THE PIARC-FISITA JOINT TASK FORCE FOR THE CONNECTED VEHICLE

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ABSTRACT

The PIARC-FISITA Joint Task Force for the Connected vehicle (JTF) was established explore and understand the impact of the next generation connected vehicles on Road Operators and explore the opportunities for the automotive sector to work with road operators. The JTF undertook workshops, debates and telephone interviews with road managers and FISITA members. This paper summarises the findings of those discussions.

1. Background to the Joint Task Force

The Joint Task Force (JTF) was first proposed in 2007 and taken up in 2008 by the PIARC Technical Committee on Road Network Operations (TCB2). As part of its work the committee determined the need to understand the changes required in response to the introduction of more intelligent, connected vehicles and the relationship between the next generation of intelligent vehicles and an intelligent road infrastructure. It foresaw a growing demand for guidance to advise road operators around the world how to plan their investment to make the most of the opportunities for greater safety and efficiency. It also identified a demand from the automotive industry to understand the role of the road operator and the benefits of working more closely with road operators

Working with FISITA (The International Federation of Automotive Engineering Societies) PIARC TCB2 developed the concept of a joint task force (JTF) to take this initiative forward. At FISITA's annual congress in Munich in 2008 the FISITA President, Christoph Huss (Vice President for Development Abroad, Type Approval and Traffic Management at BMW Group), restated his goal that FISITA re-focus the co-operation with other global transportation players. The formation of the Joint Task Force with PIARC has been endorsed by the FISITA board.

The work of JTF ensures that PIARC and FISITA membership better understand and appreciate the mutual challenges facing transportation and mobility organisations, with deliverables widely circulated and published on both PIARC and FISITA Web Sites. The JTF promotes wider understanding and acceptance of intelligent vehicles and combined vehicle highway systems among PIARC practitioners. It facilitates better understanding and co-operation from the motor manufacturers with regard to the challenges and operational issues faced by network operators.

The JTF has considered the issues to be addressed in order to accelerate appropriate deployment which will be cost effective and provide long-term benefits. The JTF has also considered the commercial case for investment in co-operative systems; the public case for deployment of these systems; the political, financial, legal and operational challenges to deployment and the likely impact on highway and road network operations practice. It has adopted an independent, commercially neutral, committee of enquiry approach gathering evidence from invited expert witnesses, workshops and participation at key conferences.

The JTF report is aimed at policymakers, directors and senior managers in Roads Administrations, the auto industry and other associated organisations. This document is short and concise consisting of self-standing chapters bound together by an introduction and recommendations. It is

published on the World Wide Web, available on paper and prepared in such a way that it is suitable for publication. The findings will be presented to the engineering and academic communities through an outreach programme and at each of the FISITA and PIARC World Congress.

The JTF found consensus that the intelligent connected vehicle has the potential to make travel safer, more efficient and more comfortable. It can make the fleet more reliable and reduce the overall running costs. It can also impact on government objectives by enabling Carbon reductions, reducing healthcare costs and reducing the pressure for new investments and construction. It provides an opportunity for the development of new applications and businesses.

2. Two routes to the connected vehicle?

Based on the evidence available to the JTF it is clear that the connected vehicle may come in two quite different guises.

The first, and easiest, involves the ongoing development of applications using existing commercial wireless telecommunications to provide V2I and perhaps even V2V services. These services can come in different forms, such as enhancements to satellite navigation systems, embedded SIM cards in vehicle systems or smartphones. The development of these systems is progressing rapidly and their capability will expand with the advent of the next generation telecommunication services which will better support machine to machine connectivity. It is also clear that the next generation of drivers will have been brought up in the connected world and will expect those services to support their travel. However, at this time there is no evidence that commercial services the technical capability, responsiveness and reliability to support the short range services necessary to obtain the maximum benefit from some safety applications.

The second approach involves the development of a new, bespoke, short-range system optimised for safety and short-range traffic control applications. The wireless technology required has been developed and tested over the last 30 years and the technological capabilities are well understood. International standards are well advanced. Deployment is dependent upon the case for investment and the task force has not been able to identify any commercial business model strong enough to support the deployment of the ground infrastructure necessary for widespread, secure implementation. The question is then whether the benefits to the community, economy and society are sufficient for central and local government to finance ground infrastructure deployment.

