ITS AUSTRALIA SUBMISSION TO THE House of Representatives Standing Committee on Communications, Information Technology and the Arts INQUIRY INTO WIRELESS BROADBAND TECHNOLOGIES

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

This submission covers the following main points:

- An introduction and discussion of Intelligent Transport Systems [ITS]
- User services relating to Intelligent Transport Systems, with mention of the issues involved in delivery of those services as they affect the consideration of Wireless Broadband Technologies and the emerging field of Telematics
- The need for and principles involved in the coverage of wireless broadband services within the land areas and in the maritime vicinity of Australia
- The technologies that are applicable now and those likely to become relevant within the next three to five years, plus the magnitude and character of necessary investment to realise the benefits of the technologies
- The nature of the radio-frequency [RF] communications involved in delivery of the services with regard to information carried, quality of service, standards and protocols, and interoperability
- A brief discussion of spectrum allocation and licensing
- The role and importance of standards and architectures in this area, plus mention of the work of the Standards and Architectures Working Group of ITS Australia that is relevant to the Inquiry

RESPONSE TO TERMS OF REFERENCE OF THE INQUIRY

ITS Australia notes the terms of the reference call for the committee to...

...inquire and report on the current and potential use of wireless technologies to provide broadband communication services in Australia, including regional Australia, having particular regard to the following:

1. The current rollout of wireless broadband technologies in Australia and overseas including wireless LAN (using the 802.11 standard), 3G (eg UMTS, W-CDMA), bluetooth, LMDS, MMDS, wireless local loop (WLL) and satellite;

   ITS Australia comment: The rollout should be partly driven by the need for safety, security and efficiency of travellers and freight especially on the roads. ITS Australia asserts that there is just as much obligation to provide appropriate coverage for travellers and freight vehicles passing through an area as there is to provide fixed services to households and businesses in that area.

2. The inter-relationship between the various types of wireless broadband technologies;

   ITS Australia comment: Some of the wireless broadband technologies are very short range eg Dedicated Short Range Communications [DSRC] for Electronic Toll Collection [ETC], while others are longer range eg beyond horizon range such as satellite. The key point here is that this should be considered on a basis of Level of Service [LoS] (aka Quality of Service [QoS]). For applications needing a high LoS such as security of freight vehicles or safety of travellers in remote areas, the user would be expected to pay a higher subscription or fee for use (unless the service was provided by government as a public service).

   Transport will be one of the few wireless broadband user groups / segments that will use multiple wireless broadband technologies whilst on the move in each vehicle. New cars, trucks and trains will have, for example, mobile telephony, electronic toll collection [ETC] collision avoidance radar and global positioning systems [GPS].

3. The benefits and limitations on the use of wireless broadband technologies compared with cable and copper based broadband delivery platforms;

   ITS Australia comment: It is critical that the mobile requirements for travellers and freight vehicles are considered in this comparison of wireless broadband with cable and copper-based delivery platforms. In other words the requirement for wireless broadband should not be assessed purely on the static and permanent residents of an area but should also include the travelling passengers and freight that have legitimate needs while within the same area.

4. The potential for wireless broadband technologies to provide a 'last mile' broadband solution, particularly in rural and regional areas, and to encourage the development and use of broadband content applications;

   ITS Australia comment: Content should be defined widely to include traveller information, navigation data updates, remote surveillance and observation video, logistics management information and other information flows associated with ITS

5. The effect of the telecommunications regulatory regime, including spectrum regulation, on the development and use of wireless broadband technologies, in particular the Radiocommunications Act (1992) the Telecommunications Act (1997), and Parts XIB and XIC of the Trade Practices Act;

ITS Australia comment: ITS Australia is playing an active role in advocacy of the allocation and licensing of spectrum for important ITS services to moving vehicles such as location referencing services, hazard warning, traffic advisory and Electronic Toll Collection [ETC]

6. Whether Government should make any changes to the telecommunications regulatory regime to ensure that Australia extracts the maximum economic and social benefits from the use of wireless broadband technologies;

ITS Australia comment: Government should add to its consideration of the telecommunications regulatory regime the recognition of the needs and expectations of vehicle users for passenger and freight transportation. The safety and well-being of travellers and security of moving freight are of equal importance to that of people in their homes and businesses and of goods in storage or on display

and

7. Likely future national and international trends in the development and use of wireless broadband technologies.

ITS Australia comment: ITS Australia has a wide range of international associations and access to a wealth of information on the use of wireless communications technologies for ITS in North America, Europe and North Asia (Japan, Korea and China). These resources can be mobilised for the assistance of the Inquiry

