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Electronic fee collection — Security framework

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National foreword

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COMITÉ EUROPÉEN DE NORMALISATION
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Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (CEN/TS 16439:2013) has been prepared by Technical Committee CEN/TC 278 “Road transport and traffic telematics”, the secretariat of which is held by NEN.

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0 Introduction

0.1 Reader's guide

The development process for the security concept and implementation to protect an existing system normally includes several steps as follows: threat analysis with risk assessment, security policy definition, requirements and countermeasures definition followed by the implementation of countermeasures and supervising of their effectiveness. Countermeasures which do not work or work incorrectly need to be improved. The development of the Electronic Fee Collection (EFC) - Security Framework follows this approach as closely as possible although there is no existing system to analyse. The used methodology needs to consider following limitations:

— No risk assessment possible: The risk assessment compares the possible loss for the stakeholder and the required resources (e.g. equipment, knowledge, time, etc.) to perform an attack. It is the trade-off evaluation of the cost and benefit of each countermeasure which is only possible for an existing system.

— No security policy exists. The security policy can only be defined by the responsible stakeholder and its freedom is only limited by laws and regulations. Nonetheless, basic but incomplete examples of possible security policies can be provided.

— No specific system design or configuration exists to be based on. Only the available EFC base standards can be taken as references. Specific technical details of a particular system (e.g. servers, computer centres, de-central elements like road side equipment) need to be taken into consideration in addition to the present security framework.

The selection of requirements and the respective security measures for an existing EFC system is based on the security policy and the risk assessment of the several stakeholders for their system parts. Due to the fact that there is neither an overall valid security policy, nor that the possibility to provide a useful risk assessment exists, the EFC security framework provides a toolbox of requirements and security measures covering as many threats as possible.

To understand the content of this Technical Specification, the reader should be aware of the methodological assumptions used to develop it. The security of an (interoperable) EFC scheme depends on the correct implementation and operation of a number of processes, systems and interfaces. Only a reliable end-to-end security ensures the accurate and trustworthy operation of interacting components of toll charging environments. Therefore, this security framework also covers systems or interfaces which are not EFC-specific, like back-office connections. For such parts however, only requirements and recommendations, no security measures, are provided. The application independent security framework for such system parts and interfaces, the Information Security Management System (ISMS), is provided in the ISO 2700x family of standards.

The development process of this Technical Specification is described briefly in the steps below:

a) Definition of the stakeholder objectives as the basic motivation for the security requirements (Annex C).

b) Based on the EFC role model and further definitions from the EFC architecture standard (ISO 17573), the specification defines an abstract EFC system model as the basis for threat analysis, definition of requirements and security measures (see Clause 1 and Annex D).

c) The threats on the EFC system model and its assets are analysed by two different methods: an asset-based analysis and an attack-based analysis. This approach, although producing some redundancy, ensures completeness and coverage of all relevant factors (Annex D).

d) The requirements specification (Clause 6) is based on the threats identified in Annex D. Each requirement is at least motivated by one threat. At this stage, the specification does not prescribe any concrete implementation of a security requirement.

e) The definition of security measures (Clause 7) provides a high level description of recommended possible methods to achieve and implement the goal(s) of the fulfilled requirements.

f) Detailed security measures are only provided for the implementation of the interoperable interfaces (Clause 8) based on the requirements and the high level security measures.

g) Basic key management requirements that support the implementation of the interoperable interfaces security measures are described in Clause 9.

A general trust model (Clause 5) is defined to form the basis for the implementation of cryptographic procedures to ensure confidentiality, integrity and authenticity of exchanged data. In this context, the security framework references approved international standards for the implementation of cryptographic procedures, enhanced by EFC specific details if needed.

A stakeholder of an EFC scheme who wants to use this security framework needs to do the following:

1) Identify the relevant processes, systems and interfaces in the security framework.

2) Extract the corresponding security requirements according to his security policy.

3) Provide evidence of compliance of its systems, processes and interfaces with the requirements of this specification. Evidence can be provided by a self-declaration, an internal or external audit or other certifications.

