



# Technical Specification

**ISO/TS 21192**

## Electronic fee collection — Support for traffic management

*Perception de télépéage — Aide pour la gestion du trafic*

**Second edition  
2024-11**

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

[ISO/TS 21192:2024](https://standards.iteh.ai/catalog/standards/iso/f4a315ba-a092-47e2-a578-e23d64c30bc7/iso-ts-21192-2024)

<https://standards.iteh.ai/catalog/standards/iso/f4a315ba-a092-47e2-a578-e23d64c30bc7/iso-ts-21192-2024>

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

[ISO/TS 21192:2024](https://standards.iteh.ai/catalog/standards/iso/f4a315ba-a092-47e2-a578-e23d64c30bc7/iso-ts-21192-2024)

<https://standards.iteh.ai/catalog/standards/iso/f4a315ba-a092-47e2-a578-e23d64c30bc7/iso-ts-21192-2024>



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2024

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>iv</b>
<b>Introduction</b> .....	<b>v</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 Architectural concepts and information exchanges</b> .....	<b>2</b>
5.1 General.....	2
5.2 Role model.....	2
5.3 Data flow model.....	3
5.4 Information exchanges between TC and RTM.....	4
<b>6 General requirements for data exchange</b> .....	<b>5</b>
6.1 General.....	5
6.2 Transaction: Set tariff scheme based on LOS.....	6
6.2.1 Overview.....	6
6.2.2 Message: <code>LevelOfServiceAdu</code> .....	7
6.2.3 Message: <code>TariffSchemeAdu</code> .....	7
6.3 Transaction: Levy toll.....	9
6.3.1 Overview.....	9
6.3.2 Message: <code>RealTimeTollInformationAdu</code> .....	9
6.3.3 Message: <code>RoadUsageDataAdu</code> .....	10
6.4 Transaction: Set tariff scheme based on travel demand model.....	11
6.4.1 Overview.....	11
6.4.2 Message: <code>TariffSchemeRequestAdu</code> .....	11
6.4.3 Message: <code>TariffSchemeAdu</code> .....	13
6.5 Privacy and quality of data.....	13
<b>Annex A (normative) Data type specification</b> .....	<b>14</b>
<b>Annex B (normative) Implementation conformance statement proforma</b> .....	<b>15</b>
<b>Annex C (normative) Reference standards for data exchange</b> .....	<b>19</b>
<b>Annex D (informative) Smart route selection in Japan</b> .....	<b>21</b>
<b>Annex E (informative) Electronic Road Pricing (ERP) in Singapore</b> .....	<b>23</b>
<b>Annex F (informative) Managed lanes in the USA</b> .....	<b>26</b>
<b>Annex G (informative) Emission control using transit data in Japan</b> .....	<b>28</b>
<b>Annex H (informative) Data flow model of EFC support for traffic management</b> .....	<b>29</b>
<b>Annex I (informative) Example of data flows</b> .....	<b>30</b>
<b>Annex J (informative) Privacy and quality of data</b> .....	<b>31</b>
<b>Bibliography</b> .....	<b>34</b>

## 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 document 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)).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights.

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*.

This second edition cancels and replaces the first edition of ISO/TS 21192:2019, which has been technically revised.

The main changes are as follows:

- [Clause 3](#) has been updated and ISO/TS 17573-2 has been made the primary source for terms and definitions;
- data definitions have been updated, including making reference to ISO 17573-3 as the primary source.

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).

## Introduction

Electronic fee collection (EFC) systems have been introduced in many countries where collected revenue is mostly used for funding the construction or maintenance of roads. EFC is also used for traffic management to reduce congestion in urban areas, such as London and Stockholm, since tolling is closely related to travel demand elasticity.

Traffic management is becoming more important as a tool used for reduction of congestion and emissions control in urban areas. EFC schemes such as the smart route selection and managed lanes are some of the key EFC applications used to support traffic management.

