

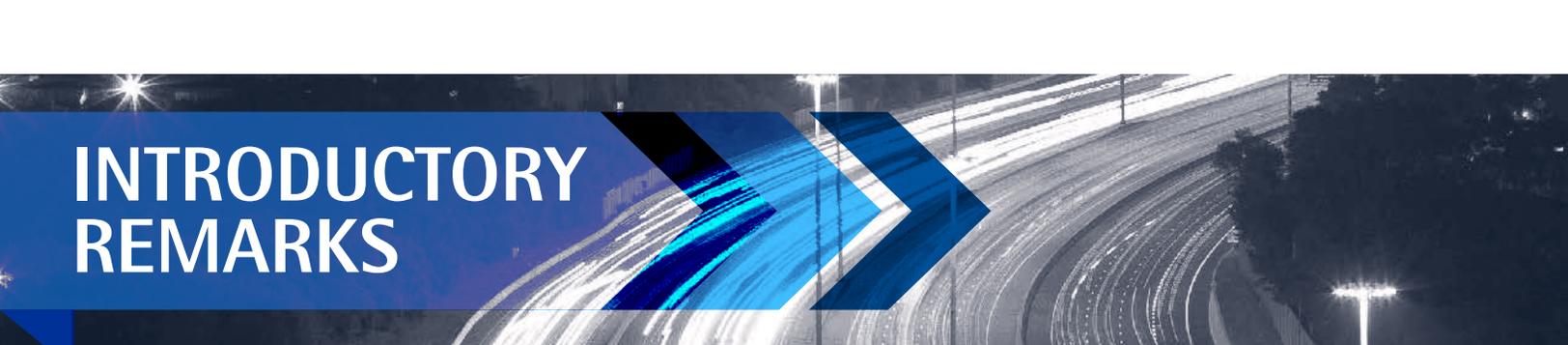
The Roadmap for Autonomous (Self-Driving) Vehicles in Ontario, Canada

July 2015

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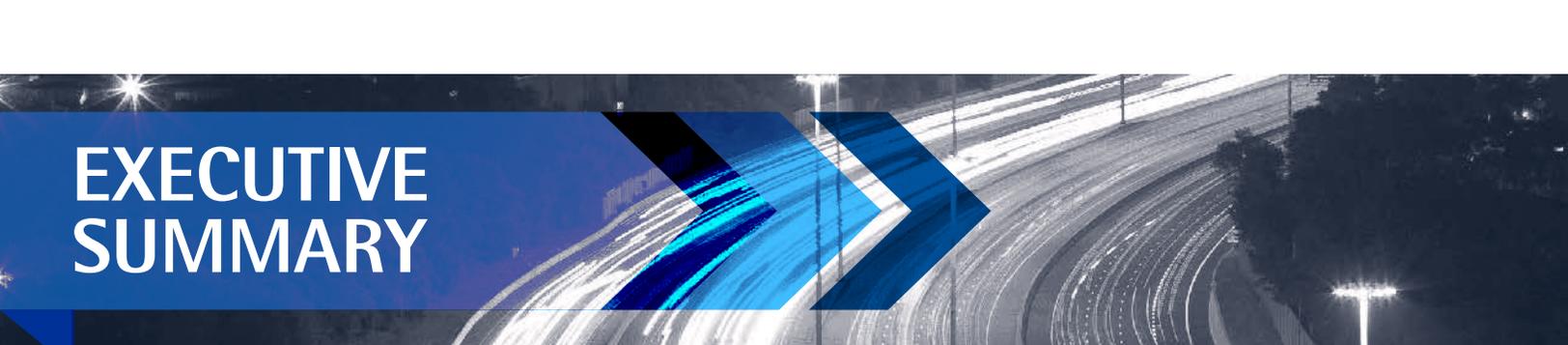
INTRODUCTORY REMARKS

Innovations and technologies are innately designed to make things better for us in one way or another. Of all the innovations that take place throughout the world, only a handful makes things so much better that they uplift humanity and shape civilizations, for decades, if not centuries. The “horseless carriage” (the automobile) was the catalyst that helped bolster the case for decent roads as the 20th century dawned. Little over a century later, we have an opportunity to witness and contribute to another technological enhancement today: Driverless Vehicles (also known as Autonomous Vehicles). This particular phenomenon has the potential to save millions of lives and change our transportation landscape for the better, forever. However, if not properly planned for and executed, it is very likely that this potentially superb enhancement will end up being a very chaotic and disliked phenomenon of this century.

This White Paper¹ recognizes the voids in the way Autonomous Vehicles (AV) have been positioned today, and provides a deep view of what specific actions are required to take this new industry in Ontario (and by extension, Canada) from its infancy stage of today to a well-tested and well-appreciated level through collaboration among public, education and private entities.

This paper is a good tool for any individual, or group, passionate about properly introducing AVs in Ontario and/or Canada. It details the need to setup a stand-alone, not-for-profit, Canadian organization with the public’s interest at its core and the motivation to work with municipalities, private industry, education and policy-makers to help test and to make the people generally comfortable with the AV technology. It is only through the gathering of all stakeholders towards a “greater goal”, for the benefit of all, can Ontario win this (presently, largely unregulated) AV race.