0.2 EFC role model

This Technical Specification complies with the role model defined in ISO 17573, *Electronic fee collection — System architecture for vehicle-related tolling*. According to this role model, the Toll Charger (TC) is the provider of the tolled infrastructure or transport service and, hence, the recipient of the road usage charges. The Toll Charger is the actor associated with the Toll Charging role, see Figure 1.

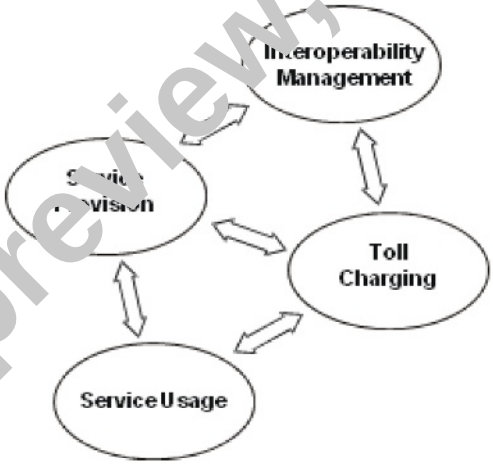

Figure 1 — The role model underlying this standard

Service Providers issue on-board equipment (OBE) to the users of the tolled infrastructure or transport service. Service Providers are responsible for providing the OBE that will be used for collecting data, enabling the Toll Charger to send a claim to the Service Provider for the usage of the infrastructure or transport service. In autonomous systems, each Service Provider delivers toll declarations to several Toll Chargers, as well as each Toll Charger receives toll declarations from more than one Service Provider. In dedicated short-range communication (DSRC) systems, the Toll Charger receives the main toll declarations from its own RSE and only supplementary charging data, if required from the Service Providers. Interoperability Management (IM) in

Figure 1 comprises all specifications and activities that in common define and maintain a set of rules that govern the overall toll charging environment.

The trust model defined in this Technical Specification is based on the role model above and it is also the technical base for the protection of the data communication between the entities of the role model. Besides this communication security, trust in the secure implementation and management of the Back End and other equipment for the EFC framework is required. A Toll Charger or Service Provider compliant to this Technical Specification needs to be able to give evidence of security management as required. Such evidence is the basement of trust relations between the involved entities.

0.3 Relation to other security standards

Several generic and specific standards and Technical Reports concerning security issues for information technology already exist. This Technical Specification uses these existing standards and expands the usability of them for EFC applications. The framework will reference and tailor the security techniques and methodologies from these standards.

Figure 2 illustrates the context of the EFC Security Framework to other security standards. It is not exhaustive description; only the most relevant standards are shown, i.e. the standards that gave most input to this Technical Specification. Standards that are directly used and referenced are highlighted in black (as opposed to grey). Other standards that may provide other security related input are given for information and completeness only but are not further used.

Each group of standards in Figure 2 provides the following features:

— **Security techniques - Security measures and algorithms** – The group is a collection of essential security measures and recommended cryptographic algorithms, including the guidelines for the accurate use of them.

— **IT - Security techniques - Information security management system** – This standard family defines requirements and guidelines for the implementation of security management systems for all types of organisations. The standards are well suited for the security solutions of the Back End and other fixed or installed equipment including software of EFC systems.

— **IT - Open system interconnection** – This group of standards provide mechanisms for the secure communications between open systems. The standards address some of the security requirements in the areas of authentication and other security services through the provision of a set of frameworks.

— **Evaluation criteria for IT security (Common Criteria)** – This standard group defines methodologies and processes for the security evaluation and certification for most categories of products used in the EFC environment. The arrows inside the group indicate the relation between the standards in a bottom up direction.

In addition, the EFC Security Framework makes use of existing threat analysis methods and also uses existing threat analysis with relations to EFC or ITS, e.g. ETSI TR 102 893 (Intelligent Transport Systems; Security; Threat, Vulnerability and Risk Analysis).

