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Intelligent transport systems — Cooperative ITS —

Part 8: Liability aspects

Systèmes intelligents de transport — Systèmes intelligents de transport coopératifs —
Partie 8: Aspects relatifs à la responsabilité

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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The committee responsible for this document is ISO/TC 204, *Intelligent transport systems*.

ISO 17427 consists of the following parts, under the general title *Intelligent transport systems — Cooperative ITS*:

— *Part 2: Framework Overview* [Technical Report]

— *Part 3: Concept of operations (ConOps) for 'core' systems* [Technical Report]

— *Part 4: Minimum system requirements and behaviour for core systems* [Technical Report]

— *Part 6: 'Core system' risk assessment methodology* [Technical Report]

— *Part 7: Privacy aspects* [Technical Report]

— *Part 8: Liability aspects* [Technical Report]

— *Part 9: Compliance and enforcement aspects* [Technical Report]

— *Part 10: Driver distraction and information display* [Technical Report]

The following parts are under preparation:

— *Part 1: Roles and responsibilities in the context of co-operative ITS architecture(s)*

— *Part 5: Common approaches to security* [Technical Report]

— *Part 11: Compliance and enforcement aspects* [Technical Report]

— *Part 12: Release processes* [Technical Report]

— *Part 13: Use case test cases* [Technical Report]

— *Part 14: Maintenance requirements and processes* [Technical Report]

Further technical reports in this series are expected to follow. Please also note that these TRs are expected to be updated from time to time as the C-ITS evolves.

Introduction

Intelligent transport systems (*ITS*) are transport systems in which advanced information, communication, sensor and control technologies, including the Internet, are applied to increase safety, sustainability, efficiency, and comfort.

A distinguishing feature of '*ITS*' are its communication with outside entities.

Some *ITS* systems operate autonomously, for example 'adaptive cruise control' uses radar/lidar/and/or video to characterize the behaviour of the vehicle in front and adjust its vehicle speed accordingly. Some *ITS* systems are informative, for example 'Variable Message Signs' at the roadside, or transmitted into the vehicle, provide information and advice to the driver. Some *ITS* systems are semi-autonomous, in that they are largely autonomous, but rely on 'static' or 'broadcast' data, for example, *GNSS* based 'SatNav' systems operate autonomously within a vehicle but are dependent on receiving data broadcast from satellites in order to calculate the location of the vehicle.

Cooperative Intelligent transport systems (*C-ITS*) are a group of *ITS* technologies where service provision is enabled by, or enhanced by, the use of 'live', present situation related, dynamic data/information from other entities of similar functionality (for example from one vehicle to other vehicle(s)), and/or between different elements of the transport network, including vehicles and infrastructure (for example from the vehicle to an infrastructure managed system or from an infrastructure managed system to vehicle(s)). Effectively, these systems allow vehicles to 'talk' to each other and to the infrastructure. These systems have significant potential to improve the transport network.

A distinguishing feature of '*C-ITS*' is that data is used across *application*/service boundaries.

It is important to understand that *C-ITS* is not an end in itself, but a combination of techniques, protocols, systems and sub-systems to enable 'cooperative'/collaborative service provision, but as these aspects of transport technology advance, the issue of who is liable in the event of a crash will likely become more complex.

The question of how liability will be resolved in the event of *C-ITS* system failure will be important in providing certainty to drivers, manufacturers, insurers and road managers. It may be that, rather than technical difficulties, uncertainty regarding liability issues could prove the largest deterrent to investment in *C-ITS* service provision.

C-ITS applications will need adequate 'audit trails' in order to trace causation. The so called "human factors" will need to be carefully considered and taken into consideration.

This means that manufacturers and services providers of *C-ITS* technology need to carefully consider the safety risks of their systems and qualify their risk carefully, and road network managers will need to assess the risk implications of providing infrastructure-based *C-ITS* solutions.

We are also in a situation where expectations of system performance and liability implications are likely to change as *C-ITS applications* move from being advisory systems to overriding driver actions, and the liability issues are different between these types of system.

The purpose of this Technical Report is to identify potential critical liability issues that *C-ITS* service provision may introduce; to consider how to control, limit or mitigate such liability issues, and to limit the risk of exposure to the financial consequences of liability issues.

This Technical Report is a 'living document' and as our experience with *C-ITS* develops, it is intended that it will be updated from time to time, as and when we see opportunities to improve this Technical Report.

