FINAL
DRAFT

INTERNATIONAL
STANDARD

**ISO/FDIS
19299**

ISO/TC **204**

Secretariat: ANSI

Voting begins on:
2020-05-14

Voting terminates on:
2020-07-09

Electronic fee collection — Security framework

Perception de télépéage — Cadre de sécurité

iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
https://standards.iteh.ai/catalog/standards/sist/3f0feff2-2a0a-4898-8729-c56f6dfa2f3b/iso-fdis-19299

ISO/CEN PARALLEL PROCESSING

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

Reference number
ISO/FDIS 19299:2020(E)

© ISO 2020

iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
https://standards.iteh.ai/catalog/standards/sist/3f0feff2-2a0a-4898-8729-c56f6dfa2f3b/iso-fdis-19299

COPYRIGHT PROTECTED DOCUMENT

© ISO 2020

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
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

 © ISO 2020 – All rights reserved

Contents

Page

Foreword ..... **v**

Introduction ..... **vi**

1 Scope **1**

2 Normative references **1**

3 Terms and definitions **2**

4 Abbreviated terms **3**

5 Trust model **4**
- 5.1 Overview 4
- 5.2 Stakeholders trust relations 5
- 5.3 Technical trust model 6
  - 5.3.1 General 6
  - 5.3.2 Trust model for TC and TSP relations 6
  - 5.3.3 Trust model for TSP and service user relations 7
  - 5.3.4 Trust model for interoperability management relations 7
- 5.4 Implementation 7
  - 5.4.1 Setup of trust relations 7
  - 5.4.2 Trust relation renewal and revocation 8
  - 5.4.3 Issuing and revocation of sub CA and end-entity certificates 8
  - 5.4.4 Certificate and certificate revocation list profile and format 9
  - 5.4.5 Certificate extensions 9

6 Security requirements **10**
- 6.1 General 10
- 6.2 Information security management system 11
- 6.3 Communication interfaces 12
- 6.4 Data storage 12
- 6.5 Toll charger 12
- 6.6 Toll service provider 14
- 6.7 Interoperability management 16
- 6.8 Limitation of requirements 17

7 Security measures — Countermeasures **17**
- 7.1 Overview 17
- 7.2 General security measures 18
- 7.3 Communication interfaces security measures 18
  - 7.3.1 General 18
  - 7.3.2 DSRC-EFC interface 19
  - 7.3.3 CCC interface 20
  - 7.3.4 LAC interface 21
  - 7.3.5 Front End to TSP back end interface 21
  - 7.3.6 TC to TSP interface 22
  - 7.3.7 ICC interface 23
- 7.4 End-to-end security measures 24
- 7.5 Toll service provider security measures 25
  - 7.5.1 Front end security measures 25
  - 7.5.2 Back end security measures 26
- 7.6 Toll charger security measures 27
  - 7.6.1 RSE security measures 27
  - 7.6.2 Back end security measures 28
  - 7.6.3 Other TC security measures 28

8 Security specifications for interoperable interface implementation **29**
- 8.1 General 29
  - 8.1.1 Subject 29

iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
https://standards.iteh.ai/catalog/standards/sist/3f0feff2-2a0a-4898-8729-c56f6dfa2f3b/iso-fdis-19299

© ISO 2020 – All rights reserved

8.1.2 Signature and hash algorithms ... 29
8.2 Security specifications for DSRC-EFC ... 29
8.2.1 Subject ... 29
8.2.2 OBE ... 29
8.2.3 RSE ... 29

9 Key management ... 30
9.1 Overview ... 30
9.2 Asymmetric keys ... 30
9.2.1 Key exchange between stakeholders ... 30
9.2.2 Key generation and certification ... 30
9.2.3 Protection of keys ... 30
9.2.4 Application ... 31
9.3 Symmetric keys ... 31
9.3.1 General ... 31
9.3.2 Key exchange between stakeholders ... 31
9.3.3 Key lifecycle ... 32
9.3.4 Key storage and protection ... 33
9.3.5 Session keys ... 34

Annex A (normative) **Security profiles ... 35**

Annex B (informative) **Implementation conformance statement (ICS) proforma ... 39**

Annex C (informative) **Stakeholder objectives and generic requirements ... 57**

Annex D (informative) **Threat analysis ... 61**

Annex E (informative) **Security policies ... 118**

Annex F (informative) **Example for an EETS security policy ... 124**

Annex G (informative) **Recommendations for privacy-focused implementation ... 126**

Bibliography ... 128

iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
https://standards.iteh.ai/catalog/standards/sist/3f0ff2-2a0a-4898-8729-c56f6da2f3b/iso-fdis-19299

 © ISO 2020 – All rights reserved

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).

