INTERNATIONAL STANDARD

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# 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*

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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).

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.

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# 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.

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# 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.

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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**

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| | |
|---|---|
| **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.

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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.

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# 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:

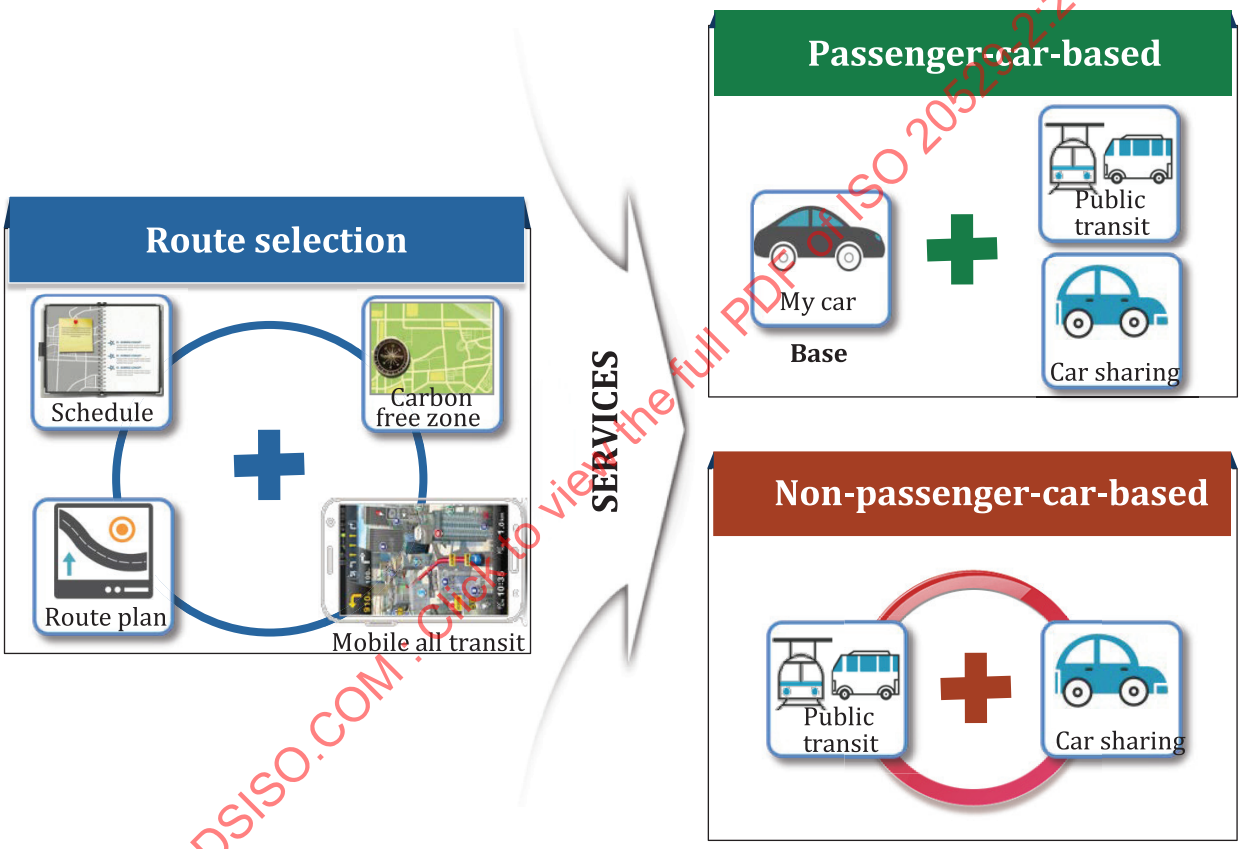


**Figure 1 — Use case overview**

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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.

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**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.<br>— UC 1.1 – User schedule interworking<br>— UC 1.2 – Route plan (based on traffic information)<br>— UC 1.3 – Carbon-free zones information<br>— 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.<br>— UC 2.1 – On-trip eco-driving support<br>— UC 2.2 – Route guidance and navigation<br>— UC 2.3 – Variable parking charging<br>— 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.<br>— UC 3.1 – On-trip eco-driving support<br>— UC 3.2 – Route guidance and navigation<br>— UC 3.3 – Variable parking charging<br>— UC 3.4 – Park and ride guidance<br>— 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.<br>— UC 4.1 – On-trip eco-driving support<br>— UC 4.2 – Route guidance and navigation<br>— UC 4.3 – Variable parking charging<br>— 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.<br>— UC 5.1 – Park and ride guidance<br>— 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.<br>— UC 6.1 – On-trip eco-driving support<br>— UC 6.2 – Route guidance and navigation<br>— UC 6.3 – Variable parking charging<br>— 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.<br>— UC 7.1 – On-trip eco-driving support<br>— UC 7.2 – Route guidance and navigation<br>— UC 7.3 – Variable parking charging<br>— UC 7.4 – Park and ride guidance<br>— UC 7.5 – Personalized multi-modal navigating |

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## 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.

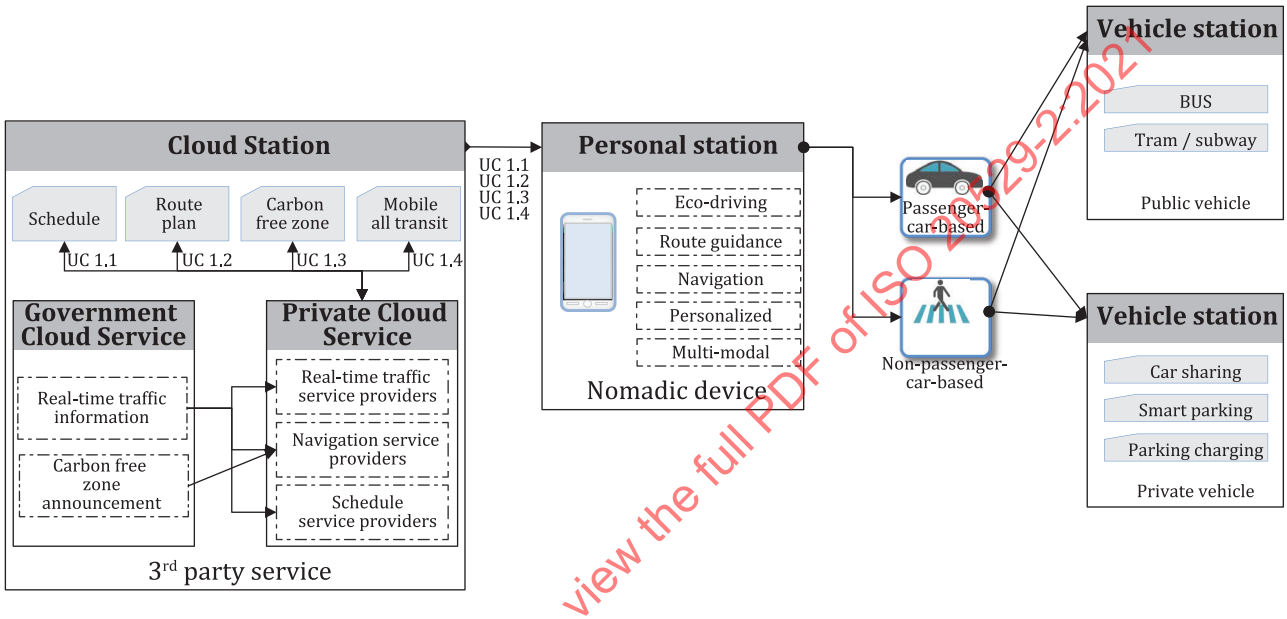


**Figure 2 — Route selection service flow**

##### 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.

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**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.<br>This information shall include:<br>— Intermodal journey planning information<br>— 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.<br>2) User enquires about his/her existing schedule using a search condition.<br>3) Server sends search results corresponding to the schedule requested to the user.<br>4) Server pushes alarm service to user on time according to schedule in case of a request by user.<br>5) User chooses one option from “cancel”, “change”, or “confirm”.<br>6) Server applies one of the following options based on the user selection:<br>a) In case of “cancel”, reset the values of status minimal.<br>b) In case of “change”, move to screen to update the schedule.<br>c) In case of “confirm”, request reset the values of status to be minimal.<br>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. |

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#### 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.


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**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.<br>This information shall include:<br>— MaaS or MoD requests<br>— 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.<br>2) In case of personal car mode, the server provides a list of routes with respect to optimal distance, minimal time, minimal cost, etc.<br>3) In case of public transport mode, the server provides a list of routes with available transit modes and cost of travel.<br>3.1) To request an available list for reservation of public transit (bus, rail, etc.) in the route.<br>3.2) To send available seats for reservation of public transit (bus, rail, etc.) in the route.<br>3.3) To reserve seat in the selected public transit.<br>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.<br>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. |

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#### 6.2.1.1.4 Carbon-free zones information

Table 4 shows the definition and message set for carbon-free zones information, in order to provide information on carbon-free zones.

**Table 4 — UC 1.3 Carbon-free zones information**

| | | | | | |
|---|---|---|---|---|---|
| **Use case** | **Cluster** | **1. Route selection** | | | |
| | **Name** | **UC 1. 3 Carbon-free zones information** | | | |
| | **Brief description** | Carbon-free zones can be designated in an established modern city in order to reduce emissions of greenhouse gases to zero; all transportation system practices that emit greenhouse gases shall cease.<br>This information shall include:<br>— Carbon-free zones identification<br>— Carbon-free zones information and management | | | |
| | **Actor** | Urban transport authority, nomadic device, cloud server | | | |
| | **Goal** | Eco-demand and access management through carbon-free zones | | | |
| | **Input** | Carbon-free zones identification | | | |
| | **Output** | Carbon-free zones information and management | | | |
| | **Processing steps** | 1) User's nomadic device periodically sends driving information including position of the vehicle, speed, etc. to the server.<br>2) Server sends roadway information on carbon-free zones to the nomadic device if any appear in the route.<br>3) In case of a carbon-free zone selected by user, server shows detailed information about the carbon-free zone such as map and related eco-points into the nomadic device.<br>4) When user enters the carbon-free zone, server guides eco-point to be added (for sustainable vehicle) or deducted (for fossil fuel vehicle) by the type of vehicle per mile.<br>5) When user exits the carbon-free zone, server calculates the eco-points by the distance of travel to notify the nomadic device. | | | |
| **Message** | **Step No.** | **Name** | **Subclause** | **Exe** | **Description** |
| | 1) | Eco-Driving-Info | 7.10 | P-ITS-S | Information on real-time driving to be sent to server. |
| | 2) | Notice-Message | — | V-ITS-SG | A text type of information, warning, and/or alarm to users. |
| | 3) | User-Response | 7.19 | P-ITS-S | Request public transit reservation in the route. |
| | 4) | Carbon-Free-Info | 7.8 | V-ITS-SG | Information on carbon-free zone. |
| | 5) | Notice-Message | — | V-ITS-SG | A text type of information, warning, and/or alarm to users. |
| | 8) | Notice-Message | — | V-ITS-SG | A text type of information, warning, and/or alarm to users. |
| | 9) | Notice-Message | — | V-ITS-SG | A text type of information, warning, and/or alarm to users. |

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#### 6.2.1.1.5 Mobile all transit

Table 5 shows the definition and message set for mobile all transit, in order to provide the eco-mobility service by mobile all transit.