Intelligent transport systems — Cooperative ITS —

Part 8:
Liability aspects

1 Scope

The scope of this Technical Report is an informative document to identify potential critical liability issues that *C-ITS* service provision may introduce; to consider strategies for how to control, limit or mitigate such liability issues; and to give pointers, where appropriate, to standards deliverables existing that provide specifications for all or some of these aspects, and to limit the risk of exposure to the financial consequences of liability issues.

The objective of this Technical Report is to raise awareness of and consideration of such issues. This Technical Report does not provide specifications for solutions of these issues.

2 Terms and definitions

2.1
application
app
software application

2.2
application service
service provided by a service provider accessing data from the *IVS*, in the case of *C-ITS* (2.3), via a wireless communications network, or provided on-board the vehicle as the result of software (and potentially also hardware and firmware) installed by a service provider or to a service providers instruction

2.3
cooperative ITS
C-ITS
group of *ITS* technologies where service provision is enabled, or enhanced by, the use of 'live', present situation related, data/information from other entities of similar functionality, for example, from one vehicle to other vehicle(s), and/or between different elements of the transport network, including vehicles and infrastructure, for example, from the vehicle to an infrastructure managed system or from an infrastructure managed system to vehicle(s)

2.4
core system
combination of enabling technologies and services that will provide the foundation for the support of a distributed, diverse set of applications (2.1), and *application* transactions which work in conjunction with 'External Support Systems' such as 'Certificate Authorities'

Note 1 to entry: The system boundary for the core system is not defined in terms of devices or agencies or vendors, but by the open, standardized interface specifications that govern the behaviour of all interactions between core system users.

2.5
global navigation satellite system
GNSS
comprises several networks of satellites that transmit radio signals containing time and distance data that can be picked up by a receiver, allowing the user to identify the location of its receiver anywhere around the globe

2.6
in-vehicle system
IVS
hardware, firmware and software on board a vehicle that provides a platform to support *C-ITS* (2.3) service provision, including that of the *ITS-station* (2.8) (ISO 21217), the facilities layer, data pantry and on-board 'apps'

2.7
intelligent transport systems
ITS
transport systems in which advanced information, communication, sensor and control technologies, including the Internet, are applied to increase safety, sustainability, efficiency, and comfort

2.8
ITS-station
entity in a communication network [comprised of *application* (2.1), facilities, networking and access layer components] that is capable of executing ITS-S *application* processes, comprised of an ITS-S facilities layer, ITS-S networking & transport layer, ITS-S access layer, ITS-S management entity and ITS-S security entity, which adheres to a minimum set of security principles and procedures so as to establish a level of trust between itself and other similar *ITS-stations* with which it communicates

3 Abbreviations and acronyms

ABS	anti-lock braking system
ACC	adaptive cruise control
ADAS	advanced driver assistance systems
C-ITS	cooperative intelligent transport systems, cooperative ITS
CA	certificate authority
CVIS	cooperative vehicle-infrastructure systems (EC Project)
EC	European Commission
ESC	electronic stability control
EU	European Union
GTR	global technical requirement (UNECE)
ITS	intelligent transport systems (2.7)
IVS	in-vehicle system (2.6)
UNECE	United Nations Economic Commission for Europe
V2V	vehicle to vehicle
V2I	vehicle to/from infrastructure

4 How to use this Technical Report

4.1 Acknowledgement

Much of the inspiration for this document and its considerations and content originate from the reports "*Cooperative ITS Regulatory Policy Issues*" and "*Cooperative Intelligent Transport Systems Policy Paper*" National Transport Commission, Australia.[1][17] And this source is acknowledged and thanked.

Contribution from various TCA (Transport Certification Australia) documents is acknowledged.

4.2 Guidance

This Technical Report is designed to provide guidance and a direction for considering the issues concerning liability associated with the deployment of *C-ITS* (2.3) service provision. It does not purport to be a list of all potential liability factors — which will vary according to the regime of the jurisdiction and to the form of the instantiation. Rather, it discusses the major issues, and provides guidance and direction for considering and managing the future and instantiation specific deployment of *C-ITS*.

4.3 C-ITS 'Liability' aspects

This part if ISO/TR 17427 explores potential business, organisational and regulatory approaches to address liability concerns, and particularly the combination of such aspects in order to manage liability issues related to *C-ITS* service provision.