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).

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.

This document was prepared by Technical Committee ISO/TC 278, *Intelligent transport systems*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 251 *Intelligent transport systems (ITS)*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition cancels and replaces the first edition of ISO/TS 19299:2015, which has been technically revised.

The main changes compared to the previous edition are as follows:

— added requirements and security measures for the use of common payment media according to ISO/TS 21193;

— updated data protection considerations in Annex G, in order to take into account the European Union's new General Data Protection Regulation (i.e. Directive 2016/679/EC).

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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
https://standards.iteh.ai/catalog/standards/sist/3f0fef2-2a0a-4808-8729-c56fdf2f3b/iso-fdis-19299

© ISO 2020 – All rights reserved

Introduction

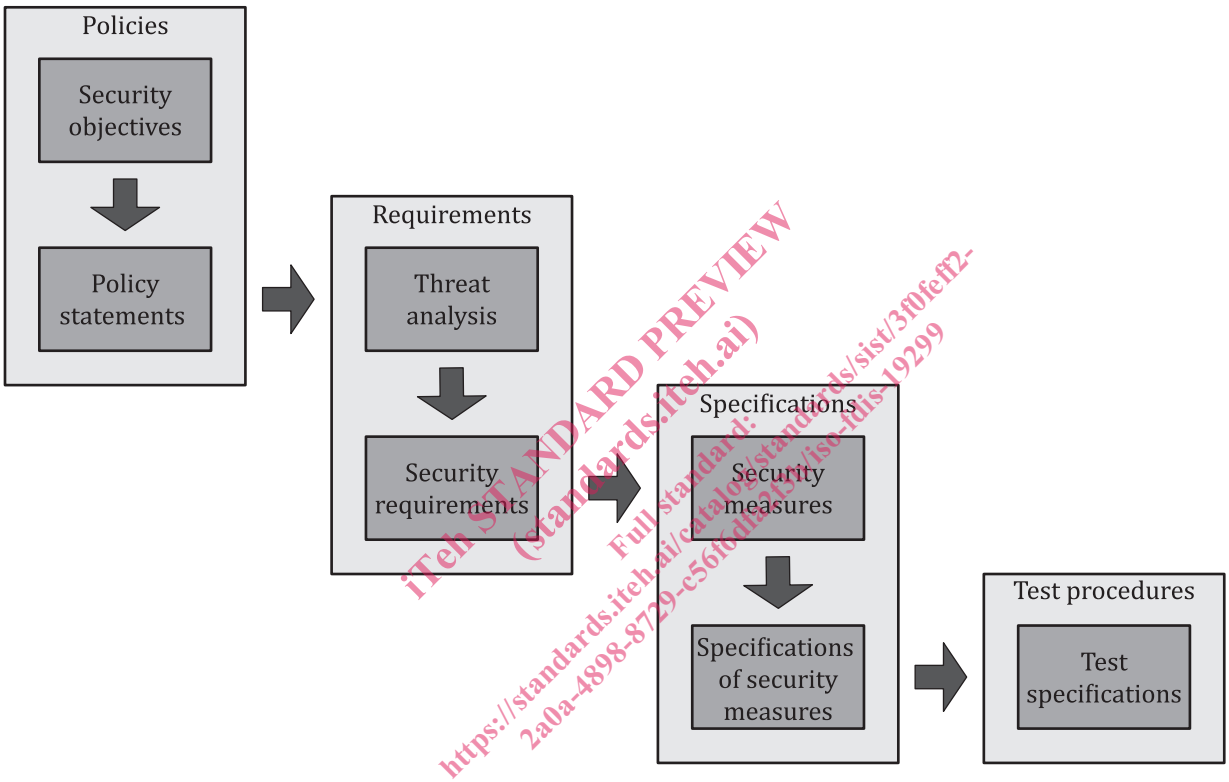
Context of this document

The development process for a security concept and implementation to protect any existing electronic fee collection (EFC) system normally includes several steps as follows (see Figure 1):

