Inquiry into the social issues relating to land-based driverless vehicles in Australia

Submission to the House of Representatives Standing Committee on Industry, Innovation and Science

Public version

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Executive Summary

Telstra welcomes the opportunity to comment on the House of Representatives Standing Committee's inquiry into "*the Social Issues Relating to Land-Based Driverless Vehicles in Australia*." Safe integration of future driverless (hereafter "autonomous") vehicles into our road and transport systems is important for both the future prosperity of Australia as well as social wellbeing for many Australians, and we thank the Committee for applying its resources to this important topic.

Telstra well appreciates that disruption of any industry comes with both benefits and consequences. The disruption of our former directories business by internet search engines brought with it social and productivity benefits to consumers as well as environmental benefits but also resulted in job losses. Disruption of the transport and related industries may result in job losses in the short-term as employees are re-skilled and transitioned into new lines of work.

Autonomous vehicles (AVs) offer the potential for numerous social and economic benefits for Australia, and it is our view that these benefits outweigh the potential or perceived drawbacks. AVs promise societal benefits in terms of safety (reduced human error), productivity (time better spent on activity other than the driving task) and mobility (they can be used by unlicensed humans or freight). An improvement in safety for all users of our roads will deliver the greatest social and economic impact through reduction in the number of injuries and deaths (and the burden this places on families and the community), as well as a reduction in the $27B annual economic cost[1] of road trauma and associated productivity loss.

Properly introduced, AVs may also bring new transport options to those unable to drive, making possible new levels of social equity, access and inclusion, as well as allowing for mass-customisation of public transport to individual users' needs. A reduction in road congestion, along with increased efficiency and productivity will arise from increased ridesharing, reduction in car ownership, and better utilisation of the time that is currently required for driving. These will deliver gains to the Australian economy as well as environmental benefits. New business models and business opportunities could also arise from AVs in areas such as IT, creating additional opportunities for employment.

Ultimately, the introduction of AVs will rely on social acceptance (and economic necessity) and this requires engagement with the broader community. Engagement is best achieved through the use of pilots and trials involving the community, including seeking to solve ethical dilemmas such as swerving to avoid an animal on the road if it may jeopardise other human road users.

Telstra is already embracing connected and autonomous technology. Telstra is a leading telecommunications and technology company with a growing international business, and a heritage that is proudly Australian. Our mobile network is Australia's largest, supported by more than 8,000 mobile network sites across the country. We have a strong interest in the opportunities created by AVs and the ecosystems in which they will operate, and we are developing technologies to assist their safe introduction into the Australian road and transport landscape. The ability to connect autonomous and non-autonomous vehicles to each other, to infrastructure and to Intelligent Transport Systems (ITS) will be underpinned by 4G and future 5G mobile networks.

Telstra is represented on the executive steering committee for the Australian Driverless Vehicle Initiative (ADVI) along with government, industry and academia. Telstra and ADVI are proud to be in a lead role to manage the safe and successful introduction of autonomous vehicles onto Australian roads, which will ultimately position Australia as an international role model in the development of new technologies and attract developers, innovation and investors.

Moving forward. In November 2016, the National Transport Commission published its policy paper[2] on Regulatory Reforms for Automated Road Vehicles. We consider this policy paper to be a well-researched and comprehensive set of reforms required to accommodate the introduction of AVs into Australia. We support all of the recommendations and timelines, and underline the need for community engagement and industry collaboration in the development of guidelines and standards.

[1] http://advi.org.au/2016/09/30/position-paper-economics-impacts-of-automated-vehicles-on-jobs-and-investment/
[2] https://www.ntc.gov.au/Media/Reports/(32685218-7895-0E7C-ECF6-551177684E27).pdf

In our submission we encourage Government to:

1. implement policies that hasten uptake of AV technologies, including semi-autonomous safety systems already available commercially, to bring forward the potential benefits of reductions in road trauma, human suffering, and cost to taxpayers;
2. ensure that AV policies specifically account for inclusion (both affordability and accessibility) and encourage ridesharing options to maximise access and inclusion for all members of our community;
3. work with industry to develop a roadmap that can help ensure adequate provision of education and training required to transition affected employees to new, high growth industries and lines of work;
4. work with industry to tune start-up and innovation ecosystems towards areas that will foster the creation new jobs; and
5. educate the public on the benefits of CAVs and facilitate pilots so that the public can gain acceptance.

