Rapid Transit Implementation Working Group

Report

1st Meeting of the Rapid Transit Implementation Working Group
February 21, 2019
Council Chambers

Attendance

PRESENT: M. Cassidy (Chair), Councillors J. Helmer, S. Hillier, A. Hopkins, A. Kayabaga, S. Lehman, E. Peloza, P. Squire and M. van Holst, T. Khan, T. Park, S. Rooth; and P. Shack (Secretary)

ALSO PRESENT: K. Burns, J. Kostyniuk, D. MacRae, S. Maguire, K. Paleczny, A. Rammeloo, J. Ramsay, C. Saunders, S. Spring, B. Westlake-Power

The meeting was called to order at 4:30 PM.

1. Call to Order

1.1 Disclosures of Pecuniary Interest

That it BE NOTED that no pecuniary interests were disclosed.

2. Organizational Matters

2.1 Election of Chair and Vice Chair for the Term Ending November 30, 2019

That it BE NOTED that the Rapid Transit Implementation Working Group elected M. Cassidy and M. van Holst as the Chair and Vice Chair, respectively, for the term ending November 30, 2019.

3. Scheduled Items

3.1 Autonomous Vehicle and Ridesharing

That it BE NOTED that the Rapid Transit Implementation Working Group, held a general discussion, with respect to Autonomous Vehicle and Ridesharing; it being noted the attached presentations, were received:

- J. Kostyniuk, Traffic and Transportation Engineer, City of London;
- B. Kirk, B.Sc., P. Eng, Executive Director, Canadian Automated Vehicles Centre of Excellence;
- E. Olson, Ph.D., CEO May Mobility Inc.; and
- Dr. A. Shalaby, Ph.D. P. Eng., Associate Director of the iCity Centre for Automated and Transformative Transportation System.

4. Consent

4.1 5th Report of the Rapid Transit Implementation Working Group

That it BE NOTED that the 5th Report of the Rapid Transit Implementation Working Group, from its meeting held on November 8, 2018, was received.

4.2 Municipal Council resolution adopted at its meeting held on December 5, 2018, with respect to the Appointments to the Rapid Transit Implementation Working Group

That it BE NOTED that the Municipal Council resolution adopted at its meeting held on December 5, 2018, with respect to the Appointments to the Rapid Transit Implementation Working Group, was received.

5. Items for Discussion

None.

6. Deferred Matters/Additional Business

None.

7. Adjournment

The meeting adjourned at 7:20 PM.

MEMO

To: Rapid Transit Implementation Working Group

From: Jennie Ramsay, P.Eng.
Project Director
Rapid Transit Implementation

Date: February 15, 2019

Re: **RTIWG February 21, 2019 Meeting Agenda**
Autonomous Vehicle and Ridesharing Expert Panel

Introduction

The contents of this memo contain background information on the Council-directed request to engage with an autonomous vehicle and ridesharing expert. The adopted Council amendment on December 18, 2018 is as follows:

> **That an expert in the field of autonomous vehicles and ridesharing be engaged to speak to the Rapid Transit Implementation Working Group (RTIWG) in the first quarter of 2018 about the coming smart transit technologies and the likely timelines for their commercialization.**

From this resolution and in concert with a previous June 12, 2018 Council direction to develop a Connected and Autonomous Vehicle Strategic Plan, staff have assembled a three-speaker panel to both address the Rapid Transit Implementation Working Group (RTIWG) inquiries and the City of London's related project.

Expert Panel Format

The Expert Panel will be moderated by Jon Kostyniuk and will include the following components discussed further below:

- Individual expert introductions and subject matter background (approximately 20-30 minutes);
- Moderated discussion panel (approximately 25-30 minutes); and
- General questions from RTIWG chair and members.

Speaker Biographies

Barrie Kirk, B.Sc., P.Eng. is the Executive Director of the Canadian Automated Vehicles Centre of Excellence (CAVCOE). He is a well-known consultant, speaker, and broadcaster on automated vehicles, and has advised many public and private sector organizations on planning for the AV era. Barrie and CAVCOE are now starting their third AV research project for the City of Toronto. His other roles include the Board of Directors of Unmanned Systems Canada, the Automotive Advisory Board of Centennial College, and the Canadian Advisory Committee for ISO TC204. Prior to this, he worked in the technology industries in Canada, the US, and the UK, including senior management positions in Ottawa-area companies. Barrie received a B.Sc. (Honours) in Electrical Engineering from Coventry University, UK and is a Professional Engineer.