This document contains the following annexes:

- Data type specifications are given in [Annex A](#);
- The implementation conformance statement proforma, to be completed by suppliers that claim their implementations are in conformity with this document, is provided in [Annex B](#);
- [Annex C](#) specifies the procedures for data exchange, in accordance with the referenced standards;
- Examples of EFC used for traffic management in other countries:
  - [Annex D](#) presents a new method for traffic management, called smart route selection, in which EFC will be used for selecting a route in the Tokyo metropolitan area to divert traffic out of central parts of the metropolitan area;
  - [Annex E](#) presents the Electronic Road Pricing scheme in Singapore;
  - [Annex F](#) presents managed lanes including services known as high occupancy vehicle (HOV) lanes and high occupancy tolls (HOT) on interstate freeways in the USA;
  - [Annex G](#) presents the dynamic pricing scheme to improve the environment in Japan;
- [Annex H](#) shows the data flow model of EFC support for traffic management;
- [Annex I](#) provides examples of data flows between components of EFC and road traffic management systems;
- [Annex J](#) explains principles and considerations of privacy and quality of data.



# Electronic fee collection — Support for traffic management

## 1 Scope

This document identifies the architecture of a toll system environment in which a toll charger (TC) can act to support traffic management with the use of a tariff scheme.

This document defines:

- the architecture relevant to the scope of this document;
- a standard framework and data flow model;
- an exchange of information between a TC and a road and traffic manager (RTM), e.g.:
  - level of service (LOS);
  - tariff scheme;
  - data which is needed to support traffic management (vehicle probe and traffic flow data).

The detailed definitions of mandatory and optional elements in real implementation are outside the scope of this document. This document does not define communication stacks or timings.

## 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/FDIS 12855<sup>1)</sup>, *Electronic fee collection — Information exchange between service provision and toll charging*

ISO 14827-2, *Intelligent transport systems — Data interfaces between centres for transport information and control systems — Part 2: AP-DATEX*

ISO 14827-3, *Transport information and control systems — Data interfaces between centres for transport information and control systems — Part 3: Data interfaces between centres for intelligent transport systems (ITS) using XML (Profile A)*

ISO 22837:2009, *Vehicle probe data for wide area communications*

ISO/TS 17573-2, *Electronic fee collection — System architecture for vehicle related tolling — Part 2: Vocabulary*

ISO 17573-3, *Electronic fee collection — System architecture for vehicle-related tolling — Part 3: Data dictionary*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TS 17573-2 and the following term and definition apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>

---

1) Under revision. Stage at the date of publication: ISO/FDIS 12855:2024.

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

### 3.1

#### level of service

#### LOS

rating of the quality of transportation facilities and services from the user perspective, with reference to speed, convenience and comfort, to evaluate problems and potential solutions

## 4 Abbreviated terms

EFC	Electronic Fee Collection
OBE	On-Board Equipment
LOS	Level of Service
RSE	Roadside Equipment
RTM	Road and Traffic Manager
TC	Toll Charger

## 5 Architectural concepts and information exchanges

### 5.1 General

This clause specifies the role model of EFC support for traffic management in terms of its roles and relationship with EFC and traffic management related roles. The information exchanges needed by a toll charger (TC) and an RTM to perform their roles are described in this clause.

### 5.2 Role model

ISO 17573-1 defines four main roles in the electronic fee collection domain. [Figure 1](#) shows the role model expanded with one role with support for traffic management. Interactions between the management role of road and traffic operation environment and the charging role of the tolling environment are both management and operational information flows, e.g. information flows regarding setting a tariff scheme, or daily operation of the tolling.

The main purpose of the role Management of road and traffic operation environment is to manage road and traffic operation environment, by defining and maintaining the set of rules that define the policy of traffic management. It should be noted that the role for traffic management is part of the traffic management domain. Hence, this document describes the interface between the two domains, see [Figure 1](#).

The responsibilities of the role allocated to the traffic management domain include:

- definition of the level of service (LOS), including required transport performance which is appropriate for a regional transportation network;
- provision of road usage data, including transit data to identify vehicle movements and usage of the road infrastructure and to calculate the relevant tolls;
- operation of travel demand model, including definition of a new tariff scheme to improve traffic management.