¹ A White Paper is an authoritative report or guide informing readers in a concise manner about a complex issue and presenting the issuing body’s philosophy on the matter. It is meant to help readers understand an issue, solve a problem, or make a decision.



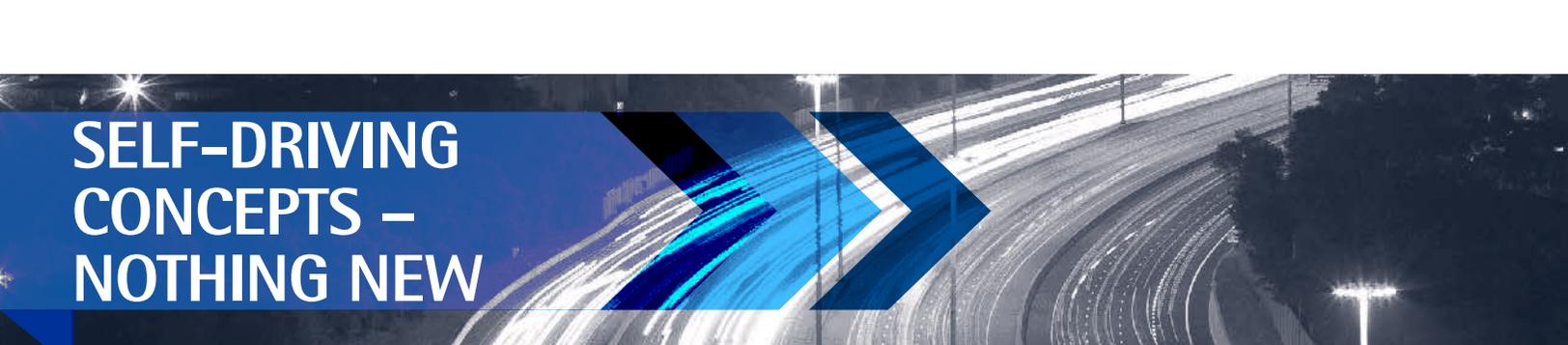
EXECUTIVE SUMMARY

The Autonomous Vehicles (AVs) race is heating up exponentially. In the past six (6) or seven (7) years, nearly all prominent car manufacturers have come on board with developing and testing their versions of the self-driving technologies, and now expect to make their solutions available to the public within the next five (5) years. However, most government bodies around the globe are not yet taking an active role in the AV industry. If these decision-makers continue to look the other way, then it is very likely that the same AV technology that is being promoted as a life-saving revolution could end up being a very disruptive phenomenon itself.

Ontario Good Roads Association (OGRA) has been monitoring the AV industry very closely and has recognized a unique opportunity for Ontario (and Canada). While most countries seem to be taking a hands-off approach to AVs, OGRA has created a hands-on Roadmap through which Ontario (and Canada) can not only enter the AV race, but become a leader in it.

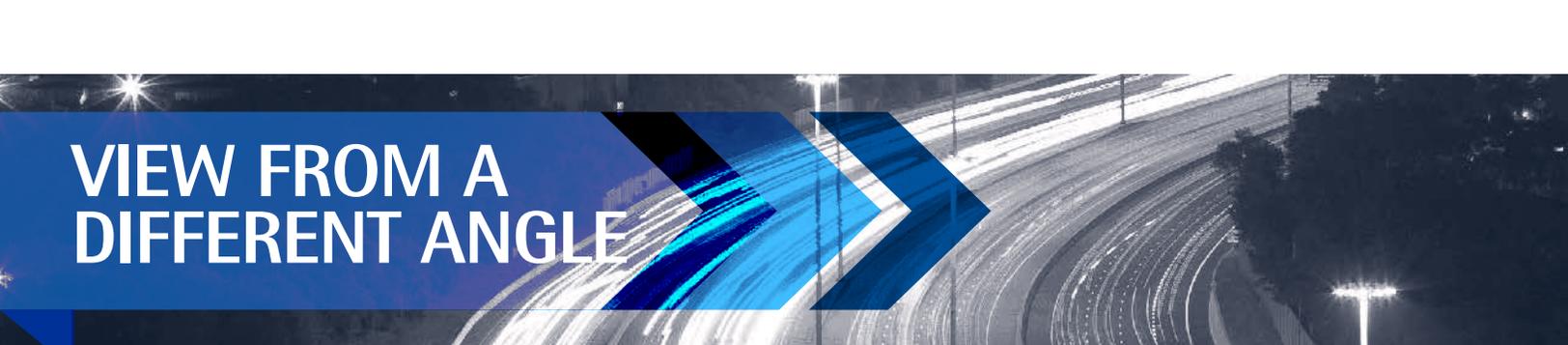
An ongoing issue in today's AV world is the fact that the manufacturers are working in silos, perhaps in hopes of out-doing one another in business, which can cause compatibility issues with competing AVs when on the road. According to a study by NYU, called Re-Programming Mobility, such a scenario will likely cause traffic to become much worse than it is today, and will create more problems than solutions.