— definition of the security objectives and policy statements in a security policy;

— threat analysis with risk assessment to define the security requirements;

— development of the security measures followed by the development of security test specifications.



iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
https://standards.iteh.ai/catalog/standards/sist/3f0feff2-2a0a-4898-8729-c56f6dfa2d5/iso-fdis-19299

Figure 1 — Development path for the security documents

Each actor in an existing EFC system implements the defined security measures and supervises their effectiveness. When a security measure is found not working properly, an improvement process is started. The development of the EFC security framework follows this approach, with the following limitations:

— No standard security policy exists, nor can it be defined: The security policy can only be defined by the responsible stakeholders and it is limited by laws and regulations. Nonetheless, this document provides basic examples of possible security policies (in Annex E to Annex F).

— No standard risk assessment is possible: Risk assessment compares possible losses to stakeholders with the required resources (e.g. equipment, knowledge, time) to perform an attack. In a real system, risk assessment is based on the evaluation of the costs and benefits of each countermeasure.

— No specific system design or configuration was deemed as universally applicable. Only the available EFC base standards were taken as references. Specific technical details of a particular system (e.g. servers, computer centres, and de-centralised elements like roadside equipment) need to be additionally taken into consideration when implementing security measures.

© ISO 2020 – All rights reserved

Selection of requirements and respective security measures for an existing EFC system is based on the security policy and the risk assessment of several stakeholders' systems. Due to the fact that there is no overall valid security policy, nor is there the possibility to provide a useful risk assessment, the EFC security framework provides an extensive (but non-exhaustive) toolbox of requirements and security measures.

To understand the content of this document, the reader should be aware of the methodological assumptions used to develop it. 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. An application independent security framework for such system parts and interfaces, an information security management system (ISMS), can be found, for example, in the ISO/IEC 27000 series.

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

a) Definition of the stakeholder objectives and generic requirements as the basic motivation for the security requirements (Annex C). A possible security policy with a set of policy statements is provided in Annex E, and an example of a European electronic toll service (EETS) security policy is given in Annex F.

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

c) The threats on the EFC system model and its assets are analysed by two different methods: an attack-based analysis and an asset-based analysis. The first approach considers several threat scenarios from the perspective of various attackers. The second approach looks in depth on threats against the various identified assets (tangible and intangible). This approach, although producing some redundancy, ensures completeness and coverage of a broad range of risks (see Annex D).

d) The requirements specification (see Clause 6) is based on the threats identified in Annex D. Each requirement is at least motivated by one threat and each threat is covered by at least one requirement.

e) The definition of security measures (see Clause 7) provides a high-level description of recommended possible methods to cover the developed requirements.

f) The security specifications for interoperable interface implementation (Clause 8) provide detailed definitions, such as for message authenticators. These specifications represent an add-on for security to the corresponding relevant interface standards.

g) Basic key management requirements that support the implementation of the interoperable interfaces are described in Clause 9. The toll charging environment uses cryptographic elements (e.g. keys, certificates, certificate revocation lists) to support security services like confidentiality, integrity, authenticity, and non-repudiation. This section of the document covers the (initial) setup of key exchange between stakeholders and several operational procedures, such as key renewal, certificate revocation.

h) A general trust model (see 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 where needed.

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

— define a security policy for the EFC scheme (may involve more than one stakeholder in an interoperable EFC scheme). Some examples for a security policy and its elements are provided (in Annex E and Annex F) as an aid to build up a secure system for a concrete interoperability framework (including the European electronic toll service).

iTeh STANDARD PREVIEW
(standards.iteh.ai)
https://standards.iteh.ai/catalog/standards/sist/39ffeff2-20a-4898-8f39-c5b6b1a21b3e/fdis-19299

© ISO 2020 – All rights reserved

— identify the relevant processes, systems and interfaces, and match them to the EFC security framework;