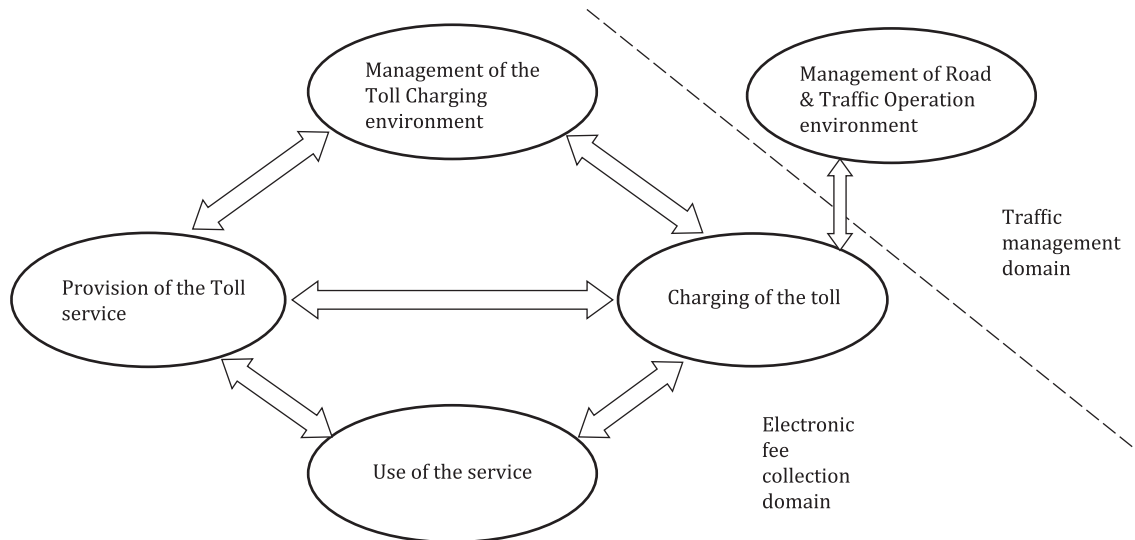


Figure 1 — Role model in EFC domain to support traffic management domain

### 5.3 Data flow model

The TC needs to establish and maintain close contact with the relevant RTM to use a tariff scheme for traffic management. In [Figure 2](#), the data flow model for EFC support for traffic management is shown with RTM, which plays an important role for traffic management in a region. The corresponding data flow of this document is shown in the double line arrows between TC and RTM.

The tasks and responsibilities of TC and RTM to support traffic management are as follows.

- RTM is responsible for road transport network operation, including monitoring of the level of transport service. RTM defines the LOS and sets transport performance requirements, based on the regional transport policy and traffic status, and sends them to TC.
- TC operates a tariff scheme, based on the transport performance requirements to optimize the toll revenue and the LOS, and provides it to RTM. TC calculates and charges the toll and provides real time toll-relevant information to RTM.
- RTM monitors the LOS by using vehicle probe and traffic flow data. RTM provides real time toll-relevant information to the users through the roadside information equipment, on-board equipment (OBE), in-car navigation devices, or web pages. RTM provides the road usage data required for tolling upon request from TC.
- RTM runs the travel demand model, to pursue better traffic management, and requests a new tariff scheme with the current data from the TC.
- TC evaluates and sets a new tariff scheme and sends it back to RTM.
- RTM activates the new tariff scheme, runs the travel demand model, and requests a new tariff scheme if necessary.