The Roadmap being proposed by OGRA in this paper identifies the need to create a public-centric organization that works closely with the private partners to properly test and deploy AVs across Ontario, in a well-planned manner. This can be achieved by creating a not-for-profit entity that would bring the public, private and education entities to the same table and establish clear and enforceable protocols within Ontario's municipalities for testing and promoting AVs.



SELF-DRIVING CONCEPTS – NOTHING NEW

The attempt to make a driverless car is nothing new. We have documented history taking us back almost a century, with the "Phantom Car" of the 1920s. Testing of such cars continued for several decades, with promising results in the 1980s coming from Carnegie Mellon University's Navlab and a few others. As exciting as it may have been, somehow this particular technology never really caught on beyond the sci-fi and "future" or "Jetsons" references. However, over the past six (6) or seven (7) years, we have seen greater momentum in this sector than ever before. It is perhaps the first time in history that all the critical, technological ingredients needed to make self-driving cars a mass-market reality have truly come together. Manufacturers are already fine-tuning their strategies and technologies for mass consumers.



VIEW FROM A DIFFERENT ANGLE

The aim of this paper is neither to republish the successful tests being carried out by nearly every major car manufacturer nor to repeat the (eventual) economic and social benefits; instead, the focus is to look at how to realistically pave the way for these technologies to become acceptable and preferred modes of transportation in our society, and eliminate the “Jetsons era” references once and for all. The technology is very much alive and ready, preparing for mass consumer adoption. While this paper is written from Ontario perspective, the same strategy could also be applied Canada-wide.

Considering all the positive work taking place in the United States and Europe for enabling self-driving vehicles through road-tests and providing vehicle licenses, Canada is clearly lagging behind. The good news is that it may not be too late. As a matter of fact, we believe there is an opportunity for Ontario (and other provinces) not only to enter the AV race, but to excel in it through proper strategy and its execution.

While the bravest and smartest minds of the world are developing different technological solutions to make cars self-aware and enabling them to easily drive down busy streets, it appears that much of the work is taking place in complete isolation. Although this makes sense from a business perspective (to have trade secrets), we can't overlook the fact that these cars are all expected to drive down our municipal/provincial streets and interact with our vehicles, citizens, infrastructure and natural elements. The stakes are high. We must be able to see the bigger picture if we want this technology to live up to being the life-saving² miracle drug that it can be. This is where Ontario (or entire Canada) can leap ahead of the competition by laying out a unified vision and strategy of welcoming various autonomous vehicle technologies to be tested on designated roadways and with proper laws in place beforehand. Without synchronized guidance, which appears to be lacking in most (if not all) other countries, we may find ourselves being overwhelmed by this technology when it inevitably arrives on our doorstep.

²“Self-driving cars could save more than 21,700 lives, \$450B a year”, Computer World, by Lucas Mearian
<http://www.computerworld.com/article/2486635/emerging-technology/self-driving-cars-could-save-more-than-21-700-lives-450b-a-year.html>

In a 2014 report by New York University, *Re-Programming Mobility*³, the authors created four⁴ (4) realistic scenarios of incorporating autonomous vehicles into our societies. The report was developed by reviewing 150+ source documents and is among most thorough and realistic research on the topic to date. The particular scenario called "Collapse" envisions a society where the government takes a hands-off approach to AVs, which leads to even worse gridlocks and problems than the pre-AV life of today. The scenario, which is described in detail in that report, is something that we can easily relate to. There is a very high probability that Ontario and Canada, along with other countries around the world will end up experiencing the turmoil cited in the report, if we do not act now to start planning for the arrival of AVs.

³"Re-Programming Mobility", *The Digital Transformation of Transportation in the United States*
<http://reprogrammingmobility.org/>

⁴The four scenarios indicated in the report include: Growth; Collapse; Constraint; and Transformation. Three of the scenarios make for a great reading; however, Collapse scenario is the one that is directly applicable to how the world is reacting to AVs today.

WHAT THE OTHERS ARE DOING

To date, very few jurisdictions have recognized the need for a unified approach to handling the autonomous vehicles. Most seem to be looking the other way as if hoping that the technology will sort itself out.

In absence of governments taking lead, the private sector is stepping forward to pave their own paths ahead.

In Japan, "...automakers (Toyota, Honda and Nissan) are teaming up to develop parts, technologies and an infrastructure strategy for self-driving cars out of fear that U.S. and European carmakers are taking the lead in establishing global standards"⁵. The article reports that the Japanese government is already committed to working with the local automakers to invest over \$83M to build test roads.

As of March 2015, the Chinese e-commerce brand Alibaba Group Holding is partnering with SAIC Motor Corp to invest \$160M⁶ in this sector. This scenario was specifically discussed (before it even happened) in the 2014 Re-Programming Mobility report, as low-cost self-driving vehicle imports, poor inter-operability of assistive and autonomous vehicles were identified as being the driving forces and could be a sign that we may be heading towards the "Collapse" scenario after all. There are also large-scale efforts underway by KAMAZ automaker in Russia, where the intention is to create a dedicated city where autonomous vehicle testing could be undertaken⁷.

Closer to home, in the United States, Google is working hard to win over the government to allow testing of their autonomous vehicle. A number of states have now started granting licenses to autonomous vehicles. So far, the leading states⁸ are: California, Michigan, Florida and Nevada.