As transport technology advances, the issue of who is liable in the event of a crash will potentially become more complex. The question of how liability would be resolved in the event of *C-ITS* system failure will be important in providing certainty to drivers, manufacturers, insurers and road managers. It is expected that the number of crashes would be reduced significantly in a fully *C-ITS* equipped environment, however crashes would still occur, with some specific *C-ITS* related reasons such as the following:

— data communication failure or interference;

— conflicting or erroneous warnings being provided to drivers;

— driver failing to respond to a warning received;

— driver over-reliance on the technology;

— driver switching off the *C-ITS* and being involved in injury to a third party that may have been avoided had he been receiving the benefits of the service.

A number of other scenarios could also be imagined, involving either the failure of the technology, limitations of the technology in different conditions or problems in the interaction between the driver and the technology. *C-ITS applications* (2.1) draw together the whole range of parties typically involved in the transport network, including road agencies, drivers, operators and manufacturers.

While *C-ITS application*s have significant potential to increase road safety, crashes will continue to occur and liability issues will arise. *ITS application*s in general raise some broad liability risks.

Within any jurisdiction, any guidance or legislation that seeks to deal with the issues raised by *ITS* based solutions will have to interact with the current regulatory framework in a sufficiently clear and delineated manner and will have to deal with a wide range of causes of liability including the following:

— device or system failure;

— conflict between multiple *ITS* products;

— operator information overload;

— loss of operator attention;

— risk compensation;

— incorrect interpretation of information;

— liability arising as a result of the interaction of both enabled and conventional vehicles.

Although most *C-ITS* service provision is designed to, and overall may be proven to, improve safety and reduce or mitigate death and injury, it must be recognized that *C-ITS applications* could potentially cause a collision, for example, when such an *application*

— fails to provide an appropriate warning in the lead-up to a collision,

— provides incorrect information (for example, in regard to the local speed zone),

— provides a misleading warning (for example, the direction of a potential collision is unclear),

— provides a warning which distracts the driver, leading to a crash, and

— overrides the driver's action in a way that causes a collision (for example, a brake assist *application* that causes a vehicle to brake suddenly in the middle of fast moving traffic).

Failure to provide appropriate warnings could result from a range of sources, including software problems (including those introduced as part of upgrades), limitations on sensors, signal interference, lack of accuracy in mapping or positioning information or other sources. The exact list will depend on the specific *applications* and whether they are merely advisory systems or more interventionist systems.

It is important to understand that liability concerns have been raised as a potential disincentive for manufacturers to develop *C-ITS applications* and other safety systems: '*these technologies pose challenges for manufacturers and may increase their liability risk in ways that discourage the efficient introduction of these technologies*'.[5][6]

The introduction of airbags by the US National Highway Traffic Safety Administration (NHTSA) is a cautionary example, where even safety technology with significant benefits can have unintended consequences.

In 1977, in the USA, NHTSA estimated that air bags would save on the order of 9,000 lives per year and based its regulations on these expectations. Today, by contrast, NHTSA calculates that air bags saved 8,369 lives in the 14 years between 1987 and 2001. Simultaneously, however, it has become evident that air bags pose a risk to some passengers, particularly smaller passengers, such as women of small stature, the elderly, and children. NHTSA determined that 291 deaths were caused by air bags between 1990 and July 2008, primarily due to the extreme force that is necessary to meet the performance standard of protecting the unbelted adult male passenger. Houston and Richardson describe the strong reaction to these losses and a backlash against air bags, despite their benefits.[6]

In another scenario, The European Commission has supported and encouraged the use/implementation of 'Electronic Stability Control' through the development of a UNECE regulation Global technical regulation No. 8 'Electronic Stability Control Systems'. The EU has adopted UNECE GTR's as a requirement for vehicles sold in the EU. "*Crash data studies conducted in the United States of America (U.S.), Europe, and Japan indicate that ESC is very effective in reducing single-vehicle crashes. Studies of the behaviour of ordinary drivers in critical driving situations (using a driving simulator) show a very large reduction in instances of loss of control when the vehicle is equipped with ESC, with estimates that ESC reduces single-vehicle crashes of passenger cars by 34 per cent and single-vehicle crashes of sport utility vehicles (SUVs) by 59 per cent. The same recent U.S. study showed that ESC prevents an estimated 71 per cent of passenger car rollovers and 84 per cent of SUV rollovers in single-vehicle crashes. ESC is also estimated to reduce some multi-vehicle crashes, but at a much lower rate than its effect on single-vehicle crashes. It is evident that the most effective way to reduce deaths and injuries in rollover crashes is to prevent the rollover crash from occurring, something which ESC can help accomplish by increasing the chances for the driver to maintain control and to keep the vehicle on the roadway. It is expected that potential benefits would be maximized by fleet-wide installation of ESC systems meeting the requirements of this gtr.*"

