SLOVENSKI STANDARD
SIST-TS CEN ISO/TS 17444-1:2013

01-januar-2013

Elektronsko pobiranje pristojbin - Uspešnost zaračunavanja - 1. del: Meritve (ISO/TS 17444-1:2012)

Electronic fee collection - Charging performance - Part 1: Metrics (ISO/TS 17444-1:2012)

Elektronische Gebührenerhebung - Abbuchungsdurchführung - Teil 1: Metriken (ISO/TS 17444-1:2012)

Perception du télépéage - Performance de charge - Partie 1: Mesurages (ISO/TS 17444-1:2012)

Ta slovenski standard je istoveten z: CEN ISO/TS 17444-1:2012

ICS:

03.220.20	Cestni transport	Road transport
35.240.60	Uporabniške rešitve IT v transportu in trgovini	IT applications in transport and trade

SIST-TS CEN ISO/TS 17444-1:2013 **en,fr,de**

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

CEN ISO/TS 17444-1

October 2012

ICS 03.220.20; 35.240.60

English Version

Electronic fee collection - Charging performance - Part 1: Metrics (ISO/TS 17444-1:2012)

Perception du télépéage - Performance d'imputation - Partie 1: Métrique (ISO/TS 17444-1:2012)

Elektronische Gebührenerhebung - Abbuchungsdurchführung - Teil 1: Metriken (ISO/TS 17444-1:2012)

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Ref. No. CEN ISO/TS 17444-1:2012: E

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Foreword

This document (CEN ISO/TS 17444-1:2012) has been prepared by Technical Committee CEN/TC 278 “Road transport and traffic telematics", the secretariat of which is held by NEN, in collaboration with Technical Committee ISO/TC 204 "Intelligent transport systems".

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TECHNICAL SPECIFICATION

ISO/TS 17444-1

First edition
2012-10-01

Electronic fee collection — Charging performance —

Part 1: Metrics

Perception du télépéage — Performance d'imputation —

Partie 1: Métrique

Reference number
ISO/TS 17444-1:2012(E)

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Published in Switzerland

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of document:

— an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;

— an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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ISO/TS 17444-1 was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*, and by Technical Committee CEN/TC 278, *Road transport and traffic telematics* in collaboration.

ISO 17444 consists of the following parts, under the general title *Electronic fee collection — Charging performance*:

— *Part 1: Metrics* [Technical Specification]

— *Part 2: Examination framework*[1)]

1) To be published.

Introduction

Electronic Tolling systems are complex distributed systems involving critical technology such as dedicated short-range communication (DSRC) and global navigation satellite systems (GNSS) both subject to a certain random behaviour that may affect the computation of the charges. Thus, in order to protect the interests of the different involved stakeholders, in particular Service Users and Toll Chargers, it is essential to define metrics that measure the performance of the system as far as computation of charges is concerned and ensure that the potential resulting errors in terms of size and probability are acceptable. These metrics will be an essential tool when establishing requirements for the systems and also for examination of the system capabilities both during acceptance and during the operational life of the system.

In addition, in order to ensure the interoperability of different systems it will be necessary to agree on common metrics to be used and on the actual values that define the required acceptable performances, although this is not covered in this part of ISO/TS 17444.

Toll schemes take on various forms as identified in ISO/TS 17575 (all parts) and ISO 14906. In order to create a uniform performance metric specification, toll schemes are grouped into two classes, based on the character of their primary charging variable: Charging based on discrete events (charges when a vehicle crosses or stands within a certain zone), and those based on a continuous measurement (duration or distance).

The following are examples of discrete (event-based) toll schemes.

— Single object charging: a road section, bypass, bridge, tunnel, mountain pass or even a ferry, charged per passage; most tolled bridges belong to this category.

— Closed road charging: a fixed amount is charged for a certain combination of entry and exit on a motorway or other closed road network; many of the motorways in Southern Europe belong to this category.

— Discrete road links charging: determined by usage of specified road links, whether or not used in their entirety.

EXAMPLE German heavy goods vehicle (HGV) charge.

— Charging for cordon crossing: triggered by passing in or out through a cordon that encircles a city core, for example.