**Table 5 — UC 1.4 Mobile all transit**

| | | | | | |
|---|---|---|---|---|---|
| **Use case** | **Cluster** | **1. Route selection** | | | |
| | **Name** | **UC 1. 4 Mobile all transit (MaT)** | | | |
| | **Brief description** | Mobile all transit (MaT), a model similar to MaaS describes a shift away from personally owned modes of transportation and towards mobility solutions that are consumed as a service. This is enabled in Korea 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.<br>This information shall include:<br>— MaT requests<br>— Eco-mobility service provision | | | |
| | **Actor** | MaT provider, Nomadic device, Cloud server | | | |
| | **Goal** | Eco-mobility service by MaT | | | |
| | **Input** | Eco-mobility service request by nomadic devices | | | |
| | **Output** | Eco-mobility utilization | | | |
| | **Processing steps** | 1) User registers transaction information about travel fare by transit card or credit card.<br>2) User sets eco-mileage for transaction of travel fare.<br>3) User updates the user information in case of card changes due to replacing, reordering, or lost.<br>4) User requests transaction of travel fare related to public transit, toll charges, parking fee, etc.<br>5) Server sends the results of transaction of travel fare related to public transit, toll charges, parking fee, etc.<br>6) The user transit card is able to be utilized in the intermodal transfer with discounted fare. | | | |
| **Message** | **Step No.** | **Name** | **Subclause** | **Exe** | **Description** |
| | 1) | Mobile-Card-Edit | 7.9 | P-ITS-S | Data to be registered in user transit card. |
| | 3) | Mobile-Card-Edit | 7.9 | P-ITS-S | Data to be registered in user transit card. |
| | 5) | Notice-Message | — | V-ITS-SG | A text type of information, warning, and/or alarm to users. |

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### 6.2.2 Service applications 2: Passenger-car-based

Figure 3 shows passenger-car-based service flow and use case clusters 2, 3 and 4.

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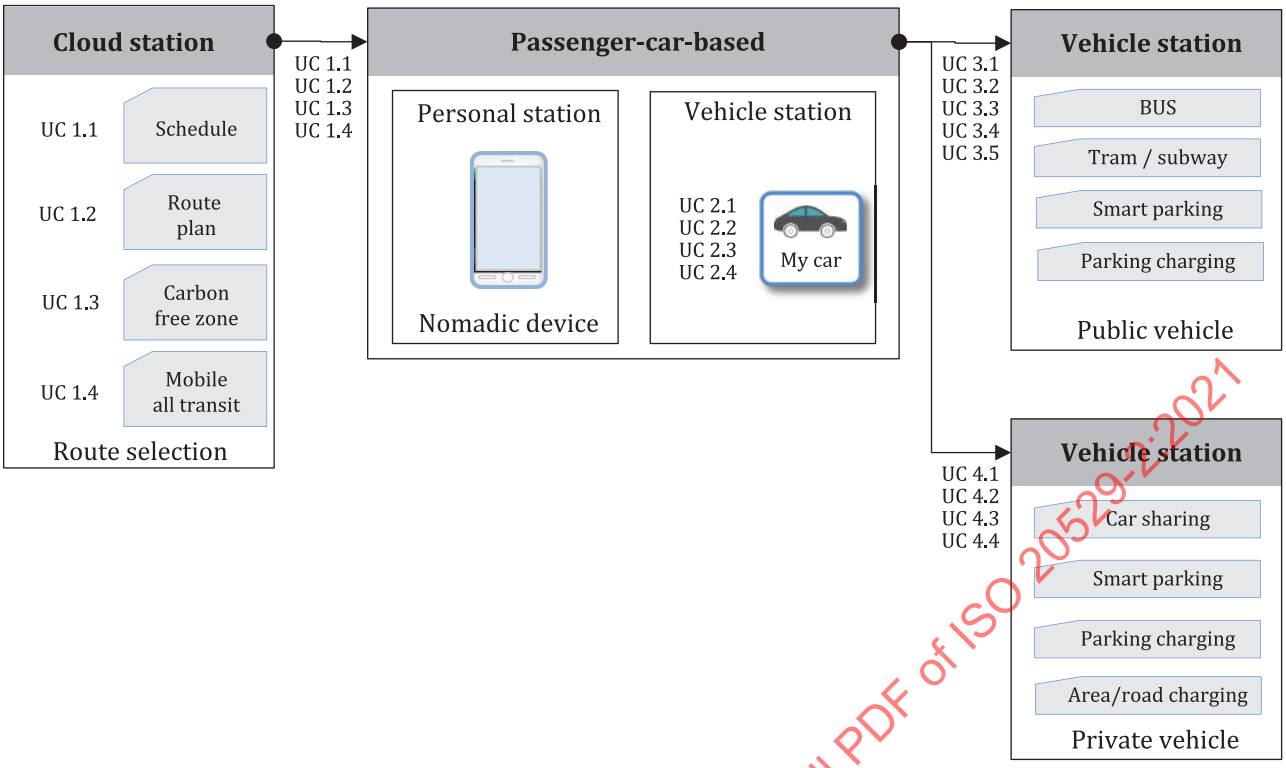


**Figure 3 — Passenger-car-based service flow**

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### 6.2.2.1 UC Cluster 2: All-day driving

#### 6.2.2.1.1 On-trip eco-driving support

Table 6 shows the definition and message set for on-trip eco-driving support, in order to provide eco-driving identification and notification through eco-driving requests.

**Table 6 — UC 2.1 On-trip eco-driving support**

| Use case | Cluster | 2 All-day driving |
|---|---|---|
| | Name | UC 2.1 On-trip eco-driving support |
| | Brief description | On-trip eco-driving support might provide drivers with better fuel efficiency while driving by combining several one-mile trips, by reducing the number of engine stops, following the speed limit, maintaining the vehicles, etc.<br>This information shall include:<br>— Vehicle Identification Number (VIN)<br>— Drivers' requests for eco-driving modes |


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**Table 6** *(continued)*

| | | | | | |
|---|---|---|---|---|---|
| | **Actor** | Vehicle driver, Nomadic device, Cloud server | | | |
| | **Goal** | Eco-driving identification and notification through eco-driving requests | | | |
| | **Input** | Eco-driving request by nomadic device | | | |
| | **Output** | Eco-driving display and notification | | | |
| | **Processing steps** | 1) User's nomadic device periodically sends driving information including position of the vehicle, speed, etc. to server.<br>2) Server sends warning signal to vehicle while monitoring the speed which is over the limit or inappropriate.<br>3) Server sends information to user on congestion, delay, free flow, etc. on the route to the destination.<br>4) Server sends information to user on accidents or incidents, road work zones, etc. on the route to the destination.<br>5) Server sends weather information to mobile devices.<br>6) Server sends information on alternative routes in case of impediments on the route to the destination.<br>7) Server calculates eco-points when user arrives at the destination based on monitoring vehicle driving data from origin. | | | |
| **Message** | **Step No.** | **Name** | **Subclause** | **Exe** | **Description** |
| | 1) | Eco-Driving-Info | 7.10 | P-ITS-S | Real-time driving information on user vehicle. |
| | 2) | Eco-Driving-Res | 7.11 | V-ITS-SG | Real-time monitoring data of user vehicle. |
| | 3) | Eco-Traffic-Info | 7.12 | V-ITS-SG | Traffic flow information for route ahead. |
| | 4) | Eco-Accident-Info | 7.14 | V-ITS-SG | Information about accident and road work zone for route ahead. |
| | 5) | Eco-Weather-Info | 7.13 | V-ITS-SG | Information on weather conditions for route ahead. |
| | 6) | Route-Plan-Info | 7.5 | V-ITS-SG | Anticipated route list by server to personal car. |

#### 6.2.2.1.2 Route guidance and navigation

Table 7 shows the definition and message set for route guidance and navigation, in order to request the eco-route guidance and navigation.

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**Table 7 — UC 2.2 Route guidance and navigation**

| | | | | | |
|---|---|---|---|---|---|
| **Use case** | **Cluster** | **2. All-day driving** | | | |
| | **Name** | **UC 2.2 Route guidance and navigation** | | | |
| | **Brief description** | Eco-route guidance and navigation can require a driver to enter a destination code into the in-vehicle system in terms of eco-measures prior to time and cost measures.<br>This information shall include:<br>— Route guidance information<br>— Eco-route guidance and navigation | | | |
| | **Actor** | In-vehicle navigation, nomadic device | | | |
| | **Goal** | Eco-information, navigation and guidance by in-vehicle navigation | | | |
| | **Input** | Eco-route guidance requests | | | |
| | **Output** | Eco-route guidance and navigation | | | |
| | **Processing steps** | 1) User requests route guidance by inserting origin and destination.<br>2) Server sends a list of routes adapted to conditions of optimal distance, minimal time and costs, carbon-free zones, etc.<br>3) User selects one route as his/her own among those in the list.<br>4) Once a route is selected, the server sends information about toll charge, fuel consumption, eco-points to be expected on the route to user.<br>5) When user leaves selected route while driving, alternative route is requested according to the current location and destination to server.<br>6) Server sends a new route to user according to the current position and to the destination based on initial conditions of route choice. | | | |
| **Message** | **Step No.** | **Name** | **Subclause** | **Exe** | **Description** |
| | 1) | Route-Plan-Req | 7.4 | P-ITS-S | Request of route of personal car by user. |
| | 2) | Route-Plan-Info | 7.5 | V-ITS-SG | Anticipated list of routes by server to personal car. |
| | 3) | User-Response | 7.19 | P-ITS-S | Values of user choice to server. |
| | 4) | Notice-Message | — | V-ITS-SG | A text type of information, warning, and/or alarm to users. |
| | 5) | Route-Navi-Req | 7.15 | P-ITS-S | Request of route of personal car by user. |
| | 6) | Route-Navi-Info | 7.16 | V-ITS-SG | Route guidance from origin to destination. |

#### 6.2.2.1.3 Variable parking charging

Table 8 shows the definition and message set for variable parking charging, in order to manage the eco-demand and access through variable parking fee charging.

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**Table 8 — UC 2.3 Variable parking charging**

| | | | | | |
|---|---|---|---|---|---|
| **Use case** | **Cluster** | **2. All-day driving** | | | |
| | **Name** | **UC 2.3 Variable parking charging** | | | |
| | **Brief description** | Variable parking fee charging may be used as a transportation management tool to reduce peak hour vehicle access and demand to park in a building or in the central business district in the city with respect to time and location, that is related to producing air pollution and greenhouse gas emissions.<br>This information shall include:<br>— Parking fee charging by time and location<br>— Eco-access control information | | | |
| | **Actor** | Parking centre, nomadic devices | | | |
| | **Goal** | Eco-demand and access management through variable parking fee charging | | | |
| | **Input** | Parking fee charging strategy | | | |
| | **Output** | Eco-access management | | | |
| | **Processing steps** | 1) User's nomadic device periodically sends driving information including position of the vehicle, speed, etc. to server.<br>2) Server sends a list of parking places near the destination including vehicle type to be permitted, costs, available lots to be parked, etc.<br>3) User selects one parking place as his or her own among those listed on the map.<br>4) Server guides a route to the selected parking place as a destination.<br>5) In case of parking places located in CBD or in private buildings, server guides information on extra charges or eco-points deduction, etc. to user.<br>6) Server terminates route guidance when user enters the guided parking places, or guides alternative information on adjacent parking places if there is no parking lot available. | | | |
| **Message** | **Step No.** | **Name** | **Subclause** | **Exe** | **Description** |
| | 1) | Eco-Driving-Info | 7.10 | P-ITS-S | Real-time driving information on user vehicle. |
| | 2) | Parking-Lot-Info | 7.17 | V-ITS-SG | Parking places information about costs, available lots, etc. |
| | 3) | User-Response | 7.19 | P-ITS-S | Values of user choice to server. |
| | 4) | Route-Plan-Info | 7.5 | V-ITS-SG | Anticipated list of routes by server to personal car. |
| | 5) | Notice-Message | — | V-ITS-SG | A text type of information, warning, and/or alarm to users. |
| | 6) | Parking-Lot-Info | 7.17 | V-ITS-SG | Parking places information about costs, available lots, etc. |

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#### 6.2.2.1.4 Variable area/road access charging

Table 9 shows the definition and message set for variable area/road access charging, in order to management the eco-demand and access through variable area/road pricing charging.

