
**Cooperative intelligent transport
systems (C-ITS) — Guidelines on the
usage of standards —**

**Part 3:
Security**

ITh Standards
*Systemes de transport intelligents coopératifs (C-ITS) - Lignes
directrices pour l'utilisation des normes —*
(<https://standards.iteh.ai>)
Partie 3: Sécurité
Document Preview

[ISO/TR 21186-3:2021](https://standards.iteh.ai/catalog/standards/iso/b88aef56-22ea-429d-a49f-f5d65a7434b5/iso-tr-21186-3-2021)

<https://standards.iteh.ai/catalog/standards/iso/b88aef56-22ea-429d-a49f-f5d65a7434b5/iso-tr-21186-3-2021>



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

[ISO/TR 21186-3:2021](https://standards.iteh.ai/catalog/standards/iso/b88aef56-22ea-429d-a49f-f5d65a7434b5/iso-tr-21186-3-2021)

<https://standards.iteh.ai/catalog/standards/iso/b88aef56-22ea-429d-a49f-f5d65a7434b5/iso-tr-21186-3-2021>



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
Website: www.iso.org

Published in Switzerland

Contents

	Page
Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Symbols and abbreviated terms	2
5 Security in C-ITS	4
5.1 General	4
5.2 Security design process for C-ITS applications	4
5.3 Communications security mechanisms in C-ITS	5
5.4 Source authentication and access control mechanisms	7
5.5 Certificate authorities and certification processes	10
5.6 Introduction to the rest of this document	11
6 Security analysis and controls for an IDX device	12
6.1 Background	12
6.2 IDX device concept	12
6.2.1 General	12
6.2.2 System architecture and device	14
6.2.3 Threat modelling data scenarios and examples	16
6.2.4 Assumed device functions and activities	19
6.3 Device assets	22
6.4 Threats	24
6.4.1 General	24
6.4.2 Threat modelling process	25
6.4.3 Threat categories and actor motivations	25
6.4.4 Scenario comparison of threats	27
6.5 Security objectives	29
6.5.1 Summary and comparison by scenario	29
6.5.2 Analysis	31
6.6 SFR and rationales	32
6.7 Comparison to other common criteria PPs	39
6.7.1 General	39
6.7.2 Summary and analysis of gaps	39
6.7.3 Gap analysis with Car2Car HSM PP	39
6.7.4 Gap analysis against V-ITS base PP	41
6.7.5 Gap analysis against V-ITS Comms Module PP	45
7 ISO/TS 21177 access control implementation guidance	45
7.1 General	45
7.2 High level architecture and access scenario	46
7.3 Application protocol architecture and ISO/TS 21177 integration	47
7.3.1 General	47
7.3.2 Example protocol architecture	47
7.3.3 Protocol integration strategy	49
7.4 Access control policy structure	50
7.5 Access control approach	51
7.6 Access control use cases and sequence diagrams	54
7.6.1 General	54
7.6.2 Define an access policy	54
7.6.3 Load an access control policy	58
7.6.4 Configure TLS	62
7.6.5 Start a secure TLS session	64
7.6.6 Secure access-controlled resource discovery	67

7.6.7	Server controls access to UGP service based on role	73
8	C-ITS CP security requirements gaps and needs	77
8.1	General	77
8.2	Overview of European C-ITS CP	78
8.3	PKI threat categories and mitigations	79
8.4	European C-ITS CP changes to support news C-ITS applications	90
8.4.1	General	90
8.4.2	CP Section 1.6.1	90
8.4.3	CP Section 1.6.2	91
8.4.4	CP Section 6.1.5.2	91
8.4.5	CP Section 4.1.2.4	92
Annex A	(informative) Scenario threats	93
Annex B	(informative) Scenario security objectives to security functional requirements mapping	107
Annex C	(informative) Informative proposal for improvements of TS 21177:2019: CRL request	109
Annex D	(informative) Informative proposal for complements to TS 21177:2019: Ownership and access policy	116
Annex E	(informative) Informative proposal for improvements of TS 21177:2019: Errata, additional rationale material, and session persistence across certificate expiry	120
Bibliography	124

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

[ISO/TR 21186-3:2021](https://standards.itih.ai/catalog/standards/iso/b88aef56-22ea-429d-a49f-f5d65a7434b5/iso-tr-21186-3-2021)

<https://standards.itih.ai/catalog/standards/iso/b88aef56-22ea-429d-a49f-f5d65a7434b5/iso-tr-21186-3-2021>

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).

