INTERNATIONAL STANDARD

ISO 20529-2

First edition
2021-11

Intelligent transport systems — Framework for Green ITS (G-ITS) standards —

Part 2: Integrated mobile service applications

Systèmes intelligents de transport - Cadres de référence pour les normes ITS vertes (G-ITS) —
Partie 2: Applications de services mobiles intégrés

Reference number
ISO 20529-2:2021(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

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

A list of all parts in the ISO 20529 series can be found on the ISO website.

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.

Introduction

Work by ISO/TC 204 on nomadic and portable devices for intelligent transport systems (ITS) services is defined to facilitate the development, promotion and standardization of the use of nomadic and portable devices to support ITS service provision and multimedia use (such as passenger information, automotive information, driver advisories and warning systems and entertainment system interfaces) to ITS service providers and motor vehicle communication networks. This document fosters the introduction of multimedia and telematics nomadic devices in the public transport and the automotive world.

Intelligent transport systems — Framework for Green ITS (G-ITS) standards —

Part 2: Integrated mobile service applications

1 Scope

This document provides information and requirements for identifying cost-effective technologies and related standards required to deploy, manage and operate sustainable “green” ITS technologies in surface transportations with eco-mobility. These ITS technologies can increase operational efficiencies and unlock enhanced transportation safety and eco-mobility applications.

The ISO 20529 series builds on the existing standards and best practices of transport operation and management systems, as well as ITS applications, and aims to accommodate the specific needs of eco-mobility.

G-ITS standards are expected to focus on the use of data exchange interface standards to enable the deployment of cloud-based multi-modal mobility solutions using wireless networks and nomadic devices. These forward-looking solutions are “infrastructure light” and can thus impact developing regions with little or no legacy transportation infrastructure.

This document is intended to provide mobility information according to user preference on demand, utilizing a variety of existing apps on nomadic devices related to various means of transport. An integrated mobility information platform is defined in this document as a service methodology to be integrated with a variety of mobile apps with respect to different modes of transport.

The framework described in this document includes:

- Identification of implementation aspects of related standards by means of use case.
- Identification of the multi-modal transport information necessary to support G-ITS.
- Eco-friendly route guidance according to user preference.
- Smart modal choice service based on carbon footprint, fuel efficiency and carbon-free zones for G-ITS.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 14817-1, *Intelligent transport systems — ITS central data dictionaries — Part 1: Requirements for ITS data definitions*

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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/

3.1.1
nomadic device
ND
implementation of a *personal ITS station* (3.1.2) which provides communication connectivity via equipment such as cellular telephones, mobile wireless broadband (WIMAX, HC-SDMA, etc.) or WiFi, and includes short range links, such as Bluetooth or Zigbee to connect portable devices to the motor vehicle communications system network

[SOURCE: ISO 18561-1:2020, 3.1.1]

3.1.2
personal ITS station
P-ITS-S
implementation of an ITS station in a personal ITS subsystem

[SOURCE: ISO 18561-1:2020, 3.1.2]

3.1.3
roadside ITS station
R-ITS-S
system installed at the roadside that receives and processes vehicular and pedestrian information within a certain zone and determines the situation in order to provide a safety warning and parking guide service to vehicles and pedestrians

[SOURCE: ISO 18561-1:2020, 3.1.3]

3.1.4
Green ITS
G-ITS
new-concept transportation system expected to arise following the paradigm shift toward eco-friendly, low-carbon green growth as global policies in the transportation sector

[SOURCE: ISO 18561-1:2020, 3.1.4, modified — added "in the transportation sector".]

3.1.5
eco-mobility
eco-transport systems and services based on eco-vehicles and their related facilities

[SOURCE: ISO 18561-1:2020, 3.1.5]

3.1.6
central ITS station
ITS station assuming a central role

[SOURCE: ISO 18561-1:2020, 3.1.6]

3.1.7
eco-mileage
incentive given to transport users who voluntarily cut back on fossil fuels in utilizing transportation modes

3.2 Abbreviated terms

ASN.1 **abstract syntax notation one**

C conditional

Cvt convention (M, O, C, S)

M mandatory

MaaS mobility as a service

MoD mobility on demand

O optional

S structure

WiFi wireless fidelity

WIMAX worldwide interoperability for microwave access

4 Document overview and structure

This document provides all documents and references required to support the implementation of the requirements related to standardized access to the framework for green ITS (G-ITS) personal ITS stations. The ISO 20529 series consists of the following documents:

— Part 1: General information and use case definition

This part provides an overview of the ISO 20529 series and document structure along with the use case definition and common set of resources (definitions, references), which are used for all subsequent parts.