INTRODUCTION

ITS Australia welcomes this opportunity to present a submission to the House of Representatives Standing Committee on Communications, Information Technology and the Arts in response to the Inquiry into Wireless Broadband Technologies

Intelligent Transport Systems (ITS)

Intelligent Transport Systems (ITS) are being developed and deployed across the world to improve the performance of transportation, providing improved social outcomes for communities and increased economic dividends for governments and markets. ITS is defined as:

> *"The application of modern computer and communication technologies to transport systems, to increase efficiency, reduce pollution and other environmental effects of transport and to increase the safety of the travelling public." (ITS Australia, Intelligent Transport Solutions for Australia: Technical Report, 1998).*

The benefits to community and business implicit in the above definition are being produced in tangible and measurable ways in the many locations where ITS systems have been deployed.

ITS also assists in encouraging road / public transport user access (Park and Ride) through providing real time traveller information via web, WAP, SMS and now low power open network radio beacons.

Australia is a world leader in the development and deployment of ITS products and services. Melbourne City Link (MCL) has in excess of 650,000 e-tags in use growing at a rate of 5,000 new tags per week. Some 1,000,000 people use the MCL network. This free flow system is the most advanced in the world, and requires wireless Direct Short Range Communications (DSRC) to operate. Allocation and standardisation for this wireless carriage was critical in ensuring toll systems Australia-wide are interoperable.

Vehicle Safety

In 2001, 1,756 people died on Australian roads. In addition to the burden of personal suffering, the monetary cost of crashes is in the order of $15 billion per annum (1996 data).1 Relative to other OECD countries Australia was ranked 12th in respect of road deaths per 100,000 population in 1998 and sits on the OECD median performance level. If deaths per 10,000 registered vehicles are considered, Australia ranks equal sixth in the OECD.2

The National Road Safety Strategy 2001-2010 was adopted by the Australian Transport Council in November 2000. The Strategy provides a framework that complements the road safety strategies of State, Territory and local governments.

Vehicle safety systems are recognised as an integral part of any fatality and trauma reduction program. "This technology, commonly known as Intelligent Transport Systems, will typically involve engineering systems built into the vehicle and/or the road

[1] Australian Transport Safety Board -The National Road Safety Strategy - 2001 to 2010.
[2] (see ATSB website: www.atsb.gov.au/road/stats/benchmk.cfm)

that intervene when users suffer lapses of concentration or make unsafe decisions. It has the potential to:

- ensure that restraints are used;
- maintain safe following distances between vehicles;
- prevent speed limits being exceeded;
- control cornering response to maintain adherence with lane markings and stability on wet surfaces;
- ensure that the driver's licence conditions are adhered to;
- monitor driver alertness (preventing driving while fatigued or intoxicated);
- require the driver to perform a breath test before starting a car (e.g. alcohol interlock); and
- detect the occurrence of a serious crash and automatically notify emergency services of the location and severity of the crash and the number of occupants involved."3

ITS safety devices such as collision avoidance radar rely heavily on wireless communications

In order to facilitate this technology deployment, extensive consultation needs to take place to understand the emerging needs of the automotive, road authority and freight and logistics organisations from a safety perspective.

Location Based Services [LBS] and e-911

In a series of orders since 1996, the US Federal Communications Commission (FCC) has taken action to improve the quality and reliability of 911 emergency services for wireless phone users, by adopting rules to govern the availability of basic 911 services and the implementation of enhanced 911 (E911) for wireless services. The Commission's wireless 911 rules seek both to improve the reliability of wireless 911 services and to provide enhanced features generally available for wire line calls. Equity issues exist between fixed and mobile wireless phone users. '000' callers in Australia when calling from a fixed land line enjoy CLI which can locate the caller and dispatch emergency services accordingly. When on the move mobile users whether in vehicle or on foot or in public transport cannot be located at present. E-911 in the USA sought to solve this problem and significant work has been done to move toward enhancing emergency service provision to mobile users. Wireless carriers are required to provide Automatic Location Identification (ALI) as part of E-911 implementation. The ALI can be provided by the handset or calculated by the network. All of America's carriers will still be required to complete the full E911 rollout by the original December 31, 2005 deadline, and be able to locate 95% of callers to within 100 meters.

