Technical Report

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Intelligent transport systems — Roadside infrastructure supported location-based services on nomadic and mobile devices for urban connected automated mobility —

Part 1: General information and use case definition

Systèmes de transport intelligents — Services basés sur la localisation supportés par l'infrastructure routière pour les appareils nomades pour une mobilité automatisée et connectée —

Partie 1: Informations générales et définition des cas d'utilisation

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Foreword

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Introduction

Conventional road safety services in intelligence transport systems (ITS) area have been mostly provided as vehicle-centred road safety services by exchanging road safety ITS messages among ITS stations (i.e. roadside ITS station, central ITS station, vehicle ITS station). However, even though lots of ITS based road safety services have been deployed in an urban localized area such as signalized intersection, roundabout, T-intersection, etc., the fatality rate related with a vulnerable road user (VRU) such as pedestrians, bicyclists as well as road vehicles without equipped ITS stations still remains high.

In order to improve road safety of VRUs, a nomadic device (i.e. a personal ITS station) can be used as a not only short range vehicle to everything (V2X) communication-supported device but also a long range V2X communication-supported device to exchange status and intent messages with conventional ITS stations including personal ITS station, vehicle ITS station, roadside ITS station, and central ITS station. In addition, a sensor-equipped roadside ITS station with an AI-supported road user behaviour detection function can support overall road safety enhancement services. It does so by sharing road users' status or intents information with nomadic device road users such as VRUs and road vehicles without equipped ITS stations.

This document specifies general information and use-cases to provide road safety enhancement services in a localized urban area by sharing status or intent messages between all types of road users with nomadic device and conventional ITS stations including a sensor-equipped roadside ITS station.

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3.2
central system
intelligent transport system (ITS) in the backend, e.g. traffic control centre, traffic management centre, edge or cloud system operated by road authorities, ITS application suppliers or automotive OEMs equipped with a central ITS station

3.3
connected vehicle
vehicle that contains a connected device

3.4
hybrid communications
composition of multiple access technologies and communication protocols combined to provide complementary or redundant communication channels

[SOURCE: ISO 21217:2020, 3.7]

3.5
intent
planned future behaviour of a road user, including but not limited to trajectory, speed, turning direction, and lane change

3.6
intelligent transport system (ITS) station
ITS station
ITS-S
functional entity comprised of an ITS-S facilities layer, ITS-S networking and transport layer, ITS-S access layer, ITS-S management entity, ITS-S security entity and ITS-S applications entity providing ITS services

Note 1 to entry: From an abstract point of view, the term "ITS station" refers to a set of functionalities. The term is often used to refer to an instantiation of these functionalities in a physical unit. Often, the appropriate interpretation is obvious from the context. The proper name of the physical instantiation of an ITS-S is ITS station unit (ITS-SU).

[SOURCE: ISO 21217:2020, 3.15]

3.7
localized communications
communications with nearby stations without involving support of an infrastructure network

[SOURCE: ISO 21217:2020, 3.53]

3.8
networked communication
communication using support of an infrastructure network

[SOURCE: ISO 21217:2020, 3.60, modified — "communications" revised to "communication".]

3.9
sensor-equipped roadside intelligent transport system (ITS) station
roadside ITS station with equipped sensors such as camera, LiDAR, or radar which make vehicle to everything (V2X) more comprehensive with object perception, detection and tracking functionalities

3.10
vehicular WiFi
short-range *localized communications* (3.8) WiFi *access technology* (3.1) specifically designed for vehicular localized communications

Note 1 to entry: An example of vehicular WiFi is IEEE 802.11 operating outside the context of a basic service (OCB), also known as IEEE 802.11p[51], used in the 5,9 GHz frequency range reserved for ITS services with profile standards named ITS-G5 (ETSI) in Europe and Australia, and US-DSRC in North America and their harmonization at ISO (ITS-M5).

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3.11
vulnerable road user
VRU
non-motorized road user, such as a pedestrian and cyclist as well as a motor-cyclist and person with disabilities or reduced mobility and orientation

3.12
vehicle to network to everything
V2N2X
anything connected to a vehicle via a "network" connected to networked communication

3.13
vehicle to network to everything ecosystem
V2N2X ecosystem
comprehensive interaction system in which data is exchanged between various types of ITS stations connected by networked communication

Note 1 to entry: Data can be exchanged based on interaction between information sharing instances connected to a central ITS station.

3.14
vehicle to network to everything intelligent transport system message
V2N2X ITS message
message exchanged between ITS stations (e.g., vehicle ITS station, personal ITS station, RSU ITS station and central ITS station) connected to the networked communication to provide any ITS service

3.15
vehicle to network to everything container
V2N2X container
part of a message exchanged via networked communication that contains metadata necessary to provide interoperable services

4 General Information

4.1 Nomadic device supported road safety service

Nomadic device supported road safety services can be categorized as road safety enhancing services and road safety critical services[1] as below:

— nomadic device supported road safety enhancing services can enhance the safety of the road user including not only the VRU but also the driver with nomadic device from potential road accident or work zone. To provide road safety enhancing services, the road users with nomadic device such as VRU, driver inside a connected or non-connected vehicle can share timely and relevant road safety enhancing information in the form of a standardized V2X message to each other in the order of seconds;

— nomadic device supported road safety critical services can improve the safety of the road user including not only the VRU but also the driver with nomadic device from immediately following the vehicle to vehicle or vehicle to VRU collision. To provide road safety critical services, the road users with nomadic device such as VRU, driver inside a connected or non-connected vehicle can share timely and relevant road safety critical information in the form of standardized V2X message to each other in micro-seconds;

sensor-equipped roadside ITS stations can provide both road safety enhancing information and critical information of road users without nomadic device to road users with nomadic device.

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