**Table 9 — UC 2.4 Variable area/road access charging**

| | | | | | |
|---|---|---|---|---|---|
| **Use case** | **Cluster** | **2. All-day driving** | | | |
| | **Name** | **UC 2.4 Variable area/road access charging** | | | |
| | **Brief description** | Variable parking fee charging may be used as a transportation management tool to reduce peak hour vehicle access demand to park into a building or the central business district in the city with respect to time and location, that is related to producing air pollution and greenhouse gas emissions.<br>This information shall include:<br>— Parking fee charging by time and location<br>— Eco-access control information | | | |
| | **Actor** | Urban transport authority, Nomadic devices, Cloud server | | | |
| | **Goal** | Eco-demand and access management through variable area/road pricing charging | | | |
| | **Input** | Area/road pricing charging strategy | | | |
| | **Output** | Eco-access management | | | |
| | **Processing steps** | 1) Nomadic device of the user sends the driving information including position of the vehicle, speed, etc. to server periodically.<br>2) Server sends information on congestion charge by the time in case in the route to user.<br>3) Server sends information on toll gates in case in the route to user.<br>4) Server sends roadway information on carbon-free zone in case in the route to user.<br>5) Server guides alternative route in case the user vehicle not being permitted to enter.<br>6) Server informs to charge extra costs or to deduct eco-points by travel mile in case of entering the carbon-free zone. | | | |
| **Message** | **Step No.** | **Name** | **Subclause** | **Exe** | **Description** |
| | 1) | Eco-Driving-Info | 7.10 | P-ITS-S | Real-time driving information on user vehicle. |
| | 2) | Notice-Message | — | V-ITS-SG | A text type of information, warning, and/or alarm to users. |
| | 3) | Notice-Message | — | V-ITS-SG | A text type of information, warning, and/or alarm to users. |
| | 4) | Notice-Message | — | V-ITS-SG | A text type of information, warning, and/or alarm to users. |
| | 5) | Route-Plan-Info | 7.5 | V-ITS-SG | Anticipated list of routes by server to personal car. |
| | 6) | Notice-Message | | V-ITS-SG | A text type of information, warning, and/or alarm to users. |

### 6.2.2.2 UC Cluster 3: Driving and public transportation

#### 6.2.2.2.1 On-trip eco-driving support (referring UC 2.1 On-trip eco-driving support)

On-trip eco-driving support is the same as use case 2.1.

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#### 6.2.2.2.2 Route guidance and navigation (referring UC 2.2 Route guidance and navigation)

Route guidance and navigation is the same as use case 2.2.

#### 6.2.2.2.3 Variable parking charging (referring UC 2.3 Variable parking charging)

Variable parking charging is the same as use case 2.3.

#### 6.2.2.2.4 Park and ride guidance

Table 10 shows the definition and message set for park and ride guidance, in order to inform drivers who enter the urban roadway networks about available parking spaces and ride on public transport.

**Table 10 — UC 3.4 Park and ride guidance**

| | | | | | |
|---|---|---|---|---|---|
| **Use case** | **Cluster** | **3. Driving and public transportation** | | | |
| | **Name** | **UC 3.4 Park and ride guidance** | | | |
| | **Brief description** | Park and ride guidance system informs drivers who enter the urban roadway networks about available parking spaces. User rides public transport to the destination in order to reduce traffic demand by vehicles driving into the central business district in the city.<br>This information shall include:<br>— Parking space detection and guidance<br>— Park and ride information provision | | | |
| | **Actor** | Parking lots detection system, Parking guidance system | | | |
| | **Goal** | Eco-traffic management by park and ride guidance | | | |
| | **Input** | Parking space detection and guidance | | | |
| | **Output** | Effectiveness of traffic flow | | | |
| | **Processing steps** | 1) User's nomadic device periodically sends the driving information including position of the vehicle, speed, etc. to server.<br>2) Server guides a list of parking places outside the city if the destination is located in the downtown of the city.<br>3) Server sends a list of parking places near the destination in the downtown of the city, including vehicle type permitted, costs, available lots in which to park, etc.<br>4) Server guides a list of park and ride places in case of intermodal transfer centre to public transport.<br>5) User selects one parking place as his or her own among those listed on the map.<br>6) Server sends detailed information about connecting transport modes from the park and ride places to destination. | | | |
| **Message** | **Step No.** | **Name** | **Subclause** | **Exe** | **Description** |
| | 1) | Eco-Driving-Info | 7.10 | P-ITS-S | Real-time driving information on user vehicle. |
| | 2) | Notice-Message | — | V-ITS-SG | A text type of information, warning, and/or alarm to users. |
| | 3) | Parking-Lot-Info | 7.17 | V-ITS-SG | Parking places information about costs, available lots, intermodal transfer, etc. |
| | 5) | User-Response | 7.19 | P-ITS-S | Values of user choice to server. |
| | 6) | Parking-Ride-Info | 7.18 | V-ITS-SG | Information about connecting transport modes near parking places. |

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#### 6.2.2.2.5 Personalized multi-modal navigating

Table 11 shows the definition and message set for personalized multi-modal navigating, in order to provide personalized journey planning for taking individual user preferences and availability into account in transport services.

**Table 11 — UC 3.5 Personalized multi-modal navigating**

| | | | | | |
|---|---|---|---|---|---|
| **Use case** | **Cluster** | **3. Driving and public transportation** | | | |
| | **Name** | **UC 3.5 Personalized multi-modal navigating** | | | |
| | **Brief description** | Personalized multi-modal navigating is capable of planning with the full spectrum of mobility services; combining individual and collective, fixed-schedule as well as on-demand modes of transport, while taking into account individual user preferences and the availability of transport services. It is also able to personalize journey planning for each individual user by employing a recommendation engine that builds a contextual model of the user from observation of the user's past travel choices.<br>This information shall include:<br>— User preferences<br>— Personalized eco-route guidance and journey planner | | | |
| | **Actor** | Public transport provider, Nomadic device | | | |
| | **Goal** | Eco-information, navigation and guidance by personalized multi-modal navigating | | | |
| | **Input** | Multi-modal connecting preference | | | |
| | **Output** | Personalized eco-route guidance and journey planner | | | |
| | **Processing steps** | 1) User requests route guidance by inserting origin and destination.<br>2) Server provides a variety of routes from origin to destination.<br>3) While driving, the server guides the preferred routes selected by other users to the front of the list.<br>4) While riding public transit on a familiar route, the server guides the preferred modes selected by the user to the front of the list.<br>5) While riding public transit on an unfamiliar route, the server guides the preferred modes selected by other users to the front of the list.<br>6) When user selects eco-measure first for mode choices, the server guides the routes of higher eco-points to the front of the list. | | | |
| **Message** | **Step No.** | **Name** | **Subclause** | **Exe** | **Description** |
| | 1) | Route-Plan-Req | 7.4 | P-ITS-S | Schedule information registered by user. |
| | 2) | Route-Plan-Info | 7.5 | V-ITS-SG | Route information with priority provided by server. |

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### 6.2.2.3 UC Cluster 4: Driving and car sharing

#### 6.2.2.3.1 On-trip eco-driving support (referring UC 2.1 On-trip eco-driving support)

On-trip eco-driving support is the same as use case 2.1.

#### 6.2.2.3.2 Route guidance and navigation (referring UC 2.2 Route guidance and navigation)

Route guidance and navigation is the same as use case 2.2.

#### 6.2.2.3.3 Variable parking charging (referring UC 2.3 Variable parking charging)

Variable parking charging is the same as use case 2.3.


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#### 6.2.2.3.4 Variable area/road access charging (referring UC 2.4 Variable area/road access charging)

Variable area/road access charging is the same as use case 2.4.

### 6.2.3 Service Applications 3: Non-passenger-car-based

Figure 4 shows non-passenger-car-based service flow and use case clusters 5, 6 and 7.

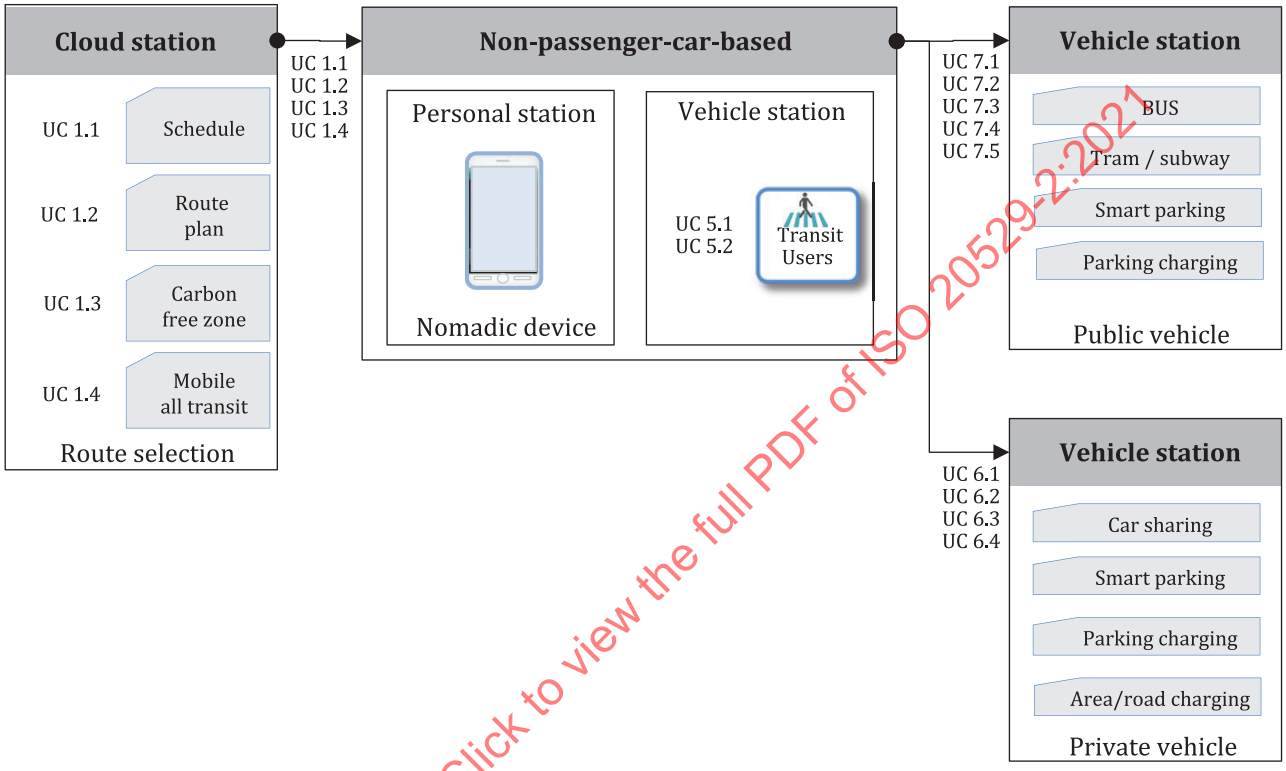


**Figure 4 — Non-passenger-car-based service flow**

#### 6.2.3.1 UC Cluster 5: All-day public transportation

##### 6.2.3.1.1 Park and ride guidance (referring UC 3.4 Park and ride guidance)

Park and ride guidance is the same as use case 3.4.

