A Cooperative Mobility Project for the Australian Trucking Industry

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An important milestone was reached in March when the final outcome of four years research was presented by three cooperative mobility projects CVIS, SAFESPOT, and COOPERS, at the Intertraffic conference in Amsterdam. Collectively the foundations for safer and more-efficient use of transport infrastructure were demonstrated.

It was established that V2V and V2I technology from these programs will emerge as a standard automobile accessory in around three years. However a longer gestation time for this technology in the trucking industry could mean that benefits with respect to road safety may not converge optimally, due to the smaller size, non-standard nature of the nation's truck fleet.

This paper comprises an outline to considerations being given to implementation of cooperative mobility for the trucking industry in the immediate period. A program to bootstrap this initiative is being developed, based on leveraging precedents set by the Intelligent Access Program (IAP) and Cohda Wireless from the University of South Australia (USA), to roll-out actual product based on integration of telematics and DSRC.

The outcome will provide immediate benefits in truck collision avoidance and other dynamic road accident situations such as rail-crossing incidents. Commercial benefits could be expected to include more efficient truck operations, including congestion avoidance. Moreover its uptake by the trucking industry will ensure convergence and support of critical mass with general automotive cooperative mobility when this emerges in around three years.

INTRODUCTION

For those not versed in this new area of technology, **Cooperative Mobility (CM)** describes a new era in the evolution of intelligent transport systems. In this new regime, motor vehicles of all types (including trucks) are electronically linked to each other, and the transport corridor being travelled.

Cooperative Mobility – What Is It?

Vehicle mounted computers (otherwise known as OBUs – On-board Units) use high-speed data communications, over a virtual wireless LAN otherwise known as DSRC (Dedicated Short Range Communications), to exchange data such as position, speed, direction etc.

Through connectivity between vehicles and RSUs (Road Side Units), a virtual image of the changing road-space through which the vehicle is passing is developed. This in turn is used by OBUs to generate strategic and tactical information for the driver including collision warnings, and advisory information about the route which they are travelling.

Other functionality in the OBU may enable the vehicle to proactively interact with road infrastructure e.g. to give priority (emergency vehicles) or change traffic lights in its favour in the case of light traffic conditions. Other lower priority capabilities may service commercial and government requirements.

The Cooperative Mobility Platform

In addition to basic functionality Cooperative Mobility provides a platform into which a range of applications may be imbedded. In this regard there is practically little difference between Cooperative Mobility and Intelematics, with each described in some literature as a subset of the other.

Cooperative Mobility however does include mission-critical capabilities such as a low-latency, high-speed (through DSRC) and its associated road safety functionality. This makes CM most attractive in terms of its road-safety benefits especially in terms of collision avoidance.

Emergence of Cooperative Mobility in Market Place

It is expected that cooperative mobility systems may begin to emerge as an integrated component in motor vehicles in as little as three years, however it is unlikely that the technology will have any meaningful deployment until the end of the new decade.

An important consideration to be kept in mind, is that certain applications such as collision avoidance are only as good as the percentage of vehicles fitted with the technology in a given volume of road space. If the vehicle is not fitted or has a faulty OBU it cannot participate in the local V2V and V2I conversations, thereby limiting details of its presence to that obtained from local ITS devices.

In Australia, much of the responsibility for Cooperative Mobility – specifically DSRC, is being undertaken by the membership of AusDSRC[1] through its member organisations and links with government, universities and industry.

AusDSRC & Cooperative Mobility

In Australia, AusDSRC has already been active in the facilitation of Cooperative Mobility through its work to embargo radio spectrum.

In addition several projects regarding mission critical applications for DSRC are under way in the areas of rail crossing crash avoidance, and over-height tunnel protection.

Collectively these and other initiatives are building the understanding necessary for emergence of Cooperative Mobility (CM) in the Australian environment.

Application to the Australian Trucking Industry

By comparison, the car industry is likely to be amply catered-for through large manufacturing economies-of-scale, the adoption of CM into the truck industry is likely to be less certain.

