ETSI TR 103 061-1 V1.1.1 (2012-11)

Intelligent Transport Systems (ITS);
Testing;
Part 1: Conformance test specification for Co-operative Awareness Messages (CAM);
CAM validation report

Reference
DTR/ITS-0010011

Keywords
application, interoperability, ITS, OTE, testing

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Contents

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (http://ipr.etsi.org).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Intelligent Transport System (ITS).

The present document is part 1 of a multi-part deliverable covering the Intelligent Transport Systems (ITS); Testing, as identified below:

Part 1: "Conformance test specification for Co-operative Awareness Messages (CAM); CAM validation report";

Part 2: "Conformance test specification for Decentralized Environmental Notification basic Service Message (DENM); DENM validation report";

Part 3: "Conformance test specification for Geographical addressing and forwarding for point-to-point and point-to-multipoint communications; GeoNetworking validation report".

Part 4: "Conformance test specification for GeoNetworking Basic Transport Protocol (BTP); GeoNetworking BTP validation report".

Part 5: "IPv6 over GeoNetworking validation report".

Introduction

In response to EC mandate M/453, ETSI Technical Committee ITS has standardized base and test specifications for ITS protocols. In a next step a prototype TTCN-3 test system was built and validated. The present document and its related TR 103 099 [i.1] (Architecture of Conformance Validation Framework), describe the validation and design of the prototype TTCN-3 test system.

The action described in the present document has supported the implementation of ITS standards by:

- Making available validated and standardized test specifications and thus enabling the application of reliable certification schemes.
- Executing conformance validation framework against real Implementations Under Test (IUTs) from industry and thus providing these companies a conformance assessment of their implementations. During the lifetime of this action, the conformance validation framework was as well provided at ITS Cooperative Mobility Services Interoperability events.
- Releasing all software as open source and thus allowing industry to build and run their own conformance validation framework.

1 Scope

The present document is the validation report of the CAM conformance tests and it provides statistics of executed and validated CAM conformance tests. The information provided has been produced by validation against two prototype implementations from industry.

Furthermore, identified base specifications and test specification issues are listed in the present document.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

Not applicable.

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI TR 103 099 (V1.1.1): "Intelligent Transport Systems (ITS); Architecture of conformance validation framework".

[i.2] ETSI EG 201 015 (V1.1.1): "Methods for Testing and Specification (MTS); Specification of protocols and services; Validation methodology for standards using SDL; Handbook".

3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ATS	Abstract Test Suite
CAM	Co-operative Awareness Message
CR	Change Request
ITS	Intelligent Transportation Systems
PICS	Protocol Implementation Conformance Statement
SUT	Implementation Under Test
TC	Test cases
TP	Test Purposes
TTCN-3	Testing and Test Control Notation 3
UT	Upper Tester

4 Validation report

4.1 Validation level

Level 3 (Rigorous) abstract test suite validation has been performed, according to the validation handbook [i.2]:

- the test suite has been compiled on more than one TTCN-3 tool;
- the complete suite of tests has been implemented and executed on more than one test platform;
- the complete suite of tests have been executed against SUTs from a range of different suppliers;
- the operation and output traces of all the tests have been validated.

4.2 Source code evaluation

4.2.1 TTCN-3 version

The CAM abstract test suite is based on TTCN-3 edition 4.2.1 (TTCN3:2010).

4.2.2 TTCN-3 tools used for compilation

The test suite has been compiled using three different TTCN-3 tools, as detailed in table 1.

Table 1: TTCN-3 tools used for compilation

Supplier	Tool name	Version	Settings	Compilation result
TestingTech	TTworkbench	1.1.13	Support for very large integers ASN.1-Language-Support-v1.1.4	No error, no warning
Elvior	TestCast T3	6.3.1		No error, no warning
OpenTTCN	OpenTTCN Tester 2012	4.2.2		No error, no warning

4.3 Validation Process

4.3.1 Test Platforms

The validation test platform has been built as described in the conformance validation framework [i.1] using the following components:

Table 2: Validation test platform components

TTCN-3 Tool	TestingTech TTworkbench v13 with ASN.1 support plugin
Test Adapter	Software: Implemented by STF424. ITS Test Adapter v1.1.1 G5 Radio hardware: Cohda Wireless™ MK2 connected via Ethernet cable
Codec	Implemented by STF424. ITS Codec v1.1.1

4.3.2 SUTs

The following SUTs have been used to validate the CAM test suite:

Table 3: SUTs used for validation

Manufacturer	Product name	Version
Hitachi™ Europe SAS	CAM	1.1
NEC™ Europe LTD	CAM	development

4.3.3 Validation Status

Table 4 shows the validation status of each test case of the CAM abstract test suite.