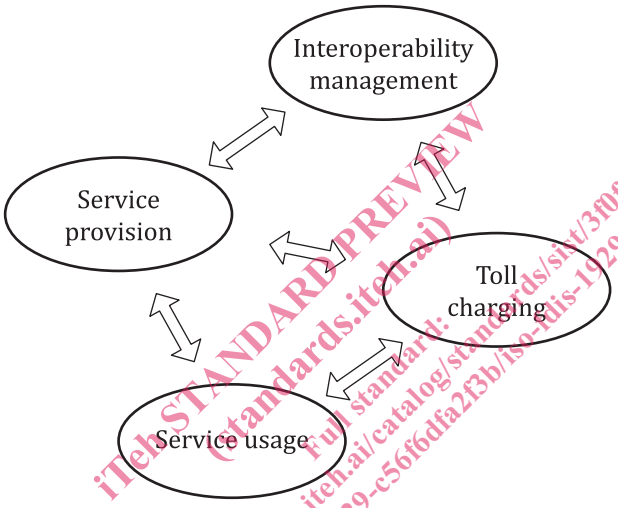
— select the corresponding security requirements according to the security policy;

— implement the security measures associated to the selected requirements;

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

EFC role model

This document complies with the role model defined in ISO 17573-1. According to this role model, the toll charger (TC) manages the tolled infrastructure or transport service and is the recipient of the road usage fees. The TC is the actor associated with the toll charging role (see Figure 2).



iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
https://standards.iteh.ai/catalog/standards/sist/3f0feff2-2a0a-4858-8729-c56f6dfa2f3b/iso-fdis-19299

Figure 2 — Role model underlying this document

Toll service providers (TSPs) act as intermediaries between TC's and road users, by providing these latter with contractual relationships and devices (generally on-board equipment — OBE) to interface the tolled infrastructure or transport service. The OBE will be used for collecting data, enabling the TC to send a claim to the TSP for the use of the infrastructure or transport service by their service users (SU). In autonomous systems, each TSP delivers toll declarations to the TC who operates the autonomous system. In dedicated short-range communication (DSRC)-based systems, the TC receives the main toll declarations from its own RSE which communicates with the TSP's OBE. The interoperability management role (IM) in Figure 2 comprises all specifications and activities that define and maintain a set of rules that govern the overall toll charging environment.

The trust model defined in this document is based on the role model summarized 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 essential. A TC or TSP compliant to this document should be able to give evidence of security management as required. Such evidence is the basis of trust relations between the involved entities.

Figure 3 below illustrates the abstract EFC system model used to analyse the threats and define the security requirements and associated security measures for this document. This document assumes an OBE that is dedicated to EFC purposes only and does not consider value added services based on EFC OBE, nor does it consider more generic OBE platforms (also called in-vehicle ITS Stations) which could be used to host the EFC application. The OBE may either be connected to a central account or use a payment medium such as integrated circuit cards (ICC) or mobile payment for on-board-account EFC system. Any financial transactions are out of scope of this document.