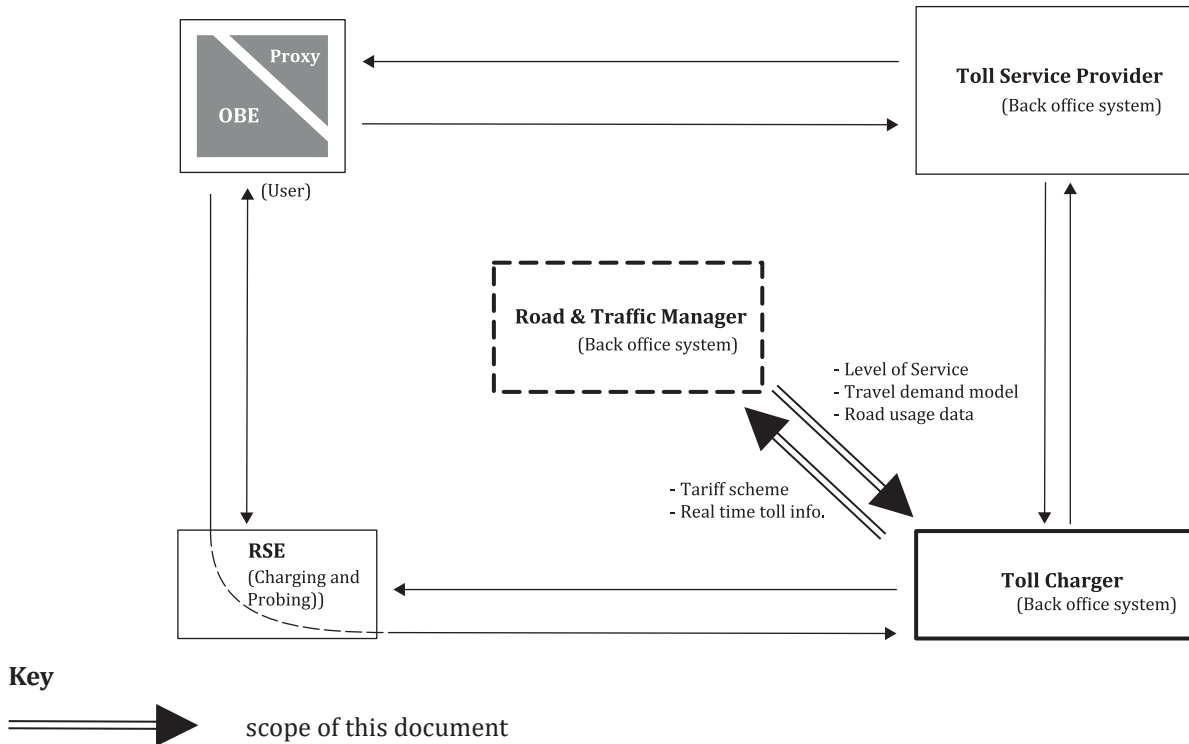


Figure 2 — Data flow model

A detailed presentation of the data flow model for EFC support to traffic management is provided in [Annex H](#).

#### 5.4 Information exchanges between TC and RTM

The information exchanges between TC and RTM, to support the traffic management with the use of EFC scheme, shall follow the order of the exchanges described in [Figure 3](#).

The first step is to define the LOS by RTM. RTM shall send a performance request based on definition of the LOS to TC. TC shall incorporate the LOS requirements in tariff scheme and provide it to RTM.

The second step is to levy the toll. The real time toll information shall be provided to RTM upon levying the toll to disseminate necessary tolling information to the road users. RTM shall provide road usage data collected from OBE as vehicle probe data to TC. The probe data is the vehicle data (with time-stamped in the scheme unique identifiers) that is used to determine traffic conditions, and to measure the vehicle's progress through the network. This includes route information, starts and stops, current position and speed and other information (e.g. heading, speed changes and snapshots of recent events) that can be used to estimate traffic conditions. TC calculates the tolls of individual vehicles. The vehicle probe data can also be transmitted to TC, where TC may calculate the tolls even when the road usage data cannot be collected.

The third step is to run the travel demand model and evaluate the tariff scheme. When the tariff scheme is found to be unsatisfactory for the LOS, new tariff scheme is defined to meet LOS requirements by running the demand model. RTM shall request TC to evaluate and set a new tariff scheme. (See informative [Annex I](#) for more detailed information on data flows between RSE and OBE).