Electronic tolling and Charging – a successful application

The one area in which short range wireless communications is commercially successful is electronic tolling and charging. This technology allows revenue to be collected without the disruption associated with toll booths. It is proven and widely used. It is possible for safety services or other commercial services to ride with these but so far the industry has shown a preference for keeping charging services separate.

The hybrid approach

There is, of course, a overlap between these types of applications and it is possible to consider an architecture in which vehicle and land systems make use of both approaches, choosing the one available and suitable for a particular application. This approach has been demonstrated using the CALM communications architecture.

3. The commercial approach

The commercial business perspective is focused on commercial opportunities, new products and services, revenue streams and a quick return on investment. A business case already exists for the development of viable services in a number of areas, using the available telecommunications networks:

- OEM and dealer services;
- navigation, journey planning and location-related applications;
- freight management applications;
- charging and payment applications;
- personal applications and social networking; and
- consumer applications and “infotainment”

Navigation companies

The digital mapping and information services sector is making a strong showing in these areas. The leading companies are equipped to provide their customers with OEM and after-market equipment and follow up services using, for example, Radio Data System data or the commercial cellular telephone network. These companies now have sophisticated databases containing data about the road network. Initially set up using survey work these databases are updated using data from user vehicles and can provide a mix of static and dynamic information. The companies argue that they are able to provide their users with information services which could replace those provided by most road operators; furthermore they could provide a new business model for the operation of road networks.

The Automotive Industry

Some parts of the industry have already developed the capability to provide a variety of customer services using voice and data networks. These capabilities are gradually being extended to include more functionality and make use of feedback of data from vehicles. Some manufacturers are developing relationships with road authorities which allow them to enhance the travel services to their customers.

From the perspective of the automotive industry there are significant technical, commercial and political risks that have to be managed. The industry is making use of proven existing communication technologies to deliver services to customers whilst collaborating in field trials and operational tests involving short range communications.

Those interviewed expressed a view that the criteria for major investment are:

- a convincing plan from government and road operators for investment in the infrastructure-side of co-operative systems;
- confidence that infrastructure-sourced data will be well managed and bring added value;
- a legal and regulatory framework that covers the deployment of co-operative systems;
- clear market opportunities and transparency in the political, regulatory and competitive environment;
- partnership agreements and leadership among the partners; and
- well-developed plans for customer support and back office arrangements

Telecommunications companies

For telecommunications companies the connected vehicle is more than just another consumer device. It is a completely new user environment where services fit in, which brings together the

home, the car, business and the mobile internet. New business models that make use of the smartphone and smartphone applications are emerging. The taxonomy for connected vehicle services will need to distinguish between those applications that are consumer market-based (value-added), automotive-based, communications-based, taxation based, or infrastructure –based.

The telecommunications sector is continuously developing its product. The third generation of services is widely available over most parts of the world and the fourth generation (LTE) promises to build on this base and provide services more appropriate to support transport applications. These companies have a huge user base and will continue to improve and harmonise their services.

Experience and research continues to show that the public will resist paying for traffic and travel services that include a subscription element, whilst they seem content to purchase applications which carry a telecommunications usage charge. New tariff arrangements suitable for automotive use are required which encourage users to retain services provided initially by OEMs.

4. The Public Sector

Governments are concerned about the big picture: security, mobility, safer roads, greater transport efficiency, employment and job creation, sustainability and lower emissions. No public investment can happen without a strong economic case based on evidence of benefits to the economy and society.

The promoters of co-operative systems need urgently to deconstruct the benefits of the technology and sell solutions to problems, especially with the politicians: safety benefits, security benefits, economic benefits, job creation, environmental benefits, etc.

The available evidence points to a case for action by governments based on improvements in road safety and by road operators based on greater efficiency in maintaining and operating roads. VICS in Japan has shown that a government-led approach can lead to a significant uptake of connected systems.

In order to act governments need to be satisfied that the chosen road-map for deployment of co-operative systems is stable, viable and has the backing of all the main stakeholders. They need to be assured that this technology will yield the safety benefits predicted. The public for their part will expect guarantees on the complete reliability of co-operative systems and sound proposals for the management of risks when things go wrong. Reassurance on issues of privacy and the “fairness” of these systems, perhaps with legislation, will also play a big part in what will be politically acceptable.