To date network positioning has only been made available by Telstra for internal applications. ALI should be made available as soon as possible for time critical emergency service applications.

Taking a Stance on Vehicle Security

Motor vehicle theft remains a significant social and economic problem. Almost 139,000 vehicles were stolen in Australia during 2000/1, representing an estimated increase of around 6 per cent over the previous year. Australia recorded that one vehicle was

[3] Australian Transport Safety Board -The National Road Safety Strategy - 2001 to 2010.

stolen for every 92 vehicles that were registered in 2000/01 and an amazing one stolen every four minutes. In respect of vehicle theft, Australia is ranked second behind the UK.

The cost of motor vehicle theft continues to impact on the whole of the community including the criminal justice system, the insurance and motor vehicle industries, and individual victims of theft. With an average insurance claim cost of $8100 for theft claims finalised in 2000/1, the cost of car theft is estimated at be at around one billion dollars annually.

Late model vehicles (1992 onwards) fitted with an Australian Design Rule equivalent immobiliser as standard equipment comprised 32 per cent of Australia's late model vehicle fleet in 2000/1. Only one of these vehicles was stolen for every 304 that were registered, while late model vehicles with no immobiliser were stolen at a rate of one vehicle for every 193 registered. Interestingly, preliminary findings of a Council study into the theft of immobilised vehicles revealed that over half of the vehicles were stolen because the thief gained access to the vehicle's original key and transponder.4

The lack of standards and spectrum allocation for wireless services technologies by automotive manufacturers is limiting uptake of theft reduction and other safety technologies is due to the long lead time for vehicle design and production (models are now being designed for 2005) it is virtually impossible for designers to know what spectrum and bandwidth (GPRS, 3G, UMTS etc) will be available three years from now and if existing services are used, will these be available for the warranty (3 years) and maintenance and parts availability obligation period (7 years)

We have a Global Centre of Competence for Body Electronics (security systems, smart card entry etc) in Melbourne (Robert Bosch) and many other regional Headquarters in Australia.

ITS Technology in Taxis

Australian cabs are also jammed with wireless technology. In vehicle cameras can transmit photos of occupants to a control centre for driver safety. One supplier, Raywood reports that this local success is soon to be found in international taxi fleets - with sales to New Zealand, Dubai, England, Scotland, Ireland, Italy and now the USA giving a high market penetration on a global scale. The 10,000th SnapShot camera was recently sold as part of an 800-unit order from the Greater Houston Transportation Company. Many jurisdictions report over 65 per cent reduction in driver assaults after the installation of cameras, indicating that this Australian designed and developed wireless technology is proving a significant contributor to driver safety.

In New York and even Tokyo, it is impossible to pay with a credit card in a taxi, let alone use ATM style payment. Around Australia, Mobile banking facilities use EFTPOS technology to permit not only the use of credit cards, but also other banking debit cards. These systems currently use UHF communications; however further enhancements of the systems are likely to be possible only through 3G/UMTS style carriage. Greater use of imaging and positioning in private transport, public transport, cash security vans, and other security related applications will only be possible if wireless broadband spectrum is allocated for this use. Management systems for road and rail networks also use wireless communications to ensure safe, reliable and efficient use is made of our infrastructure.

[4] National Motor Vehicle Theft Reduction Council. CareSafe Theft Watch Newsletter.

Electronic Road Pricing

With the emerging discussion relating to Electronic road pricing such as is being introduced in the Singapore, Netherlands, London and Tokyo, wireless communications are critical both to calculate a position from GPS satellites and to communicate via GSM to the financial transaction clearance house.

Remote Engine Management Systems for Freight Vehicles

Engine temperatures, emissions, vibration, oil level, fuel consumption as well as transmission and suspension parameters are monitored onboard the vehicle to provide alarms well before a problem gets serious and to provide remote coordination for spare-parts and services to be available at the first available stopping point.

National Strategy for Intelligent Transport Systems (e-transport)

To maximise the benefits of ITS technologies and avoid potential dysfunctional outcomes for transportation, it was recognised that a systematic and structured strategy for the identification of ITS priorities and for their development and application was needed. In November 1999, the Australian Transport Council of Ministers [ATC] endorsed ***e-transport***, *The National Strategy for Intelligent Transport Systems.*

The ten strategic goals of ***e-transport*** are shown below.