 © ISO 2020 – All rights reserved

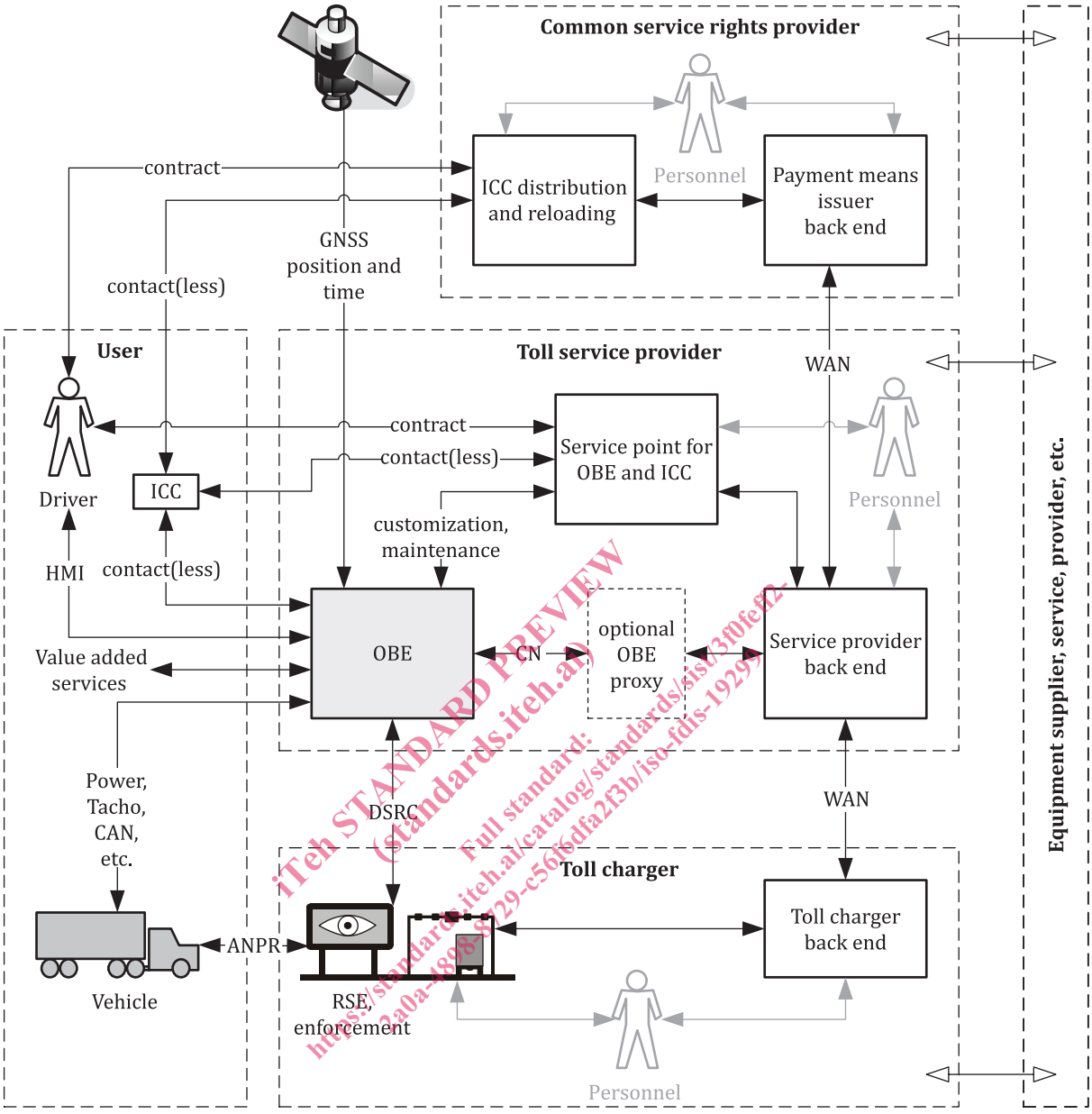


Figure 3 — EFC system model of the EFC security framework

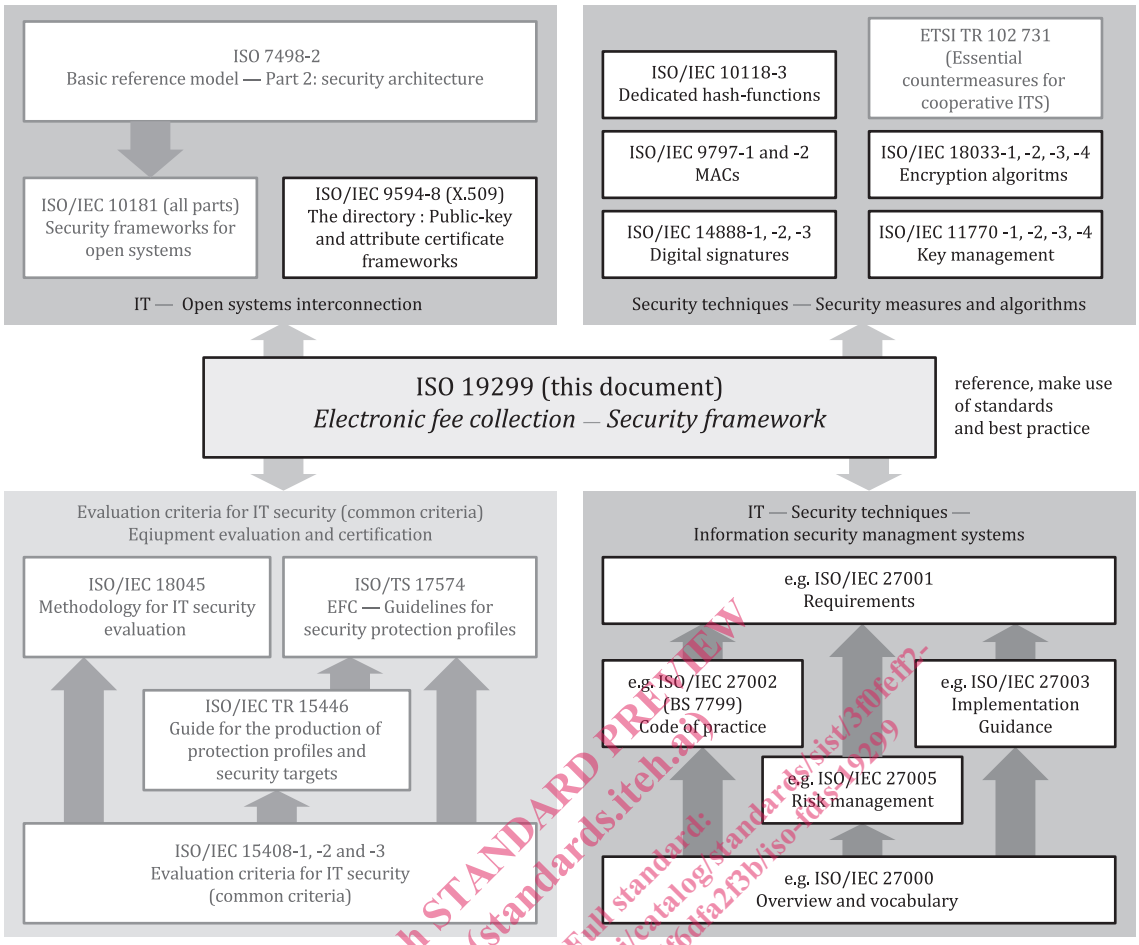
iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
https://standards.iteh.ai/catalog/standards/sist/3f0fef02-2a0a-4898-8729-c56fdfa2f3b/iso-fdis-19299