⁵"Self-Driving Cars: Japan Wants To Establish Global Standard For Autonomous Vehicle Technology, Safety, Infrastructure", International Business Times, by Angelo Young
<http://www.ibtimes.com/self-driving-cars-japan-wants-establish-global-standard-autonomous-vehicle-technology-1829404>

⁶"Alibaba, SAIC Motor To Invest \$160 Million In Connected Cars", Forbes, by Yue Wang
<http://www.forbes.com/sites/ywang/2015/03/12/alibabasaic-motor-to-invest-160-million-in-connected-cars/>

⁷"KAMAZ Creating Artificial City In Russia To Serve As Testing Ground For Autonomous Vehicles", Clean Technica, James Ayre
<http://cleantechnica.com/2015/03/31/kamaz-creating-artificial-city-russia-serve-testing-ground-autonomous-vehicles/>

⁸Map of the U.S. states granting autonomous vehicle licenses
https://commons.wikimedia.org/wiki/File:Driverless_Car.png

This is not to infer that the government agencies across the globe are not taking any initiatives at all. There certainly are a few, but there are nowhere as many as there should be and nowhere nearly as synchronized as they need to be, considering what the repercussions will likely be for being silent (or insufficiently organized) while such a giant technology sector is gaining momentum.

Singapore appears to be moving towards planning for and providing an excellent opportunity for autonomous vehicles through their "Future Urban Mobility" project, where the goal is "... to develop, in and beyond Singapore, a new paradigm for the planning, design and operation of future urban mobility systems"⁹. The project has been active since 2010, with several sub-projects either completed or underway, including one with MIT. This group appears to be the most organized thus far, and could provide good learning and/or collaboration opportunities ahead.

Germany is set to upgrade its famous Autobahn for autonomous vehicles, to allow vehicle-to-infrastructure communication. The German government has identified goals to support automakers in general, but it is likely that the local manufacturers (BMW, Mercedes-Benz and Volkswagen Group) may receive more support for obvious reasons.¹⁰

The UK appeared to have been ready to allow the vehicles to operate on their roadways starting in 2015; however, it is now unclear whether they will proceed wholeheartedly as "...almost half of MPs were against further investment in autonomous vehicle research, despite the government having announced plans to have trial driverless cars on UK roads by the end of this year"¹¹.

The Ontario Ministry of Transportation has taken an excellent step as of December 2013, by considering a "Pilot Project to Safely Test Autonomous Vehicles"¹². The forum was open to the public for comments until February 2014. It is assumed that MTO is now reviewing the feedback received.

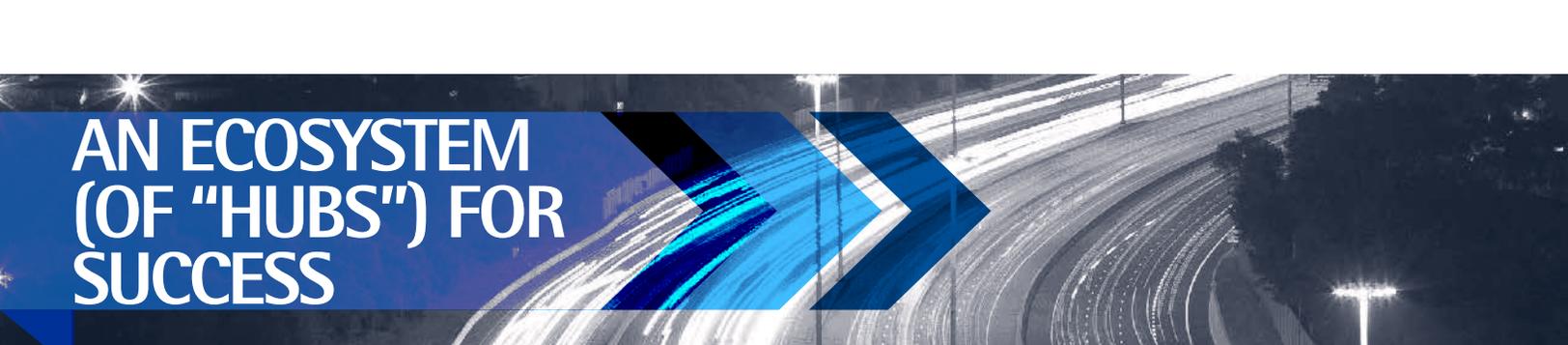
All-in-all, while there are several attempts by the private sector to test the vehicles in as realistic of scenarios as possible, a unified vision by a country or a large jurisdiction/province is not easy to find, which ironically is likely the element most needed to truly benefit from the autonomous vehicle technology. This is where Ontario (and Canada) has an opportunity to shine.