##### 6.2.3.1.2 Personalized multi-modal navigation (referring UC 3.5 Personalized multi-modal navigating)

Personalized multi-modal navigation is the same as use case 3.5.

#### 6.2.3.2 UC Cluster 6: All-day car sharing

##### 6.2.3.2.1 On-trip eco-driving support (referring UC 2.1 On-trip eco-driving support)

On-trip eco-driving support is the same as use case 2.1.

##### 6.2.3.2.2 Route guidance and navigation (referring UC 2.2 Route guidance and navigation)

Route guidance and navigation is the same as use case 2.2.

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#### 6.2.3.2.3 Variable parking charging (referring UC 2.3 Variable parking charging)

Variable parking charging is the same as use case 2.3.

#### 6.2.3.2.4 Variable area/road access charging (referring UC 2.4 Variable area/road access charging)

Variable area/road access charging is the same as use case 2.4.

### 6.2.3.3 UC Cluster 7: Public transportation and car sharing

#### 6.2.3.3.1 On-trip eco-driving support (referring UC 2.1 On-trip eco-driving support)

On-trip eco-driving support is the same as use case 2.1.

#### 6.2.3.3.2 Route guidance and navigation (referring UC 2.2 Route guidance and navigation)

Route guidance and navigation is the same as use case 2.2.

#### 6.2.3.3.3 Variable parking charging (referring UC 2.3 Variable parking charging)

Variable parking charging is the same as use case 2.3.

#### 6.2.3.3.4 Park and ride guidance (referring UC 3.4 Park and ride guidance)

Park and ride guidance is the same as use case 2.4.

#### 6.2.3.3.5 Personalized multi-modal navigating (referring UC 3.5 Personalized multi-modal navigating)

Personalized multi-modal navigating is the same as use case 3.5.

# 7 G-ITS data exchange format

## 7.1 Schedule-Info-Edit

### 7.1.1 Definition

Table 12 shows the definition for Schedule-Info-Edit. Schedule-Info-Edit allows the user to create new schedule information or modify it if necessary and save it on the server.

**Table 12 — Definition of Schedule-Info-Edit**

| | | | | |
|---|---|---|---|---|
| **Message** | ID | GITS1 | | |
| | Name | Schedule-Info-Edit | | |
| | Executor | P-ITS-S | | |
| | Description | User sends appointed place and time information to server to save his/her schedule | | |
| | Name | Data Type (Unit) | Description | Cvt |
| | Authorized key | UTF8String | Nomadic device unique key value issued by the server | M |
| | Service ID | UTF8String | ID of service provided by G-ITS service application | M |
| | User ID | UTF8String | Individual unique ID (e.g. user1) | M |
| | Data format | UTF8String | Data format received from server (e.g. xml, json) | M |

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**Table 12** *(continued)*

| | | | | |
|---|---|---|---|---|
| **Data parameter** | Class ID | UTF8String | ID that classifies schedule by type (e.g. Go to work, Go to school, Meet a friend, etc.) | M |
| | Subject | UTF8String | Subject of schedule (e.g. ## meeting) | M |
| | Contents | UTF8String | Detailed description of schedule | O |
| | Start date | GeneralizedTime | Start date of schedule, YYYYMMDDHH24MISS (e.g. 20170109112233) | M |
| | End date | GeneralizedTime | End date of schedule, YYYYMMDDHH24MISS (e.g. 20170109112233) | O |
| | Area name | UTF8String | City/Area name with schedule (e.g. Seoul-si, Jeju-do, etc.) | O |
| | Coordinate system | UTF8String | Coordinate system name (GRS80) | M |
| | Latitude | REAL | Latitude to display the schedule location on the map | M |
| | Longitude | REAL | Longitude to display the schedule location on the map | M |
| | Alarm | NumericString | Selecting whether alarm is set before schedule starts (0: none, 1: 1 day before, 2: 1 hour before, 3: cancel) | M |

### 7.1.2 Example

Table 13 shows the data structure and sample for Schedule-Info-Edit. It contains the schedule title, date and GPS information that can be displayed on the map.

**Table 13 — Example for Schedule-Info-Edit**

| | |
|---|---|
| **ASN.1** | sendScheduleInfoEdit ::= SEQUENCE {<br>authorized-key UTF8String,<br>service-id UTF8String,<br>user-id UTF8String,<br>data-format UTF8String,<br>class-id UTF8String,<br>subject UTF8String,<br>start-date GeneralizedTime,<br>end-date GeneralizedTime OPTIONAL,<br>areaname UTF8String OPTIONAL,<br>coordinate-system UTF8String,<br>latitude REAL,<br>longitude REAL,<br>alarm NumericString<br>} |

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**Table 13** *(continued)*

| | |
|---|---|
| **Dataset** | {“ sendScheduleInfoEdit”: {<br>“authorized-key”: “BVxqYe1vQodFCNuAIzaSyO3mzwJeGv169qN”, /* UTF8String */<br>“service-id”: “GITS-1101-1”, /* UTF8String */<br>“user-id”: “ USER001”, /* UTF8String */<br>“data-format”: “json”, /* UTF8String */<br>“class-id”: “SC021”, /* UTF8String */<br>“subject”: “## Meeting”, /* UTF8String */<br>“start-date”: “20190109112233”, /* GeneralizedTime */<br>“end-date”: “20191120143000”, /* GeneralizedTime */<br>“areaname”: “Seoul-si”, /* UTF8String */<br>“coordinate-system”: “GRS80”, /* UTF8String */<br>“latitude”: “37.365148”, /* REAL */<br>“longitude”: “126.970547”, /* REAL */<br>“alarm”: 1 /* NumericString */<br>}} |

## 7.2 Schedule-Info-Req

### 7.2.1 Definition

Table 13 shows the definition for Schedule-Info-Req. Schedule-Info-Req defines keywords for searches that the user passes to the server to retrieve his/her schedule information.

**Table 14 — Definition of Schedule-Info-Req**

| | | | | |
|---|---|---|---|---|
| **Message** | ID | GITS2 | | |
| | Name | Schedule- Info-Req | | |
| | Executor | P-ITS-S | | |
| | Description | User requests his/her schedule information to server | | |
| **Data parameter** | Name | Data Type (Unit) | Description | Cvt |
| | Authorized key | UTF8String | Nomadic device unique key value issued by the server | M |
| | Service ID | UTF8String | ID of service provided by G-ITS service application | M |
| | User ID | UTF8String | Individual unique ID (e.g. user1) | M |
| | Data format | UTF8String | Data format received from server (e.g. xml, json) | M |
| | Class ID | UTF8String | ID that classifies schedule by type (e.g. Go to work, Go to school, Meet a friend, etc.) | O |
| | Subject | UTF8String | Subject of schedule (e.g. :## meeting) | O |
| | Contents | UTF8String | Detailed description of schedule | O |
| | Start date | GeneralizedTime | Start Date of schedule, YYYYMMDDHH24MISS (e.g. :20170109112233) | O |
| | End date | GeneralizedTime | End Date of schedule, YYYYMMDDHH24MISS (e.g. 20170109112233) | O |

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### 7.2.2 Example

Table 15 shows the data structure and sample for Schedule-Info-Req. It consists of schedule class, subject, date, etc.

**Table 15 — Example for Schedule-Info-Req**

| | |
|---|---|
| **ASN.1** | sendScheduleInfoReq ::= SEQUENCE {<br>authorized-key UTF8String,<br>service-id UTF8String,<br>user-id UTF8String,<br>data-format UTF8String,<br>class-id UTF8String OPTIONAL,<br>subject UTF8String OPTIONAL,<br>start-date GeneralizedTime OPTIONAL,<br>end-date GeneralizedTime OPTIONAL<br>} |
| **Dataset** | "sendScheduleInfoReq": {<br>"authorized-key":"BVxqYe1vQodFCNuAIzaSyO3mzwJeGv169qN", /* UTF8String */<br>"service-id": "GITS-1102-1", /* UTF8String */<br>"user-id": " USER001", /* UTF8String */<br>"data-format": "json", /* UTF8String */<br>"class-id": "SC021", /* UTF8String OPTIONAL */<br>"subject": "## Meeting", /* UTF8String OPTIONAL */<br>"start-date": "201901091122 33", /* GeneralizedTime OPTIONAL */<br>"end-date": "20191120143000" /* GeneralizedTime OPTIONAL */<br>} |

## 7.3 Schedule-Info

### 7.3.1 Definition

Table 16 shows the definition for Schedule-Info. Schedule-Info defines a structure for the server to deliver the schedule result that meets the search condition to the user.

**Table 16 — Definition of Schedule-Info**

| | | |
|---|---|---|
| **Message** | ID | GITS3 |
| | Name | Schedule-Info |
| | Executor | V-ITS-SG |
| | Description | Server sends schedule result data that meets search condition to user |

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**Table 16** *(continued)*

| | Name | Data Type (Unit) | Description | Cvt |
|---|---|---|---|---|
| **Data parameter** | Result code | NumericString | Value encoded by the user's request processing result (e.g. 00) | M |
| | Result message | UTF8String | Message about user's request processing result (e.g. "Successfully processed") | M |
| | Service ID | UTF8String | ID of service provided by G-ITS service application | M |
| | User ID | UTF8String | Individual unique ID (e.g.user1) | M |
| | Data format | UTF8String | Data format received from server (e.g. xml, json) | M |
| | Return count | INTEGER | Number of results | M |
| | Schedule data | SEQUENCE OF | Schedule list | S |
| | Class ID | UTF8String | ID that classifies schedule by type (e.g. Go to work, Go to school, Meet a friend, etc.) | M |
| | Subject | UTF8String | Subject of schedule (e.g. ## meeting) | M |
| | Contents | UTF8String | Detailed description of schedule | O |
| | Start date | GeneralizedTime | Start date of schedule, YYYYMMDDHH24MISS (e.g.20170109112233) | M |
| | End date | GeneralizedTime | End date of schedule, YYYYMMDDHH24MISS (e.g.20170109112233) | O |
| | Area name | UTF8String | City/Area Name with schedule (e.g. Seoul-si, Jeju-do, etc.) | O |

### 7.3.2 Example

Table 17 is a data structure and sample of Schedule-Info, and when there are a plurality of results meeting the search condition, it is delivered in list form.

**Table 17 — Example for Schedule-Info**

| | |
|---|---|
| **ASN.1** | sendScheduleInfo ::= SEQUENCE {<br>result-code NumericString,<br>result-message UTF8String,<br>service-id UTF8String,<br>user-id UTF8String,<br>data-format UTF8String,<br>return-count INTEGER,<br>schedule -data ::= SEQUENCE-OF SEQUENCE {<br>class-id UTF8String,<br>subject UTF8String,<br>start-date GeneralizedTime,<br>end-date GeneralizedTime OPTIONAL,<br>area name UTF8String OPTIONAL,<br>}<br>} |

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**Table 17** *(continued)*

| | |
|---|---|
| **Dataset** | "sendScheduleInfo": {<br>"result-code": "00", /* NumericString */<br>"result-message": "Successfully processed", /* UTF8String */<br>"service-id": "GITS-1102-2", /* UTF8String */<br>"user-id": "USER001", /* UTF8String */<br>"data-format": "json", /* UTF8String */<br>"return-count": 2, I/* NTEGER */<br>"schedule-data": [ /* SEQUENCE OF SEQUENCE */<br>{<br>"class-id": "SC021", /* UTF8String */<br>"subject": "## Meeting", /* UTF8String */<br>"start-date": "20190109112233", /* GeneralizedTime */<br>"end-date": "20190109143000", /* GeneralizedTime OPTIONAL */<br>"area name": "Seoul-si", /* UTF8String OPTIONAL */<br>},<br>{<br>"class-id": "SC021", /* UTF8String */<br>"subject": "XX Seminar", /* UTF8String */<br>"start-date": "20190109153000", /* GeneralizedTime */<br>"end-date": "201901091700000", /* GeneralizedTime OPTIONAL */<br>"area name": "Seoul-si", /* UTF8String OPTIONAL */<br>}<br>]<br>} |

## 7.4 Route-Plan-Req

### 7.4.1 Definition

Table 18 shows the definition for Route-Plan-Req. Route-Plan-Req defines the data that a user sends to request a route guide using Mycar to the server.