Edwin Olson, Ph.D. is an Associate Professor of Computer Science and Electrical Engineering at the University of Michigan, and co-founder/CEO of May Mobility, Inc., which develops self-driving shuttles. He earned his Ph.D. from MIT in 2008 for work in robot mapping. He has worked on autonomous vehicles for over a decade, including work on the 2007 DARPA Urban Challenge, vehicles for Ford and Toyota Research Institute, and now May Mobility. His academic research includes work on perception, planning, and mapping. He was awarded a DARPA Young Faculty Award, named one of Popular Science's "Brilliant 10", and was winner of the 2010 MAGIC robotics competition. He is perhaps best known for his work on AprilTags, SLAM using MaxMixtures and SGD, and Multi-Policy Decision Making.

Dr. Amer Shalaby, Ph.D., P.Eng. is a Professor of Transportation Engineering and Planning at the University of Toronto and Associate Director of the iCity Centre for Automated and Transformative Transportation Systems. He is specialized in urban transit planning and operations, intelligent transportation systems, and transportation planning for large-scale events and mega cities. His research program has been sponsored by numerous public agencies and private companies in Canada, the US, and internationally. Dr. Shalaby has also led consulting projects for many clients in Canada and internationally, and he has offered short courses on public transit planning and modelling to the professional community since 2008. Dr. Shalaby is an appointed member of two transit technical committees of the TRB, he serves as associate editor of the Canadian Journal of Civil Engineering and he sits on the editorial board of two international journals. Dr. Shalaby has also served on expert and advisory panels of several transit projects in Canada and internationally. Between 2008 and 2010, Professor Shalaby held an honorary appointment of a visiting scholar at Carnegie Mellon University.

Autonomous Vehicle and Ridesharing Background Information

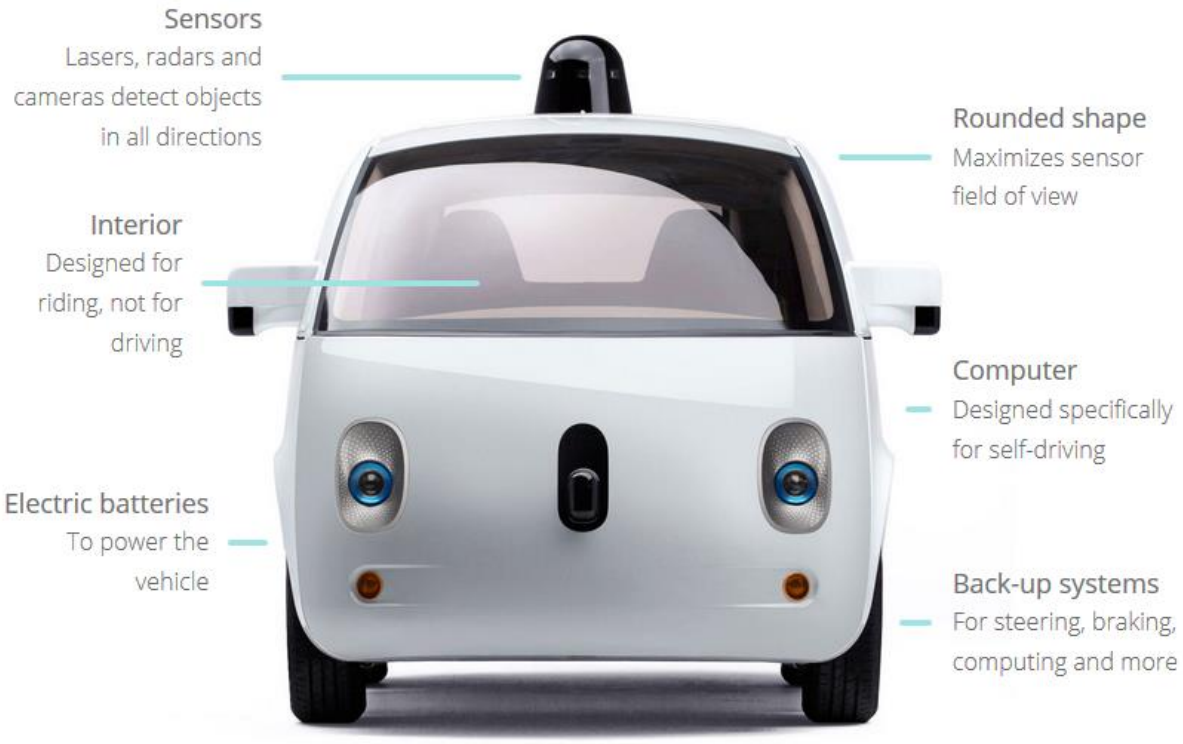
Autonomous Vehicles (AVs)