— Part 2 (this document): Integrated mobile service application and specification

This document specifies all technical requirements related to the integrated mobile service application for G-ITS to be used on the personal ITS station and to be interfaced with the central ITS station, vehicle ITS station and roadside ITS station. The requirements reflect the user services from the use cases as specified in the relevant sections of ISO 20529-1. The protocol shall be defined according to the requirements as specified in ISO 14817-1.

5 General information

5.1 Purpose of this document

This document addresses three major areas:

— Identification of the requirements of application level framework for green ITS (G-ITS) services, that can be frequently inserted, modified and deleted;

— Identification of the method to describe the general information for all subjects related to G-ITS services on the personal ITS station interfaced with the central ITS station, vehicle ITS station, and roadside ITS station;

— Specification of the general use cases that should be included for the G-ITS services.

5.2 Overview of G-ITS services

The document mainly describes eco-mobility services, eco-information, navigation and guidance.

ISO/TC 204 plans to develop standards, specifications and informational reports for central and local government officials who intend to manage and operate green ITS in their respective cities with eco-mobility.

Examples include the delivery and management of ITS services using wireless networks and personal nomadic devices, as well as the use of commercial off-the-shelf technologies and services, such as smartphone apps for public transit route planning and obtaining road congestion information for use by traffic management centres and personal route planning, etc.

The green ITS standard framework will build on the existing standards and best practices in transport operation and management systems and ITS applications, but will be customized to accommodate the specific needs of eco-mobility in countries and cities. This includes:

— the surveying and identification of appropriate ITS technologies and corresponding standards required to deploy eco-mobility systems and services and infrastructure in the cities;

— the identification of gaps and proposed revisions/amendments to existing standards where appropriate; and

— the development of a standard framework for the deployment and management of green ITS standards.

As increased urbanization and traffic congestion contribute to climate change and impact on the quality of life and economic activities in many cities, ITS hold the promise of a better future. The challenges of G-ITS standards are:

— the creation of a mobility ecosystem where consumers can avail themselves of various mobility services through the use of mobile applications or web interfaces through nomadic devices that can allow them to plan, travel and pay for mobility services that best fit their needs;

— the evolution of transportation in regions from an isolated, stove-piped network of public transit, toll, parking, taxi, and other transportation services to a more integrated, multi-modal, convergence of publicly delivered and privately delivered mobility services;

— addressing the new mobility ecosystem in grass roots partnerships between public transport and shared mobility services, as well as through mobile mobility and demand management application providers that provide multi-modal trip planning, targeted traveller information, and increasingly, payment.

6 Use case overview and definitions

6.1 Use case overview

6.1.1 Basic principles for use cases

Basic use cases are separated into two steps:

a) making a choice of routes according to user preference;

b) deciding on a mode of transport, either by passenger car or not (modal choice).

The G-ITS services shall include the following group of use cases:

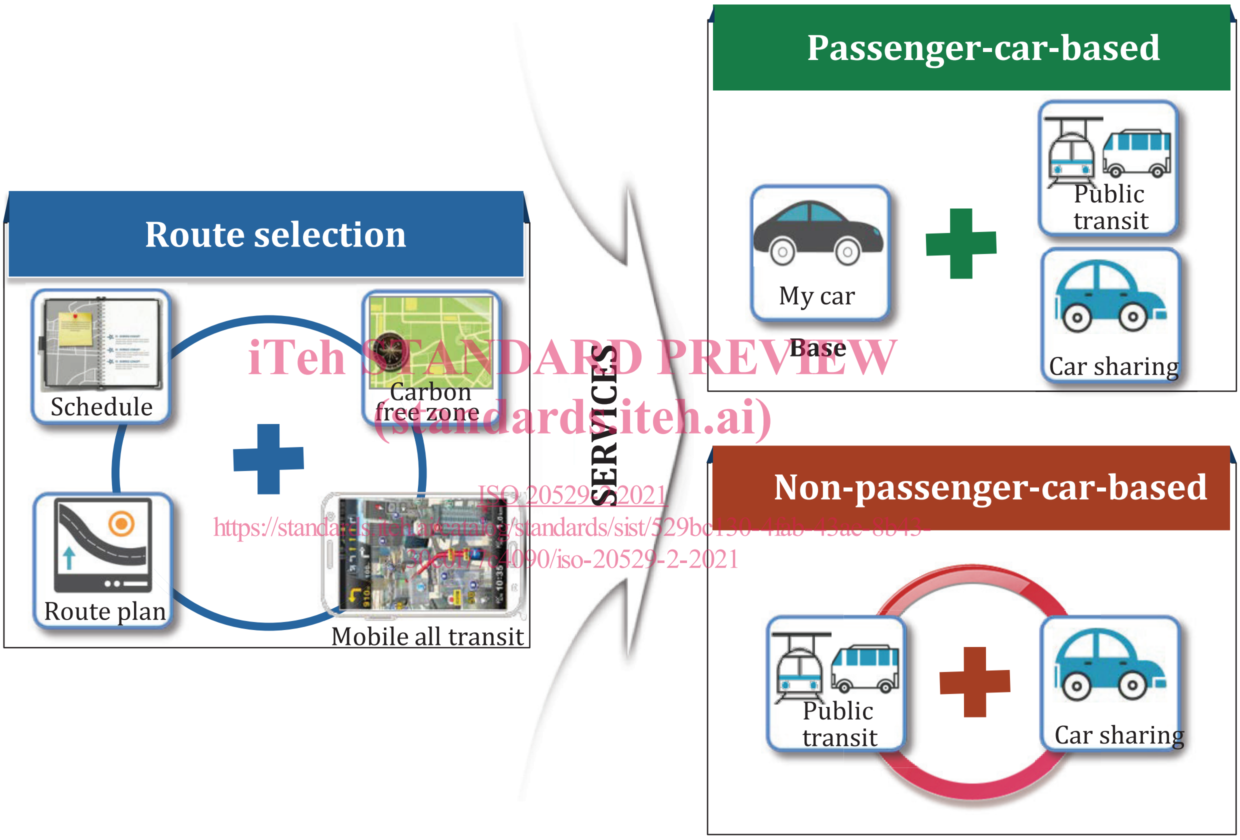

Figure 1 — Use case overview

Route choices are based on user preferences, including personal trip schedule and plans, previous route selections, mobile all transit or mobility on demand, carbon-free zone, etc.

Modal choices include either taking a passenger car from the beginning of a personal trip, including park and ride with public transport for a connection, or else riding public transit including car sharing, etc. from the beginning of the trip.

6.1.2 Use case clusters

Table 1 provides an overview of the different use case categories.

Table 1 — Use case clusters and associated use case overview

	Title of use case cluster	Brief description
Route selection	1. Route selection	Route choice service based on user preference according to personal trip schedule and plans, and a variety of mobility information from central ITS stations such as mobile all transit or mobility on demand, carbon-free zone, etc. — UC 1.1 – User schedule interworking — UC 1.2 – Route plan (based on traffic information) — UC 1.3 – Carbon-free zones information — UC 1.4 – Mobile all transit
Passenger-car-based	2. All-day driving	Modal choice service of taking a passenger car all day from the beginning of a personal trip. — UC 2.1 – On-trip eco-driving support — UC 2.2 – Route guidance and navigation — UC 2.3 – Variable parking charging — UC 2.4 – Variable area/road access charging
Passenger-car-based	3. Driving and public transportation	Modal choice service of taking a passenger car from the beginning of a personal trip and transferring to public transport after park and ride. — UC 3.1 – On-trip eco-driving support — UC 3.2 – Route guidance and navigation — UC 3.3 – Variable parking charging — UC 3.4 – Park and ride guidance — UC 3.5 – Personalized multi-modal navigating
	4. Driving and car sharing	Modal choice service of taking a passenger car from the beginning of personal trip and transferring to shared mobility such as car sharing, ride sharing, etc. — UC 4.1 – On-trip eco-driving support — UC 4.2 – Route guidance and navigation — UC 4.3 – Variable parking charging — UC 4.4 – Variable area/road access charging
Non-passenger- car-based	5. All-day public transportation	Modal choice service of taking public transit all day including bus, subway, etc. — UC 5.1 – Park and ride guidance — UC 5.2 – Personalized multi-modal navigating
	6. All-day car sharing	Modal choice service of taking shared mobility all day including car sharing, ride sharing, etc. — UC 6.1 – On-trip eco-driving support — UC 6.2 – Route guidance and navigation — UC 6.3 – Variable parking charging — UC 6.4 – Variable area/road access charging
	7. Public transportation and car sharing	Modal choice service of taking a combination of public transport such as bus, tram, subway, etc. and shared mobility, such as car sharing, ride sharing, etc. — UC 7.1 – On-trip eco-driving support — UC 7.2 – Route guidance and navigation — UC 7.3 – Variable parking charging — UC 7.4 – Park and ride guidance — UC 7.5 – Personalized multi-modal navigating