**Table 18 — Definition of Route-Plan-Req**

| | | |
|---|---|---|
| **Message** | ID | GITS4 |
| | Name | Route-Plan-Req |
| | Executor | P-ITS-S |
| | Description | User asks server for route to destination using Mycar |

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**Table 18** *(continued)*

| | Name | Data Type (Unit) | Description | Cvt |
|---|---|---|---|---|
| **Data parameter** | Authorized key | UTF8String | Nomadic device unique key value issued by the server | M |
| | Service ID | UTF8String | ID of service provided by G-ITS service application | M |
| | User ID | UTF8String | Individual unique ID (e.g. user1) | M |
| | Data format | UTF8String | Data format received from server (e.g. xml, json) | M |
| | Mode | NumericString | Mode that the user uses to get to the destination (e.g. 1.myCar, 2.train, 3.express bus, 4.subway) | M |
| | VIN | UTF8String | 17-digit unique number to identify using vehicle (1MH-JF34JKTU123456) | O |
| | Coordinate system | UTF8String | Coordinate system name (GRS80) | M |
| | Departure ID | UTF8String | ID of the origin city | O |
| | Departure name | UTF8String | Name that can represent origin (e.g. city, station, building) | O |
| | Departure latitude | REAL | Departure latitude | M |
| | Departure longitude | REAL | Departure longitude | M |
| | Arrival ID | UTF8String | ID of destination city | O |
| | Arrival name | UTF8String | Name that can represent destination (e.g. city, station, building) | O |
| | Arrival latitude | REAL | Arrival latitude | M |
| | Arrival longitude | REAL | Arrival longitude | M |

### 7.4.2 Example

Table 19 shows a data structure and sample of Route-Plan-Req, which contains Mycar information, GPS coordinates of departure and arrival.

**Table 19 — Example for Route-Plan-Req**

| | |
|---|---|
| **ASN.1** | sendRoutePlanReq ::= SEQUENCE {<br>authorized-key UTF8String,<br>service-id UTF8String,<br>user-id UTF8String,<br>data-format UTF8String,<br>mode NumericString,<br>VIN UTF8String OPTIONAL,<br>coordinate-system UTF8String,<br>departure id UTF8String OPTIONAL,<br>departure name UTF8String OPTIONAL,<br>departure latitude REAL,<br>departure longitude REAL,<br>arrival ID UTF8String OPTIONAL,<br>arrival name UTF8String OPTIONAL,<br>arrival latitude REAL,<br>arrival longitude REAL<br>} |

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**Table 19** *(continued)*

| | |
|---|---|
| **Dataset** | "sendRoutePlanReq": {<br>"authorized-key": "BVxqYe1vQodFCNuAIzaSyO3mzwJeGv169qN", /* UTF8String,<br>"service-id": "GITS-1201-1", /* UTF8String */<br>"user-id": " USER001", /* UTF8String */<br>"data-format": "json", /* UTF8String */<br>"mode": 1 /* NumericString */<br>"VIN": "1MHJF34JKTU123456", /* UTF8String OPTIONAL */<br>"coordinate-system": "GRS80", /* UTF8String */<br>"departure id": "", /* UTF8String OPTIONAL */<br>"departure name": "", /* UTF8String OPTIONAL */<br>"departure latitude": 37.365148, /* REAL */<br>"departure longitude": 126.970547, /* REAL */<br>"arrival ID: "", /* UTF8String OPTIONAL */<br>"arrival name": "", /* UTF8String OPTIONAL */<br>"arrival latitude": 36.338369, /* REAL */<br>"arrival longitude": 127.393381 /* REAL */<br>} |

## 7.5 Route-Plan-Info

### 7.5.1 Definition

Table 20 shows the definition of Route-Plan-Info. Route-Plan-Info sends data to the user for server guidance to the Mycar.

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**Table 20 — Definition of Route-Plan-Info**

| | | | | |
|---|---|---|---|---|
| **Message** | ID | GITS5 | | |
| | Name | Route-Plan-Info | | |
| | Executor | V-ITS-SG | | |
| | Description | Server sends result data for route request to user | | |
| | Name | Data Type (Unit) | Description | Cvt |
| | Result code | NumericString | Value encoded by the user's request processing result (e.g. 00) | M |
| | Result message | UTF8String | Message about user's request processing result (e.g. "Successfully processed") | M |
| | Service ID | UTF8String | ID of service provided by G-ITS service application | M |
| | Data format | UTF8String | Data format received from server (e.g. xml, json) | M |
| | Departure ID | UTF8String | ID of the origin city | O |
| | Departure name | UTF8String | Name that can represent origin (e.g. city, station, building) | O |
| | Arrival ID | UTF8String | ID of destination city | O |
| | Arrival name | UTF8String | Name that can represent destination (e,g,: city, station, building) | O |
| | Return count | INTEGER | Number of results | M |
| | Return data1 | SEQUENCE OF | Bundle of route results of the same type | S |
| | Plan number | INTEGER | Priority of results | M |
| | Mode | UTF8String | Mode that the user uses to get to the destination (e.g. 1.myCar, 2.train, 3.express bus, 4.subway) | M |
| | Selection | UTF8String | Whether the user is selected by the given route (e.g. 'Y', 'N') | M |
| | Return Data2 | SEQUENCE OF | Bundle of detailed route results by return data1 | S |
| | Line ID | UTF8String | Line ID of public transit | O |
| | Line name | UTF8String | Line name of public transit (e.g. Line 1, Line 2) | O |
| | Seat grade ID | UTF8String | Seat grade ID of public transit (e.g. 특실, 우등, etc.) | O |
| | Seat grade name | UTF8String | Seat grade name of public transit (e.g. 특실, 우등, etc.) | O |
| | Vehicle number | UTF8String | Vehicle number of public transit (e.g. 7열차) | O |
| | Seat number | UTF8String | Reserved seat number of public transit (e.g. 4D) | O |

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**Table 20** *(continued)*

| | | | | | | |
|---|---|---|---|---|---|---|
| **Data parameter** | | | Departure time | GeneralizedTime | Departure time of public transit<br>(e.g. YYYYMMDDHH24MISS) | O |
| | | | Arrival time | GeneralizedTime | Arrival time of public transit<br>(e.g. YYYYMMDDHH24MISS) | O |
| | | | Coordinate system | UTF8String | Type of coordinate system used to provide information (e.g. GRS80) | M |
| | | | Departure ID | UTF8String | ID of the origin city | O |
| | | | Departure name | UTF8String | Name that can represent origin<br>(e.g. city, station, building) | O |
| | | | Departure latitude | REAL | Departure latitude | M |
| | | | Departure longitude | REAL | Departure longitude | M |
| | | | Arrival ID | UTF8String | ID of destination city | O |
| | | | Arrival name | UTF8String | Name that can represent destination<br>(e.g. city, station, building) | O |
| | | | Arrival latitude | REAL | Arrival latitude | M |
| | | | Arrival longitude | REAL | Arrival longitude | M |
| | | | Geometry data | UTF8String | Coordinates from departure to arrival<br>(xml -> GML, json -> geojson)<br>"geometry": {<br>"type": "Polygon",<br>"coordinates": [<br>[<br>[100.0, 0.0], [101.0, 0.0], [101.0, 1.0],<br>[100.0, 1.0], [100.0, 0.0]<br>]<br>]<br>} | M |
| | | | Transportation cost | REAL | Transportation cost for trip | M |
| | | | Monetary unit | UTF8String | Monetary unit by country | M |

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### 7.5.2 Example

Table 21 shows a data structure and sample for Route-Plan-Info, which includes GPS coordinates of departure and arrival, coordinates for route.

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**Table 21 — Example for Route-Plan-Info**

**ASN.1**

```
sendRoutePlanInfo ::= SEQUENCE {
    result-code             NumericString,
    result-message          UTF8String,
    service-id              UTF8String,
    data-format             UTF8String,
    departure ID            UTF8String OPTIONAL,
    departure name          UTF8String OPTIONAL,
    arrival ID              UTF8String OPTIONAL,
    arrival name            UTF8String OPTIONAL,
    Return-Count            INTEGER,
    Return-Data1        ::= SEQUENCE OF SEQUENCE {
        plan-number         INTEGER,
        selection           UTF8String,
        mode                UTF8String,
        Return Data2        ::= SEQUENCE OF SEQUENCE {
            line ID                     UTF8String OPTIONAL,
            line name                   UTF8String OPTIONAL,
            seat grade ID               UTF8String OPTIONAL,
            seat grade name             UTF8String OPTIONAL,
            vehicle number              UTF8String OPTIONAL,
            seat number                 UTF8String OPTIONAL,
            departure time              GeneralizedTime OPTIONAL,
            arrival time                GeneralizedTime OPTIONAL,
            coordinate system           UTF8String,
            departure ID                UTF8String OPTIONAL,
            departure name              UTF8String OPTIONAL,
            departure latitude          REAL,
            departure Longitude         REAL,
            arrival ID                  UTF8String OPTIONAL,
            arrival name                UTF8String OPTIONAL,
            arrival latitude            REAL,
            arrival longitude           REAL,
            geometry data               UTF8String,
            transportation cost         REAL,
            Monetary unit               UTF8String
        }
    }
}
```

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**Table 21** *(continued)*

| | |
|---|---|
| **Dataset** | “sendRoutePlanInfo”: {<br>“result-code”: “00” , /* NumericString */<br>“result-message”: “Successfully processed”, /* UTF8String */<br>“service-id”: “GITS-1201-2”, /* UTF8String */<br>“data-format”: “json”, /* UTF8String */<br>“departure ID”: “”, /* UTF8String OPTIONAL */<br>“departure name”: “”, /* UTF8String OPTIONAL */<br>“arrival ID”: “”, /* UTF8String OPTIONAL */<br>“arrival name”: “”, /* UTF8String OPTIONAL */<br>“return-Count”: 2, /* NTEGER */<br>“route-Plan-Data”: [ /* SEQUENCE OF SEQUENCE */<br>{<br>“plan-number”: 1, “selection”: “N”, “mode”: 1,<br>“Return Data”: {<br>“line ID”: “”, “line name”: “”, “seat grade ID”: “”, “seat grade name”: “”,<br>“vehicle number”: “1 M H J F 3 4 J K T U 1 2 3 4 5 6”, “seat number”: “”,<br>“departure time”: “”, “arrival time”: “”, “coordinate system”: “GRS80”, “departure ID”: “”, “departure name”: “”,<br>“departure latitude”: 37.365148, “departure longitude”: 126.970547,<br>“arrival ID”: “”, “arrival name”: “”, “arrival latitude”: 36.338369, “arrival longitude”: 127.393381,<br>“geometry data”: {<br>"type": "Polygon",<br>"coordinates": [<br>[<br>[100.0, 0.0], [101.0, 0.0], [101.0, 1.0], [100.0, 1.0], [100.0, 0.0]<br>]<br>]<br>},<br>“transportation cost”: 25700, “monetary unit”: “₩”<br>}<br>},<br>{<br>“plan-number”: 1, “selection”: “N”, “mode”: 1, |

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**Table 21** *(continued)*

| | |
|---|---|
| | “return Data”: {<br>“line ID”: “”, “line name”: “”, “seat grade ID”: “”, “seat grade name”: “”,<br>“vehicle number”: “1 M H J F 3 4 J K T U 1 2 3 4 5 6”, “seat number”: “”,<br>“departure time”: “”, “arrival time”: “”, “coordinate system”: “GRS80”, “departure ID”: “”, “departure name”: “”,<br>“departure latitude”: 37.365148, “departure longitude”: 126.970547,<br>“arrival ID”: “”, “arrival name”: “”, “arrival latitude”: 36.338369, “arrival longitude”: 127.393381,<br>“geometry data”: {<br>"type": "Polygon",<br>"coordinates": [<br>[<br>[100.0, 0.0], [101.0, 0.0], [101.0, 1.0], [100.0, 1.0], [100.0, 0.0]<br>]<br>]<br>},<br>“transportation cost”: 27900, “monetary unit”: “₩”<br>}<br>}<br>},<br>} |

## 7.6 Route-Pub-Req

### 7.6.1 Definition

Table 22 shows the definition for Route-Pub-Req. Route-Pub-Req defines the data that a user sends to request a route guidance to a server using public transportation.