*D*riverless or self-driving vehicles that are capable of detecting the surrounding environment in order to safely navigate a transportation system.

Generally, autonomous vehicles detect the surrounding environment using:

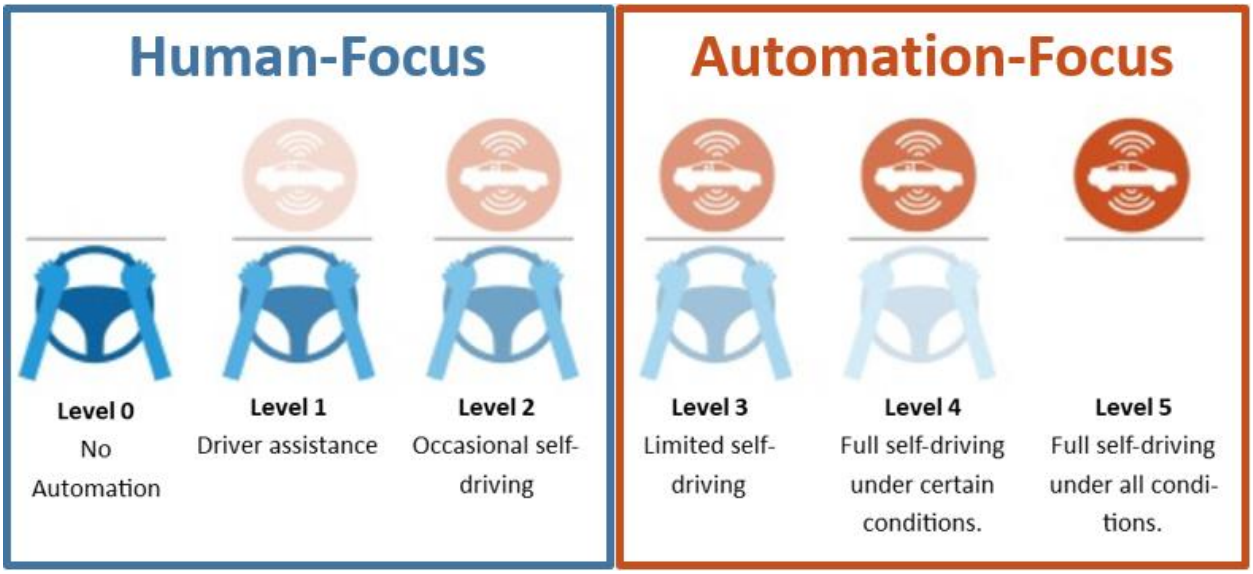
- A variety of sensors;
- A Global Positioning System (GPS); and
- Computer algorithms based on Artificial Intelligence (AI).

Typical Autonomous Vehicle Components



Source: https://www.theurbanist.org/2016/01/07/the-good-and-the-bad-of-driverless-cars-for-cities/

All autonomous vehicles are not created equal, the Society of Autonomotive Engineers (SAE) classifies the levels of automation as follows:



The key distinction is between SAE Levels 2 and 3, where SAE Level 3 begins to focus more on the automated systems monitoring the environment and performing the entire driving task.