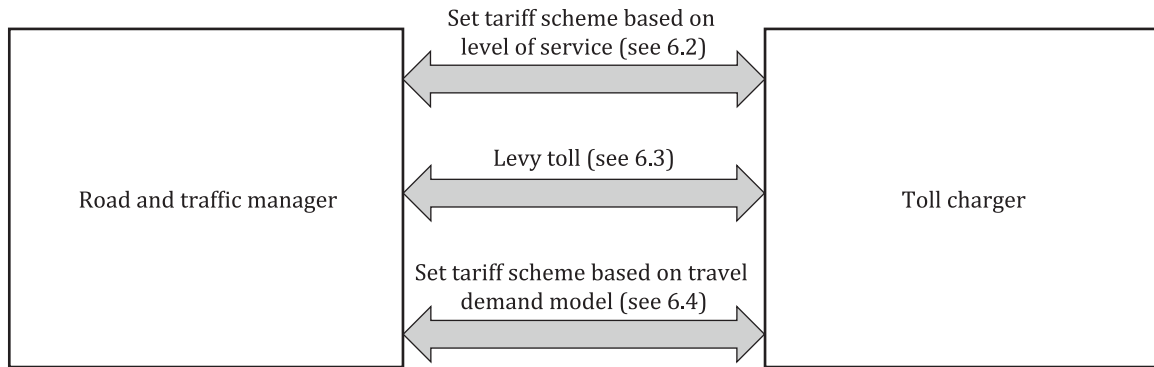


Figure 3 — Information exchanges between TC and RTM

## 6 General requirements for data exchange

### 6.1 General

Data to be exchanged for traffic management is categorized as traffic flow related, traffic incident-related and tolling-related data. The purposes of the data are shown in [Table 1](#), together with the terms which are required to evaluate the performance of traffic management. The performance measures, which are required to set and evaluate the tariff scheme for supporting traffic management, should be categorized into congestion management, tolling, safety, monitoring environmental impact, monitoring goods movement, and total management.

Table 1 — Exchanging data for traffic management purposes

Exchanging data	Traffic management purpose					
	Congestion management	Tolling	Safety	Monitoring environmental impact	Monitoring goods movement	Total management
Traffic speed	✓	✓	✓	✓	✓	✓
Traffic volume	✓			✓		✓
Traffic density	✓					✓
Vehicle type/ fleet composition	✓	✓		✓	✓	✓
Traffic incident data			✓			✓
Toll data (revenues and transactions)		✓				✓

The interface specifications of traffic management domain and EFC domain shall refer to ISO 14827-2 and ISO 14827-3 for traffic management and ISO 12855 for EFC, respectively. The interface between RTM and TC is specified by referring to data exchange procedure in ISO 12855, ISO 14827-2 and ISO 14827-3.

The specifications of the ASN.1 data types, relating to the data elements described in [Clause 6](#), shall be in accordance with [Annex A](#).

To facilitate reading, the following conventions are adopted in this document:

- the ASN.1 data elements are written with a lower case first letter using `Courier New` font;
- the corresponding ASN.1 data types are written with an upper case first letter using `Courier New` font.

This document allows the implementer to define suitable protocol procedures such as basic interaction, protocol mechanism, and choice of transfer protocol. The implementation conformance statement proforma

provided in [Annex B](#) shall be used by a supplier claiming that its implementation is in conformity with this document.

The reference interface specification based on these standards is shown in [Annex C](#). This document defines the data attributes as application data units (ADUs) for EFC supporting traffic management. The data exchanges shall be in accordance with [Annex C](#).

The description of data message in [Clause 6](#) is ADU based on ISO 12855. Basic transaction flow including AckADU is described in ISO 12855:—, Clause 6.

The following basic data attributes are described in [6.2](#) to [6.4](#):

- LOS;
- tariff scheme;
- real time toll information;
- road usage data;
- new tariff scheme request.

The following annexes provide examples of EFC supported traffic management.

- [Annex D](#) presents an example of a smart route selection scheme;
- [Annex E](#) presents an example of an electronic road pricing scheme;
- [Annex F](#) presents managed lanes in the USA;
- [Annex G](#) presents an example of an emission control scheme, based on the usage of transit data;
- [Annex I](#) provides examples of data flows between components of EFC and road traffic management systems.

Typical data flows using messages described in [6.2](#) to [6.4](#) between RTM, RSE, OBE and TC are shown in [Annex H](#).

## 6.2 Transaction: Set tariff scheme based on LOS

### 6.2.1 Overview

LevelOfService and TariffScheme are exchanged between the RTM and TC for setting and revising tariff scheme based on LOS as shown in [Figure 4](#).

For each correct LevelOfServiceAdu the RTM sends, the TC shall respond with one corresponding TariffSchemeAdu. For each correct TariffSchemeAdu the TC sends, the RTM shall respond with one corresponding and positive AckAdu. Any incorrect ADU shall respond with a negative AckAdu.