



# NEXT GEN ITS IS COMING TO CANADA: ARE WE READY?

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RDIMS 12746267

Canada

## PRESENTATION OUTLINE

- Overview of transformational technologies.
- Some key challenges.
- Wanted: new approaches & thinking.
- Final thoughts.



## TRANSFORMATIONAL TECHNOLOGIES

- New and emerging technologies and business models have begun to impact and disrupt traditional on-road transportation.
- Canadian stakeholders need to prepare for next generation ITS deployment in ways that meet and ensure their public policy objectives:
  - Improve safety, mobility, sustainability, accessibility.
  - Reduce congestion & waste (duplication of resources/services).
  - Support and foster economic development.
  - Understand impact on agency planning, transportation modelling, design, construction, operations, maintenance and monitoring.
  - Adapt to coming shifts in demographics, consumer choices, vehicle ownership, land use and travel patterns.
  - Cope with as of yet undetermined social consequences to communities and the environment.

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## SOME COMMON DEFINITIONS

- **Connected Vehicles (CV):** Use connectivity, positioning (e.g., GPS) and processing (e.g., computers) to enable vehicles, infrastructure and mobile devices to communicate with each other. CVs have the potential to significantly enhance transportation safety, mobility and environmental performance.
- **Smart Roadway Infrastructure (SRI):** Enables vehicles to communicate with traffic lights, border crossings, grade crossings. SRI also fosters and supports CV/AV interoperability, privacy and security.
- **Automated Vehicles (AV):** Use a combination of in-vehicle technologies (e.g., sensors, cameras, positioning, digital maps, processing) and, in some cases, connectivity to enable vehicles to navigate by taking over driving functions. This includes:
  - **Partial Automation** or driver assist systems, which are already available in high-end vehicles. The trend is toward increasingly higher levels of vehicle automation.
  - **Full Automation** (often called “autonomous” or “self-driving”) can drive without any human intervention in all driving situations, scenarios and conditions.

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## SOME KEY TECHNOLOGIES

- Connected Vehicles (CV)
  - Automated Vehicles (AV)
- Connected Automated Vehicles (CAV)



Smart Roadway Infrastructure (SRI)

- Shared Mobility Services (SMS)
  - Shared Freight Services (SFS)
- Transportation as a Service (TAAS)

- Smart Cities → *technology meeting societal goals*

- Cybersecurity → *vehicles, critical infrastructures, back offices*



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## SOME ENABLING TECHNOLOGIES

- Internal in-vehicle and embedded infrastructure sensors
  - LiDAR, radar, ultrasonic, microwave detectors, camera and vision systems
  - Wired, wireless and ad-hoc sensor networks
  - Health monitoring systems
- Wired / Wireless Communications
  - DSRC (V2X), Trunked, Cellular, Bluetooth, Satellite, Infrared, Fiber
  - Internet-of-Things (IoT)
- Public Key Infrastructure and Credential Authentication / Management
- Artificial Intelligence and Machine Learning
- Big Data and Big Data Analytics
- High resolution digital maps / Geographic / Geospatial Information Systems
- Global Satellite Navigation Systems (GNSS) / Inertial Navigation Systems
- Cloud computing
- Unmanned aerial systems (UAS)
- Crowdsourcing
- 3-D Printing
- Blockchain

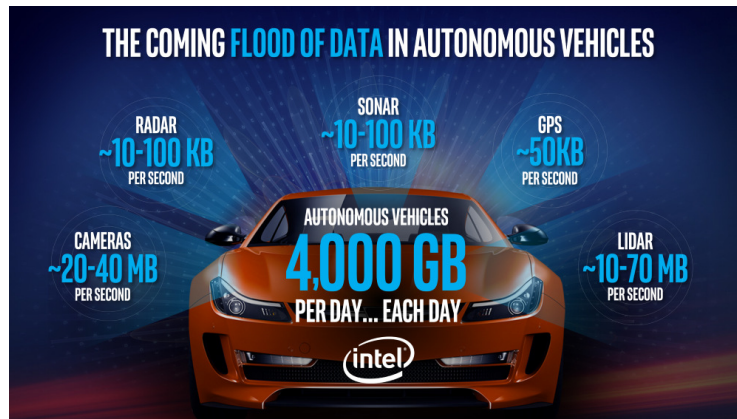
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## DATA IS THE NEW OIL *(Brian Krzanich, CEO, Intel, 2017)*

Intel Buys Mobileye: \$15 Billion for Self-Driving Car Technology



***NOTE: does NOT include telematics data!***

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## SOME KEY CHALLENGES

- On-road legacy “system” inertia opposing change.
  - Separation of industry domains.
- On-road and ICT infrastructure:
  - Who pays cost: capital, operations, maintenance?
- Security & Trust:
  - Roles & responsibilities: industry, government, general public?
- Data:
  - Collection, ownership, privacy, warehousing, access?
- Certification of OEM & aftermarket equipment
  - Liability due to equipment failure?

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## SOME KEY CONSIDERATIONS

- Interoperability:
  - pan-Canadian & North American models.
  - Governance structures, safety & security regimes.
- Human Factors / Human-Machine Interface:
  - Driver distraction; Drivers with disabilities.
  - Driver engagement / disengagement in AVs.
- Shortages of Highly Qualified Personal (HQP).
- Technologies continuously emerging & evolving.
- Overwhelming / confusing marketing & media hype.
- Consumer acceptance

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## WANTED: NEW APPROACHES / THINKING

- Rethink everything:
  - Just because something worked in the past does not mean it will continue to work in the future.
- Pace of change accelerating:
  - Advances that took decades or years in the past now happening in months or even days or hours.
- New ways of understanding consumers:
  - Views on ownership, convenience, flexibility, affordability.
  - Reliance on social media, crowd sourcing, crowd funding.
  - Desire for door-to-door services.
  - Desire for integrated mode-to-mode services.

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## NEW APPROACHES, NEW THINKING

- Use of Data:
  - Owned vs. Shared vs. Open.
- Data quality assurance & confidence interval:
  - Regimes to assess, assign and rate data quality.
  - Best before / stale date.
- Evaluation frameworks that can handle diverse:
  - Operational environments & operational conditions.
  - Societal standards, community needs, stakeholders needs.
- New approaches to research, development & demos:
  - Smart cities as living laboratories.



## NEW APPROACHES, NEW THINKING

- New approaches to partnering:
  - Evolving “modal competition” into “intermodal partnerships”
  - Government, academia, industry innovation clusters.
  - New models for sharing risk, costs, benefits.
- Valuing both new and legacy HQP:
  - Actual succession planning
- Moving from Roadmaps to Frameworks that allow:
  - Questions, discussions, flexible thought, evolution of ideas, trial and error, learning to change
- Acknowledgement that stakeholders have multiple goals, and competing interests.



## FINAL THOUGHTS . . .

- Recognition that mixed-fleet are the current reality for the near and foreseeable future.
- Being truly innovative means learning to live with failure by learning from failure.
- Today's transportation professionals and decision makers must be truly multi-disciplinary teams.
- Decisions made today can effect the quality of life of people and communities of generations to come.



## ***NOBODY HAS ALL THE ANSWERS . . .***





## THANK YOU

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