⁹Future Urban Mobility, Singapore
<http://ares.lids.mit.edu/fm/index.html>

¹⁰"Germany to Upgrade Autobahn for autonomous vehicles", Left Lane, by Justin King
<http://www.leftlanenews.com/germany-to-allow-autonomous-cars-on-autobahn.html>

¹¹"Government Unprepared for Autonomous Driving", Mobile Marketing, by Tom Maytom
<http://mobilemarketingmagazine.com/government-unprepared-autonomous-cars>

¹²"Pilot Project to Safely Test Autonomous Vehicles"
<http://www.ontariocanada.com/registry/showAttachment.do?postingId=14802&attachmentId=22912>



AN ECOSYSTEM (OF "HUBS") FOR SUCCESS

In a race where all contenders are exceptionally focused on their own and/or localized technological solutions, Ontario should develop a connected ecosystem across the province, welcoming all these isolated products and related technologies within a controlled environment. This can be achieved through creating "Hubs" – one per selected municipalities – all strategically spread across the province.

Hubs should report to and take directions from a Command Centre, which itself could operate as a Hub. Creating such a flow of guidance will allow all Hubs to operate together, and to be unified in their vision of assisting autonomous vehicle technologies to prosper efficiently and consistently. Such a network of Hubs will provide massive opportunities for all stakeholders. At the same time, the municipalities hosting the Hubs will of course receive direct benefits for supporting such an endeavour.

Candidate municipalities should be carefully chosen, based on unique characteristics:

- Population,
- Local weather patterns,
- Terrain,
- Types of dominant road networks (e.g. gravel, paved, etc.),
- Proximity to bordering provinces and countries,
- Proximity to water-bodies and airports for easy transport,
- And any other attributes that differentiate one Hub from another

Essentially, each Hub should be able to provide a unique opportunity to participating technology manufacturers rather than duplicating offerings of other Hubs. For instance: municipality with a large population and a number of city roads; municipality that receives higher than normal snow during winter seasons; municipality where there are only gravel roads and small population; municipality where the weather is very unpredictable; etc. Not only will this be beneficial for enhancing the respective technologies, it will also allow jurisdictions to be competitive in doing the best for their local Hub to grow and prosper.

It is important to note that having a Hub and the Command Centre in a municipality should not necessarily require additional administrative space; instead, existing office space and infrastructure should be utilized, with an emphasis on virtual governance to save on costs.

While the Hubs will primarily be testbeds for vehicles, they will also familiarize the local public with the technology and raising the level of acceptance. Presently, a majority of people opposing the concept of AVs stems from the "unknown" aspect of the technology. By testing the technology in the midst of communities, there is a greater likelihood that the public will not only accept but also that there will be a higher chance of them forgiving any shortcoming of the AV technology. The latter may be a critical element, considering that some prominent manufacturers are attempting to promote their version of AVs by calling them "Accident Free", which will falsely raise public expectations of AVs. The fact is that all technologies have their flaws and even the best designs sometimes fail. This is not to say that zero-accidents is not a target we should aspire to, but it is better to be transparent about the possibility of occasional mishaps rather than promising a difficult-to-reach utopia.

HUB LAYOUT

The main function of the Hubs should be to provide testing grounds for the different autonomous vehicle technologies. Considering that National Highway Traffic Safety Administration (NHTSA) has already defined the different Levels of Vehicle Automation¹³, "0" to "4", it only makes sense to officially adopt the Levels and incorporate them into base design of the Hubs:

- Level 0 (No Automation)
- Level 1 (Function-specific Automation)
- Level 2 (Combined Function Automation)
- Level 3 (Limited Self-Driving Automation)
- Level 4 (Full Self-Driving Automation)

The municipalities with Hubs, in consultation with the Command Centre, should designate a Level to each of their roadways. This will be the first step towards ensuring that the vehicles' testing is clearly confined as needed and will prepare the public through different levels of interactions with autonomous vehicles. As the autonomous vehicles and their technologies "graduate" in their Levels, they should be able to integrate more and more within everyday society. The same Levels could also be adopted to classify the licenses for the vehicles with different automation capabilities. For instance, a Level 4 License should only be granted to a vehicle that meets all the requirements of the ministry.

¹³"Preliminary Statement of Policy Concerning Automated Vehicles", 2013, NHTSA
http://www.nhtsa.gov/staticfiles/rulemaking/pdf/Automated_Vehicles_Policy.pdf

THE COMMAND CENTRE

For all Hubs to operate smoothly there needs to be a single Command Centre responsible for governing the operations of the entire network of Hubs. This Command Centre should be home to the Steering Organization.

THE STEERING ORGANIZATION

Humans learn a great deal from and implement things in our lives that are typically found in nature. In particular, the importance of having a body overseeing the overall operations is a must. We see it in the animal world, e.g. Pride of the Lions; Queens of honey bees and ants; etc. Such a hierarchy is a must for any entity to be successful (whether you are a queen bee or the CEO of an organization), since multiple authoritative bodies of equal power are bound to clash, which is ultimately detrimental to the overall workings of the colony/organization. Similarly, the Steering Organization will be the driving force behind the setup, upkeep and smooth running of the Command Centre and the network of Hubs across the province/country.

In order to have a balanced governance, it is important for public-private sectors to come together in this Steering Organization to form a new body that will oversee and steer the autonomous vehicles enhancement across Ontario (or across Canada). However, the public sector representation should be greater in terms of votes to ensure that the final decisions are truly for the benefit of the society at large. After all, this group will be at the core of the Command Centre, which is to be responsible for the province-wide policy-making and implementation, across all Hubs.