**Table 22 — Definition of Route-Pub-Req**

| | | |
|---|---|---|
| **Message** | ID | GITS6 |
| | Name | Route-Pub-Req |
| | Executor | P-ITS-S |
| | Description | User asks server for route to destination using public transportation |

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**Table 22** *(continued)*

| | Name | Data Type (Unit) | Description | Cvt |
|---|---|---|---|---|
| **Data parameter** | Authorized key | UTF8String | Nomadic device unique key value issued by the server | M |
| | Service ID | UTF8String | ID of service provided by G-ITS service application | M |
| | User ID | UTF8String | Individual unique ID (e.g. user1) | M |
| | Data format | UTF8String | Data format received from server (e.g. xml, json) | M |
| | Departure date | GeneralizedTime | Departure date (e.g. 20170109) | M |
| | Coordinate system | UTF8String | Type of coordinate system used to provide information (e.g. GRS80) | M |
| | Departure ID | UTF8String | ID of the origin city | O |
| | Departure name | UTF8String | Name that can represent origin<br>(e.g. city, station, building) | O |
| | Departure latitude | REAL | Departure latitude | M |
| | Departure longitude | REAL | Departure longitude | M |
| | Arrival ID | UTF8String | ID of destination city | O |
| | Arrival name | UTF8String | Name that can represent destination (e.g. city, station, building) | O |
| | Arrival latitude | REAL | Arrival latitude | M |
| | Arrival longitude | REAL | Arrival longitude | M |

### 7.6.2 Example

Table 23 shows a data structure and sample for Route-Pub-Req, which includes the departure date, coordinates of the departure and arrival for display on the map.

**Table 23 — Example for Route-Pub-Req**

| | |
|---|---|
| **ASN.1** | sendRoutePubReq ::= SEQUENCE {<br>authorized-key UTF8String,<br>service-id UTF8String,<br>user-id UTF8String,<br>data-format UTF8String,<br>departure date GeneralizedTime,<br>coordinate system UTF8String,<br>departure ID UTF8String OPTIONAL,<br>departure name UTF8String OPTIONAL,<br>departure latitude REAL,<br>departure longitude EAL,<br>arrival ID UTF8String OPTIONAL,<br>arrival name UTF8String OPTIONAL,<br>arrival latitude REAL,<br>arrival longitude REAL<br>} |

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**Table 23** *(continued)*

| | |
|---|---|
| **Dataset** | "sendRoutePubReq": {<br>"authorized-key": "BVxqYe1vQodFCNuAIzaSyO3mzwJeGv169qN", /* UTF8String */<br>"service-id":: "GITS-1202-1", /* UTF8String */<br>"user-id": " USER001", /* UTF8String */<br>"data-format": "json", /* UTF8String */<br>"departure date": "20190516", /* GeneralizedTime */<br>"coordinate system": "GRS80", /* UTF8String */<br>"departure ID": "", /* UTF8String OPTIONAL */<br>"departure name": "", /* UTF8String OPTIONAL */<br>"departure latitude": 37.365148, /* REAL */<br>"departure longitude": 126.970547, /* REAL */<br>"arrival ID": "", /* UTF8String OPTIONAL */<br>"arrival name": "", /* UTF8String OPTIONAL */<br>"arrival latitude": 36.338369, /* REAL */<br>"arrival longitude": 127.393381 /* REAL */<br>} |

## 7.7 Route-Pub-Res

### 7.7.1 Definition

Route-Pub-Res delivers data to the user for route guidance by the server on public transport.

**Table 24 — Definition of Route-Pub-Res**

| | | |
|---|---|---|
| **Message** | ID | GITS7 |
| | Name | Route-Pub-Res |
| | Executor | V-ITS-SG |
| | Description | User sends a list of routes to reach the destination by public transport. |

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**Table 24** *(continued)*

| | Name | Data Type (Unit) | Description | Cvt |
|---|---|---|---|---|
| | Result code | NumericString | Value encoded by the user's request processing result (e.g. 00) | M |
| | Result message | UTF8String | Message about user's request processing result (e.g. "Successfully processed") | M |
| | Service ID | UTF8String | ID of service provided by G-ITS service application | M |
| | Data format | UTF8String | Data format received from server (e.g. xml, json) | M |
| | Return count | INTEGER | Number of results | M |
| | Return data | SEQUENCE OF | Bundle of route results of the same type | S |
| | Mode | UTF8String | Mode that the user uses to get to the destination (e.g. 1.myCar, 2.train, 3.express bus, 4.subway) | M |
| | Line ID | UTF8String | Line ID of public transit | M |
| | Line name | UTF8String | Line name of public transit<br>(e.g. Line 1, Line 2) | M |
| | Seat grade ID | UTF8String | Seat grade ID of public transit<br>(1: S class, 2: A class, etc.) | M |
| | Seat grade name | UTF8String | Seat grade name of public transit<br>(e.g. S class, A class, etc.) | M |

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**Table 24** *(continued)*

| | | | | | |
|---|---|---|---|---|---|
| **Data parameter** | | Vehicle number | UTF8String | Vehicle number of public transit | M |
| | | Seat number | UTF8String | Reserved public transit seat number (e.g. 4D) | M |
| | | Departure station ID | UTF8String | Departure station ID for public transit | O |
| | | Departure station name | UTF8String | Departure station name for public transit (e.g. ## station) | O |
| | | Arrival station ID | UTF8String | Arrival station ID for public transit | O |
| | | Arrival station name | UTF8String | Arrival station name for public transit (e.g. ## station) | O |
| | | Departure time | GeneralizedTime | Departure time of public transit (e.g. YYYYMMDDHH24MISS) | M |
| | | Arrival time | GeneralizedTime | Arrival time of public transit (e.g. YYYYMMDDHH24MISS) | M |
| | | Departure ID | UTF8String | ID of the origin city | O |
| | | Departure name | UTF8String | Name that can represent origin (e.g. city, station, building) | O |
| | | Arrival ID | UTF8String | ID of destination city | O |
| | | Arrival name | UTF8String | Name that can represent destination (e.g. city, station, building) | O |
| | | Coordinate system | UTF8String | Type of coordinate system used to provide information (e.g. GRS80) | M |
| | | Departure latitude | REAL | Departure Latitude | M |
| | | Departure longitude | REAL | Departure Longitude | M |
| | | Arrival latitude | REAL | Arrival Latitude | M |
| | | Arrival longitude | REAL | Arrival Longitude | M |
| | | Transportation cost | REAL | Transportation cost for trip | M |
| | | Monetary unit | UTF8String | Monetary unit by country | M |
| | | Date of reservation | GeneralizedTime | Date of reservation (e.g. YYYYMMDDHH24MISS) | M |

### 7.7.2 Example

Table 25 shows a data structure and sample for Route-Pub-Res, which includes additional information such as station name and seat number depending on the type of public transportation.

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**Table 25 — Example for Route-Pub-Res**

| | |
|---|---|
| **ASN.1** | sendRoutePubRes ::= SEQUENCE {<br>result-code NumericString,<br>result-message UTF8String,<br>service-id UTF8String,<br>data-format UTF8String,<br>return-count INTEGER,<br>return-data ::= SEQUENCE-OF SEQUENCE {<br>mode UTF8String,<br>line ID UTF8String,<br>line name UTF8String,<br>seat grade ID UTF8String,<br>seat grade name UTF8String,<br>vehicle number UTF8String,<br>seat number UTF8String,<br>departure station ID UTF8String OPTIONAL,<br>departure station name UTF8String OPTIONAL,<br>arrival station ID UTF8String OPTIONAL,<br>arrival station name UTF8String OPTIONAL,<br>departure time GeneralizedTime,<br>arrival time GeneralizedTime,<br>departure ID UTF8String OPTIONAL,<br>departure name UTF8String OPTIONAL,<br>arrival ID UTF8String OPTIONAL,<br>arrival name UTF8String OPTIONAL,<br>Coordinate System UTF8String,<br>departure latitude REAL,<br>departure longitude REAL,<br>arrival latitude REAL,<br>arrival longitude REAL,<br>transportation cost REAL,<br>Monetary unit UTF8String,<br>date of reservation GeneralizedTime<br>}<br>} |

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**Table 25** *(continued)*

| | |
|---|---|
| **Dataset** | "sendRoutePubRes": {<br>"result-code": "00", /* NumericString */<br>"result-message": "Successfully processed", /* UTF8String */<br>"service-id": "GITS-1202-2", /* UTF8String */<br>"data-format": "json", /* UTF8String */<br>"return-count": 1, /* INTEGER */<br>"return-data": { /* SEQUENCE-OF SEQUENCE */<br>"mode": 2, /* UTF8String */<br>"line ID": "NAEK010300", /* UTF8String */<br>"line name": "Line 1", /* UTF8String */<br>"seat grade ID": "1", /* UTF8String */<br>"seat grade name": "S class", /* UTF8String */<br>"vehicle number": "7", /* UTF8String */<br>"seat number": "4D", /* UTF8String */<br>"departure station ID": "NAEK177", /* UTF8String OPTIONAL */<br>"departure station name": "## station", /* UTF8String OPTIONAL */<br>"arrival station ID": "NAEK032", /* UTF8String OPTIONAL */<br>"arrival station name": "@@ station", /* UTF8String OPTIONAL */<br>"departure time": 201910012020, /* GeneralizedTime */<br>"arrival time": 201610012115, /* GeneralizedTime */<br>"departure ID": "", /* UTF8String OPTIONAL */<br>"departure name": "", /* UTF8String OPTIONAL */<br>"arrival ID": "", /* UTF8String OPTIONAL */<br>"arrival name": "", /* UTF8String OPTIONAL */<br>"Coordinate System": "GRS80", /* UTF8String */<br>"departure latitude": 37.365148, /* REAL */<br>"departure longitude": 126.970547, /* REAL */<br>"arrival latitude": 36.338369, /* REAL */<br>"arrival longitude": 127.393381, /* REAL */<br>"transportation cost": 37500, /* REAL */<br>"monetary unit": "₩", /* UTF8String */<br>"date of reservation": 201909012115 /* GeneralizedTime */<br>}<br>} |

## 7.8 Carbon-Free-Info

### 7.8.1 Definition

Carbon-Free-Info defines the data provided to the user when a carbon-free zone exists in the path to the destination.