- Improved transport safety and security.
- Improved transport efficiency, performance and quality for the movement of people (by public and personal transport) and goods, by covering all transport modes and their linkages.
- Reduced congestion and travel times, and improved travel demand management.
- Improved effectiveness of use of transport infrastructure.
- Improved transport environmental outcomes, including reduced environmental and energy (including greenhouse) impacts.
- Improved contribution to Australia's economic development, including regional, rural and remote area development.
- Improved transport contribution to sustainable development.
- Improved transport accessibility and equity.
- Enhanced transport planning, policy-making and delivery.
- Achievement of a growing share of the world's ITS market for Australian-based business.

The National Strategy provides a necessary reference point for all major ITS initiatives. Australia's Federal and State Transportation Ministers have made a commitment to the

implementation of its vision and its individual actions. To view e-transport please visit the ITSA web site (www.its-australia.com.au)

E-transport identifies several equity issues relating to the deployment of ITS in rural, regional, and remote areas (R3A). Whilst ITS Australia is working to enhance intermodal operations for the carriage of goods, people, freight and information, it is critical to ensure involvement from the relevant regulatory authorities in order to plan for the transport communication needs into the next decade.

USER SERVICES AND INTELLIGENT TRANSPORT SYSTEMS

Intelligent Transport Systems [ITS] comprise an expandable list of identified User Services, the logical architecture that supports the provision of those Services, the physical architecture and infrastructure to implement the Services and the standards and protocols that are defined to support the implementation. The listing of User Services varies from country to country in minor ways but in general all developed countries consider the area in much the same way as the Australian classification[5] shown in Table 1. The 32 services are grouped into categories for convenience of assigning priority and other attributes. The column headed 'Wireless Needs' has been added to provide a preliminary assessment of the relevance wireless communications to that service

Telematics, ITS and Wireless Broadband

Telematics is the application of information and communications technologies to the enhancement of safety, security and efficiency of vehicle operations. It covers the essential vehicle segment of the ITS domain

Automobile manufacturers have announced that all new cars will have ITS systems of one form or another fitted. Of these a significant proportion will rely on external communications and/or other forms of RF transmissions. There will be significant overlap between ITS and Telematics.

One forecast proposes that by 2006 about 50% of new cars being sold in the US, Western Europe and Japan will be telematics-capable. In Japan alone 8.8 million vehicles are fitted with car navigation, and 5.0 million of these are supplied with real time traffic information free of charge.[6]

Telematics applications will be based on permanent or long-duration packet-switched connection to the internet. Wireless mobile internet [WMI] is under active development and will be widely available in the next 2 to 3 years.

[5] A National Reference Architecture for ITS. ITS Australia. May 1999
[6] ITS Japan Market Report April 2002

FUNDAMENTAL ITS USER SERVICES			
Service category	**SvcID**	**Service name**	**Wireless needs**[7]
Traveller information	1	Pre-trip information	
	2	On-trip driver information	Data message
	3	On-trip public transport information	Data message
	4	Personal information services	Interactive data
	5	Route-guidance and navigation	Data messages may be needed to update onboard data
Traffic management	6	Transportation planning support	
	7	Traffic control	
	8	Incident management	Voice and data messages
	9	Demand management	
	10	Policing / enforcing traffic regulations	
	11	Infrastructure maintenance management	
Vehicle-related	12	Vision enhancement	Millimetre radar
	13	Automated vehicle operation	
	14	Longitudinal collision avoidance	Millimetre radar
	15	Lateral collision avoidance	Millimetre radar
	16	Safety readiness	
	17	Pre-crash restraint deployment	Data message
Freight and Fleet	18	Commercial vehicle pre-clearance	
	19	Commercial vehicle administrative processes	
	20	Automated roadside safety inspection	
	21	Commercial vehicle on-board safety monitoring	Data message
	22	Commercial vehicle fleet management	Data message
Public Transport	23	Public transport management	Data message, voice
	24	Demand responsive transport management	Data message
	25	Shared transport management	Data message
Emergency Management	26	Emergency notification and personal security	Data message
	27	Emergency vehicle management	Data message; voice
	28	Hazardous materials and incident notification	Data message; voice
Electronic payment	29	Electronic financial transactions	Data message
Safety	30	Public travel safety	Data message; voice
	31	Safety enhancement for vulnerable road users	
	32	Intelligent junctions and links	Data message

Table 1 – Fundamental Intelligent Transport Systems User Services

7 Data messages - can be a wide variety of data, of varying size files and varying currency
Interactive data - two-way interactive session between user and another site
Millimetre radar – vehicle fitted low-power radar to detect obstacles
Voice - any form of voice communication via mobile phone

GEOGRAPHICAL COVERAGE OF WIRELESS BROADBAND SERVICE

There has been much community discussion on the need for geographical coverage for mobile phones and for the provision of telecommunications subscriber service using wireless transmission. What has been less frequently acknowledged is that mobile phones have opened up a vast new user community for telecommunications on this same personal level.