There are a number of organizations that should have a seat in this Steering Organization – a list that should be created by the initiating partners, whoever they may be. The initiative should stem from a public-supporting organization/group/individual.

A list of action items has been proposed in Appendix A, designed to help the individual or group intending to initiate the Steering Organization and implementing the suggestions in this paper.

BEING CAREFUL WITH PERSONAL DATA

Most self-driving vehicles today rely heavily on capturing the live built environment around them. Typically, the eyes of such vehicles are 3D laser scanners that are constantly scanning everything to millimetre accuracy. Using these scanners and running the acquired data through different algorithms, the vehicle tries to make sense of the world around it, which is how it is able to drive independently, following laws of the road like their human-driver counterparts. In the midst of all this, a tremendous amount of data is gathered by each vehicle, every second. Essentially, anything that the vehicle can "see", is generating data and being saved somewhere, in real-time. And since these vehicles are sharing space with our citizens, there is an incredible amount of personal data that will be available to the automakers. Such data is already being captured by automakers that are testing their vehicles on the roads with or without government approvals.

Inside the vehicle, while there may not be lasers scanning the passengers, there will certainly be enhanced systems reading and responding to their needs. In doing so, a large amount of personal data¹⁴ of the passengers will be available to the automakers, including: their voice patterns, names, ages and other attributes; specific addresses of their homes, places of employment, schools, cottages, daily routes they take, etc.; typical hours when each family member uses the vehicle, and other routines; etc.

In most cases automakers can be expected to perform ethically; however, with so much personal information at stake, it is vital to set the ground rules on how to deal with the data being captured. This is a critical component that the Command Centre should set policies on, as their first priority. There are lessons to be learned from the smartphones and telecommunications industry about the way they deal with the sensitive user-information. In particular, Apple takes great care in not only making their iPhone users aware of which Apps are requesting sensitive data (e.g. location, microphone, pictures, calendar entries, etc.), they place the user in full control – giving them the ability to shut off the sharing of data either across all or selected Apps on their phones. In an interview during the "All Things Digital Conference: D8", Steve Jobs summed it up the best: "...Privacy means people know what they are signing up for in plain English...Some people want to share more data. Ask them. Ask them every time. Let them know precisely what you are going to do with their data."

¹⁴"How Microsoft sees the connected car", Network World, by Patrick Nelson, December 15, 2014
<http://www.networkworld.com/article/2859695/mobile-apps/how-microsoft-sees-the-connected-car.html>

While it is important to set serious ground rules, it is also vital to understand that these technologies are fresh and new – the Command Centre should refrain from exerting unnecessary control over the technologies and/or their manufacturers in order to foster continuous innovation. There will likely be a consistent push from the private sector¹⁵ to ease the laws and policies, but the important point is to make final decisions with utmost ethics and high morality in favour of humanity, which will ultimately be beneficial to all parties involved. In fact, doing so could actually enhance innovation¹⁶ as automakers will have the support of the host Hub municipalities in testing the vehicles and there will not be a need for expensive (e.g. lobbying) efforts – the same dollars could be used to make the technology better and offer greater value to consumers.

Furthermore, through the collaboration between manufacturers and governing bodies, municipalities themselves could benefit greatly. Examples of collaborations are already underway in different places around the world including the City of Boston where Über plans to share its data with the city, which will be used to manage growth as well as improve congestion and reduce pollution¹⁷. For example, imagine if a municipality could use the aggregate 3D laser-scanned data on buildings/highways/lakeshores/etc., captured through all the AVs operating within its jurisdiction, it could easily study the changes in the entire landscape over the period of day, months or even years. However, this will be nearly impossible if all AVs operate in silos (a path they are on today), as they will all have proprietary ways of saving and even showing the same data. Therefore, with proper ground-rules in place and healthy teamwork between the public and the private sectors, the end result can be expected to be thoroughly beneficial¹⁸.

¹⁵"Self-Driving Car Bill Stalled by Google, Carmakers", Future Structure, by Aman Batheja, April 22, 2015
<http://www.govtech.com/fs/Self-Driving-Car-Bill-Stalled-by-Google-Carmakers.html>

¹⁶"7 Ways Self-Driving Cars Could Impact States and Localities", Government Technology, by Daniel Vock, January 15, 2015
<http://www.govtech.com/transportation/GT-7-Ways-Self-Driving-Cars-Could-Impact-States-and-Localities.html>

¹⁷"Uber data to make cities a better place to be", tnooz, by Linda Fox January 13, 2015
<http://www.tnooz.com/article/uber-data-boston/>

¹⁸"Driverless cars to bring 'huge societal benefits' once hurdles are overcome", Fleet World, by Natalie Middleton, February 12, 2015
<http://fleetworld.co.uk/news/2015/Feb/Driverless-cars-to-bring-8216huge-societal-benefits8217-once-hurdles-are-overcome/0434018412>

INTEGRATING WITH THE EDUCATION SECTOR

Many of the innovations taking place with autonomous vehicles today appears to have emerged from universities and research institutes. Some of the most prestigious and prominent universities in the U.S. took part in DARPA Grand Challenges (starting in 2004), including: Stanford, Carnegie Mellon, Virginia Tech, MIT, Pennsylvania, Cornell and more. The winning teams from these universities are now leading many of the departments with automakers, making the driverless technologies better each day. Needless to say, as important as it is to allow automakers to test their inventions within the cities, it is almost equally important to integrate and educate the future leaders in this rapidly evolving field.