We look forward to continued engagement with government on the introduction of AVs into Australia, addressing community concerns and ultimately realising the benefits to be gained socially and economically for Australia.

1 Introduction

We welcome the opportunity to respond to the Committee's inquiry into "*the Social Issues Relating to Land-Based Driverless Vehicles in Australia*." Through our involvement with the Australian Driverless Vehicle Initiative, the Intelligent Transport Systems World Congress, Australia's state transport agencies and many vendor and stakeholder relationships, we are aware that Connected and Autonomous Vehicles (CAVs) will have numerous social benefits for Australia compared to the potential drawbacks. We believe government and industry should work together to encourage and support their rapid uptake and we thank the Committee for applying its resources to this important topic.

Today's connected and autonomous vehicles (CAVs) are evolving rapidly and early iterations are already making a presence in Australia with features such as semi-autonomous steering modes and self-parking. Over the next half-decade, capabilities will evolve to full automation. When it comes to CAVs, Australia is lagging compared to CAV initiatives in Europe and North America. Given our history in world leading ITS platforms and communication networks, Australia has the opportunity to take a leading role both regionally and globally in CAV enabling technology. Policies and incentives are urgently required to facilitate trials, gain community acceptance and to adapt the legal and regulatory framework to support and accelerate the introduction of AVs into Australia.

We use the term CAV to describe Connected and Autonomous Vehicles, although in many of the cases we outline below, the benefits are realised simply through autonomy without the need for the vehicle to be connected to other vehicles around it, to infrastructure (e.g., traffic lights) or to a central system for monitoring. Additional benefits may also be realised through the connection of vehicles (autonomous or otherwise) for collision avoidance when there is no line of sight, or to a central monitoring facility for traffic flow/congestion and safety improvements, which can then be fed back to individual vehicles for journey planning, optimisation and improved driving behaviour. Generally, we refer to Autonomous Vehicles (AVs) throughout our submission, however from time-to-time, we refer to CAVs to highlight instances where additional benefits arise from connectivity.

We note that the inquiry is into *land-based driverless vehicles*, which is not constrained to public roads, nor is it constrained to cars or trucks. We expect that AVs such as autonomous wheelchairs and walking-speed delivery vehicles are being developed and that such vehicles are expected to travel on public paths and in public spaces. We see these vehicles as fitting into the scope of this inquiry.

Our submission is structured as follows:

- In section 2, we comment on what we believe are the social issues associated with the introduction of AVs in Australia and the associated opportunities and challenges, as per the terms of reference.
- In section 3, we outline our support for the development of policy and regulatory settings being led by the National Transport Commission, which we believe are essential for social acceptance of the introduction of AVs.
- In section 4, we discuss a number of initiatives Telstra is working on, and describe how these may be of assistance in addressing the social issues relating to AVs.

2 Social issues

Disruption of any industry comes with both benefits and consequences, which Telstra is familiar with. As an example, the disruption of our former directories business by internet search engines delivered social and productivity benefits to consumers in terms of being able to search for information anytime anywhere online, as well as the obvious environmental benefits of not printing hundreds of thousands of phone books. However, it also resulted in job losses in areas such as collection and collation of information, printing and distribution, and contact (call) centres for directory assistance. Undoubtedly, disruption of the transport and related industries will similarly result in job losses in the short-term as employees are re-skilled and transitioned into new lines of work.