This is due to a number of issues which relate to the need for new levels of efficiency, and the raising of the bar with respect to truck industry operations generally.

The remainder of this paper comprises an examination of the various issues and considerations in undertaking such a project including:

- Why Cooperative Mobility is seen as an important project for the Australian trucking industry;
- The scope, issues and timelines for undertaking such a project;
- The strategies that might be required to take such a project through to fruition.

Essentially many of the justifications have already been laid down, however it is worth stating these to clarify the reasons why such a project should be got underway.

WHY A PROJECT FOR COOPERATIVE MOBILITY IN THE TRUCKING INDUSTRY?

In late March 2010 following demonstration of the outcomes of the CVIS, Coopers and Safespot Projects in Amsterdam, it became obvious that some level of dedicated attention should be given to the trucking industry in this country.

This was not only seen as justifiable with respect to development of the nation's professional transport operations, but also the addressing specific nuances in the adaptation of Cooperative Mobility to the Australian environment – particularly in long-haul trucking operations.

Further considerations have included:

(a) That given the increasing size, weight, and capacities of trucks, that these should already be capable and preferably already be leveraging Cooperative Mobility technologies in advance of the arrival of cars fitted with this technology; and

[1] The acronym DSRC stands for Dedicated Short Range Communications, which collectively describes the radio technology used for communications in the cooperative mobility environment.

(b) That the trucking industry could commence to realise benefits in terms of the need to negotiate various road infrastructure, less prominence in road accidents involving the trucking industry;

(c) There was an developing cloud of annoyance with some operators in relation to the number of disparate boxes appearing in truck cabins – all with different functionality and associated complexity of usage;

(d) The leveraging the congestion avoidance aspects of cooperative mobility systems; and

(e) An immediate need to build experience by government regarding the deployment, administration, and maintenance aspect of the infrastructure side of Cooperative Mobility Technology.

Underpinning these concepts have been similar aspirations of the industry itself through the Australian Trucking Association. As part of their lobbying activities they have made comment of a number of concerns in a brief to both parties for the 2010 Federal Election as follows.

According to an Australian Trucking Association in an election briefing document:

- Trucks move three-quarters of Australia's domestic freight;
- Half the kilometres travelled by trucks are in the cities where rail is not an option;
- The demand for truck freight is growing faster than other transport options.

Further to this the Australian Trucking Association has asserted that:

- Ongoing investment in roads connecting freight routes and ports is vital;
- Roads will need to be built to standards that safely accommodate all vehicles;
- There is a need for government to promote the use of increased truck safety and capacities;
- There is recognition that the advanced safety technology is making modern trucks safer than cars;
- There is recognition that safer trucks with greater capacity need less monitoring than remaining trucks on the road;
- There is a requirement to build industry capacity while encouraging professionalism and skills development;
- Market opportunities should exist to encourage investment in new technologies and alternative fuels.

Other 'Drivers' for Development of Cooperative Mobility in the Trucking Industry

Many of the ideas being presented by the Australian Trucking Association have been reflected in other sources including the CVIS, Coopers, and Safespot programs mentioned above. It is therefore evident there are common concepts of what needs to be achieved in the evolution of the trucking industry in the near future, with Cooperative Mobility technology holding many of the answers to all parties in the discussion.