Whether communicating directly to a portable (mobile) phone or via some transceiver system built into the vehicle (hands-free kit for example) the information available to the end user is more timely and relevant than would have been the case in times where there were only fixed phones available for private use, and private radio networks for commercial operators.

The recent announcement by Telstra that satellite mobile phones will be subsidised in the outback is welcomed because this should be applicable to all travellers and freight vehicles in the same areas for which the subsidies will apply.

ITS Australia also welcomes the Government's recent policy to expand mobile phone coverage in the GSM and CDMA networks, however significant gaps remain in remote areas as well as some regional areas. Equity issues remain between urban and regional users of Intelligent Transport Systems, which require wireless broadband communications.

ITS Australia proposes the following principles for geographical coverage of wireless broadband communications in Australia and its nearby maritime areas:

- universal coverage for distress and emergency calls
- full coverage for all intermodal transfer points
- full coverage of all main transport routes
- full coverage of all major tourist and traveller locations, plus
- further coverage for all services on a cost-benefit basis.

TECHNOLOGIES AND INVESTMENT

This material in this section is stated only to the point that it is useful for the consideration of the issues before the Inquiry. There is an enormous body of knowledge that applies to development of technology in this area and it is not possible to be familiar with all of it. The following comments are made where the technology is relevant to the feasibility and success of the design, implementation and operation of the various forms of ITS.

Wireless Technologies Relevant to ITS

Wireless technologies relevant to ITS fall into the following frequency band groupings:

- Non-RF: acoustic (not further considered here)
- Optical – infra-red, laser (not further considered here)
- Radio-frequency:
  - High Frequency [HF] – long-range emergency eg VKS-737
  - VHF)
  - UHF) distress beacons
  - 900 MHz)

- 1.8 GHz) mobile phone service
- 2.9 GHz)
- 5.8 GHz) DSRC
- millimetric - radar

Bandwidth Relevant to ITS

The bandwidth needed for ITS communications depends on the data rate required – this in turn depends on the amount of data to be transmitted, the error rates that are acceptable, the latency that is acceptable and the protocols and standards in use.

Wireless Quality of Service

The following Table 2 provides a useful classification of the types of service and acceptable QoS for each type. All of these are applicable to Telematics delivery to vehicles

Class=>	Conversational	Streaming	Interactive	Background
Example application	Voice over IP	Audio / video	Web browsing	Email
Acceptable delay	Strict & low	Bounded	Tolerable	Unbounded
Acceptable bit error rate [BER]	$\leq 10^{-3}$	$\leq 10^{-5}$	$\leq 10^{-8}$	$\leq 10^{-8}$

Table 2 – UMTS QoS Classes: fundamental features and attributes[8]

Protocols and Standards

Within the terrestrial communications domain there is special interest in the use of packet-based technologies becoming available through evolving mobile phone technologies. In general the more advanced the technology the more likely it is to meet the wireless broadband needs of ITS and Telematics

Specifically the following technologies are of interest:
2G[9] GSM (short message service [SMS] and datacall (circuit-switched))
2.5G GPRS, CDPD
3G EDGE, UMTS, W-CDMA
LMDS, MMDS

Satellite Communications

The availability of global coverage through selected satellite networks provides an ideal solution for ITS in regional, rural and remote areas [R3A] and offshore. Unfortunately there have been difficulties in constraining consumer costs on the one hand or keeping the network operating companies solvent with slow take-up of subscriptions.