It is our view that AVs promise a range of social benefits to the Australian economy, local communities and families through improvement of road safety, reduction in traffic congestion and emissions, increased access for elderly and other unlicensed drivers, along with the creation of new jobs and business models that ultimately will outweigh potential drawbacks. However, it will take the right policy settings from government, along with assistance from, and

collaboration with the private sector to ensure that the social and economic benefits are realised, and to ensure that side effects such as employment impacts in transport industries are well managed through the transition.

Safety: First and foremost, the advent of AVs are expected to contribute to a materially significant reduction in Australia's road toll. Road accidents are primarily caused by human error such as distraction, failure to obey rules, fatigue or the influence of substances, all of which are preventable in a world of software controlled vehicles which can continuously learn and adapt, based on experiences and accumulated data. AVs also have situational awareness augmented by direct wireless connection to other vehicles and roadside infrastructure, as well as additional perception systems such as radar, LIDAR, ultrasonics and infrared imaging. Even basic types of autonomy like electronic stability control (ESC) have a large safety impact. The National Highway Traffic Safety Administration in the United States concluded in a 2011 report that ESC reduces crashes by 35 per cent[3]; further a 2006 report[4] by the Insurance Institute of America concluded 10,000 fatal crashes a year could be avoided in the US alone. This is strong evidence that such systems should be made mandatory, as they were in Australia in 2013.

During 2016, in the 11 months between 1st January and 30th November, 1185 people died due to injuries in motor vehicle accidents[5]. AIHW data covering the period 2001 to 2010 further suggests that each year around 35,000[6] Australians suffer serious injury in road accidents which require hospitalisation. The ADVI notes that there are huge potential benefits in reducing road deaths and trauma, which costs the Australian economy $27B per annum[7]. Reducing deaths and serious injury caused by vehicle accidents will have positive and far-reaching economic benefits to Australian society as well as relieving thousands of individuals of the personal pain and grief associated with the death or injury of a loved one.

Aside from the direct impact on individuals involved in a vehicle accident, consideration must be given to the immediate and extended family along with close friends of those involved in a road fatality or who suffer a serious life-threatening injury. Assuming on average each person has around 50 close family and friends, then around 1.75M people are impacted to some degree by the approximately 35,000 people with serious road injuries requiring hospitalisation.

AVs have the ability to learn by example and it would be beneficial for government to develop policy requiring car manufacturers to share data on AVs learning to drive to prevent manufacturer silos and for the benefit of all. Companies like Telstra could facilitate data aggregation and analytics for this purpose.

Recommendation 1: We encourage Government to implement policies that hasten uptake of AV technologies, including semi-autonomous safety systems already available commercially, to bring forward the potential benefits of reductions in road trauma, human suffering, and cost to taxpayers.

Social equity, access and inclusion. We also see a number of benefits for people who cannot drive or readily access public transport such as elderly people, people with disabilities, children, unlicensed or those for whom car ownership and licensing is economically unviable. The primary benefit is economic, as AVs, when used like taxis or shuttles, will be potentially cheaper than current practice, thereby increasing access to these community groups. There will also be benefits in terms of increased empowerment for these people as they are able to plan and control their transport and journey options. There is an increased sense of independence that comes from not being reliant on others for transport, and policies will need to address both affordability (all socio-economic levels) and accessibility (e.g., for people with disability, blind, wheelchair, etc.) to maximise inclusion across the community.

[3] https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/811486
[4] http://www.iihs.org/iihs/news/desktopnews/electronic-stability-control-could-prevent-nearly-one-third-of-all-fatal-crashes-and-reduce-rollover-risk-by-as-much-as-80-effect-is-found-on-single-and-multiple-vehicle-crashes
[5] https://bitre.gov.au/statistics/safety/fatal_road_crash_database.aspx
[6] Australian Institute of Health and Wellbeing (AIHW). Trends in serious injury due to road vehicle traffic crashes, Australia: 2001 to 2010. Published 11 February, 2016. http://www.aihw.gov.au/publication-detail/?id=60129554605. 146.4 seriously injured per 100,000 of population.
[7] http://advi.org.au/2016/09/30/position-paper-economics-impacts-of-automated-vehicles-on-jobs-and-investment/

Recommendation 2: We encourage Government to ensure that AV policy specifically accounts for inclusion (both affordability and accessibility) and encourage ridesharing[8] options to maximise access and inclusion for all members of our community.