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**Table 26 — Definition of Carbon-Free-Info**

| | | | | |
|---|---|---|---|---|
| **Message** | ID | GITS8 | | |
| | Name | Carbon-Free-Info | | |
| | Executor | V-ITS-SG | | |
| | Description | Server sends information data to user when carbon-free zone exists on path. | | |
| **Data parameter** | Name | Data Type (Unit) | Description | Cvt |
| | Result code | NumericString | Value encoded by the user's request processing result (e.g. 00) | M |
| | Result message | UTF8String | Message about user's request processing result (e.g. "Successfully processed") | M |
| | Service ID | UTF8String | ID of service provided by G-ITS service application | M |
| | Data format | UTF8String | Data format received from server (e.g. xml, json) | M |
| | Return count | INTEGER | Number of results | M |
| | Return data | SEQUENCE OF | Bundle of carbon-free zone search result | S |
| | Carbon-free zone ID | UTF8String | Carbon-free zone ID (12478965) | M |
| | State name | UTF8String | Name of state where carbon-free zone is located | O |
| | City name | UTF8String | City name in which carbon-free zone is located | O |
| | Setting year | UTF8String | Year in which carbon-free zone is set | O |
| | Coordinate System | UTF8String | Type of coordinate system used to provide information (e.g. GRS80) | M |
| | Geometry data | SEQUENCE OF | Coordinates indicating carbon-free zone<br>(xml -> GML, json -> geojson)<br>"geometry": {<br>"type": "Polygon",<br>"coordinates": [<br>[<br>[100.0, 0.0], [101.0, 0.0], [101.0, 1.0],<br>[100.0, 1.0], [100.0, 0.0]<br>]<br>]<br>} | M |

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### 7.8.2 Example

Table 27 shows a data structure and sample for Carbon-Free-Info, which contains polygonal coordinates.

**Table 27 — Example for Carbon-Free-Info**

**ASN.1**

```
sendCarbonFreeInfo ::= SEQUENCE {
    result-code             NumericString,
    result-message          UTF8String,
    service-id              UTF8String,
    data-format             UTF8String,
    return-count            INTEGER,
    return-data             ::=     SEQUENCE-OF SEQUENCE {
        green-zone-id               UTF8String,
        state name                  UTF8String OPTIONAL,
        city name                   UTF8String OPTIONAL,
        setting year                    UTF8String OPTIONAL,
        coordinate system       UTF8String,
        geometry data               SEQUENCE OF
    }
}
```

**Dataset**

```
"sendCarbonFreeInfo":     {
    "result-code": "00",                                    /* NumericString */
    "result-message": "Successfully processed",             /* UTF8String */
    "service-id": "GITS-1301-2",                            /* UTF8String */
    "data-format": "json",                                  /* UTF8String */
    "return-count": 1,                                      /* INTEGER */
    "Carbon-Free-data" : {                                  /* SEQUENCE-OF SEQUENCE */
        "carbon-free-zone-id": "GZ0651867",                 /* UTF8String */
        "state name": "###",                                /* UTF8String OPTIONAL */
        "city name": "@@@",                                 /* UTF8String OPTIONAL */
        "setting year": "20100726",                         /* UTF8String OPTIONAL */
        "coordinate System": "GRS80",                       /* UTF8String */
        "geometry data" : {
                "type": "Polygon",
                "coordinates": [
                    [
                        [100.0, 0.0], [101.0, 0.0], [101.0, 1.0], [100.0, 1.0], [100.0, 0.0]
                    ]
                ]
            }
    }
}
```

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## 7.9 Mobile-Card-Edit

### 7.9.1 Definition

Table 28 shows the definition for Mobile-Card-Edit. Mobile-Card-Edit defines the data that the user passes to the server to register a card to pay for the transportation.

**Table 28 — Definition of Mobile-Card-Edit**

| | | | | |
|---|---|---|---|---|
| **Message** | ID | GITS9 | | |
| | Name | Mobile-Card-Edit | | |
| | Executor | P-ITS-S | | |
| | Description | User registers payment card information on server. | | |
| **Data parameter** | Name | Data Type (Unit) | Description | Cvt |
| | Authorized key | UTF8String | Nomadic device unique key value issued by the server | M |
| | Service ID | UTF8String | ID of service provided by G-ITS service application | M |
| | User ID | UTF8String | Individual unique ID (e.g. user1) | M |
| | Data format | UTF8String | Data format received from server (e.g. xml, json) | M |
| | Card type | UTF8String | Type of card the user has registered for transportation<br>(1. credit card, 2. debit card, etc.) | M |
| | Card company | UTF8String | Company that issued card<br>(e.g. City bank) | M |
| | Card number | UTF8String | Card number (e.g. 5874-9682-0000-0000) | M |
| | Valid year | NumericString | Card valid year<br>(e.g. 2022) | M |
| | Valid month | NumericString | Car valid month<br>(e.g. 10) | M |
| | Enabled | UTF8String | Availability of transportation fee<br>(Y:possible, N:impossible) | M |

### 7.9.2 Example

Table 29 shows a data structure and sample for Mobile-Card-Edit, which contains information such as car number and valid year/month.

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**Table 29 — Example for Mobile-Card-Edit**

| | |
|---|---|
| **ASN.1** | sendMobileCardEdit ::= SEQUENCE {<br>Authorized-Key UTF8String,<br>Service-ID UTF8String,<br>User-ID UTF8String,<br>Data-Format UTF8String,<br>card type UTF8String,<br>card company UTF8String,<br>card number UTF8String,<br>valid year NumericString,<br>valid month NumericString,<br>enabled UTF8String<br>} |
| **Dataset** | "sendMobileCardEdit": {<br>"authorized-key": "BVxqYe1vQodFCNuAIzaSyO3mzwJeGv169qN", /* UTF8String */<br>"Service-ID": "GITS-1401-1", /* UTF8String */<br>"User-ID": " USER001", /* UTF8String */<br>"data-format": "json", /* UTF8String */<br>"card type": "1", /* UTF8String */<br>"card company": "Gold Bank", /* UTF8String */<br>"card number": "1234-5678-9012-3456", /* UTF8String */<br>"valid year": 25, /* NumericString */<br>"valid month": 11, /* NumericString */<br>"enabled": "Y" /* UTF8String */<br>} |

## 7.10 Eco-Driving-Info

### 7.10.1 Definition

Table 30 shows a definition for Eco-Driving-Info. Eco-Driving-Info defines the data provided to the server to analyse whether the real-time driving information from the moving vehicle reflects eco-driving.

**Table 30 — Definition of Eco-Driving-Info**

| | | |
|---|---|---|
| **Message** | ID | GITS10 |
| | Name | Eco-Driving-Info |
| | Executor | P-ITS-S |
| | Description | When the user uses Mycar or Sharing car, real-time driving information for the vehicle is periodically displayed on the server. |

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**Table 30** *(continued)*

| | Name | Data Type (Unit) | Description | Cvt |
|---|---|---|---|---|
| **Data parameter** | Authorized key | UTF8String | Nomadic device unique key value issued by the server | M |
| | Service ID | UTF8String | ID of service provided by G-ITS service application | M |
| | User ID | UTF8String | Individual unique ID (e.g. user1) | M |
| | Data format | UTF8String | Data format received from server (e.g. xml, json) | M |
| | VIN | UTF8String | 17-digit unique number to identify using vehicle (e.g. 1MHJF34JKTU123456) | M |
| | Vehicle type | UTF8String | Vehicle type (1.EV, 2.gasoline vehicle, 3.diesel car, etc.) | M |
| | Current time | GeneralizedTime | Current time the vehicle is driving (e.g. YYYYMMDDHH24MISS) | M |
| | Road number | UTF8String | Road number the vehicle is driving | O |
| | Current speed | REAL | Current speed the vehicle is driving (km/H) | M |
| | Coordinate system | UTF8String | Type of coordinate system used to provide information (e.g. GRS80) | M |
| | Latitude | REAL | Current latitude the vehicle is driving | M |
| | Longitude | REAL | Current longitude the vehicle is driving | M |

### 7.10.2 Example

Table 31 shows a data structure and sample for Eco-Driving-Info, which includes information such as VIN, road number and current speed.

**Table 31 — Example for Eco-Driving-Info**

| | |
|---|---|
| **ASN.1** | "sendEcoDrivingInfo ::= SEQUENCE {<br>authorized-key UTF8String,<br>service-id UTF8String,<br>user-id UTF8String,<br>data-format UTF8String,<br>VIN UTF8String,<br>vehicle type UTF8String,<br>current time GeneralizedTime,<br>road number UTF8String OPTIONAL,<br>current speed REAL,<br>Coordinate System UTF8String,<br>Latitude REAL,<br>Longitude REAL<br>} |

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**Table 31** *(continued)*

| | |
|---|---|
| **Dataset** | sendEcoDrivingInfo": {<br>"authorized-key": "BVxqYe1vQodFCNuAIzaSyO3mzwJeGv169qN", /* UTF8String */<br>"service-id": "GITS-2101-1", /* UTF8String */<br>"user-id": "USER001", /* UTF8String */<br>"data-format": "json", /* UTF8String */<br>"VIN ": "1MHJF34JKTU123456", /* UTF8String */<br>"vehicle type": "3", /* UTF8String */<br>"current time": "20190512094516", /* GeneralizedTime */<br>"road number": "17", /* UTF8String OPTIONAL */<br>"current speed": 85, /* REAL */<br>"Coordinate System": "GRS80", /* UTF8String */<br>"Latitude": 36.338369, /* REAL */<br>"Longitude": 127.393381 /* REAL */<br>} |

## 7.11 Eco-Driving-Res

### 7.11.1 Definition

Table 32 shows a definition of Eco-Driving-Res. Eco-Driving-Res analyses real-time driving information and defines the data delivered to guide the user on eco-driving.

**Table 32 — Definition of Eco-Driving-Res**

| | | | | |
|---|---|---|---|---|
| **Message** | ID | GITS11 | | |
| | Name | Eco-Driving-Res | | |
| | Executor | V-ITS-SG | | |
| | Description | Server analyses real-time driving information for the vehicle sent by the user and sends a caution notice in case of deviation from the eco-policy. | | |
| **Data parameter** | Name | Data Type (Unit) | Description | Cvt |
| | Result code | UTF8String | Value encoded by the user's request processing result (e.g. 00) | M |
| | Result message | UTF8String | Message about user's request processing result (e.g. "Successfully processed") | M |
| | Service ID | UTF8String | ID of service provided by G-ITS service application | M |
| | User ID | UTF8String | Individual unique ID (e.g. user1) | M |
| | Data format | UTF8String | Date format (e.g. xml, json) | M |
| | Information | UTF8String | Guides and warning phrases for driving on eco | M |
| | Violation content | UTF8String | Contents that violated eco-driving<br>(e.g. aggressive deceleration, aggressive acceleration, etc.) | M |
| | Start time | GeneralizedTime | Time when the eco-driving violation began<br>(e.g. YYYYMMDDHH24MISS) | M |
| | End time | GeneralizedTime | Time when the eco-driving violation ended<br>(e.g. YYYYMMDDHH24MISS) | M |
| | Max speed | INTEGER | Maximum speed for eco-driving violations (km/h) | M |
| | Min speed | INTEGER | Minimum speed for eco-driving violations (km/h) | M |

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**Table 32** *(continued)*

| | | | | |
|---|---|---|---|---|
| | Duration | INTEGER | Duration for eco-driving violations<br>(unit: sec) | M |
| | Accumulated mileage | REAL | Eco-mileage that the user originally owned | M |
| | Deduction mileage | REAL | Eco-mileage that should be deducted in violation of eco-driving | M |
| | Final mileage | REAL | Last remaining mileage | M |
| | Recent grade | UTF8String | Recent grade about eco-mileage<br>(e.g. A, B, C...) | M |
| | Final grade | UTF8String | Final grade about eco-mileage<br>(e.g. A, B, C...) | M |

### 7.11.2 Example

Table 33 shows a data structure and sample for Eco-Driving-Res, which includes information on eco-driving violations, messages and mileage.