A short video (3:16) explaining the SAE levels of automation is found here: https://www.youtube.com/watch?v=Eq89YGbERzs

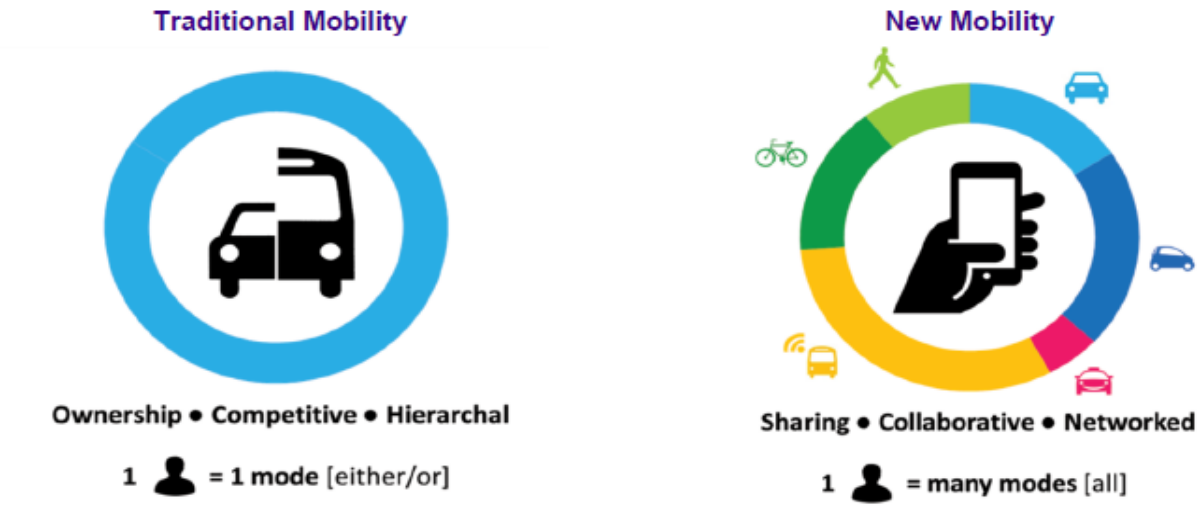
Connected Vehicles (CVs)

Autonomous vehicles may receive up to date information through connected vehicle technology, which primarily communicates through three different channels:

- **Vehicle-to-Vehicle (V2V):** Enhance situational predictability (AVs travelling together in close proximity.
- **Vehicle-to-Infrastructure (V2I):** Directly communicate the status and condition of nearby infrastructure. Includes Smart Traffic Signals and Smart Parking to manage transportation demands and to avoid congestion.
- **Vehicle-to-Everything (V2X):** A more general term for communications with the surroundings in addition to V2V and V2I, such as pedestrian/bicycle communication.

Ridesharing and Mobility-as-a-Service (MaaS)

Many companies such as Uber, Lyft, and others are developing their own autonomous vehicle products and incorporating these vehicles into their business models. These app-based transportation services target lower journey prices, increased convenience, and improved rider amenities.



Related to ridesharing is Mobility-as-a-Service (MaaS), which expands upon the ridesharing concept. MaaS describes a shift away from personally-owned modes of transportation and towards mobility solutions that are consumed as a service.

MaaS is enabled by combining transportation services from public and private transportation providers through a unified gateway (e.g. a mobile app) that creates and manages the trip, which users can pay for with a single account. Users could subscribe to various transportation service packages (similar to existing cellular phone or cable subscriptions) tailored to the needs of individuals, couples, or families.

In addition to and including ridesharing, MaaS may include services such as:

- Real-time transit and/or commuter rail schedule integration;
- Traditional taxi integration;
- Car sharing and car rental integration;
- Bicycle sharing integration; and
- Other third-party service integration.

A short video (2:10) explaining MaaS is found here:
https://www.youtube.com/watch?v=ZQieTU7_5xo

Autonomous Vehicle and Ridesharing Background Information

Rapid Transit Implementation Working Group

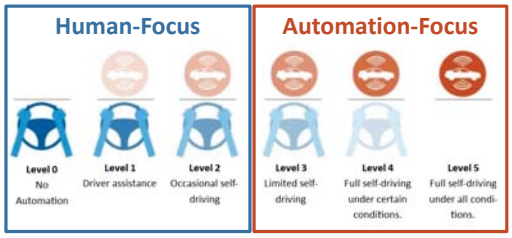
February 21, 2019

Autonomous Vehicles

- Ideally, **Autonomous Vehicles (AVs)**:
  - Are capable of **"sensing" the surrounding environment**;
  - Use AI, sensors, and GPS to **successfully and safely navigate a transportation system**; and
  - Provide **major improvements to road safety** by eliminating human driver error and distraction.