We also observe that AVs are expected to take many forms, and can be expected to operate on infrastructure other than public roads, such as public paths, shopping centres and other public spaces. Autonomous wheelchairs[9] are being developed to give greater mobility to people with disabilities, and ensuring that pedestrians and AVs of this type can share public paths safely should be a priority. A watch-and-learn approach will likely suffice given the low risk of injury when travelling at pedestrian speeds.

Public and new transport choices: AVs can potentially do the work of private cars, taxis, buses, light rail and trucks. Since there is no driver cost, there is no imperative for public transport to be based around the use of large vehicles like buses and trams. This provides a completely new set of possibilities for public transport that is highly configurable.

The future of mobility is about configuring a host of on-demand transportation options to enable people to get around more easily and economically, offering scalability and on-demand choices for people whose daily activities do not align with mainstream public transport options. Today, public transport routes and schedules are optimised for majority scenarios such to and from the CBD for commuters travelling to and from work, or to major shopping hubs. This results in the need to schedule a journey involving multiple stages for anyone using public transport outside the main scenarios, for example, elderly people accessing a health specialist on another side of town.

The ability for governments to scale public transport options to small groups on customised routes will increase the utilisation of public transport (as a result of increased utility) and simultaneously reduce cost (no half-empty buses at non-peak times, and driver costs). Further, AVs are being considered for the "last mile" of public transport - providing door to station transport which vastly improves "catchment" and the economic case for heavy rail in the low density sprawl typical of Australian major cities. BlaBlaCar[10] and SNCF in France, and Lyft in US are currently exploring such models with rideshare and human drivers.

Congestion and transport efficiency: Infrastructure Australia in 2015 reported[11] that traffic congestion in six (6) major capital cities alone costs the Australian economy over $13B per annum in lost productivity. By 2030 – if left unchecked – congestion will cost the nation over $50B per annum. As the driver is increasingly freed from the driving task, productivity will increase.

In addition to productivity losses, congestion (and long commutes) affect quality of life. The UK Office of National Statistics conducted a study[12] that found every minute added to a commute created extra stress and anxiety, and affected well-being.

Connected Intelligent Transport Systems (C-ITS) and AVs have a major role to play in alleviating or avoiding congestion. At the simplest level, GPS navigation and phone-based navigation apps that are connected can help drivers make better route and time of travel decisions, though these are in vendor specific silos rather than holding a single view of the road and traffic situation.

The next level is where C-ITS connect vehicles to each other and roadside infrastructure, precisely understanding individual vehicle location, speed and direction as well as the traveller's intended destination - with appropriate privacy measures. This comprehensive view, aggregated in cloud platforms and processed with powerful optimisation and machine learning algorithms could provide each vehicle with a set of real-time instructions to optimise its own

[8] Ridesharing is essential in an autonomous vehicle future to prevent increased traffic congestion, and there is a central role for mobile phones, positioning and big-data algorithms to facilitate ridesharing, which are things Telstra can facilitate
[9] http://cmtoday.cmu.edu/robotics_technology/autonomous-wheelchair-improves-patient-mobility/
[10] https://en.wikipedia.org/wiki/BlaBlaCar
[11] http://infrastructureaustralia.gov.au/policy-publications/publications/files/Australian-Infrastructure-Audit-Executive-Summary.pdf
[12] http://webarchive.nationalarchives.gov.uk/20160105160709/http://www.ons.gov.uk/ons/dcp171766_351954.pdf

journey and overall traffic performance, leading to faster and more reliable trips. 4G and future 5G networks have an important role in providing the communications for this capability.

