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Intelligent transport systems (ITS) — Communications — ITS communication role and functional model

Systèmes de transport intelligents (ITS) — Communications — Rôle des communications et modèle fonctionnel des ITS

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Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Abbreviated terms **1**
5 ITS communication functions **1**
5.1 General 1
5.2 Cyber security in ITS application services 2
5.3 Moving data between actors 2
5.4 Connected vehicle/device environment 2
5.4.1 General 2
5.4.2 Low latency 2
5.4.3 Multi-device access capability 2
5.4.4 Network slicing 2
5.4.5 Carrier aggregation 3
5.4.6 Propagation speed difference between wired and wireless environments 3
5.4.7 Radio frequency spectrum sharing 3
5.4.8 Open radio access network 3
5.4.9 Cloud network 3
6 Role and function model **3**
6.1 Objective 3
6.2 National variations 3
6.3 Basic role model architecture 4
6.3.1 General 4
6.3.2 Smart city sensor data (probe data) 4
6.3.3 3D HD map 4
6.3.4 Digital infrastructure 4
6.3.5 Mobility supporting facility 5
6.3.6 Physical infrastructure platform 5
6.3.7 ITS service providers 5
6.3.8 Communication (communication service provider) 5
6.3.9 Mobility users 5
6.4 Application layer role and functional model for ITS application service 5
6.4.1 General 5
6.4.2 Role and functional model options 6
6.4.3 Certification of service providers 6
6.5 ITS service role and functional model 6
Bibliography **8**

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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 document 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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This document was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Currently, more than 70 % of the world's people live in cities. The proportion of people living in cities is rising around the world as civilizations develop and congregate around cities where employment opportunity most arises. Societies develop more innovatively and more rapidly in cities; and cities present better entertainment opportunities, all adding to their attraction and popularity; hence, the continuing trend. The Economist magazine recently forecast that by 2045 an extra two billion people will live in urban areas. Due to the concentration of the population that this causes, various issues arise such as road congestion due to increase in vehicle population, and environmental pollution due to exhaust gas and tire erosion. This has been attributed to increases in the number of delivery trucks, taxis, and town centre traffic which is further exacerbated by obstacles and effective use of urban space due to private ownership of cars (parking lots, street parking).

It is recognized that there is also road infrastructure deterioration, lack of provision of information on the use of public transportation, driver shortages, and inconvenience of multimodal fare payments. The action to improve this situation is urgently needed.

Changing consumer tastes are also calling for new types of infrastructure. Today’s city dwellers, for example, increasingly shop online and expect ever faster delivery times. To meet their needs, modern urban areas need the support of last-minute distribution centres, backed by out-of-town warehouses.

In recent years, European studies on the development of mobility integration standards have been active to solve urban problems. Important key factors are the core architectural elements of smart cities, including urban intelligent transport system (ITS) sharing of probe data (also called sensor data), connected cars, automated driving, and communication infrastructure. In addition, current issues have been recognized with the introduction of the connected car to the real world in respect of privacy protection, the need to strengthen security measures, big data collection, and processing measures, which are becoming important considerations.

In terms of effective use of urban space, it is hoped that the introduction of connected cars and automated driving can significantly reduce the requirements for urban parking lots (redistribution of road space). If technology can eliminate congestion, city road area usage can also be minimized - reallocated (space utilization improvement) to improve the city living environment/quality of life. In addition, the environment around the road will be improved by improving enforcement (e.g. overloaded vehicles). Even in rural areas it is possible to introduce automated driving robot taxis and other shared mobility that saves labour (and is, therefore, more affordable) and improves mobility for those who do not drive (e.g. the elderly and those with disabilities). The communications will play a significant role.

Achieving this requires the realization of various issues. Some examples are as follows:

— cooperation with harmonization of standards such as ISO and existing industry standards;

— recognition of the significance of international standardization (for example, to reduce implementation costs);

— recognition of the significance of harmonization activities by countries around the world.

As mentioned previously, automated driving mobility is expected to play a significant role both in cities and in rural areas. The main effects are reduction of traffic accidents, reduction of environmental burden, elimination of traffic congestion, and realization of effective use of urban space.

ITS technology is a crucial element for realizing ‘smart’ cities; and it is important to clearly understand the role model of ITS application services when developing standards to achieve these objectives.

This document is intended to be an important guidebook for this objective. Considering the emerging direction of mobility electrification, automated driving, and the direction of an environmentally friendly society, incorporating other urban data such as traffic management into the city management will improve the mobility of urban society. It is important to identify the importance of the communication role that connects all related actors in the framework with necessary security measures. To consider this, the creation of a common open role model for communication platforms is important. The platforms will be necessary

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for the realization of the future mobility services such as automated driving vehicles. A common role model will be developed for all modes of vehicles, including public transport, general passenger vehicles, and heavy vehicles. The incorporation of electronic regulation is especially important for automated vehicles, and it is essential to incorporate it as a core element of urban ITS.

This document describes how ITS data can be presented, interchanged, and used by smart cities by using communications. This document does not describe smart city use cases for ITS data in detail, nor does it describe in detail any specific ITS use cases; instead, this document focuses on the generic role model for data exchange between ITS and smart cities.

ISO 21177 establishes the necessary security and data exchange protocols to provide a 'secure ITS interface' (i.e. exchange information with bi-directional protection).

ISO 21177 enables two devices to cooperate in a trusted way (i.e. exchange information in secure application sessions, and thus only access data or request data that it has the appropriate credentials to access).

Multiple standards have been published regarding communication media, communication security, networking, ITS Station architecture, and ITS station management. It is true that as these standards are used for ITS services to cooperate with various related services such as smart city and mobility as a service (MaaS), the role and functions of communication also have a tendency to be changed.

One of this document's purposes is to reorganize the role-function model of communication corresponding to the smart city/MaaS era from the viewpoint of standardization.

This document can contribute to the development of communications standards for the mobility system service business cases other than system services described within this document.

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Intelligent transport systems (ITS) — Communications — ITS communication role and functional model

1 Scope

This document describes a basic role model of communications as a common platform for ITS services including cooperative service in smart city areas:

a) a framework for the provision of a communication service;

b) a description of the concept of operations and the role models;

c) a conceptual architecture between actors involved in the provision/receipt of communication;

d) references for the key documents on which the architecture is based;

e) a taxonomy of the organization of generic procedures, with a focus on the basic role and functional model of service for the introduction of communications including infrastructure facilities to support mobility in urban and rural areas.

In-vehicle control system is not within the scope of this document.

The scope of this document is limited to the communications using physical and digital infrastructure.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Abbreviated terms

EV electric vehicle

PKI public key infrastructure

5 ITS communication functions

5.1 General

The ITS communication, which connects various actors in ITS service framework, needs various functions to perform necessary capabilities for ITS application services.

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