Automation Levels Defined

- The **Society of Automotive Engineers (SAE)** international standard that classifies vehicles automated driving systems from:
  - **Level 0 = No Automation** to **Level 5 = Full Automation**



Connected Vehicles

- Interrelated with AVs, **Connected Vehicle (CV)** technology provides up-to-date information to vehicles through a **variety of communications channels**.
- Types of CV technology include:
  - **Vehicle-to-Vehicle (V2V)**
  - **Vehicle-to-Infrastructure (V2I)**
  - **Vehicle-to-Everything (V2X)**

Ridesharing and MaaS

- An app that **creates, manages, and pays** for trips.
- Subscribe to **travel packages** tailored to customer needs.
- MaaS include services such as:
  - **Transit integration;**
  - **Ridesharing and taxi integration;**
  - **Car sharing/rental integration;**
  - **Bicycle sharing integration; and**
  - **Other third-party service integration.**

Expert Speakers

Barrie Kirk, B.Sc., P.Eng.
Executive Director,
CAVCOE

Edwin Olson, Ph.D.
CEO, May Mobility

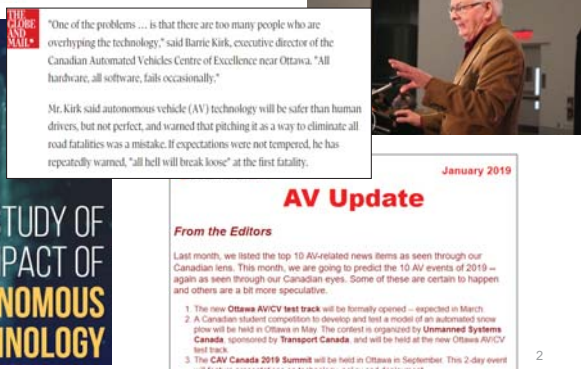
Dr. Amer Shalaby, P.Eng.
Associate Director,
iCity Centre

CAVCOE

Autonomous Vehicles and Ridesharing

Presentation to the City of London's RTIWG
Barrie Kirk, P.Eng.
Executive Director, CAVCOE
February 21, 2019

CAVCOE



New York City 1900

New York City 1913

Deployment Timing

Now: 1st gen	• **Advanced Driver Assistance Systems (ADAS) in commercial cars** • **Commercial, low-speed, fully-automated vehicles for applications in controlled environments**
2020-2022: 2nd gen	• **First street-legal, fully-autonomous cars** • **No steering wheel, pedals, etc.** • **Focus: driverless taxis, urban applications, limited rollout** • **In US first, then Canada**
2020s	• **Ramp-up in capability and deployment** • **AVs increasing part of total Vehicle Kilometres Travelled (VKTs)**
2030s: 3rd gen	• **Advanced fully-automated vehicles: go anywhere, any time in almost any weather**

Deployment Challenges

- Extreme weather
- Work zones, detours
- Traffic signals AND police officer
- Pedestrian prediction
- Hand gestures
- Reversing
- Regulations
- Insurance

CAVCOE

Fewer Collisions

- Driver error a factor in 93% of collisions
- AVs expected to be much safer than human drivers
- Hopefully we can reduce collisions by 80%

Ottawa Citizen

motoring

News Lifestyle Vehicles Road tests Customs & Classics Bikes Motorsport

Volvo aims to make 'crash-proof' car

CNN tech

U.S. government pushes to end traffic deaths as fatalities sharply rise

VISION ZERO NETWORK

ite

- **Great goals but unachievable !!!**
- All hardware, software fails occasionally
- 7% of collisions have nothing to do with the driver
  - Will happen whether a human or computer is driving
- There will be collisions, fatalities, injuries - but far fewer

Mobility-as-a-Service (MaaS)

