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Intelligent transportation systems — Energy-based green ITS services for smart city mobility applications via nomadic and mobile devices —

Part 1: General information and use case definitions

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Systèmes de transport intelligents - Services STI écologiques basés sur l'énergie pour les applications de mobilité des villes intelligentes via des dispositifs nomades et mobiles —

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

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Foreword

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

A list of all parts in the ISO 17748 series can be found on the ISO website.

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Introduction

Environmentally friendly and energy-efficient mobility services have been deployed around the world to address rising urban energy problems caused by population growth, rapid climate change and increased energy use. While attempts are being made to combine technical solutions for transportation and energy use for improved energy efficiency, there are no traffic-energy-related guidelines that meet the various needs of diverse stakeholders in the transportation industry.

A smart city uses foundation technologies to manage energy efficiency. A smart city does this by measuring, metering and forecasting demand for energy, and by providing data platforms on the transport sector. These can be presented as management technology for solving urban problems.

An energy-based green intelligent transport systems (G-ITS) service provides users with customized services to meet their energy needs. The service does this by keeping users informed about their energy use and integrating management using nomadic devices to maximize energy efficiency.

This document considers the conversion of the existing efficiency and safety-oriented transportation system into a more energy-efficient system through the distribution of urban energy, allowing for improved management and energy consumption measurements.

Specifically, this document:

— identifies the general information of the applicable framework for energy-based green intelligent transport systems(G-ITS) services;

— identifies the method to describe the general information for all subjects related to energy-based G-ITS services interfaced with smart city cloud and charging infrastructure, with vehicle stations based on nomadic devices;

— specifies the general use cases for inclusion in energy-based G-ITS as services.

Intelligent transportation systems — Energy-based green ITS services for smart city mobility applications via nomadic and mobile devices —

Part 1:
General information and use case definitions

1 Scope

This document provides a framework and information on the total amount of energy appropriate for the deployment of smart city mobility and energy efficiency technologies. These technologies can increase operational energy efficiency and unlock enhanced transportation waste-free energy applications, as well as measuring energy consumption.

The standard framework for energy-based green intelligent transport systems (G-ITS) builds on the best practices for energy efficient transport and management systems, as well as applications of intelligent transport systems (ITS), and aims to accommodate the specific needs of energy-based green ITS in smart cities.

G-ITS use data platforms to measure energy for transport and to forecast demand. A smart city provides G-ITS services to improve energy efficiency by using nomadic devices and by monitoring energy supply and demand.

This document describes the change in the traffic paradigm from the perspective of energy efficiency. It outlines:

— general information for energy-based G-ITS as a service using nomadic and mobile devices;

— use cases for energy-based G-ITS services using nomadic and mobile devices;

— use cases for energy-based mobility services, for example electric vehicles (EV), transportation infrastructure and other mobility services using nomadic devices.

2 Normative references

There are no normative references in this document.

3 Terms and definitions and abbreviated terms

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

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

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

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

3.1
nomadic device
ND
device that provides communications connectivity via equipment such as cellular telephones, mobile wireless broadband (e.g. WIMAX, HC-SDMA), WiFi, etc.

3.2
mobile charging truck
mobile energy storage truck that can go anywhere and provide power, including charging electric vehicles

3.3
smart city
advanced city using advanced information and communication technology to intelligently network key functions of the city

3.4
eco-mobility
eco-friendly transport systems and services based on eco-friendly vehicles and their related facilities

3.5
e-hub
energy-hub
storage for electrical energy, including renewable energy, which can be used when charging an electric vehicle

3.6
demand-responsive charging
DRC
technology that induces changes in electricity consumption patterns according to electricity supply and demand conditions, such as peak periods, through incentive benefits for demand management in a charging zone

3.7
discharging
reversing the remaining amount of mobility energy to the power system

4 General information on energy-based green intelligent transport systems

4.1 Overview of energy-based G-ITS

4.1.1 The background and challenges of energy-based G-ITS

The increase in urbanization due to population growth, energy depletion, rising carbon emission and traffic congestion contributes to climate change and affects cities and local communities. Cities are addressing these issues by adopting environmentally friendly and energy-efficient ITS services.