Global Positioning System [GPS] and Other Similar Systems

The cost of GPS microcircuit chips for portable and mobile applications has dropped steadily and GPS systems are now commercially available in watches, mobile phones, freight tags and personal digital assistants [PDA]. It is therefore well within the

[8] '3GPP, "Universal Mobile Telecommunication System (UMTS); QoS Concepts and Architecture," TS 23.107 v.3.5.0, http://www.3gpp.org, 1999 quoted in Moustafa et al, 2002
[9] Second generation – applied to mobile phone technologies

acceptable cost for all vehicles to be fitted with such capability. When this is allied with wireless communications this creates a formidable location based platform for almost any mobile use. A surface vehicle provides a suitable environment for such applications

ITS Australia has representatives on the Global Navigation Satellite Systems [GNSS] special working group of the ATC Standing Committee on Transportation [SCOT]. This group is also considering the emerging issues associated with the European global positioning satellite system *Galileo*.

Investments Needed to Realise Potential Benefits

Investments needed to realise the potential benefits to travellers, freight carriers and customers include the following:

Coverage

- universal coverage for distress and emergency calls – this need not all be the same technology nor need it be available at no cost
- full coverage for all intermodal transfer points anywhere in or near Australia
- full coverage of all main transport routes
- full coverage of all major tourist and traveller locations
- plus further coverage for all services on a cost-benefit basis.

Systems

- standards for data messaging
- mobile antennas

Services

- content for services

RADIO-FREQUENCY COMMUNICATIONS FOR WIRELESS BROADBAND

There are various options for RF communication with moving vehicles carrying passengers and freight.

For communication between a vehicle and a fixed location options include:

- short range – DSRC, IR
- medium and long range – mobile phone 3G, satellite

For communication between two moving vehicles

- DSRC, IR

The nature of the radio-frequency [RF] communications involved in delivery of the services varies with regard to information carried, quality of service, standards and protocols, and the required levels of interoperability.

Electronic Toll Collection [ETC]

A commissioned report on Electronic Tolling Standards recommended the European Standard (CEN) as the preferred system for use in Australia. An Electronic Tolling Working Group was established, which bought together key stakeholders in industry and government. Toll roads now utilise a harmonised standard for interoperability of communication. The DR00310 Electronic toll collection transaction specification for Australian interoperability using CEN DSRC link has the potential to provide the electronic tolling and parking industry with a national set of standards for electronic fee

collection systems in order to establish interoperability across all tollways and vehicle to roadside applications throughout Australia. ETC is now being used in the USA for McDonalds drive-through payment and trials are underway in Japan for downloading music, route guides and other maps and other content via this same link.

Work will continue across Australia to achieve complete interoperability of electronic toll tags including the successful operation of tags intra and interstate between the various toll systems and the expanded use of electronic toll tags to enable more efficient use of other road management resources, such as those applied to parking and park and ride, incident management and system performance.

SPECTRUM ALLOCATION AND LICENSING

It is important that the appropriate RF spectrum allocation is made for terrestrial communications involved in ITS

Australia has developed a National Strategy for Intelligent Transport Systems, also referred to as ***"e-transport"***. This strategy provides a basis for the accelerated integration of these technologies within the vehicle to enhance safety and security, and reduce transport emissions. Section 4.2.2 of ***e-transport*** details that *"Transport Ministers at Commonwealth, State and Territory levels inform other Ministers (including **communications**, planning, industry, science, environment and trade) and enlist their support in implementing the Strategy, including consideration of appropriate institutional mechanisms."* Section 4.1.7 further notes *"Commonwealth Government advice be sought on how policies and processes of the Australian Communications Authority, **including spectrum allocation**, can assist development and deployment of ITS."*

However it is important to avoid giving too much emphasis to spectrum allocation. It is analogous to declaring right of way for railway lines to be laid. The spectrum allocation does not guarantee anyone will raise the money to provide the service. And then after the service is provided it does not guarantee the passengers will come to use the service. In this analogy the analogue of the standards and protocols is the rail gauge to be used for the new line.

STANDARDS AND ARCHITECTURES

ITS Architecture

In any large-scale or complex network it is important to create an architectural model to provide a coherent framework for more detailed work

Australia has a National Reference Architecture for Intelligent Transport Systems. This document is a concise, comprehensive and systematic statement of the systems' principles and aims. It serves to lay the foundations for transport technology deployment and effectively map the market operators, elements, interrelationships and interaction with the actors. The Architecture assists in building consensus, encouraging interoperability and reduces cost of deployment of transport technologies. From this Architecture, the National Reference Architecture Working Group (ITS NRA-WG) will

develop a number of Logical and Physical architectures, and thereafter, move on to expand the body of Standards applicable to ITS.