- Aka “Transportation-as-a-service”, “Personalized mass transit” or “Micro-transit”
- Trend to driverless taxis
  - Call one via smartphone
  - Slightly more expensive than premium transit ticket
  - Reduced personal car ownership
- Merging of business models: regular taxi, ride sharing, car rental, transit

nbc4i.com

WCMH-TV COLUMBUS

NEWS VIDEO WEATHER TRAFFIC I-TEAM POLITICS SPORTS PROGRAMMING LOCA

Ohio Statehouse Newsroom

Bus drivers' union threatens strike over driverless buses

By: Jason Aubry

Posted: Sep 18, 2018 04:58 PM EDT

Updated: Sep 18, 2018 06:00 PM EDT

11.6K

Tren

Impacts on City of London

- Charging infrastructure
- City economy (insurance sector)
- City revenues (traffic tickets, parking)
- City vehicles
- Data (ownership, privacy)
- Delivery robots on sidewalks
- Electricity
- Parking
- Policing
- Public
- Security / surveillance
- Traffic management
- Transit (reduced ridership, infrastructure, union)
- Transportation policies and regulations
- Urban planning, housing
- Zoning

Conclusions

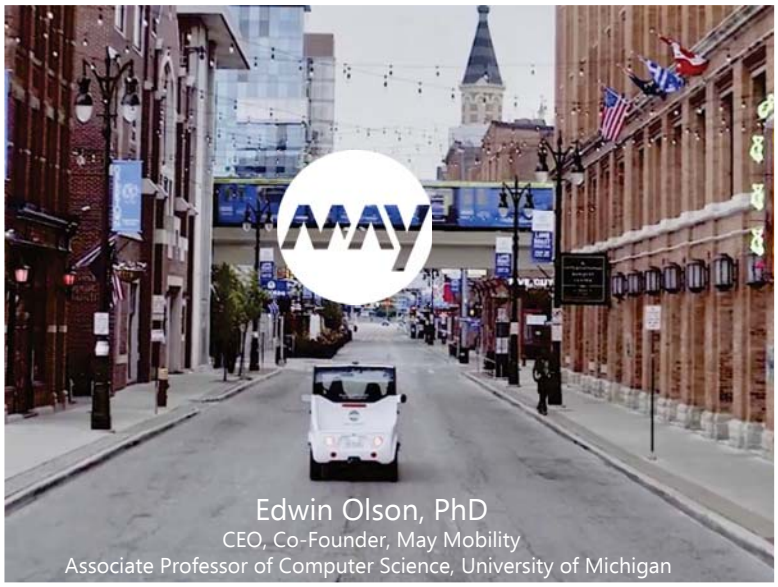
- AVs will lead to huge, disruptive changes to our personal lives and society
  - Key benefit: computers will be much better drivers than humans
  - Major municipal opportunities and challenges
- Changes to our world will start slowly in 2020
  - By early 2030s, our lives, cities will be very different

Recommendations

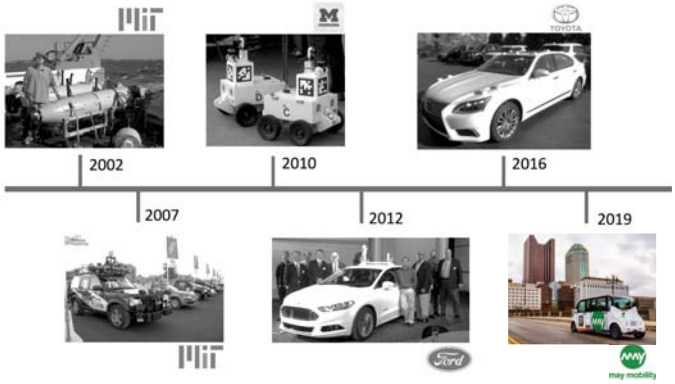
- Have a vision for 2050
  - Plan for the future, not the past
- Appoint full-time in-house CAV expert
- Take city-wide approach
  - City-wide working group (Scope of CAVWG ?)
- Ensure that all transportation / transit master plans assess impact of CAVs

Follow-up

- Barrie Kirk
  - bkirk@cavcoe.com
  - 613-271-1657
- ***AV Update***
  - Free monthly newsletter with AV news from Canada and around the world
  - www.cavcoe.com for latest issue, subscription link



Edwin Olson, PhD



Opportunity

Increase access to healthcare, education, and economic opportunity to underserved areas. Provide cost-effective mobility options to the disabled and elderly.