AVs can potentially take such efficiencies to the next level. AVs across an entire metropolitan area could conceivably operate as a single fleet, continuously optimising operations and responding in a way that human drivers are unable to do. Further, AVs can drive closer to one another and coordinate perfectly across intersections, again in ways that no human could achieve, leading to high road utilisation. These approaches would be especially effective when AVs are separated from human drivers and such "fleets" are operated by single organisations such as a public transport provider. IEEE Spectrum reports[13] that CAVs at high penetration could improve highway capacity by a factor of 3.7. Combining AVs with Mobility-as-a-Service models has potential for vastly better use of our road assets, offsetting the need for major capital funds otherwise required to build new roads.

Nevertheless, if overall demand exceeds the total available capacity of the road system, such measures will alleviate but not avoid congestion, so we need to continue working on measures to reduce the number of vehicles on the road. This means increasing mode share on mass transit systems, increasing the average number of passengers per vehicle through reinvigorating carpooling and greater use of shuttles, and reshaping the urban form so that jobs and desirable housing are closer.

Environmental benefits: In the future, CAVs will typically be Electric Vehicles (EVs) and ideally 100 per cent renewable energy could be used in conjunction with Connected EVs. Further, even semi-autonomous systems for internal combustion engine vehicles can save fuel by driving optimally and taking advantage of information from C-ITS. Sustainability imperatives are seeing aggressive goals for reducing fossil fuel use. AVs in the Transport & Logistics sector can take advantage of techniques like truck platooning (where a truck travels close enough behind another to benefit from the wind break created by the leader, informed by C-ITS) or vehicle to infrastructure (V2I) communication which can provide green light priority for heavy vehicles to reduce carbon emissions from both fuel burn and reduced congestion. These are important initiatives to make cities more liveable. Connected vehicles and associated traffic optimisation will lower emissions from vehicles, currently contributing almost 18 per cent of Australia's emissions profile. For example, Platooning vendor Peloton estimates a 7.5 per cent fuel reduction[14] from platooning just two trucks. A reduction in vehicle emissions will assist in achieving Australia's commitment to keep emissions 26-28 per cent below 2005 levels by 2030[15].

Unlocking the urban environment: AVs do not need permanent parking spaces, are likely to be shared so there won't be as many, and can move away from the urban core when needed. This will drastically reduce the need for carparks and driveways, giving us scope to redevelop these areas for greater social amenity and economic benefit. McKinsey[16] suggests that AVs combined with ridesharing could take 4 out of 5 cars off the road, meaning we may need fewer roads as well, further unlocking precious land in our urban areas.

Returning to the theme of AVs operating on infrastructure such as public paths, shopping centres and other public spaces, we foresee that there are likely to be AVs developed for short-distance delivery applications. Such AVs are likely to be smaller and travel at pedestrian speeds. AVs like this, in replacing drivers on public roads, have the potential to further unlock the urban environment (less need for roads) and could give rise to new local economic opportunities. We may see the return of home-delivered milk!

[13] http://spectrum.ieee.org/automaton/robotics/artificial-intelligence/intelligent-cars-could-boost-highway-capacity-by-273
[14] http://www.itwire.com/strategy/75220-telstra-joins-industry-initiative-to-explore-%E2%80%98truck-platooning%E2%80%99-benefits.html
[15] https://www.environment.gov.au/system/files/resources/cab3140e-5adb-479f-9af4-a7c605d762dc/files/national-inventory-report-2014-revised-vol-1.pdf
[16] http://www.mckinsey.com/business-functions/sustainability-and-resource-productivity/our-insights/full-speed-ahead-how-the-driverless-car-could-transform-cities

New jobs and business models: As existing transport industries are disrupted, the reality is that there will be job reductions in the transport and logistics industries. The important question becomes how we as a nation will address it. New job roles will emerge in technology industries and potentially in vehicle manufacture of CAVs and their components. For example, new jobs may emerge and be fostered by building on Australia's rich background in ITS platforms and vehicle design. Australia is one of the world's leading providers of today's ITS systems having created two fundamental ITS technologies, **SCATS**[17] and **STREAMS**. Australia also has local companies such as Cohda Wireless who are world leaders in Cooperative and Connected ITS.