The NRA-WG has also proposed the establishment of an Australasian ITS Data Registry, which will take data concepts through to ratification. These will include concepts relating to wireless data carriage from an infrastructure perspective and also from an in-vehicle perspective.

Standards

A number of national and international standards apply to the development and deployment of ITS systems. These standards serve to ensure that our systems remain interoperable across transportation modes and across political constituencies and commercial markets. In order to advance our national transportation objectives all transport planning, involving the application of wireless ITS solutions, must comply with national standards.

For more information please refer to the following URLs:

http://www.ntcip.org/

http://standards.ieee.org/

http://www.ite.org/

http://www.iso.org/iso/en/stdsdevelopment/tc/tclist/

National and International Standards

A key focus of the National Strategy, ***e-transport***, involves encouraging and mandating for the interoperability of ITS systems. Interoperability for our transportation infrastructure equates to avoiding repetition of the rail gauge dilemmas that confronted our transport planning forefathers.

One measure instituted to further the objective of interoperability is the production of a *National Reference Architecture for Intelligent Transport Systems (ITS) for Australia.* The National Reference Architecture provides a framework for the development of standards in all aspects of ITS development. Many national standards have since been developed against this framework. To view The National Reference Architecture document and the NRA Working Group activity please visit the ITSA web site (www.its-australia.com.au)

The National Reference Architecture and national and international ITS standards in force in Australia, will provide clarity for those seeking to develop and deploy ITS systems in our markets, reducing their risk of market entry. Furthermore, infrastructure planners know that they should select ITS solutions that comply with a clear hierarchy of technical criteria. Ultimately, the beneficiary of these products is the end-user, with solutions delivered with greater speed and certainty and greater compatibility between separate parts of the transport infrastructure.

Intelligent Transport Systems Australia Inc (ITSA)

ITSA represents Australia's eyes on the ITS World, helping Australia to play an active role in shaping international ITS standards and providing a framework for local ITS developments to ensure that they are compatible with national and international standards.

ITSA is able to provide the Inquiry with further assistance as it moves through later stages of investigation. Our strong capacity to assist your investigations is due to the organisational attributes that we have developed since our inception. ITSA is:

1. A clearinghouse for ITS knowledge.
ITSA has a strong membership base, and is seen by many ITS stakeholders as both a repository and conduit for ITS related information.

2. A transaction hub for ITS interaction.
Our membership base, capability register and involvement in a number of ITS related initiatives and events provides a sound basis for ITSA to serve as a facilitator of links between industry participants.

3. The only multi-modal ITS institution.
The ITSA charter maintains that we represent ITS issues for all modes of transport. This is an important attribute given the growing recognition of the benefits of cross-modal integration and interoperability.

4. The "Endorsed" agency for management of ITS industry growth.
ITSA is central to the implementation of the National Strategy for Intelligent Transport Systems, and is represented in a number of important ITS forums.

ITS Australia is an organisation ideally placed to facilitate access to information about ITS matters, and is also able to provide informed advice about the latest market developments and applications of ITS technologies.

ITSA would be pleased to assist the Inquiry by providing access to information or by assisting you in making contact with other ITS stakeholders. Furthermore, we can provide a more comprehensive technical review on a consultancy basis if required.

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GLOSSARY

ALI	Auto location identification
ATC	Australian Transport Council of Ministers
BER	Bit error rate
CDMA	Code-division multiple-access
CDPD	Cellular digital packet data
CLI	Caller line identification
DSRC	Dedicated short-range communications
EDGE	Enhanced data rate for global evolution
ETC	Electronic toll collection
FCC	US Federal Communications Commission
GPRS	General packet radio system
GPS	Global positioning system
GSM	Global system for mobile
ITS	Intelligent transport system
ITSA	Intelligent Transport Systems Australia Inc
LBS	Location based services
LMDS	Local multipoint distribution service
LoS	Level of service
MCL	Melbourne City Link
MMDS	Multichannel multipoint distribution service
QoS	Quality of service
R3A	Regional, rural and remote areas
RF	Radio-frequency
SCOT	ATC Standing Committee on Transport
SDR	Software defined radio
TDMA	Time division multiple access
UMTS	Universal mobile telecommunications services
VKS-737	Public radio service operated by Australian National 4WD Radio Network Inc
W-CDMA	Wideband CDMA
WMI	Wireless mobile internet

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