While most universities in Ontario have programs in robotics, mechanical engineering and other related fields (or combinations thereof) the topic of autonomous vehicles specifically needs to be brought forward among all major institutes. This task should be undertaken as part of the mandate of the Command Centre and its respective Hubs across the province. Doing so will allow engagement with the youth, which in turn will allow for further and steady stream of enhancements and future job creation.

The following universities appear to be leading in this field today:

- University of Waterloo¹⁹
- Ryerson Urban Transportation Lab²⁰

By setting a proper curriculum at the universities in Ontario, we will be better equipped to take part in our Command Centre and Hubs and we will be able to participate globally in AV competitions – something we may not be generally prepared for today, compared to our U.S. educational counterparts. In particular, considering the cold climate of Ontario, students should be able to take part in the Institute of Navigation (ION) Autonomous Snowplow Competitions²¹, which could enhance the winter operations practices in Ontario and other “snow” provinces and States.

¹⁹UW: <https://uwaterloo.ca/centre-automotive-research/>
<http://wavelab.uwaterloo.ca/>
<https://uwaterloo.ca/embedded-software-group/>

²⁰RU: http://www.academia.edu/9952276/Ryerson_Urban_Transportation_Lab_2014_Research_Brief

²¹Institute of Navigation (ION) Autonomous Snowplow Competition
<http://www.autosnowplow.com/welcome.html>

LAWS AND REGULATIONS

The United States is a good example for Ontario, as they have already started issuing autonomous vehicle licenses in some states. Also, as of April 2014, the United Nations has amended Article 8 of the 1968 Convention on Road Traffic, which used to state that 'Every driver shall at all times be able to control his vehicle or to guide his animals.' This amendment "...was pushed by Germany, Italy and France, whose high-end carmakers believe they are ready to zoom past American tech pioneers and bring the first 'autonomous vehicles' to market."²²

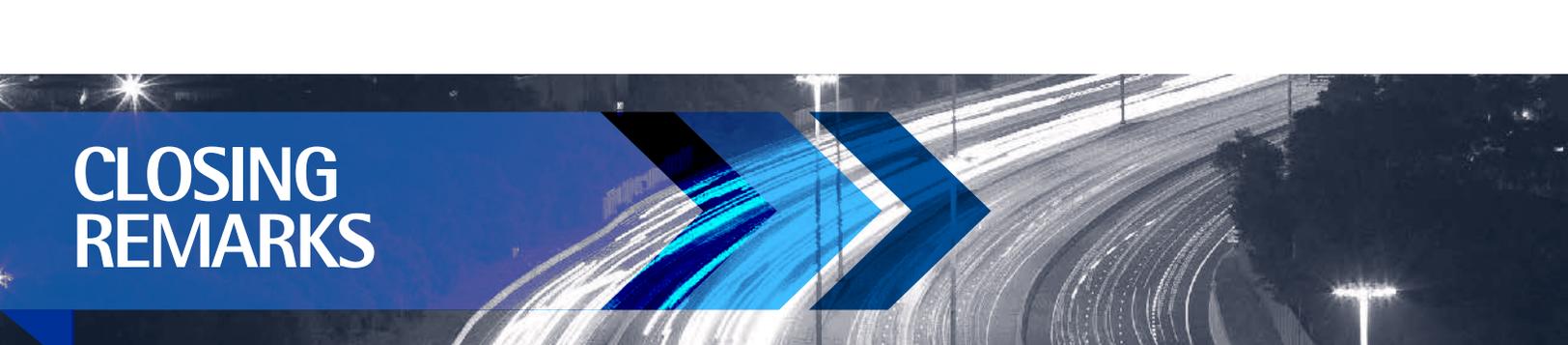
One of the leading causes for the slow integration of autonomous vehicles in Ontario/Canada is the lack of laws and regulations to support such activities. The Steering Organization / Command Centre should work with Hubs across Ontario to update/create laws that will promote the growth of this sector. Efforts to make these laws a reality will likely require much of the attention of the group during the beginning phases as much legwork is required in Ontario.

At minimum, the following will need to be reviewed and updated:

1. Ontario Traffic Manual
2. Highway Traffic Act
3. Ontario Provincial Standards
4. Standards by the Canadian Standards Association

Laws take time to be amended or created; therefore, it is critical to identify all the areas that will require amendments, and to initiate efforts as quickly as possible.

²²"Is Europe set to win the race for driverless cars?", Daily Mail (UK), by Mark Prigg, May 20, 2014
<http://www.dailymail.co.uk/sciencetech/article-2633237/Europe-set-win-race-driverless-cars-New-global-treaty-means-automated-vehicles-EU-roads-far-US-gives-ahead.html>



CLOSING REMARKS

We live in a time when the conventional norms are being challenged and revolutionized – sometimes overnight. One particular norm (the automotive sector) is overdue for an overhaul, but it won't happen without a concentrated effort. Though, however much the required hard work may be, it will be miniscule when compared to the benefits to ourselves and our future generations.