A long term roadmap, co-developed with the industry, can help ensure adequate provision of education and training required to transition affected employees to new, high growth industries and lines of work. Beyond the retaining of impacted individuals, there is also a role for government to work with industry to tune start-up and innovation ecosystems towards areas that will foster the creation new jobs.

Recommendation 3: We encourage Government to work with industry to develop a roadmap that can help ensure adequate provision of education and training required to transition affected employees to new, high growth industries and lines of work.

Recommendation 4: We encourage Government to work with industry to tune start-up and innovation ecosystems towards areas that will foster the creation new jobs.

Social Acceptance: We appreciate that for some people there will initially be concerns about the reliability of 'software controlling vehicles' along with concerns about security and privacy of CAVs. Self-driving technology can ultimately address these concerns. Self-driving technology does not suffer from distraction, fatigue or human error, potentially resulting in significant reductions in road trauma, traffic congestion and cost to taxpayers. However, to achieve the required level of social acceptance, reliability needs to be demonstrated through pilots and public participation. RAC WA's Intellibus trial[18] has taken this into account by involving the public in the trial and closely surveying participants' perception and reaction to the AV. Security and privacy concerns can be addressed through implementation of legislation, industry codes and standards, with strong input from the community.

Recommendation 5: There is a role for Government in educating the public on the benefits of CAVs, and in facilitating pilots so that the public can gain acceptance.

Another part of the journey to social acceptance is working towards resolution of the so-called "ethical dilemmas"[19] that arise from unavoidable or no-win situations. Even in a future with high take-up of AVs, incidents will still occur, such as children or pets unexpectedly running onto a road with insufficient time for even an AV to brake. Computer software will need to be pre-programmed with responses to prioritise options to deal with such scenarios. For example, should the vehicle act to protect occupants of the vehicle over people outside the vehicle or people in other (perhaps oncoming) vehicles? Projects such as the Massachusetts Institute of Technology's "Moral Machine"[20] are underway soliciting input from the community to gather data that could be used to resolve ethical dilemmas. Interestingly, Mercedes' Christopher von Hugo recently announced that their autonomous vehicles will prioritise passengers in the vehicle[21]. This is an area where robust and open debate is needed.

[17] Australia is one of the world's leading providers of today's Intelligent Traffic Management systems with NSW Roads & Maritime Services' **SCATS** traffic signal control system and Qld Transport & Main Roads' **STREAMS** managed motorway system. **SCATS** 'adapts' to real-time vehicle density to implement signal phasing to optimise urban arterial road traffic flow. **STREAMS** controls freeway ramp signalling and variable speed signs to enable world's best practice motorway traffic flow.

[18] RAC's Intellibus trial in Perth is designed to help the public accept and understand AVs and is a collaboration between RAC and the WA State Government.

[19] TEDEd The ethical dilemma of self-driving cars - Patrick Lin. http://ed.ted.com/lessons/the-ethical-dilemma-of-self-driving-cars-patrick-lin

[20] Massachusetts Institute of Technology (MIT) Moral Machine. http://moralmachine.mit.edu/

[21] http://blog.caranddriver.com/self-driving-mercedes-will-prioritize-occupant-safety-over-pedestrians/

3 Policy framework and regulatory settings

The community looks to government for the creation and implementation of safety standards, road rules and legislation to ensure safe access to our road and transport system for all users. It is essential for social acceptance of AVs that the community is confident in the design and implementation of safety standards for, and certification of, AVs on a complete range of aspects such as the ability to operate in adverse conditions (e.g., weather), immunity to cyber-attacks, and maintenance (including software updates).

A recent example of the fruits of sound policy settings was the announcement[22] by the South Australian Government that the RDM Group, a leading international driverless car supplier, will open its Asia-Pacific headquarters in Adelaide, with future plans to develop an assembly facility in South Australia.