Safety

Drivers are at fault in 81% crashes annually in the United States alone

Congestion

Traffic costs commuters hours each day and slows economic development. Many cities and regions also require more space allocated to parking than human adding 67% to building costs.

Taking an incremental path

Safety

Technology

Regulatory

Learning

2018 WAS A GOOD YEAR

MAJOR MILESTONES

Focusing on enterprise and government contracts, we have gained significant experience around the technology and service side

$33 million
Total funding through Seed and Series A rounds

1st Deployments
Our deployments were the first commercial and publicly available

40,000 Rides
Over 40,000 rides in less than eight months of service

+69 NPS Score
Quality service has increased ridership for our partners

Solving real problems today


Columbus, OH


Providence, RI


Grand Rapids, MI


Detroit, MI

Transit in the Era of Automated and Shared Mobility Technologies

Amer Shalaby, Ph.D., P.Eng.
iCity CATTS, Associate Director

RTIWG Meeting – City of London

February 21, 2019

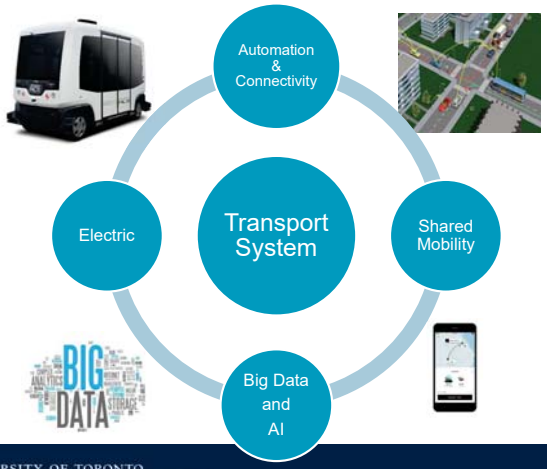
UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING
Transportation Research Institute

CATTS

Centre for Automated & Transformative Transportation Systems

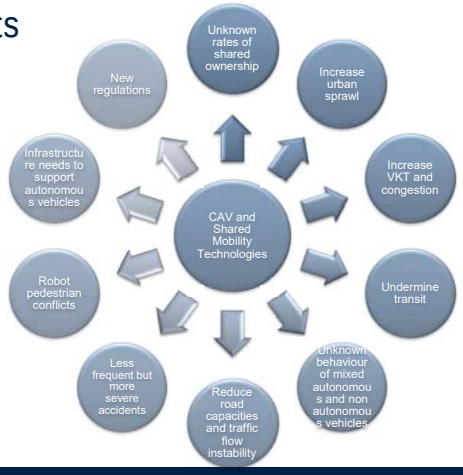
- A new centre within UTTRI (University of Toronto Transportation Research Institute)

Major Trends



The Promise

The Threat: Risks, Unknowns & Unintended Effects



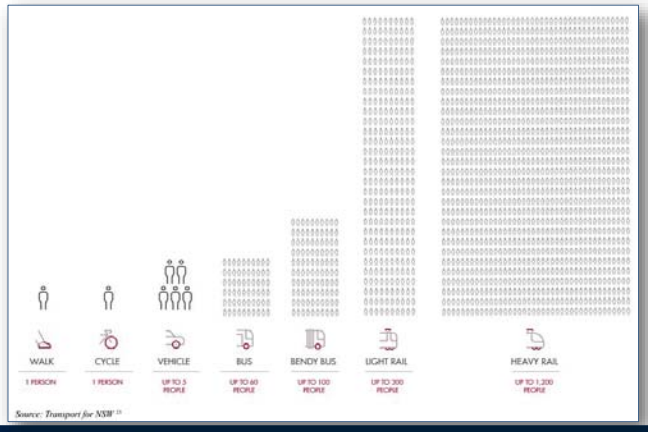
The Evidence (thus far)

Effects of ride-sourcing on:

