



# Traffic simulation in the era of autonomous vehicles

## CAVeat

- The terms Connected and Autonomous Vehicles (CAVs) bundles two upcoming technologies
- *Connected Vehicles* talk to each other (V2V) and to infrastructure (V2I)
- *Autonomous Vehicles* reduce or eliminate human driver tasks
- However, each of these technologies is not necessarily reliant upon the other

## Two perspectives - Private & Public

- Private sector
- Who
  - Car Companies;
  - Service Providers;
- Model Applications
  - Virtual test environments for testing embedded software
  - Optimize and manage a fleet of AVs (potential real time application)
  - Test wireless communication between the vehicles and with the infrastructure

## Two perspectives - Private & Public

- Public Sector
  - Government;
  - Transportation Planners;
  - Universities;
- Model Applications
  - Academic research;
  - Assess the impacts on Key Performance Indicators (KPIs);
  - Short term operational impacts - Capacity/service benefits;
  - Long term regional Impacts - Travel trends

## AV & CV Key Performance Indicators

- Many Indicators are expected to have a positive impact on the network, below are some examples of areas where the Public sector can test the impact and sensitivity of AVs using simulation:
  - Travel Time Reliability;
  - Freight optimization;
  - Traffic Volumes;
  - Environmental Impacts;

## Public Sector Modeling Tests

- By using models the Public Sector can test the impacts of wide selection of AV elements:
  - AV fleet make up:
    - Public transit;
    - Taxi/Ride share;
    - Personal vehicle;
  - Market Share and penetration;
  - V2V and V2I communications protocols;
  - V2V and V2I Applications such as:
    - Cooperative Adaptive Cruise Control (CACC);
    - Trajectory Conversion Algorithm (TCA);
  - Traveller behavior changes;
  - Communication infrastructure locations;

## Challenges and incognita

- What will deployment of AVs look like:
  - Will the AVs be a fleet of public transport vehicles operated by private companies (like taxis) or just be another kind of private vehicle?
- We are still learning
  - The public sector (and the consultants) are still relatively new to the technology and do not always have insight to private sector and their knowledge

## Meeting the challenges with improved tools

- Higher fidelity of the vehicle behavior
- Integrate all agents (vehicles, bikes and pedestrians)
- Non-compliant behavior
- Human factors
- Emulation of wireless data transmission
- Emulation of V2V and V2I logics