For example, mobility ecosystems have been created where various mobility services can be accessed through mobile apps or web interfaces, providing energy-efficient routes and optimizing travel routes while allowing users to pay for the most suitable mobility services in terms of time and cost.

Additionally, efforts to reduce carbon emissions have been made, including a shift from fossil fuel energy sources to electricity. Various electric mobility services are emerging, contributing to the overall energy management of cities.

It is expected that numerous convergent services will emerge for decarbonization in transportation and energy. However, there is currently a lack of guidance to meet the diverse demands of these services. It is necessary to develop several leading service models for traffic energy management, including mobile charging vehicles, charging with renewable energy, and total energy consumption control in the public transportation sector.

4.1.2 The energy-based G-ITS concept

4.1.2.1 General

Some conceptual aspects of energy-based G-ITS services are illustrated in Figure 1.

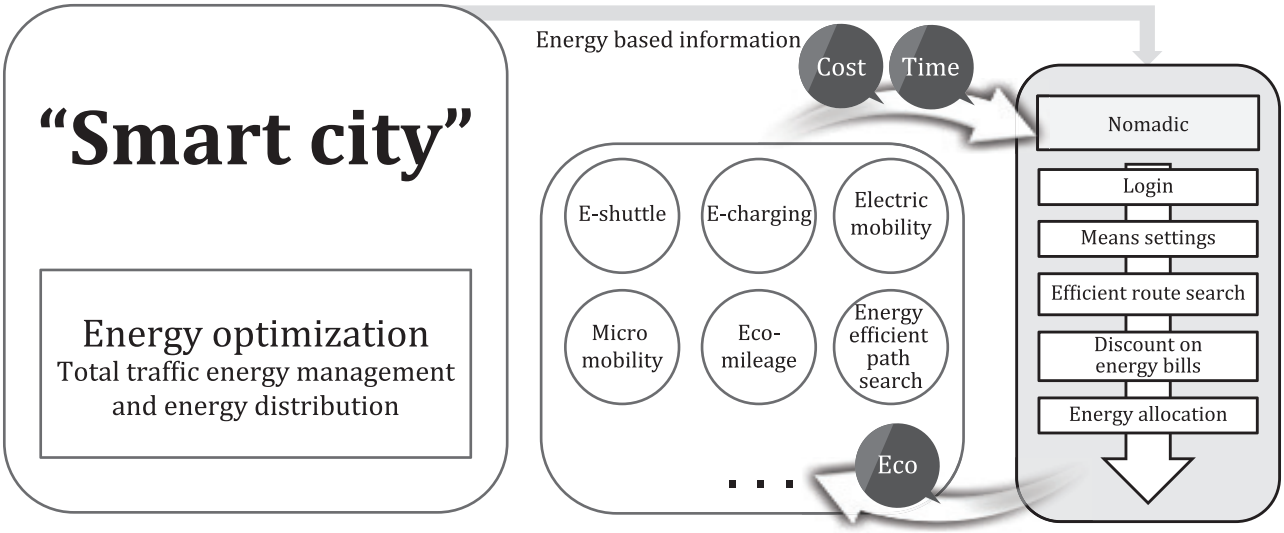

Figure 1 — Conceptual aspects of energy-based G-ITS

An energy-based G-ITS service consists of a data platform for smart cities that balances energy supply and demand using new information and communication (ICT)-based technologies such as smartphones, integrated data platforms and connected vehicles. To transform the existing paradigm of traffic efficiency and safety into an energy efficient system, an energy-based G-ITS service aims to allocate and distribute urban energy to manage the energy use of individuals. An energy-based G-ITS also supports the real-time operation management of complex transportation through connection with information systems such as generator information, system price information, and charging infrastructure.

The stakeholders for the proposition of energy-based G-ITS are described in the following subclauses.

4.1.2.2 Smart city cloud

A smart city collects data from various domains, such as administration, crime prevention, transportation, energy, climate, and welfare. A smart city provides each domain with real-time and static information by collecting data from intelligent urban infrastructure and network systems that are not accessible to the private sector.

Ultimately, by transmitting data to the data platform, a smart city aims to provide information on the supply and demand of energy usage in the transportation sector, such as energy reduction directions by smart cities.