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 204, *Intelligent transport systems*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 278, *Intelligent transport systems*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

A list of all parts in the ISO 21186 series can be found on the ISO website.

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.

Introduction

This document provides informative material of interest to implementers deploying secure systems to carry out ITS applications. ITS stations are rapidly maturing with regards to specification, use and security conformance standards. In support of the ITS station ecosystem new standards have been developed, such as ISO/TS 21177, which provide a framework for device-to-device secure sessions and resource access authorization. Common criteria protection profiles have been developed and adopted for use in distinctive European ITS service domains, such as automotive V2X safety services, as well as a narrow set of infrastructure messaging based services.

NOTE ITS services are provided by means of ITS applications.

Given the diversity of anticipated ITS services and potential data sensitivities, this document was constructed to provide ITS stakeholders with a holistic analysis and indication of possible extensions to the ITS station security ecosystem.

This document includes the following sections:

- 1) An overview of security considerations for application specification and deployment in ITS. This overview also provides a detailed rationale for the following sections.
- 2) A use-case driven threat model based roughly on common criteria processes in establishment of threats, security objectives and SFR relative to three genericized ITS station data sensitivity and access control scenarios. Each scenario can be used by security practitioners as a starting point to baseline ITS station platform protection profiles of varying application types and data sensitivities. The genericized protection profile security requirements are then compared to several existing (or under development) protection profiles established for automotive use cases to determine possible gaps in security controls that should be addressed when tailoring subsequent security targets or related protection profiles.
- 3) An implementation example of the development of an access control policy implementation for an ISO/TS 21177 conformant ITS station unit. The example access control policy is application-specific and depends on many factors, including the type of ITS station unit on which the access control policy is used. Consequently, this access control policy implementation example is not suitable for being copy-pasted to the context of other ITS applications. Rather, the process described in this example can be considered as a suitable template for a process aimed at creating an access control policy for any ITS application running in an ISO/TS 21177 conformant unit.
- 4) Inputs for the development of a CP governing the issuance of certificates for ITS station units. A CP is necessary for the deployment of a system to ensure consistent behaviour of different CAs (or, more generally, credential issuance actors) within the system. This consistent behaviour enables receiving devices to trust all received messages to the appropriate level, knowing that those devices have been through the same certificate-issuing process no matter where the certificates were obtained. In early 2019, the European Commission published a CP for use for "Day 1" ITS applications, to be enforced by a top-level root of trust implemented in an entity called the TLM. This document concludes with a set of high-level gaps and potential mitigations for ITS PKI participants and implementers.
- 5) A description of additional functionality that extends the functionality of ISO/TS 21177. This material is written in a manner which will enable it to be inserted into a future revision of ISO/TS 21177.

These five areas of content significantly ease the process of deploying new ITS applications securely.

This document is forms part of the ISO 21186 series on "Guidelines on the usage of standards," which is comprised of the following Parts:

- 1) Standardization landscape and releases;
- 2) Hybrid communications;
- 3) Security (this document).

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

[ISO/TR 21186-3:2021](https://standards.itih.ai/catalog/standards/iso/b88aef56-22ea-429d-a49f-f5d65a7434b5/iso-tr-21186-3-2021)

<https://standards.itih.ai/catalog/standards/iso/b88aef56-22ea-429d-a49f-f5d65a7434b5/iso-tr-21186-3-2021>