Relation to other security standards

Several generic and specific standards and technical reports concerning security issues for information technology already exist. This document makes use of existing standards and expands their usability for EFC applications. This framework references and adapts security techniques and methodologies from relevant standards.

Figure 4 shows the context of the EFC security framework to the most relevant security standards that gave input to this document. Standards that are directly used and referenced are highlighted in black.

© ISO 2020 – All rights reserved



iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
https://standards.iteh.ai/catalog/standards/sist/3f0feff2-2a0a-4898-8720-c56f6dfa2f3b/iso-fdis-19299

Figure 4 — Relevant security standards in the context of the EFC — Security framework

Standards shown in Figure 4 are grouped in the following categories, where arrows inside each group indicate which standard provides input to other standards:

— **Security techniques — Security measures and algorithms**: collection of essential security measures and recommended cryptographic algorithms including the guidelines for accurate use.

— **IT — Open system interconnection**: provides mechanisms for the secure communications between open systems. These 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)**: defines methodologies and processes for the security evaluation and certification for most categories of products used in the EFC environment.

— **IT — Security techniques — Information security management system**: defines requirements and guidelines for the implementation of security management systems for all types of organizations. The standards in this group are suited for security solutions of back end and other fixed or installed equipment of EFC systems, including their software.

An ISO/IEC 27001 certification of a TC or TSP organization may be used to demonstrate conformity with this document, provided that the scope and the Statements of Applicability (SoA) include the EFC business processes specified in ISO 17573-1 and that security requirements and their associated security measures provided by this document are applied, for example by using them as part of so-called catalogues, i.e., sets containing the security measures and control objectives. Figure 5 illustrates how this approach works in two parallel paths. The first step of both paths is analysing the business

 © ISO 2020 – All rights reserved

processes, which is then followed by a threat analysis. A common risk analysis combines the generic and the EFC related analysis and results in the respective security measures and controls.