4.1.2.3 Data platform

A data platform collects information on all transportation means so that users have access to related energy-based G-ITS services. The platform collects and analyses the usage history of these services to provide targets for energy reduction, charging and discharging, and integrated reservation and payment services.

4.1.2.4 Service provider (vehicles)

A vehicle service provider manages information about different modes of transport such as car sharing, personal mobility, demand responsive transport, etc. It also manages information on operations, location, charging and reservation fees. In the case of electric mobility, a service provider is a means of charging and discharging. The generated service provider information can be re-collected by smart city cloud subject to agreement from users.

4.1.2.5 Service provider (infrastructure operators)

Infrastructure operators manage transport energy infrastructure and relevant information services. The infrastructure includes charging facilities, renewable energy facilities, mobile charging trucks and parking lots.

4.1.2.6 Users (nomadic and mobile)

Users can use energy-based G-ITS services through nomadic and mobile devices with energy-optimized information. Users can also pay with green mileage points on their mobile phones.

The flow of data related to energy-based G-ITS services is illustrated in Figure 2.

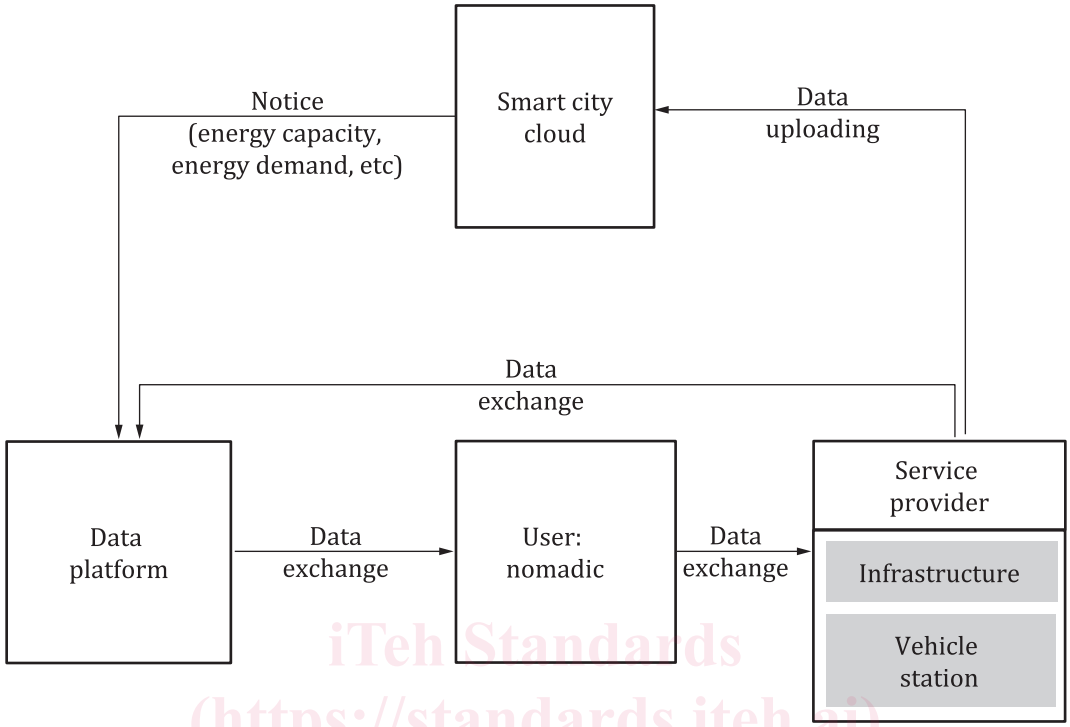

Figure 2 — Energy-based G-ITS data flow

5 Use cases overview and definitions

5.1 Use cases overview

5.1.1 Basic principles for use cases

Subclause 5.1 provides general information on use cases.

Certain basic principles have been established as a framework to define the use cases.

— The use cases of energy-based G-ITS services describe the interaction between conventional ITS services and mobility for eco transport systems and services based on various vehicles and their related facilities.

— The use cases outlined in this document define a sample case for energy-based G-ITS services for transport users, including general drivers, freight drivers and pedestrians. These use cases are applicable for any personal ITS station.

5.1.2 Use case clusters

Table 1 provides an overview of the use case clusters.