Road Operators

The network operator has many conflicting calls on capital and revenue finance. For the road operator to consider investing in roadside devices for vehicle communications the case investment must be strong.

The road manager has to make two decisions. The first is whether to provide short range and strategic traffic information or whether it is better or acceptable to leave this to the private sector. The second decision is whether the investment in wireless roadside devices to support V2V or V2I are the most cost effective way of providing a universal service.

The are opportunities for road managers to improve their services by taking advantage of data collected from connected vehicles. In order to make the most of these opportunities managers will

have to consider changing the way they work and the specifications for the information they collect about the roads and traffic conditions and the way it is collected.

5. Collaboration

The development of this market requires close relationships between all sides of industry. The commercial sector may be able to satisfy the needs of their customers by working in isolation but there are wider opportunities and business models being developed which involve with governments and road operators.

Collaboration at an international level is seen to be essential and the examples of collaborative working emerging within and between US, Europe and Japan are welcome developments.

6. Privacy

The consultations showed a diverse set of opinions and requirements for privacy. There are some sectors of the market which resist any intrusion into privacy. There are seen to be issues of personal security, financial security and personal freedom. There are also market sectors which perceive advantages to loss of privacy through, for example, cheaper insurance or even, in the case of the young, feasible insurance. The younger generation seemed less concerned about loss of privacy.

7. Security

Systems that rely on spatial and temporal information are reliant on high integrity data. The temptation for some individuals to listen to vehicle communications or interfere destructively will be great. Therefore the development vehicle communications systems has to proceed using the assumption that the system will be subject to malicious interference. As an example, consider the implications of a hacker intervening in a dialogue between traffic signal and vehicle, or interfering with the vehicle's CANbus. Telecommunications companies have developed measures to protect users of commercial wireless systems, Dedicated short range systems will require a certification and quality assurance system to be in place. There was a view that V2V may not be able to exist without being accompanied by V2I and that the architecture should include the provision of a certification system using trusted roadside units ("trust centres").

Confidence is critical. Interference and a failure in security, either during trials or pilot schemes or during the early phases of roll out, would seriously damage commercial prospects. Security solutions have to be built in to the system architecture, requiring both vehicles and roadside devices to maintain firewalls.

8. Legislative issues

The automotive sector has concerns about the consequences of a failure in design. It looks to governments to provide a legal and regulatory framework that covers the deployment of co-operative systems. There is a presumption that most applications, even safety-related applications, will assist the driver rather than take over any control functions and that, providing system design is carefully considered, liability need not be the difficult issue that some have made it out to be. This has not been tested in law.

9. Follow up work

The task force welcomes the interest and engagement of international organisations such as UNECE, IRF, CEDR who have established groups to consider these issues. ERTICO have lead the establishment of the Co-operative Mobility Alliance. There is agreement to international collaborations between US, Europe and Japan. There has been much progress with international standards. There is now plenty of collaborative activity which makes it unnecessary for the task force to continue in its current form.

However, from the perspective of the road manager, there remains a requirement for continuous monitoring and consideration of the issues as they continue to develop. There is a need to develop further understanding of the implications of the connected vehicle and to provide impartial education and information so that key investment and deployment strategies can be developed.

The connected vehicle has the potential to enable Road Managers to improve the way they can maintain and operate their roads using the knowledge and feedback available from the user fleet. These benefits will not be fully realised unless Road Managers are prepared to consider new ways of working, new types of data and even new organisational structures.

The evidence given to the task force has confirmed that the vehicle has the capability of gathering, storing and returning useful data on traffic and road conditions. The use of vehicle data for traffic monitoring is being exploited but its use for road condition monitoring requires further work. How can the physical condition of a carriageway be described such that data from a vehicle can be used to create a continuous description of its condition?

PIARC, as a world wide body, includes the necessary expertise, government membership, access to the road operators and an in-depth understanding of road network operations, with the breadth of coverage necessary to consider the requirements of countries and regions throughout the world. It is sensible for the JTF to continue to work on this important topic.