To our advantage, technology is not the limiting factor any longer in making the autonomous vehicles a preferred mode of transportation. The primary hold-back is the lack of a uniform approach to allowing the technologies to be thoroughly tested within our communities, in a safe and controlled manner. And while most manufacturers and countries are operating in silos, it is an excellent opportunity for Ontario and Canada to come together under a unified and systematic approach – unless we are willing to handle the problems that will inevitably accompany the unregulated automobiles entering our municipalities and interacting with our citizens in the very near future.

If not planned properly, the AVs being created in silos today will inevitably enter our roadways by force (and very soon) and will certainly cause unforeseen challenges that are bound to cause a public outcry. By then, it will be nearly impossible to expect a rational reaction from not only the public, but also the policy makers. In the midst of any chaos created by malfunctioning AVs, the ultimate loss will directly be attributable to the lack of a sound strategy for AVs in the first place. By creating a Steering Organization, based out of the Command Centre and connecting it to all the Hubs across Ontario/Canada, we will get started on the right path, which will not just help the private, education and public sectors but it will effectively allow us to embark on an unprecedented opportunity to knock road-related deaths from the Top-10 Causes of Deaths²³ in the world.

Our world is essentially what we dream and then make it to be.

²²"The top 10 causes of death", World Health Organization, May 2014
<http://www.who.int/mediacentre/factsheets/fs310/en/>

ABOUT ONTARIO GOOD ROADS ASSOCIATION (OGRA)

In 1894, the year OGRA was founded, the horse and wagon still reigned supreme, as they had since Roman times. However, Ontario roads were in a sorry state of disrepair compared to those built by Caesar's legions. Cyclists and "wheelman's" associations were the first to lobby for better roads. Ontario farmers depended on the railways to transport cattle, dairy products, and other produce to city markets. Even delegates to the founding meeting of the Ontario Good Roads Association were forced to use rail transport to get to and from their meetings. It was because of the vision and conviction of a few dedicated individuals that road reform took place. And the founders of the Ontario Good Roads Association laid the groundwork for a modern province-wide road and highway network.

OGRA has come a long way from its early days more than a century ago, when the "Good Roads Train" (right) made its way across Eastern Ontario, pulling into stations with all the latest equipment for road building, and information for local farmers. Since then, roads and road building in Ontario have changed more than in all of road-building history.



The mandate of the OGRA is to represent the transportation and public works interests of municipalities through advocacy, consultation, training and the delivery of identified services. This mandate translates into four (4) main business objectives:

- To advocate the collective interests of municipal transportation and public works departments through policy analysis, assessment of legislation and consultation with partners and stakeholders.
- To provide affordable and accessible education and training services.
- To promote leadership with regard to infrastructure asset management.
- To develop plans, programs and partnerships for the delivery of services that meet the needs of municipal transportation and public works departments, while recognizing the contribution of the corporate sector.

For 121 years, OGRA has contributed to the well-being of Ontario and its municipalities. And as the world steers towards Autonomous Vehicles, we will continue to provide support to our member municipalities through guidance, services, advocacy and education on this promising subject.

APPENDIX A

List of some of the key tasks to be carried out by the (future) Steering Organization:

- a) Ensure public safety is at the forefront of the organization's motto
- b) Setup the organization as a Canadian, not-for-profit entity
- c) Make a list of public and private stakeholders and create a Board of Directors with a majority holding by the public stakeholders
- d) Create a budget for the organization
- e) Create a simple organizational structure to handle the overall workload of the organization, with a focus to ensure future expansions of the structure on as-needed basis
- f) Develop a detailed list of selection criteria for Hubs
- g) Breakdown Ontario into geographically distinct sectors and extend an invitations to all of the municipalities to submit their applications towards being selected as Hubs, and carry out a formal selection and awarding process – make sure it is a prestigious offer, raising the value of the selected, as opposed to a burden on the selected municipality
- h) Have the selected municipalities mark out the different Levels for their entire road networks
- i) Work with the municipality and other stakeholders to develop road signs, prompting the citizens as well as the AV testing crews on the acceptable Levels of AVs on the given roadways etc.
- j) From the final set of Hubs selected, designate a Hub as the Command Centre – ideally a municipality that is in close proximity of the United States and one that is, by nature, forward-looking
- k) Send out a request to each of the automakers to send in applications to test their AVs
- l) Integrate the education sector
- m) Start a media campaign through each of the Hubs to educate the public
- n) Create a list of all the laws and regulations that will need to be amended
- o) Develop regulations on how data should be collected, stored and shared by the automobile industry, with direct authority of the Steering Organization to audit as needed
- p) Work with the local governments and regulatory bodies to enforce the regulations on AVs
- q) Work with the Ministry of Transportation to setup licences for different Levels of AVs
- r) Hold an open meeting with the public and private sector audience as kick-off to the organization as well as the Hubs and the Command Centre
- s) Work closely with each of the Hubs to ensure proper operations