Table 4: Testcase validation status

TC identifier	Verdict	Log analysis	Validated	Required test suite corrections
TC_CAM_MSG_BV_01	PASS	OK	Yes	
TC_CAM_MSG_BV_02	PASS	OK	Yes	
TC_CAM_MSG_BV_03	PASS	OK	Yes	
TC_CAM_MSG_BV_04	PASS	OK	Yes	
TC_CAM_MSG_BV_05	PASS	OK	Yes	
TC_CAM_PC_BV_01	PASS	OK	Yes	
TC_CAM_PC_BV_02	PASS	OK	Yes	
TC_CAM_PC_BV_03	FAIL	SUT sends 'heading', 'positionConfidence' and 'elevationConfidence' (field should be omitted)	Yes	
TC_CAM_PC_BV_04	PASS	OK	Yes	
TC_CAM_INA_CRS_BV_01	PASS	OK	Yes	
TC_CAM_INA_CRS_BV_02	PASS	OK	Yes	
TC_CAM_INA_DAG_BV_01	PASS	OK	Yes	
TC_CAM_INA_DAG_BV_02	FAIL	SUT sends 'dangerousGoods' with value 0 (field should be omitted)	Yes	
TC_CAM_INA_CLW_BV_01	PASS	OK	Yes	
TC_CAM_INA_CLW_BV_02	FAIL	SUT sends 'Width/Length Confidence' with value 0 (field should be omitted)	Yes	
TC_CAM_INA_DOP_BV_01	PASS	OK	Yes	
TC_CAM_INA_DOP_BV_02	PASS	OK	Yes	
TC_CAM_INA_DOP_BV_03	PASS	OK	Yes	
TC_CAM_INA_DOP_BV_04	PASS	OK	Yes	
TC_CAM_INA_DOP_BV_05	PASS	OK	Yes	
TC_CAM_INA_DOP_BV_06	PASS	OK	Yes	
TC_CAM_INA_DOP_BV_07	PASS	OK	Yes	
TC_CAM_INA_DSL_BV_01	PASS	OK	Yes	
TC_CAM_INA_TAD_BV_01	PASS	OK	Yes	
TC_CAM_INA_CUC_BV_01	PASS	OK	Yes	
TC_CAM_INA_OCC_BV_01	PASS	OK	Yes	
TC_CAM_INA_LBU_BV_01	PASS	OK	Yes	
TC_CAM_INA_LBU_BV_02	PASS	OK	Yes	
TC_CAM_INA_LBU_BV_03	PASS	OK	Yes	
TC_CAM_INA_LBU_BV_04	PASS	OK	Yes	
TC_CAM_INA_SIU_BV_01	PASS	OK	Yes	
TC_CAM_INA_SIU_BV_02	PASS	OK	Yes	
TC_CAM_INA_SIU_BV_03	PASS	OK	Yes	
TC_CAM_INA_SIU_BV_04	PASS	OK	Yes	
TC_CAM_INA_TLP_BV_01	PASS	OK	Yes	
TC_CAM_INA_SCE_BV_01	PASS	OK	Yes	
TC_CAM_INA_PLD_BV_01	PASS	OK	Yes	

TC identifier	Verdict	Log analysis	Validated	Required test suite corrections
TC_CAM_INA_EXL_BV_01	PASS	OK	Yes	
TC_CAM_INA_EXL_BV_02	PASS	OK	Yes	
TC_CAM_INA_EXL_BV_03	PASS	OK	Yes	
TC_CAM_INA_EXL_BV_04	PASS	OK	Yes	
TC_CAM_INA_EXL_BV_05	PASS	OK	Yes	
TC_CAM_INA_EXL_BV_06	PASS	OK	Yes	
TC_CAM_INA_EXL_BV_07	PASS	OK	Yes	
TC_CAM_INA_EXL_BV_08	PASS	OK	Yes	
TC_CAM_INA_EXL_BV_09	PASS	OK	Yes	
TC_CAM_INA_EXL_BV_10	PASS	OK	Yes	
TC_CAM_INA_EXL_BV_11	PASS	OK	Yes	
TC_CAM_INA_EXL_BV_12	PASS	OK	Yes	
TC_CAM_INA_EXL_BV_13	PASS	OK	Yes	
TC_CAM_INA_EXL_BV_14	PASS	OK	Yes	
TC_CAM_INA_EXL_BV_15	PASS	OK	Yes	
TC_CAM_IA_POA_BV_01	INCONC	'ChangePosition' not fully implemented in UT	No	Unable to validate this TC without SUT
TC_CAM_MP_BV_01	INCONC	PX_TESTER_IS_MOBILE has to be set to false, otherwise CAM is invalid	No	Mantis ID #5894

4.4 Feedback to standardization process

During the CAM validation exercise, a number of issues were raised.