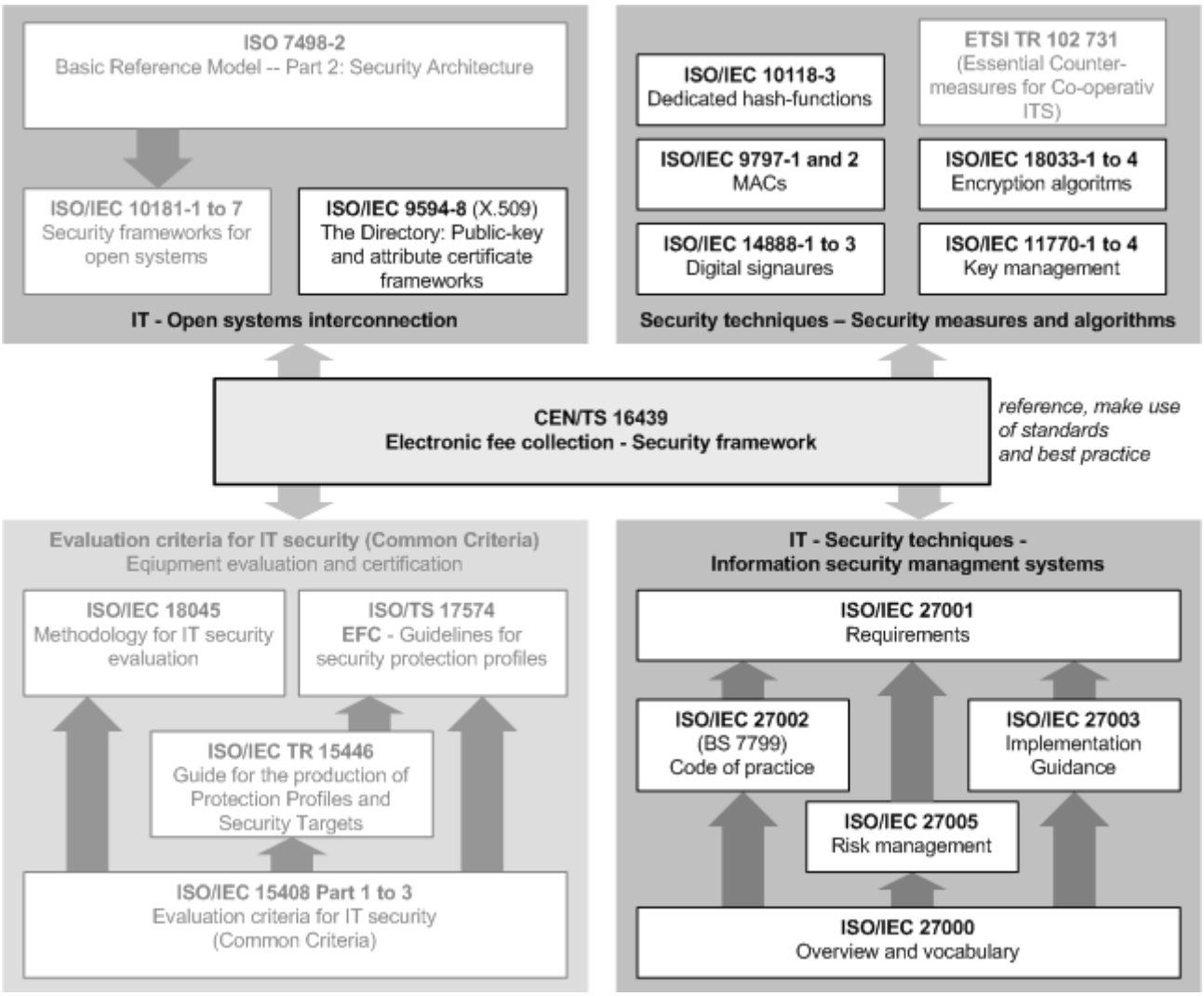

Figure 2 — Relevant security standards in the context of the EFC — Security framework

1 Scope

1.1 EFC specific scope

ISO 17573 defines the roles and functions as well as the internal and external entities of the EFC system environment. Based on the system architecture defined in ISO 17573, the security framework describes a set of requirements and security measures for stakeholders to implement and operate their part of an EFC system as required for a trustworthy environment according to its basic information security policy. In general, the overall scope is an information security framework for all organisational and technical entities and in detail for the interfaces between them.

