Status Update on the Alberta Cooperative Transportation Infrastructure and Vehicular Environment (ACTIVE) Test Bed

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ACTIVE-AURORA Project

- **Project Title:** An infrastructure to build a network of wireless communication test beds for multimodal transportation to promote commercialization and innovation, and advance education and training in the Asia-Pacific Gateway

- **University of Alberta:** ACTIVE - Alberta Cooperative Transportation Infrastructure and Vehicular Environment

- **University of British Columbia:** AURORA - Automotive testbed for Reconfigurable and Optimized Radio Access
History of ACTIVE-AURORA

- **Sponsorship**
  - Infrastructure Project with support from Transport Canada, Alberta Transportation and City of Edmonton

- **Project Time line**
  - 2012 Mar 5 - Initial discussion, project team formed
  - 2012 Nov 8 - Official proposal submission
  - 2013 Sep 3 - Official approval
  - 2014 Apr 1 - Agreements officially signed
  - 2014 Oct 22 - ACTIVE-AURORA project official launch
  - 2016 Sep 16 - Milestone of full operation in ACTIVE
  - 2017 Sep 30 - full operation in ACTIVE-AURORA
Connected Vehicle (DSRC) Environment

- Road Side Equipment
- On Board Equipment
- Traffic Signal Controller
- Traffic Management Centre
- Freeway
- Smart Phone
- Smart Tablet
ACTIVE Test Bed Coverage

- 30 RSEs installed, 60 kilometers coverage
- City of Edmonton
  - 109 St and Saskatchewan Drive
  - Whitemud Drive (10)
  - 23 Avenue Arterial Corridor (13)
- Alberta Transportation
  - Anthony Henday Drive (6)
ACTIVE Installation Process

- Scope & Designs

- TC Finance Process Audit done.
- Stantec engaged for:
  - PM, Electrical Design
- City of Edmonton
  - Revising Electrical Designs
  - Procured Switch for testing
- Installation Contractor selection going to RFP
- Wireless backhaul modem in testing
- Received Developmental Radio Licenses
- CSA Exemption acceptance
General Data Flow within CV

Lab/TMC

RSE

Controller

OBE

Smartphone

OBE

1

2

3
ACTIVE Test Bed – Cellular Network
Cellular Phone Data Analytics

- Cell Towers Distribution in Alberta

  - Alberta: Total #: 1847
  - City of Edmonton: Total #: 417
  - City of Calgary: Total #: 569
Edmonton Based Trip A & P

- O-D Distribution

O-D Distribution (1 Day)

Daily Trip Attraction

- Daily Trip Production
Application 1 – Signal Priority Control

- SPaT
- DSRC
- NTCIP
- Signal Request message
- Hold
- Omit
- Force off
- Traffic light Status
Transit Signal Priority Control

This project will demonstrate the application of the distributed, active TSP system along a 4.5 km-long corridor and one intersection on campus that will fully realize the connected vehicle technology based wireless communications among transit buses and traffic signal.
Application 1

- Evaluate the performance of several TSP strategies on four corridors in the City of Edmonton
- Passive, Active and Adaptive

TSP Corridor VISSIM Model with ASC/3 Signal Controller
RSE and OBE Interface

RS

E

OBU

Transmitting Signal Request message

Receiving Signal Request message

Receiving SPaT
The Controller Interface

Remaining Time

Active Phase
Application 2 – Corridor Signal Control

Arterial Corridor Management

- This project will demonstrate the application of receiving Signal Phrase and Timing Data (SPaT) along the arterial corridor, advisory driving speed control, performance measurement, and signal timing optimization.
Application 2 – Corridor Signal Control

Connected Vehicle Environment (FHWA, 2013)

V2V, V2I, V2VI

New Data Source

NTCIP and DSRC

Controller Health Monitoring

Road Weather CV applications (Paul Pisano, 2013)

Weather Effect on Arterial Operation
CV provides a communication method to retrieve the real-time status of traffic signal controllers to diagnose the health of traffic signal equipment.
Application 3 – CV-Enabled RWIS

- RWIS Information Broadcast and Mobile RWIS
  - To facilitate road weather information access as well as augment fixed RWIS stations by introducing mobile weather sensors on vehicles using CV technology
ACTIVE CAV Test Track (U of A)

- Support from U of A executives, and build a smart campus
- CAV Tracks:
  - CV track – 2 km
  - AV Track – 1 km
- CV RSEs for V2I
- CV OBEs for
  - Test vehicles
  - Fleet vehicles
- LTE-V / 5G Base Station
- D-GPS Base Station
- Camera Video Coverage
Summary and Conclusion

- What vehicle will be connected?
  - Corporate fleets: fire, ambulance, transits.
  - Partnership development with vehicle manufacturers.

- Security and Credential Management System (SCMS) is missing in our existing infrastructure.
  - Potential attack to signal controller, system and DMS.

- Real-time and historical data achieving and management to support different purposes.

- Understand the added value brought by the evolving technology.
Open Discussion

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