Telstra supports emerging policy directions. In August 2016, the Transport and Infrastructure Council (TIC) published its National Policy Framework for Land Transport Technology[23] ("the Framework"). Section 5.1 of the Framework outlines four main roles for government related to the development of new transport technology: leadership; enablement; a supportive regulatory environment; and investment. Section 5.2 of the Framework then outlines a principles based approach to guide government decision making, outlining seven principles ranging from consumer centric design through to the use of self-regulation where possible and best-practice regulatory approaches where not. We fully agree with, and support these principles. It is our view that these principles will serve to ensure the best outcomes for the community and for businesses choosing to invest in AVs. It is our view that the policy principles could have benefitted from one additional element; namely fostering collaboration between business/industry, government and the community, which could help to accelerate the introduction of AVs in Australia.

In November 2016, the National Transport Commission (NTC) published its policy paper[24] on Regulatory Reforms for Automated Road Vehicles. We consider this policy paper to be a well-researched and comprehensive set of reforms required to accommodate the introduction of AVs into Australia. In the policy paper, the NTC arrived at a total of eight recommendations for activities required to progress the introduction of AVs in Australia. We support all of the recommendations and the timelines for associated actions, underlining the need for community and industry collaboration in the development of guidelines and standards.

CAV systems will gather and organise large volumes of data relating to vehicle to vehicle 'safety' messages, vehicle behaviour and more. Thought needs to be given to how these may be used to ensure vehicles are safe and complying with regulations (for example, initially full AV mode may only be safe on motorways and major roads). The data could also be used to understand accidents and incidents and, as mentioned previously, part of a shared data set to help all AVs "learn" to improve their driving. Government and industry must ensure that such systems and the networks connecting them are secure, robust and scalable, to meet the needs of a wide range of users and stakeholders across public and private sectors.

[22] http://www.premier.sa.gov.au/index.php/stephen-mullighan-news-releases/1696-international-driverless-car-company-to-set-up-office-in-adelaide
[23] http://transportinfrastructurecouncil.gov.au/publications/files/National_Policy_Framework_for_Land_Transport_Technology.pdf
[24] https://www.ntc.gov.au/Media/Reports/(32685218-7895-0E7C-ECF6-551177684E27).pdf

4 Telstra initiatives and how they address social issues

Telstra is actively exploring autonomous and connected technology on several fronts to understand the challenges and opportunities involved and help bring economic and societal benefits forward. This section outlines three initiatives in which we are involved, along with the associated societal and/or economic benefits.

1. **Connected ITS:** Telstra has been exploring Connected ITS for several years and in October 2016, in partnership with Cohda Wireless, successfully trialled Vehicle-to-Infrastructure (V2I) technology over Telstra's 4G network in South Australia, a pivotal first step in developing Cellular Vehicle-to-Everything (C-V2X)[25] technology.

   Applications demonstrated included alerting a driver to roadworks ahead, giving green light priority to high priority vehicles, and testing optimal green light timing where the vehicle is informed of the optimal speed to approach a traffic light so that that they get a green light when they arrive, therefore allowing a smoother flow of traffic.

   Future trial phases are planned for testing Vehicle-to-Vehicle and Vehicle-to-Vulnerable (bicycles and pedestrians). The upcoming Vehicle-to-Vulnerable testing will showcase sending of standardised intelligent transport systems messages over the 4G network to enable interaction of vehicles with smartphone-equipped bicycles, extending the safety net to active transport, with trials expected in 2017.

   More broadly, Telstra is closely engaged with the global LTE[26] community which is evolving special automotive capabilities for the mobile network. These build on existing uses such as telematics and entertainment to extend to direct vehicle to vehicle and vehicle to infrastructure communications with low latency and extended range.

2. **Truck Platooning**: Telstra has partnered with US-based automated and connected vehicle technology company Peloton Technology and the ADVI, supported by the Western Australian Road Transport Association and the WA Government, to explore the safety and fuel efficiency benefits of truck platooning for Australia.