EXAMPLE Stockholm congestion charging.

The following are examples of continuous toll schemes.

— Charging based on direct distance measurement: defined as an amount per kilometre driven.

EXAMPLE Switzerland's HGV charge; US basic vehicle miles travelled approach.

— Charging based on direct distance measurement in different tariff zones or road types: defined as an amount per kilometre driven, with different tariffs applying in different zones or on different road types. This is a widely discussed approach, also known as Time-Distance-Place charging, and is under consideration in many European countries. The pilot programme in Oregon is an example from North America.

— Time in use charge: determined by the accumulated time a vehicle has been in operation, or, alternatively, by the time the vehicle has been present inside a predefined zone.

In all these examples of toll schemes, tolls may additionally vary as a function of vehicle class characteristics such as trailer presence, number of axles, taxation class, operating function, and depending on time of day or day of week, so that, for example, tariffs are higher in rush hour and lower on the weekends.

With this degree of complexity, it is not surprising to find that the attempts to evaluate and compare technical solutions for Service User charging have been made on an individual basis each time a procurement or study is initiated, and with only limited ability to reuse prior comparisons made by other testing entities.

The identification of different types of schemes as proposed in ISO/TS 17575 (all parts) and their grouping in the mentioned two classes is described in Table 1, which also identifies the examples mentioned above.

Table 1 — Tolling scheme designs grouped according to Scheme categories

Examples	Scheme type	ISO/TS 17575 category
Single object charging	Discrete	Sectioned roads pricing
Closed road charging	Discrete	Sectioned roads pricing
Discrete road links charging	Discrete	Sectioned roads pricing
Charging for cordon crossing	Discrete	Cordon pricing
Time in use charge	Continuous	Area pricing – time
Cumulative distance charge	Continuous	Area pricing – distance
Charging for cumulative distance (or time) in different zones (or by road type)	Continuous	Area pricing – distance

No toll schemes are purely continuous. At the very least, a system must be able to stop accumulating charges when it leaves a jurisdiction in which a charge is due, and resume charging when it returns or enters another. Additionally, many Charging Schemes are set up so that the tariff is modified using discrete parameters, such as spatial zones, time spans, vehicle classes, etc. Under those circumstances, each unit of distance or time costs a different amount depending, for example, on whether it takes place inside or outside an area, such as a city, whether a trip takes place in rush hour or at night, or depending on what type of vehicle is used. In this part of ISO/TS 17444 references to a “continuous system” have to be understood as those systems having some continuous behaviour even though they may also integrate some discrete nature. References to “discrete systems” are limited to those systems that are purely discrete.

In these schemes, all the discrete parts (zones, cordons, events, time, vehicle class, etc.) that a system has to identify are translated into a particular tariff (e.g. price per kilometre) that has to be applied to the measured continuous variable (e.g. travelled kilometres) resulting in another continuous parameter, money.

Among the different Interoperability Application Profiles defined in CEN/TS 16331, only Section Road Tolling has a purely discrete nature while the other four profiles have both discrete and continuous natures.

Some features of discrete and continuous toll schemes that are of relevance for the definition of metrics proposed in this part of ISO/TS 17444 are analysed below.

Discrete toll schemes

In a discrete toll scheme, distinct events are associated with the identification of Charge Objects. It can be that a vehicle crossed a cordon, passed a bridge, was present in an area, or in an area on a given day. An event that takes place can either be correctly recorded by the system or can be missed. However, there is also the possibility that an event is recorded even though it did not actually take place. This is summarized in the following matrix in Table 2.

Table 2 — Theoretical event decision matrix for discrete schemes

Event Matrix		*System detects Chargeable Event*	
		Yes	*No*
Chargeable Event takes place	*Yes*	**Correct Charging**	**Missed Recognition** (Undercharging)
	No	**False Positive** (Overcharging)	**Correct Non-charging**

In this matrix there are two successful scenarios (Correct Charging and Correct Non-charging), and two unsuccessful (Missed Recognition and False Positive). The unsuccessful scenarios have very different consequences. A Missed Recognition, i.e. a Chargeable Event that takes place but is not recorded by the system, implies an undercharging, as the Service User is not charged.