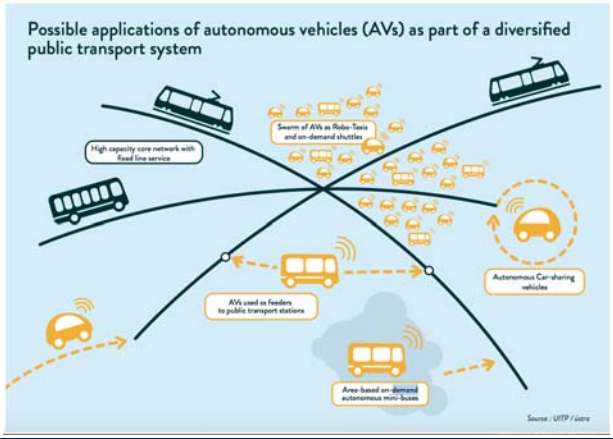
- Auto ownership and VKT
  - Negligible change in auto ownership
  - High rates of VKT increase due to latent demand and deadhead trips
- Traffic Congestion and GHG
  - Increase in congestion in large cities
  - Increase in commute times and congestion in cities with poor transit service
- Transit Ridership
  - Generally, ride-sourcing is competitive with transit, particularly in contexts characterized by low order transit
  - Complements high order transit (e.g. metro) serving as a FM/LM service

Higher order transit is the most space efficient of all modes, offering the highest person capacity

Higher order transit is the ultimate form of "Shared Mobility"



The Transit Future



The Transit Future

Thank You!

Rapid Transit Implementation Working Group

Report

5th Meeting of the Rapid Transit Implementation Working Group
November 8, 2018
Council Chambers

Attendance

PRESENT: S. Rooth (Chair), Councillors P. Hubert, T. Park, P. Squire, H. Usher and M. van Holst, D. Sheppard and P. Shack (Secretary)

ABSENT: Mayor M. Brown and Councillor J. Helmer

ALSO PRESENT: A. Kemick, K. Paleczny, A. Rammeloo, J. Ramsay and M. Ribera

The meeting was called to order at 4:30 PM.

1. Call to Order

1.1 Disclosures of Pecuniary Interest

That it BE NOTED that no pecuniary interests were disclosed.

2. Scheduled Items

2.1 Bus Rapid Transit Project Update

That it BE NOTED that the Bus Rapid Transit Project Update presentation from J. Ramsay, Project Director and K. Paleczny, General Manager, London Transit Commission, as included on the November 8, 2018 Rapid Transit Implementation Working Group Agenda, was received.

3. Consent

3.1 4th Report of the Rapid Transit Implementation Working Group

That it BE NOTED that the 4th Report of the Rapid Transit Implementation Working Group, from its meeting held on July 5, 2018, was received.

4. Items for Discussion

That it BE NOTED that the Rapid Transit Implementation Working Group did not discuss the following items:

4.1 Bus Hailing Web Application being tested in the City of Bellville

4.2 Test of Driverless Shuttles Performed in the City of Edmonton during the week of October 9, 2018

4.3 Potential Rapid Transit Overlap with Opportunities for London as part of the Autonomous Vehicle Innovation Network

4.4 Request an Expert on the Autonomous Field to Speak to the Committee

5. Deferred Matters/Additional Business

None.

6. Adjournment

The meeting adjourned at 6:15 PM.

P.O. Box 5035
300 Dufferin Avenue
London, ON
N6A 4L9

December 6, 2018

Rapid Transit Implementation Working Group

I hereby certify that the Municipal Council, at its meeting held on December 5, 2018 resolved:

That Councillors M. van Holst, P. Squire, M. Cassidy, J. Helmer, A. Kayabaga, S. Hillier, E. Peloza, A. Hopkins and M. Lehman BE APPOINTED to the Rapid Transit Implementation Working Group for the term December 1, 2018 to November 30, 2019;

it being noted that the City Clerk is undertaking a review of Advisory Committees, Working Groups and Task Forces and will be reporting on this matter in 2019. (4.32/1/SPPC)

C. Saunders
City Clerk
/hw

cc: Councillor van Holst
Councillor Squire
Councillor Cassidy
Councillor Helmer
Councillor Kayabaga
Councillor Hillier
Councillor Peloza
Councillor Hopkins
Councillor Lehman

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