6.2 Use case definition

6.2.1 Service applications 1: Route selection

6.2.1.1 UC Cluster 1: Route selection

6.2.1.1.1 Introduction

Figure 2 shows the route selection service flow for use case cluster 1.

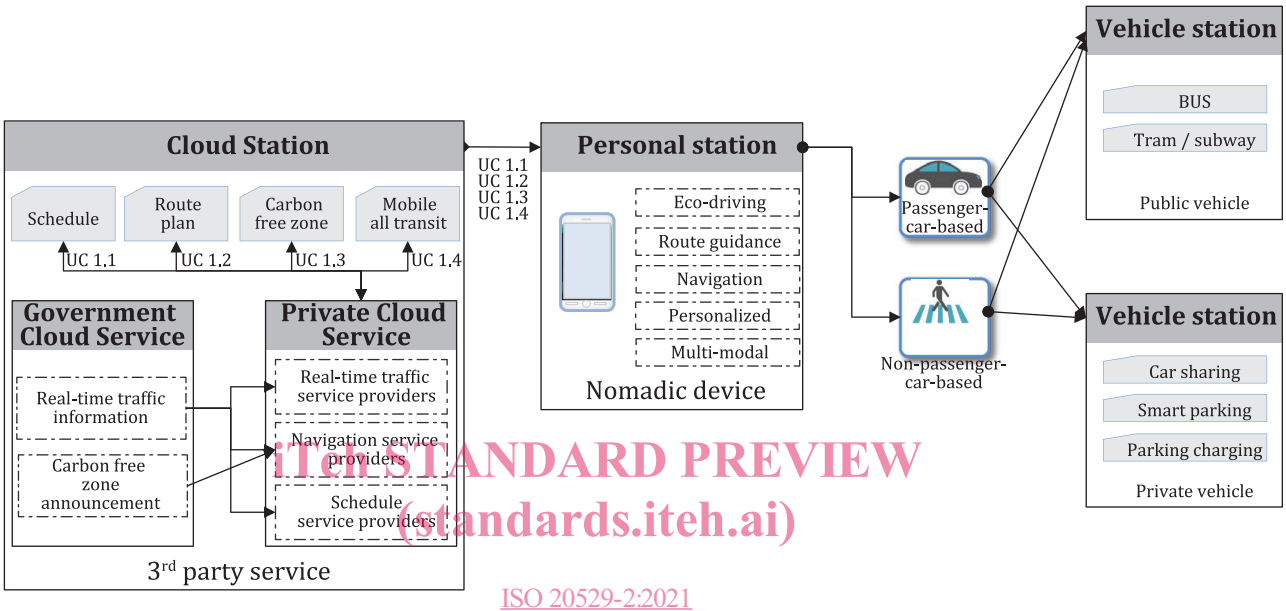

Figure 2 — Route selection service flow

6.2.1.1.2 User schedule interworking

Table 2 shows the definition and message set for user schedule interworking, in order to navigate and guide by intermodal journey planning.