For each issue concerning PICS, TP or ATS, a bug report has been filled in ETSI's bug reporting tool (Mantis).

Issues found in SUT implementations have been signalled directly to the concerned manufacturer, joining detailed explanations and test logs.

4.4.1 Base standard issues

Table 5 lists the change requests reported by STF424 to the ETSI TC ITS WG1.

Table 5: Change requests reported to working group

CR Id	Description
CD_20	Clarification for units of vehicle size measurement
CD_21	Coherent optionality definition for Confidence parameters
CD_23	Clarification of ReferencePosition definition
CD_24	Clarification of the meaning of 0 frequency value
CD_25	Clarification of the meaning of 0 trafficFlowEffect value
CD_26	DistanceToStopLine structure can be removed
CD_27	Clarification of DangerousGoods type
CD_28	TurnDirection should be an enumeration
CD_29	Clarification of algorithm and unit of Curvature and CurvatureChange
CD_30	trafficLightPriority parameter can directly utilise Priority type
CD_31	Additional door types could be added
CD_32	Internationalisation of text string types
CD_33	RoadSegmentID clarification is required
CD_34	Adding next stop location to PTLineDescription
CD_35	ScheduleDeviation type update to support more than one hour delay
CD_36	Unused WiperSystemFront type can be removed
CD_37	Removal of informative Annex A
CD_39	Removal of Notes from B.17 - B.19 data elements definitions
CD_40	Clarification of the logic of data element descriptions in Annex B
CD_41	Clarification of Confidence handling
CD_42	Clarification of CauseCode and SubCauseCode interpretation
CD_43	TimeStamp semantics update

CR Id	Description
CD_44	Table 3 and Figure 5 removal/correction
CD_45	Section 6.2.2 cleanup
CD_46	Naming coherence in CAM section 7.2
CD_47	Removal of inline definitions
CD_48	Octet Alignment for easier encoding/decoding
CD_49	Life cycle management through the use of protocol version number instead of extensions
CD_52	Deletion of codec related comments

4.4.2 Test specification issues

The following problems have been found and reported. They will be addressed in the maintenance process:

- Mantis #5879 PICS, minor, "tagged list elements still listed in PICS".
- Mantis #6145 TSS&TP, minor, "TC_CAM_MSG_BV_03/05: missing precondition".
- Mantis #6147 ATS, minor, "TC_CAM_INA_DOP_BV_03: check need for f_removeUnsignificantBits".
- Mantis #6146 ATS, minor, "TC_AM_INA_DAG_BV_01: missing check".

4.4.3 Typical SUT issues

The following SUT problems have been often encountered during CAM test suite validation:

- Basic vehicle profile parameters not transmitted.
- SUT sending 'dangerousGoods' with value 0 when no dangerous goods are transported (field should be omitted).
- SUT sending 'Width/Length Confidence' with value 0 when no information is available (fields should be omitted).
- SUT sending 'heading', 'positionConfidence' and 'elevationConfidence' fields for non-mobile ITS stations.
- 'DoorOpen' information not updated correctly.

Annex A: Bibliography

ETSI TS 102 637-2 (V1.2.1): "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 2: Specification of Cooperative Awareness Basic Service".

ETSI TS 102 868-1 (V1.1.1): "Intelligent Transport Systems (ITS); Testing; Conformance test specification for Co-operative Awareness Messages (CAM); Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS) proforma".

ETSI TS 102 868-2 (V1.1.1): "Intelligent Transport Systems (ITS); Testing; Conformance test specification for Co-operative Awareness Messages (CAM); Part 2: Test Suite Structure and Test Purposes (TSS&TP)".

ETSI TS 102 868-3 (V1.1.1): "Intelligent Transport Systems (ITS); Testing; Conformance test specification for Co-operative Awareness Messages (CAM); Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT)".

ETSI ES 201 873-1 (V4.3.1): "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 1: TTCN-3 Core Language".

ETSI EG 202 798 (V1.1.1): "Intelligent Transport Systems (ITS); Testing; Framework for conformance and interoperability testing".

List of tables

History

Document history		
V1.1.1	November 2012	Publication