

# DIN CEN/TR 16690:2018-12 (E)

## Electronic fee collection - Guidelines for EFC applications based on in-vehicle ITS stations; English version CEN/TR 16690:2014

---

<b>Contents</b>		<b>Page</b>
Foreword.....		5
Introduction .....		6
1 Scope .....		8
2 Normative references .....		8
3 Terms and definitions .....		9
4 Symbols and abbreviations .....		12
5 Context of C-ITS.....		13
5.1 Definition of C-ITS.....		13
5.1.1 Introduction .....		13
5.1.2 The European Commission basic definition.....		14
5.1.3 The vehicle active safety viewpoint.....		14
5.1.4 The CEN/ETSI/ISO definition .....		14
5.2 C-ITS role model and business architecture .....		15
5.2.1 Role model.....		15
5.2.2 Business architecture .....		17
5.3 Technical architecture.....		19
5.3.1 ITS Station architecture .....		19
5.3.2 ITS communication access technologies .....		20
5.3.3 Application provisioning and life cycle management.....		22
5.3.4 Security.....		23
5.4 Legal aspects and background .....		23
5.4.1 European action plan and directive for ITS .....		23
5.4.2 User privacy and data protection.....		24
5.4.3 Liabilities regarding application performance / suitability for use.....		24
5.5 Overview of standardization activities .....		24
5.5.1 Introduction.....		24
5.5.2 Basic set of ITS applications.....		25
5.5.3 CEN/TC 278/WG 16 on cooperative systems .....		26
5.5.4 ISO/TC 204/WG 18 on cooperative systems .....		26
5.5.5 ISO/TC 204/WG 16 on wide area communications/protocols and interfaces.....		27
5.5.6 ETSI Technical Committee on ITS (ETSI TC ITS).....		27
5.6 Overview of R&D projects and other relevant initiatives .....		27
5.6.1 CVIS project on cooperative vehicle infrastructure systems .....		27
5.6.2 SAFESPOT project on road safety related applications.....		28
5.6.3 eCoMove project on road transport efficiency applications.....		29
5.6.4 DRIVE C2X project with focus on field trials .....		29
5.6.5 Car-to-car communication consortium (C2C-CC) .....		29
5.6.6 EasyWay project on applications for the major EU road network.....		30
5.6.7 COMeSafety and COMeSafety2 projects on road safety applications.....		30
5.6.8 Amsterdam Group .....		30
6 Context of EFC.....		30
6.1 Definition of EFC.....		30
6.2 EFC role model and business architecture.....		31
6.2.1 Role model.....		31
6.2.2 Business architecture .....		32
6.3 Technical architecture.....		33
6.3.1 Overview .....		33
6.3.2 Communication architecture.....		35

6.3.3	Autonomous OBE / Front End implementation.....	36
6.3.4	EFC security.....	37
6.4	Additional major aspects.....	38
6.4.1	Interoperability.....	38
6.4.2	Value added services based on EFC OBE.....	38
6.4.3	EFC outside Europe.....	40
6.5	Legal aspects and background.....	41
6.5.1	Toll domain specific.....	41
6.5.2	European Electronic Toll Service (EETS).....	41
6.5.3	User privacy and data protection.....	42
6.6	Overview of standardization activities.....	42
6.6.1	CEN/TC 278/WG 1 on Electronic fee collection and access control applications.....	42
6.6.2	ISO/TC 204/WG 5 on electronic fee collection and access control applications.....	42
6.6.3	ETSI Technical Committee for ITS (ETSI TC ITS).....	42
6.7	Examples of commercial projects.....	43
6.7.1	Small EFC system: Herrentunnel Lübeck (Germany).....	43
6.7.2	Nationwide EFC system: Germany.....	43
6.7.3	Interoperable EFC system: EasyGo.....	44
7	Outline of EFC requirements to an ITS Station.....	44
7.1	High level EFC requirements.....	44
7.2	Requirements for the EFC application(s).....	46
7.2.1	Detection of Charge Objects (autonomous toll domains).....	46
7.2.2	Provision of charge reports (autonomous toll domains).....	47
7.2.3	Fee calculation (autonomous toll domains).....	48
7.2.4	Generation of charge data (DSRC based toll domains).....	48
7.2.5	Location support (autonomous toll domains).....	49
7.2.6	Support of enforcement application.....	49
7.2.7	Operation of an enforcement application.....	49
7.2.8	Changing variable tariff parameters.....	50
7.2.9	Feedback to the road user.....	50
7.3	Resulting requirements for the ITS Station.....	51
7.3.1	Technical requirements.....	51
7.3.2	Security requirements.....	55
7.3.3	Operational requirements.....	58
8	EFC services in the C-ITS environment.....	60
8.1	EFC services on ITS Stations.....	60
8.2	Involved C-ITS sub-roles in the life cycle of EFC services.....	61
8.2.1	Life cycle of EFC services.....	61
8.2.2	C-ITS sub-roles involved in different phases of the EFC service life cycle.....	62
8.3	Combined models of EFC services in C-ITS context.....	66
8.3.1	C-ITS and EFC role model relations.....	66
8.3.2	Technical EFC architecture in C-ITS context.....	68
8.3.3	ITS Station Service Provider.....	70
8.3.4	Extended EFC role model in C-ITS environment.....	70
8.3.5	Business architecture.....	71
9	Considerations on particular implementation aspects.....	72
9.1	Introduction.....	72
9.2	Synergies.....	73
9.3	Particular and critical areas in relation to EFC in an ITS environment.....	74
9.3.1	Phase of migration from dedicated EFC devices to ITS-S based EFC.....	74
9.3.2	Resource management.....	77
9.3.3	Performance monitoring.....	80
9.4	Suitability for use and certification.....	81
9.4.1	Introduction.....	81
9.4.2	Conformity to specifications.....	82

9.4.3	Suitability for use tests .....	83
9.4.4	Certification .....	83
9.4.5	Registration and Certification Authority .....	84
9.4.6	Quality system approval und surveillance.....	85
9.5	Governance and responsibility .....	85
9.5.1	Introduction .....	85
9.5.2	Application configuration of the ITS Station .....	86
9.5.3	Technical implementation of the ITS Station .....	87
9.5.4	Update and installation of applications.....	88
10	Guidelines for further work.....	89
10.1	Role of EFC to boost the deployment of C-ITS.....	89
10.2	Actions to reduce barriers for the deployment of EFC applications — Create harmonized certification and test rules .....	90
10.2.1	Introduction .....	90
10.2.2	Issuing test rules .....	90
10.2.3	Guidelines on certification and tests.....	91
10.3	Recommendations for further standardization activities .....	91
10.3.1	Recommendations with regard to the area of EFC .....	91
10.3.2	Recommendations with regard to the area of (C-)ITS.....	93
10.4	Best practice .....	94
Annex A	(informative) Security Considerations.....	95
A.1	Introduction .....	95
A.1.1	Security areas and targets.....	95
A.1.2	System and application availability and reliability.....	95
A.1.3	Data security .....	95
A.1.4	User privacy protection.....	96
A.2	Security scope of this annex .....	96
A.3	General EFC security considerations.....	96
A.3.1	Security analysis.....	96
A.3.2	Security system .....	98
A.3.2.1	General.....	98
A.3.2.2	Technical security architecture.....	98
A.3.2.3	Organisational security architecture .....	98
A.4	System and application availability and reliability.....	99
A.5	Security of an ITS Station .....	100
A.5.1	General.....	100
A.5.2	Closed ITS Station application platform .....	100
A.5.3	Open ITS Station application platform .....	101
A.6	Summary.....	101
Bibliography	.....	102