Perceived Truck Involvement in Accidents

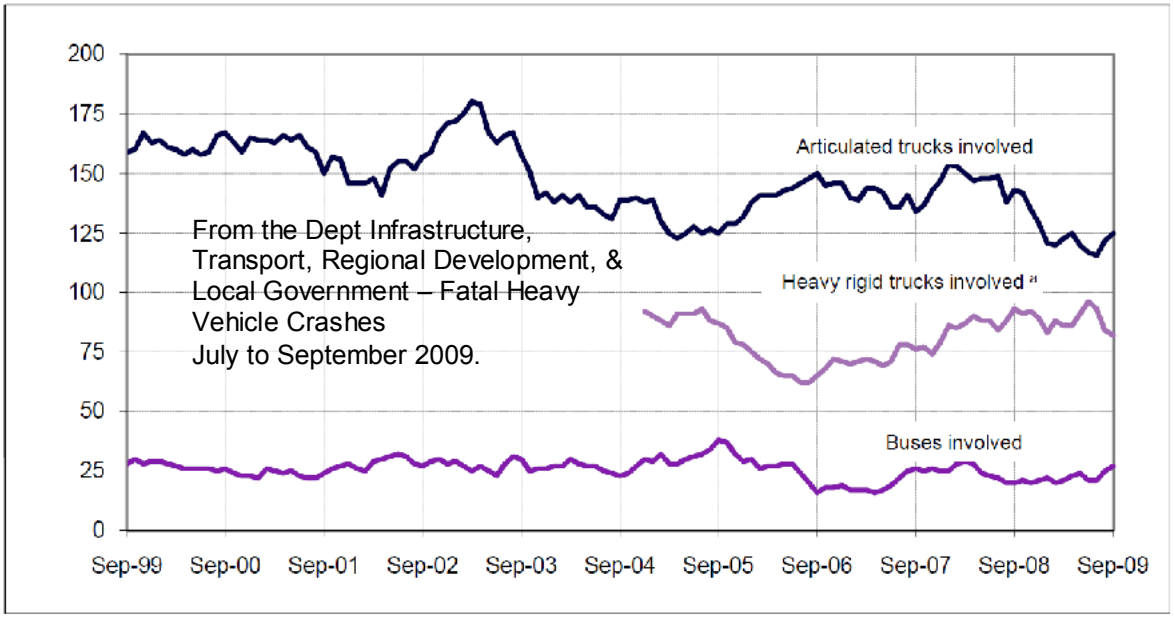
Most significant of these are the perceived high levels of accidents in which trucks are a feature. It is emphasised that this is not to say that trucks necessarily caused the accidents, but by virtue of the fact the image of the truck in the newspaper articles, there is an inference that the truck was probably some-way responsible.

Truck Industry Road Safety & Need to Achieve Further Improvements

The fact that the trucking industry has achieved an increased level of safety is supported by the following graphic showing the moving sum of fatal truck accidents over the preceding 12 months.

Fatal crashes involving heavy vehicles, Australia, 12 month rolling total · Ten years ended September 2009

Each point shows the number of fatal crashes in the preceding 12 months



a Data unavailable prior to 2004.

This has similarly reflected in other road accident statistics where further reductions have proven to be difficult to achieve. Consequently the concept of Cooperative Mobility has been developed as the means of moving towards a zero fatality objective.

SCOPING OF A COOPERATIVE MOBILITY PROJECT

Scoping of the truck Industry Cooperative Mobility project has been perceived to be challenging due to the sheer number of elements involved including the –

- Requirement to come to terms with a standard telematics/ cooperative mobility platform and standard for truck cabins which integrates disparate systems into a suitable package commensurate with the requirement of government and industry:
- Identification of a test route/s which incorporate sufficient ITS infrastructure and RTU equipment to demonstrate the outcomes of the initial roll-out such as the rail crossing and tunnel over height protection systems etc.(not including other innovations):

- Engagement of a candidate/s in the trucking industry prepared to commence using Cooperative Mobility on an evaluation basis with the idea of converting to full implementation on a commercial basis:
- Finding of government authorities willing to implement the road infrastructure aspects of cooperative mobility with the idea of understanding the deployment, administrative, and maintenance aspects of such a system:
- Development and deployment of infrastructure and communications to support such a program in practice:
- Exercising of the Cooperative Mobility solutions with the idea of evolving the system to full implementation in association with the emergence of mixed vehicle operations at some time in the future.