**Table 33 — Example for Eco-Driving-Res**

| | |
|---|---|
| **ASN.1** | sendEcoDrivingRes ::= SEQUENCE {<br>result-code UTF8String,<br>result-message UTF8String,<br>service-id UTF8String,<br>user-id UTF8String,<br>data format UTF8String,<br>information UTF8String,<br>violation content UTF8String,<br>start time GeneralizedTime,<br>end time GeneralizedTime,<br>max speed INTEGER,<br>min speed INTEGER,<br>duration INTEGER,<br>accumulated mileage REAL,<br>deduction mileage REAL,<br>final mileage REAL,<br>recent grade UTF8String,<br>final grade UTF8String<br>} |

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**Table 33** *(continued)*

| | |
|---|---|
| **Dataset** | “sendEcoDrivingRes”: {<br>“result-code”: “00” , /* UTF8String */<br>“result-message”: “Successfully processed”, /* UTF8String */<br>“service-id”: “GITS-2101-2”, /* UTF8String */<br>“user-id”: “ USER001”, /* UTF8String */<br>“data format”: “json”, /* UTF8String */<br>“inforation”: “limit speed exceeded”, /* UTF8String */<br>“violation content”: “overspeed”, /* UTF8String */<br>“start time”: 20190421112533, /* GeneralizedTime */<br>“end time”: 20190421114530, /*GeneralizedTime */<br>“max speed”: 60, /* INTEGER */<br>“min speed”: 30, /* INTEGER */<br>“duration”: 2003, /* INTEGER */<br>“accumulated mileage”: 2531, /* REAL */<br>“deduction mileage”: 5, /* REAL */<br>“final mileage”: 2526, /* REAL */<br>“recent grade”: “AA”, /* UTF8String */<br>“final grade”: “AB” /* UTF8String */<br>} |

## 7.12 Eco-Traffic-Info

### 7.12.1 Definition

Table 34 shows a definition for Eco-Traffic-Info. Eco-Traffic-Info defines the data delivered to the user by analysing the traffic situation for the route ahead.

**Table 34 — Definition of Eco-Traffic-Info**

| | | | | |
|---|---|---|---|---|
| **Message** | ID | GITS12 | | |
| | Name | Eco-Traffic-Info | | |
| | Executor | V-ITS-SG | | |
| | Description | Server delivers traffic information in the forward direction while the user is following the driving route. | | |
| | Name | Data Type (Unit) | Description | Cvt |
| | Result code | NumericString | Value encoded by the user’s request processing result (e.g. 00) | M |
| | Result message | UTF8String | Message about user’s request processing result (e.g. "Successfully processed”) | M |
| | Service ID | UTF8String | ID of service provided by G-ITS service application | M |
| | Data format | UTF8String | Data format received from server (e.g. xml, json) | M |
| | Return count | INTEGER | Number of results | M |
| | Return data | SEQUENCE OF | Bundle of traffic information results of the same type | S |
| | Road number | UTF8String | Road number the vehicle is driving | O |
| | Name of start point | UTF8String | Name of the traffic information start location (e.g. xx building, etc.) | O |

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**Table 34** *(continued)*

| | | | | | |
|---|---|---|---|---|---|
| **Data parameter** | | Name of end point | UTF8String | Name of the traffic information end location<br>(e.g. post office) | O |
| | | Latitude of start point | REAL | Latitude of the traffic information start location<br>(e.g. 35.23364) | M |
| | | Longitude of start point | REAL | Longitude of the traffic information start location<br>(e.g. 126.38456) | M |
| | | Latitude of end point | REAL | Latitude of the traffic information end location<br>(e.g. 37.365148) | M |
| | | Longitude of end point | REAL | Longitude of the traffic information end location<br>(e.g. 126.970547) | M |
| | | Distance | REAL | Total distance of traffic information section<br>(unit: m) | O |
| | | Start node ID | UTF8String | Node ID of traffic information start location | O |
| | | End node ID | UTF8String | Node ID of traffic information end location | O |
| | | Link speed | REAL | Average link speed from the start point to the end point of the vehicles<br>(unit: km/h) | M |
| | | Link travel time | REAL | Average link travel time from the start point to the end point of the vehicles<br>(unit: sec) | M |
| | | Traffic condition code | NumericString | Code indicating traffic conditions<br>(01: 소통원활, 02 : 서행, 03 : 정체 등) | M |
| | | Information generation time | GeneralizedTime | Time that generated traffic information<br>(e.g. YYYYMMDDHH24MISS) | M |

### 7.12.2 Example

Table 35 shows a data structure and sample for Eco-Traffic-Info, which includes data such as the coordinates of the start point and end point and traffic condition information.

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**Table 35 — Example for Eco-Traffic-Info**

**ASN.1**

```
sendEcoTrafficInfo ::= SEQUENCE {
    Result-Code             NumericString,
    Result-Message          UTF8String,
    Service-ID              UTF8String,
    Data-Format             UTF8String,
    Return-Count            INTEGER,
    Return-Data             ::= SEQUENCE-OF SEQUENCE {
            road number                         UTF8String OPTIONAL,
            name of start point                 UTF8String OPTIONAL,
            name of end point                   UTF8String OPTIONAL,
            latitude of start point             REAL,
            longitude of start point            REAL,
            latitude of end point               REAL,
            longitude of end point              REAL,
            distance                            REAL OPTIONAL,
            start node ID                       UTF8String OPTIONAL,
            end node ID                         UTF8String OPTIONAL,
            link speed                          REAL,
            link travel time                    REAL,
            traffic condition code              NumericString,
            information generation time         GeneralizedTime
    }
}
```

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**Table 35** *(continued)*

| | |
|---|---|
| **Dataset** | "sendEcoTrafficInfo": {<br>"result-code": "00", /* NumericString */<br>"result-message": "Successfully processed", /* UTF8String */<br>"Service-ID": /* UTF8String */<br>"data-format": "json", /* UTF8String */<br>"Return-Count": 1, /* INTEGER */<br>"Return-Data": { /* SEQUENCE-OF SEQUENCE */<br>"road number": "117", /* UTF8String OPTIONAL */<br>"name of start point": "", /* UTF8String OPTIONAL */<br>"name of end point": "", /* UTF8String OPTIONAL */<br>"latitude of start point": 37.365148, /* REAL */<br>"longitude of start point": 126.970547, /* REAL */<br>"latitude of end point": 36.338369, /* REAL */<br>"longitude of end point": 127.393381, /* REAL */<br>"distance": 123, /* REAL OPTIONAL */<br>"start node ID": "4060006480", /* UTF8String OPTIONAL */<br>"end node ID": "4060006500", /* UTF8String OPTIONAL */<br>"link speed": 57, /* REAL */<br>"link travel time": 716, /* REAL */<br>"traffic condition code": "01", /* NumericString */<br>"information generation time": 20190202020202 /* GeneralizedTime */<br>}<br>} |

## 7.13 Eco-Weather-Info

### 7.13.1 Definition

Table 36 shows a definition for Eco-Weather-Info. Eco-Weather-Info defines data that conveys weather conditions along the route.

**Table 36 — Definition of Eco-Weather-Info**

| | | |
|---|---|---|
| **Message** | ID | GITS13 |
| | Name | Eco-Weather-Info |
| | Executor | V-ITS-SG |
| | Description | Server delivers weather information that changes along the driving route, which is then displayed on the top of the nomadic device. |

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**Table 36** *(continued)*

| | Name | | Data Type (Unit) | Description | Cvt |
|---|---|---|---|---|---|
| **Data parameter** | Result code | | NumericString | Value encoded by the user's request processing result (e.g. 00) | M |
| | Result message | | UTF8String | Message about user's request processing result (e.g. "Successfully processed") | M |
| | Service ID | | UTF8String | ID of service provided by G-ITS service application | M |
| | Data format | | UTF8String | Data format received from server (e.g. xml, json) | M |
| | Return count | | INTEGER | Number of results | M |
| | Return data | | SEQUENCE OF | Bundle of weather information results of the same type | S |
| | | City code | UTF8String | City code to provide weather information | O |
| | | Weather code | UTF8String | Code for weather information (1. sunny, 2. cloudy 3. rainy, etc.) | M |
| | | Weather | UTF8String | Weather information (e.g. sunny, cloudy, rainy, snowy, etc.) | M |
| | | Probability of rainfall/snowfall | REAL | Probability of rainfall or snowfall (unit: %) | M |
| | | Rainfall/Snowfall | REAL | Rainfall or Snowfall (unit: mm/hr) | M |
| | | Coordinate system | UTF8String | Type of coordinate system used to provide information (e.g. GRS80) | M |
| | | Latitude | REAL | Latitude of the point where the vehicle is driving (e.g. 35.23364) | M |
| | | Longitude | REAL | Longitude of the point where the vehicle is driving (e.g. 126.38456) | M |
| | | Information generation time | GeneralizedTime | Time that generated traffic information (e.g. YYYYMMDDHH24MISS) | M |

### 7.13.2 Example

Table 37 shows a data structure and sample for Eco-Weather-Info, which includes coordinates, weather and probability of rainfall/snowfall of the road ahead.

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**Table 37 — Example for Eco-Weather-Info**

**ASN.1**

```
sendEcoWeatherInfo ::=  SEQUENCE {
    Result-Code          NumericString,
    Result-Message       UTF8String,
    Service-ID           UTF8String,
    Data-Format          UTF8String,
    Return-Count         INTEGER,
    Return-Data          ::=       SEQUENCE-OF SEQUENCE {
                city code                              UTF8String,
                weather code                           UTF8String,
                weather                                UTF8String,
                probability of rainfall/snowfall       REAL,
                rainfall/snowfall                      REAL,
                coordinate system                      UTF8String,
                latitude                               REAL,
                longitude                              REAL,
                information generation time            GeneralizedTime
    }
}
```

Dataset

```
"sendEcoWeatherInfo":      {
    "result-code": "00" ,                                  /* NumericString */
    "result-message": "Successfully processed",            /* UTF8String */
    "Service-ID": "GITS-2103-2",                           /* UTF8String */
    "data-format": "json",                                 /* UTF8String */
    "Return-Count": 2,                                     /* INTEGER */
    "Return-Data" : [                                      /* SEQUENCE-OF SEQUENCE */
        {
            "city code": "23",                  "weather code": "2",
            "weather": "rainy",                 "probability of rainfall/snowfall": 80,
            "rainfall/snowfall": 23,            "Coordinate System": "GRS80",
            "latitude": 36.338369,              "Longitude": 127.393381,
            "information generation time":      20190101010101
        },
        {
            "city code": "23",                  "weather code": "2",
            "weather": "rainy",                 "probability of rainfall/snowfall": 100,
            "rainfall/snowfall": 50,            "Coordinate System": "GRS80",
            "Latitude": 36.336901,              "Longitude": 127.382543,
            "information generation time":      20190101010101
        },
    ]
}
```

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