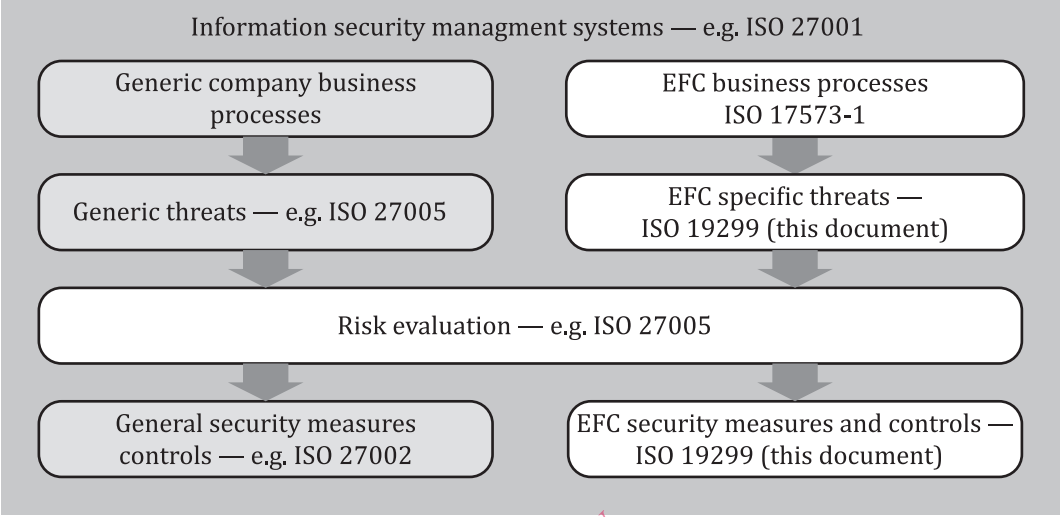


Figure 5 — Scope in relation to the information security management system

iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
https://standards.iteh.ai/catalog/standards/sist/3f0fe1f2-2a0a-4898-8729-56f6dfa223b/iso-fdis-19299

In addition, the EFC security framework makes use of existing threat analysis methods and uses existing threat analysis with relation to EFC or ITS, such as ETSI/TR 102 893.

This document contains:

— definition of a trust model (Clause 5): basic assumptions and principles for establishing trust between the stakeholders;

— security requirements (Clause 6): security requirements to support EFC system implementations;

— security measures — countermeasures (Clause 7);

— security specifications for interface implementation (Clause 8): security add-on to EFC standards, as shown in Figure 6;

— key management (Clause 9): initial setup of key exchange between stakeholders and several operational procedures, such as key renewal, certificate revocation;

— security profiles (Annex A);

— implementation conformance statement (Annex B): checklist to be used by an equipment supplier, a system implementation, or an actor of a role declaring their conformity to this document;

— general information security objectives of the stakeholders (Annex C) which provide a basic motivation for the security requirements;

— threat analysis (Annex D) on the EFC system model and its assets using two different complementary methods, an attack-based analysis, and an asset-based analysis;

— security policy examples (Annex E and Annex F);

— recommendations for privacy-focused implementation (Annex G).