Interestingly, the basis for many of the technical requirements already exists within Australia. This includes the internationally recognised DSRC technology developed by Cohda Wireless in South Australia. In addition most state governments already operate sophisticated ITS on most of their freeways and main traffic thoroughfares.

Industry & Community Considerations

Not surprising industry discussions at the moment indicate a number of industry and community concerns that will need to be addressed within the scope of the project. These include the:

- Need to address security and privacy, with many truck operators sensitive to performance monitoring capabilities in Telematics/ Cooperative Mobility systems;
- Legal liability and responsibility with respect to their operation of the truck and possibility for limited autonomous operations by Telematics/ CM systems;
- Appropriate up skilling and the training necessary for the correct operation of the Telematics/ cooperative mobility equipment;

Project Timelines

With the amount of work to be undertaken, timelines are seen as spanning several years. Cooperative Mobility in the trucking industry is clearly a work-in-progress, however like many other large projects there is a requirement to start somewhere.

The program to advance the trucking industry in this direction is likely to comprise several phases as described below:

1. A Bootstrapping funding application stage;
2. Participant engagement & design stage;
3. Initial Roll-out, Implementation & review stage; and
4. Public roll-out & engagement program.

The practicability of these stages is yet to be tested with industry parties likely to participate in the project.

Strategies Required to Take Project to Successful Completion

From the discussion so far Cooperative Mobility is perceived by many to be a long way off, and perhaps never likely to materialise.

Yet in a changing economic climate there are few options in progressing transport when faced with issues such as;

- Increasing road transport costs;
- Complex tolling requirements;
- Management of traffic congestion; and
- Limiting of pollution & other elements of climate change.

Precedents for the types of technology provided by Cooperative Mobility have already been established with sophisticated Telematics applications. Radio spectrum has already been set aside, and test projects are underway.

Opportunities also exist for the development of home-grown technology and its development into an important export industry.

Effective strategies for encouragement in the take-up of CM may include:

- Design and development of Cooperative Mobility technology;
- Demonstration of improved safety and commercial outcomes;
- Government purchasing support; and
- Development of open standards for encouragement of 3rd party solutions.

Cooperative Mobility for the Australian Trucking Industry is clearly a work-in-progress and the project is likely to take a number of years to implement.

CONCLUSIONS

The technological means of implementing Cooperative Mobility in the Australian sphere exists. Its introduction by way of the trucking industry could be expected to be timely given that:

(a) Precedents are already being established with telematics and other government programs such as IAP;

(b) The reduction of road accidents in the Australian context has pretty well plateaued and will not go lower without new initiatives;

(c) Trucks represent a significant proportion of the road transport operations, and are increasing in all aspects including number and tonnage carried;

(d) Costs of both trucks and payloads are increasingly significant and therefore valuable against loss and replacement;

(e) It is vital that cooperative mobility be developed uniformly across the Australian transport industry to maximise take-up and benefits from its arrival to create critical mass and therefore achieve convergence with the emergence of the technology in the car industry.

It therefore makes sense, that the truck industry be at the vanguard of cooperative mobility so that interoperability with the nation's vehicle fleet can occur as soon as possible.

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Glossary of Acronyms & Terminology Used in the Paper

Terminology	Description
CVIS	Cooperative Vehicle Infrastructure Systems
DSRC	Dedicated Short Range Communications – Specialised communications operating in the 5.9 GHz spectrum and using protocols described under the IEEE802.11p standard for exchange of information – specifically for Cooperative Mobility Systems.
GPS	Global Positioning System – A receiver associated with the OBU and in some instances the RSU, for detailed determination of vehicle position.
HMI	Human Machine Interface – Process used for communicating with the Cooperative Mobility computer – maybe visual, audible, speech, touch; or a combination of all four.
OBU	Onboard Unit – The Cooperative Mobility computer installed on the motor vehicle and including GPS, DSRC, HMI and associated devices.
RSU	Road Side Unit – The stationery Cooperative Mobility computer installed in fixed infrastructure for communications with OBUs.