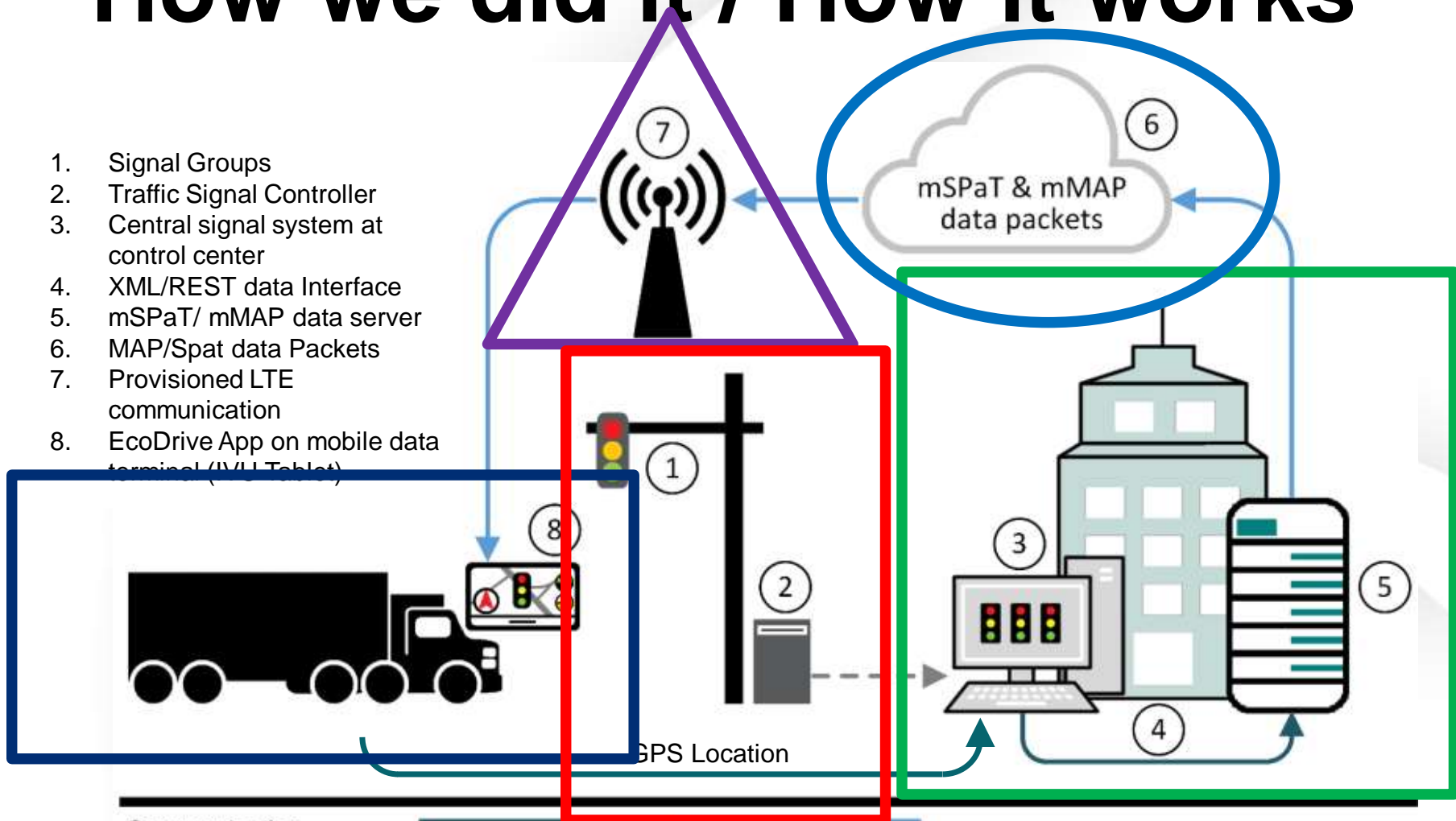
With the conceptual implementation of the EcoGlidePath project, further development is required in order to be deployed for commercial applications and implementation within the vehicle (V2V) communication to address the safety of driving vehicles on the road. The goal is to eventually create a road-side infrastructure for possible commercial deployment in the future.

What was possible

- Signal System-to-Vehicle Connection (I2V)
 - Cellular ★
 - DSRC
 - Lidar/Radar/Video
- Advantages
- Disadvantages

How we did it / How it works

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Where we go from here

- Expand the application
- Scale the system - # of signals, # and type of vehicles, area of coverage, data availability
- Extension of predictability application to DSRC for more localized applications

Where we go from here

- Reduce latency, improve responsiveness
- Further development of predictability app though improved signal system data and its transfer.
- Further development of IVU
- More research in practical applications

Acknowledgements

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- TT – Thompson Technologies
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- City of Ottawa Staff
- Purolator, Crepin Cartage

Questions?

Greg Kent, P.Eng
Manager Traffic Management
City Of Ottawa
greg.kent@ottawa.ca

Andy Thompson
Principal
Thompson Technologies
andy@thompsonstech.net

Ottawa - Audi Demonstration

Live event

- Nov 2017, Ottawa Hunt Club Road test corridor
- TTS EcoDrive I2V Pilot signal application utilized
- Audi Equipped vehicles with IVU support (current production vehicles)
- Replicate City of Las Vegas current operation (LV went from research to near full city application in 2 years)



Michael Zweck, Audi Connected Systems Developer, Karen McCrimmon, MP, Kanata-Carleton, and Parliamentary Secretary to the Minister of Transport, Mayor Jim Watson and Coun. Marianne Wilkinson pose with a fully connected Audi during a test drive held at Mark Motors on Thursday, Nov. 16. - Jake Davies/Metroland



Various Audi equipped vehicles such as the Q5 present real time signal information on their main instrument cluster.

Ottawa - Audi Demonstration

Live event Links to Media articles and news releases

- <https://intelligent-transportation.govciooutlook.com/vendor/traffic-technology-services-making-vehicles-smarter-and-safer-cid-119-mid-16.html>
- <https://www.toronto.com/news-story/7933426-vehicles-to-save-time-energy-connected-to-the-city-traffic-light-system/>
- <https://ottawa.ca/en/news/city-infrastructure-connects-vehicles-traffic-signals-safer-smoother-greener-trip>

Spring 2018 TAC Session Demo

