

# TECHNICAL REPORT

ISO/TR  
**4445**

First edition  
2021-09

---

---

## Intelligent transport systems — Mobility integration — Role model of ITS service application in smart cities

*Systèmes de transport intelligents - Intégration de la mobilité -  
Schéma d'application des services ITS*

**iTeh Standards**  
**(<https://standards.iteh.ai>)**  
**Document Preview**

[ISO/TR 4445:2021](#)

<https://standards.iteh.ai/catalog/standards/iso/d9f5b27b-3dd7-4325-95ce-de9737c5eacf/iso-tr-4445-2021>



Reference number  
ISO/TR 4445:2021(E)

© ISO 2021

**iTeh Standards**  
**(<https://standards.iteh.ai>)**  
**Document Preview**

[ISO/TR 4445:2021](#)

<https://standards.iteh.ai/catalog/standards/iso/d9f5b27b-3dd7-4325-95ce-de9737c5eacf/iso-tr-4445-2021>



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2021

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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

Published in Switzerland

# Contents

Page

<b>Foreword</b>	<b>v</b>
<b>Introduction</b>	<b>vi</b>
<b>1 Scope</b>	<b>1</b>
<b>2 Normative references</b>	<b>1</b>
<b>3 Terms and definitions</b>	<b>1</b>
<b>4 Abbreviated terms</b>	<b>2</b>
<b>5 General overview and framework</b>	<b>3</b>
5.1 Objective	3
5.2 National variations	3
5.3 Mandatory, optional and cooperative issues	3
5.4 Specification of service provision	3
5.5 Architecture options	3
<b>6 Concept of operations</b>	<b>4</b>
6.1 General	4
6.2 Statement of the goals and objectives of the system	4
6.3 Strategies, tactics, policies, and constraints affecting the system	4
6.4 Organizations, activities and interactions among participants and stakeholders	4
6.5 Clear statement of responsibilities and authorities delegated	4
6.6 Operational processes for the system	5
6.6.1 General	5
6.6.2 Service requirements definition	5
6.7 Appointment of an approval authority (regulatory)	5
6.8 In-vehicle system	5
6.9 User	5
6.10 Application service	6
6.11 Big data management entity	6
6.12 Data aggregator	6
<b>7 Conceptual architecture framework</b>	<b>6</b>
7.1 General	6
7.2 Actors	6
7.3 Service definition	8
7.4 Role model architecture	8
7.4.1 General	8
7.4.2 Jurisdictions	9
7.4.3 Application service actors	9
7.4.4 Service provider(s)	10
7.4.5 The OBE equipment installer	10
7.4.6 The OBE equipment maintainer	10
7.4.7 Approval authority (regulatory)	11
7.4.8 Security credential management system/public key infrastructure	11
7.4.9 Certification authority (digital)	12
7.4.10 Application service approval	12
7.4.11 Onboard equipment OBE approval	12
7.4.12 Vehicle user	14
7.4.13 Application service provision	15
<b>8 Communications architecture</b>	<b>15</b>
<b>9 Quality of service requirements</b>	<b>15</b>
<b>10 Test requirements</b>	<b>16</b>
<b>11 Marking, labelling and packaging</b>	<b>16</b>

12	Declaration of patents and intellectual property.....	16
Annex A (informative)	ITS data management architecture.....	17
Bibliography.....		36

**iTeh Standards**  
**(<https://standards.iteh.ai>)**  
**Document Preview**

[ISO/TR 4445:2021](#)

<https://standards.iteh.ai/catalog/standards/iso/d9f5b27b-3dd7-4325-95ce-de9737c5eacf/iso-tr-4445-2021>

## Foreword

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

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://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](http://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](http://www.iso.org/iso/foreword.html).

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

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

[ISO/TR 4445:2021](http://ISO/TR 4445:2021)

<https://standards.iteh.ai/catalog/standards/iso/d9f5b27b-3dd7-4325-95ce-de9737c5eacf/iso-tr-4445-2021>

## Introduction

Currently, more than 70 % of the world's people live in cities. The proportion of people living in cities is rising around the world as civilisations develop and congregate around cities where there are more employment opportunities. Societies develop more innovatively and rapidly in cities, and they present better entertainment opportunities, adding to their attraction. *The Economist* magazine recently forecast that by 2045, an extra 2 billion people will live in urban areas<sup>[16]</sup>. The resulting concentration of population creates various issues such as road congestion due to an increase in vehicle population and environmental pollution due to exhaust gas and tyre erosion. These issues have been attributed to increases in the number of delivery trucks, taxis and town centre traffic and are further exacerbated by obstacles to the effective use of urban space due to the private ownership of cars (parking lots, street parking).

The pressures caused by scientific advice that significant action and change of behaviour is needed to ameliorate the adverse effects of climate change require a more environmentally friendly use of the transport system.

It is recognized that there is also road infrastructure deterioration, a lack of provision of information on the use of public transportation, driver shortages due to the increase in the number of elderly people and the inconvenience of multimodal fare payments, and action to improve the situation is urgently needed.

The International Data Corporation forecasts that of the USD 81 billion that will be spent on smart city technology in 2020, nearly a quarter will go into fixed visual surveillance, smart outdoor lighting and advanced public transit<sup>[17]</sup>.

Eventually, this is likely to mean high speed trains and driverless cars. Consultancy McKinsey forecasts that up to 15 % of passenger vehicles sold globally in 2030 will be fully automated, while revenues in the automotive sector could nearly double to USD 6.7 trillion thanks to shared mobility (car-sharing, e-hailing) and data connectivity services (including apps and car software upgrades)<sup>[18]</sup>.

Changing consumer tastes are also calling for new types of infrastructure. Today's city dwellers, for example, increasingly shop online and expect ever faster delivery times. To meet their needs, modern urban areas need the support of last-minute distribution centres, backed by out-of-town warehouses<sup>[15-2021]</sup>.

Therefore, in recent years, in Europe, studies on the development of mobility integration standards have been active to solve urban problems. There are various movements around the world making efforts to address these issues. In the United States, ITS technology is used to try to solve these urban problems, as in the Smart City Pilot Project. Columbus, Ohio has been selected as a smart city pilot project which is currently being designed in detail. Important key factors here are the core architectural elements of smart cities, and urban ITS sharing of probe data (also called sensor data), connected cars and automated driving. In addition, new issues have been recognized with the introduction of the connected car to the real world in respect of privacy protection, the need to strengthen security measures, big data collection and processing measures, which are becoming important considerations.

In terms of the effective use of urban space, it is hoped that the introduction of connected cars and automated driving can significantly reduce the requirements for urban parking lots (redistribution of road space). If technology can eliminate congestion, the city road area usage can also be minimized and reallocated (space utilization improvement) to improve the living environment of, and quality of life in, the city. In addition, the environment around the road will be improved by improving enforcement (e.g. overloaded vehicles). On the other hand, even in rural areas, it is possible to introduce automated driving robot taxis and other shared mobility that saves labour (and is therefore more affordable) and improves the mobility of elderly people.

To achieve this requires the realization of various issues, for example:

- cooperation with harmonization of de-jure standards such as ISO and industry de facto standards;
- recognition of the significance of international standardization (e.g. to reduce implementation costs);