© ISO 2020 – All rights reserved

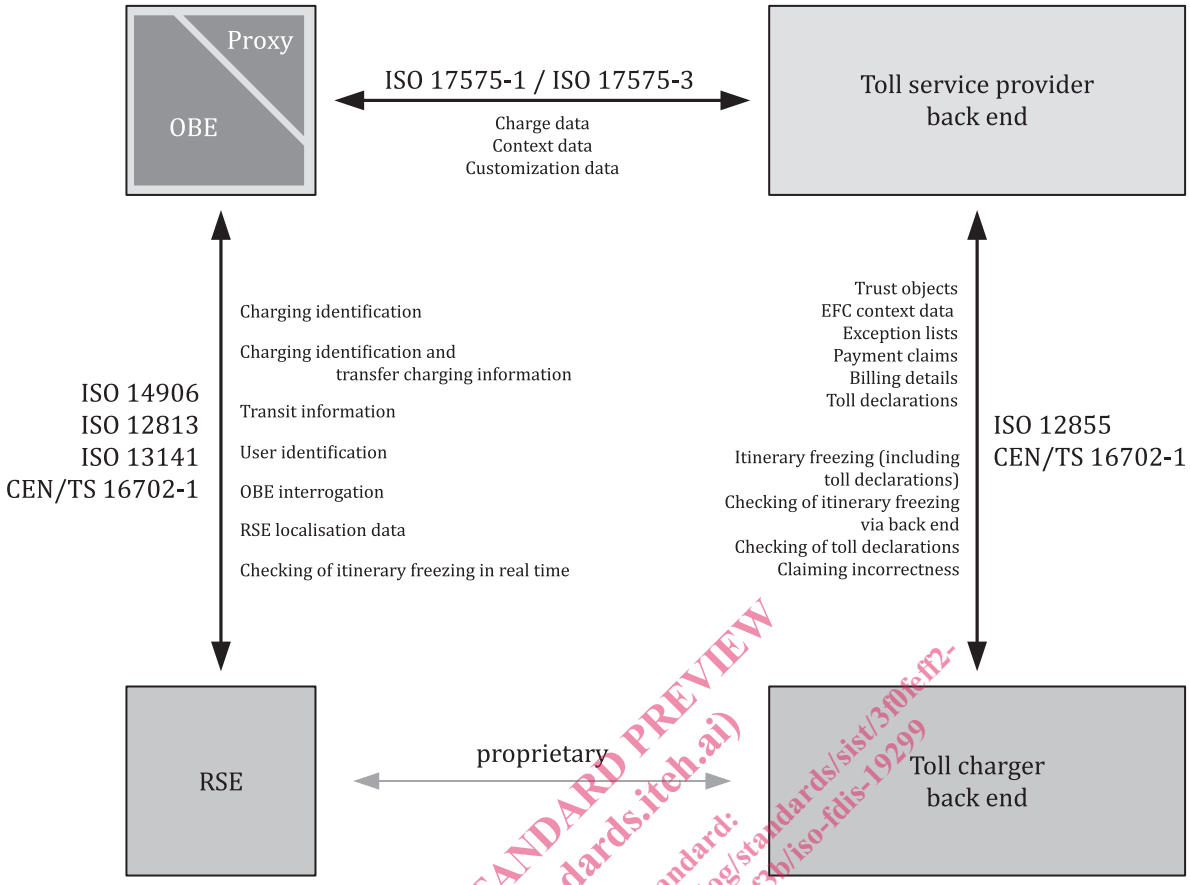


Figure 6 — Scope of EFC security framework for secure communication

iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
https://standards.iteh.ai/catalog/standards/sist/3f0feff2-2a0a-4298-8729-c56dfa2f3b/iso-fdis-19299

This document does not encompass:

— a complete risk assessment for an EFC system;

— security issues rising from an EFC application running on an ITS station;

NOTE Security issues associated with an EFC application running on an ITS station are covered in CEN/TR 16690.

— the technical trust relation between TSP and service user;

— specifications for implementation of security for specific EFC services, such as European Electronic Toll Service (EETS);

— detailed specifications required for privacy-friendly EFC implementations;

— any financial transactions between the payment service provider and the payment medium, for example ICC issued by it.

© ISO 2020 – All rights reserved

Electronic fee collection — Security framework

1 Scope

This document defines an information security framework for all organizational and technical entities of an EFC scheme and for the related interfaces, based on the system architecture defined in ISO 17573-1. The security framework describes a set of security requirements and associated security measures.

Annex D contains a list of potential threats to EFC systems and a possible relation to the defined security requirements. These threats can be used for a threat analysis to identify the relevant security requirements for an EFC system.

The relevant security measures to secure EFC systems can then be derived from the identified security requirements.

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 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO/IEC 7816-3, *Identification cards — Integrated circuit cards — Part 3: Cards with contacts — Electrical interface and transmission protocols*

ISO/IEC 8825-1, *Information technology — ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER) — Part 1:*

ISO/IEC 9594-8:2017, *Information technology — Open Systems Interconnection — The Directory — Part 8: Public-key and attribute certificate frameworks*

ISO/IEC 9797-1:2011, *Information technology — Security techniques — Message Authentication Codes (MACs) — Part 1: Mechanisms using a block cipher*

ISO/IEC 11770-1:2010, *Information technology — Security techniques — Key management — Part 1: Framework*

ISO/IEC 11770-3:2015, *Information technology — Security techniques — Key management — Part 3: Mechanisms using asymmetric techniques*

ISO 12813, *Electronic fee collection — Compliance check communication for autonomous systems*

ISO 12855, *Electronic fee collection — Information exchange between service provision and toll charging*

ISO 13141, *Electronic fee collection — Localisation augmentation communication for autonomous systems*

ISO 14906, *Electronic fee collection — Application interface definition for dedicated short-range communication*

ISO 17575-1, *Electronic fee collection — Application interface definition for autonomous systems — Part 1: Charging*

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

iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
https://standards.iteh.ai/catalog/standards/sist/330feff2-2a0a-4898-8729-c56f6dfa2f3b/iso-fdis-19299

© ISO 2020 – All rights reserved