   Platooning comprises two or more vehicles, closely following one after the other, all equipped with state-of-the-art driving support systems. First-generation driver-assistive truck platooning is a promising technology for near-term deployment, representing a blend of connected and semi-autonomous driving technologies. In platooning mode, acceleration and braking of the following vehicle(s) are automated to match the front vehicle via a secure and encrypted vehicle-to-vehicle wireless link, with drivers retaining full steering control. Engineered in collaboration with a professional driving team, the system is equipped with in-cab truck-to-truck video that increases drivers' awareness of the road, a clear driver interface for platooning operations, and contextual over-the-horizon alerts.

   Building on proven active safety systems, sensors, and advanced vehicle communications, Peloton says its system allows two trucks to save an average of 7.5 per cent in fuel by operating safely in an aerodynamic platoon. Peloton's driver-assistive truck platooning system will initially roll out to commercial fleets in the US in 2017.

   A Network Operations Centre (NOC) delivers data to fleets and provides continuous safety supervision of vehicles equipped with the platooning system, whether operating in platoon or individually. Based on real-time GPS, system health, and road environment data, the NOC authorises all platooning activity to ensure that platooning occurs only on appropriate roads under suitable traffic and weather conditions.

3. **Core member of Australian Driverless Vehicle Initiative**: Telstra is represented on the executive steering committee of the ADVI[27] and supports its objectives. ADVI is the peak advisory body for autonomous vehicle technology across Australia and New Zealand, and is a trusted adviser to government and industry partners. Telstra has had an active role in underpinning activities needed to raise public awareness through knowledge-sharing, demonstrations, and simulated and in-field investigative trials; a learn by doing approach. Telstra and ADVI are proud to be in a lead role to manage the safe and successful introduction of autonomous vehicles onto

[25] Examples of V2X include vehicles talking to infrastructure (such as traffic lights), vehicles talking to other vehicles, and vehicles talking to vulnerable road users such as cyclists and pedestrians.
[26] LTE is "Long Term Evolution" which is the roadmap for 4G and beyond. See http://www.3gpp.org/news-events/3gpp-news/1798-v2x_r14
[27] http://advi.org.au/

Australian roads, which will ultimately position Australia as an international role model in the development of new technologies and attract developers, innovation and investors.

As ADVI states, "The key thrust of the ADVI is to build momentum by rapidly exploring the impacts and requirements of this new technology in a truly Australian context and making recommendations on ways to safely and successfully bring self-driving vehicles to Australian roads". ADVI aims to raise public awareness through live demonstrations involving government, industry, research entities and the media. The intention is to provide an avenue to showcase the involvement and contributions of collaborating partners involved in this important initiative.

As a cooperative of its members, ADVI will work with government, industry and academia to investigate and ultimately identify options and outcomes to help inform the development of robust national policy, legislation, regulation, facilities and operational processes to bring self-driving vehicles safely to Australian roads.

Telstra has already partnered with ADVI on several projects and is exploring further opportunities with ADVI.

5 Closing remarks

Australia as a global leader: Australia potentially has much to gain from the introduction of connected and autonomous vehicles. Governments, industry, businesses and the community have the opportunity to catalyse the emergence of new mobility systems and this should be done through cross-sector collaboration (transport, telecommunications, and universities/research sector) and partnership. The Australian geography and environment lends itself to being the perfect test bed for such technologies, but Australia is currently lagging globally, and policies and incentives are urgently required. Australia has been a global leader in establishing today's ITS technologies such as SCATS and STREAMS and has a rich heritage in vehicle and component design. These advantages can help us build a significant CAV technology development capability locally as well as enabling Australian to be early adopters and contributing to the global test bed.

We look forward to continued engagement with the government and community on the introduction of driverless vehicles into Australia, addressing community concerns and ultimately realising the benefits to be gained from driverless vehicles.