Table 2 — UC 1.1 User schedule interworking

Use case	**Cluster**	**1. Route selection**
	Name	**UC 1.1 — User schedule interworking**
	Brief description	Intermodal journey planning involves using two or more transport modes in a journey. Travellers can choose a smart way to complete the trip by taking the options of a variety of intermodal journey plans that have been devised to help travellers to plan and schedule their route guidance, where they reduce dependence on driving vehicles as the major mode of ground transportation and increase the use of public transport. This information shall include: — Intermodal journey planning information — Eco-route guidance and journey planner
	Actor	Public transport provider, nomadic device
	Goal	Eco-information, navigation and guidance by intermodal journey planning
	Input	Intermodal journey planning information
	Output	Eco-route guidance and journey planner
	Processing steps	1) User (traveller) inputs a new day trip schedule or updates the existing schedule to save it by setting alarms. 2) User enquires about his/her existing schedule using a search condition. 3) Server sends search results corresponding to the schedule requested to the user. 4) Server pushes alarm service to user on time according to schedule in case of a request by user. 5) User chooses one option from “cancel”, “change”, or “confirm”. 6) Server applies one of the following options based on the user selection: a) In case of “cancel”, reset the values of status minimal. b) In case of “change”, move to screen to update the schedule. c) In case of “confirm”, request reset the values of status to be minimal. 7) If the user confirms, the server sends an anticipated way of travel based on the schedule.

Message	**Step No.**	**Name**	**Subclause**	**Exe**	**Description**
	1)	Schedule-Info-Edit	7.1	P-ITS-S	Standardized format of schedule to be edited and registered by users to the server.
	2)	Schedule-Info-Req	7.2	P-ITS-S	Keyword to search the schedule of users.
	3)	Schedule-Info	7.3	V-ITS-SG	Item lists of the schedule by users.
	4)	Notice-Message	—	V-ITS-SG	A text type of information, warning, and/or alarm to users.
	5)	User-Response	7.19	P-ITS-S	A value of users’ choice.
	7)	Route-Plan-Res	7.7	V-ITS-SG	Information on routes to destination provided to users.

6.2.1.1.3 Route plan

Table 3 shows the definition and message set for route plan, in order to provide the combining transportation services from public and private transportation.

Table 3 — UC 1.2 Route plan

Use case	**Cluster**	**1. Route selection**			
	Name	**UC 1. 2 Route plan (based on traffic information)**			
	Brief description	Mobility as a service (MaaS) describes a shift away from personally owned modes of transportation and towards mobility solutions that are consumed as a service. This is enabled by combining transportation services from public and private transportation providers through a unified gateway that creates and manages the trip, which users can pay for with a single account. The key concept behind MaaS is to offer the travellers mobility solutions based on their travel needs. This information shall include: — MaaS or MoD requests — Eco-mobility service provision			
	Actor	MaaS or MoD provider, nomadic device, cloud server			
	Goal	Eco-mobility service by MaaS or MoD			
	Input	Eco-mobility service request by nomadic devices			
	Output	Eco-mobility utilization			
	Processing steps	1) User (traveller) chooses a mode of transport (personal car or public transport) and requests route guidance according to origin and destination. 2) In case of personal car mode, the server provides a list of routes with respect to optimal distance, minimal time, minimal cost, etc. 3) In case of public transport mode, the server provides a list of routes with available transit modes and cost of travel. 3.1) To request an available list for reservation of public transit (bus, rail, etc.) in the route. 3.2) To send available seats for reservation of public transit (bus, rail, etc.) in the route. 3.3) To reserve seat in the selected public transit. 4) Once the route and mode are selected, the server provides information on eco-mileage points to be added or deducted according to the vehicle type and carbon-free zone location included in the route from origin to destination. 5) Once the route and mode are selected, the server provides information on traffic accidents, road construction, congestion, etc. included in the route from origin to destination.			
Message	**Step No.**	**Name**	**Subclause**	**Exe**	**Description**
	1)	Route-Plan-Req	7.4	P-ITS-S	Request for route guidance according to user's way of travel.
	2)	Route-Plan-Info	7.5	V-ITS-SG	Sending of the anticipated route list upon the request by user.
	3.1)	Route-Pub-Req	7.6	P-ITS-S	Request for public transit information for the route.
	3.2)	Route-Pub-Res	7.7	V-ITS-SG	Sending of the available seats list in the public transit modes.
	3.3)	User-Response	7.19	P-ITS-S	Request for public transit reservation for the route.
	4)	Notice-Message	—	V-ITS-SG	A text type of information, warning, and/or alarm to users.
	5)	Notice-Message	—	V-ITS-SG	A text type of information, warning, and/or alarm to users.