Figure 3 below illustrates the abstract EFC system model used to analyse the threats, define the security requirements and security measures of this Technical Specification. This Technical Specification is based on the assumption of an OBE which is dedicated to EFC purposes only and neither considers value added services based on EFC OBE, nor more generic OBE platforms (called in-vehicle ITS Stations) used to host the EFC application.

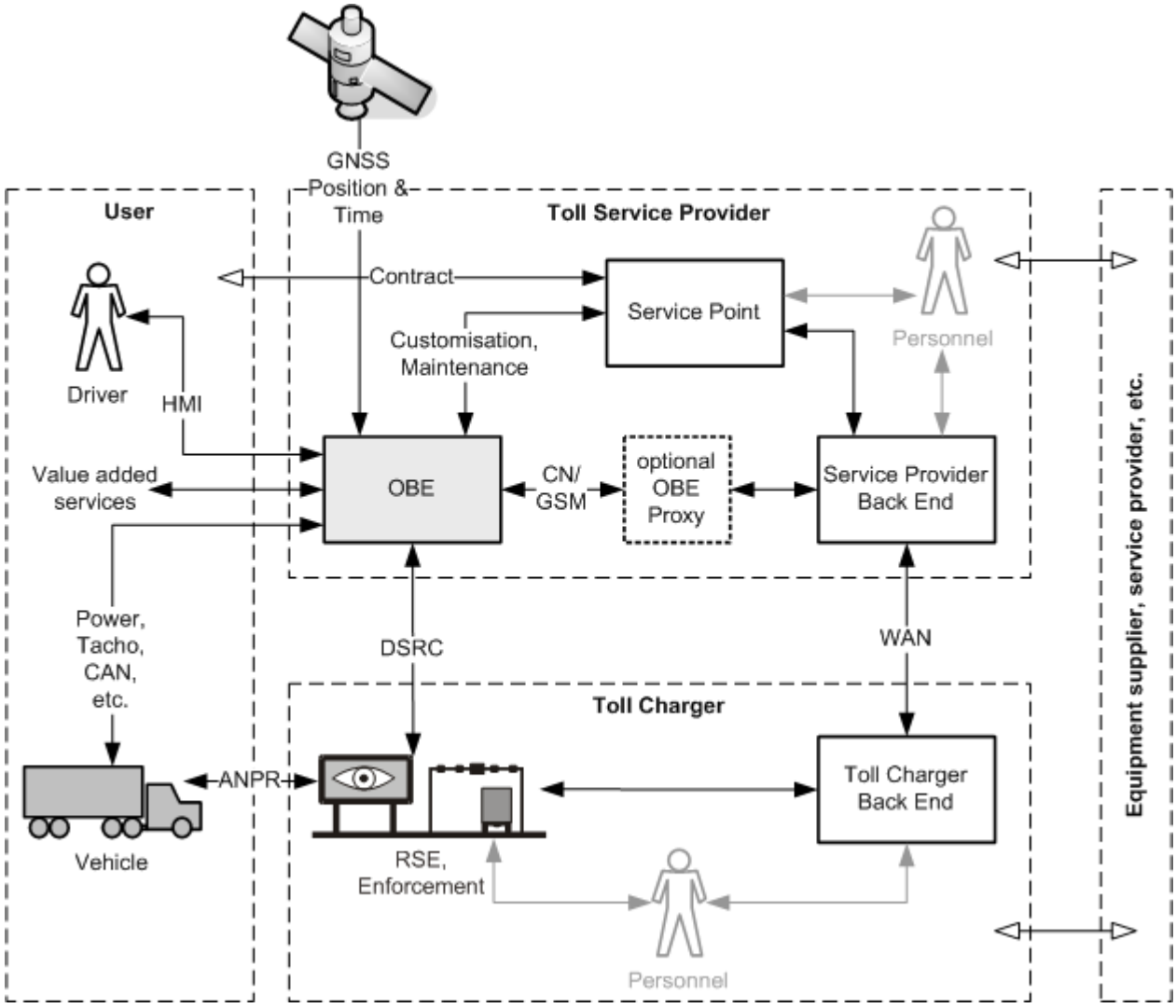

Figure 3 — EFC system model of the EFC Security Framework