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Intelligent Transport Systems (ITS);
Communications Access for Land Mobiles (CALM);
Test specifications for non-IP networking (ISO 29281);
Part 2: Test Suite Structure and Test Purposes (TSS & TP)

Reference
RTS/ITS-00270

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Contents

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Intelligent Transport Systems (ITS).

The present document is part 2 of a multi-part deliverable covering Communications Access for Land Mobiles (CALM); Test specifications for non-IP networking (ISO 29281), as identified below:

Part 1: "Protocol Implementation Conformance Statement (PICS) proforma";

Part 2: "Test Suite Structure and Test Purposes (TSS & TP)";

Part 3: "Abstract Test Suite (ATS) and partial PIXIT proforma".

1 Scope

The present document provides the test suite structure and test purpose specification for the ISO protocols specified in ISO 29281-1 [1] in compliance with the relevant requirements, and in accordance with the relevant guidance given in EG 202 798 [i.1].

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.

[1] ISO 29281-1:2013: "Intelligent transport systems -- Communication access for land mobiles (CALM) -- Non-IP networking -- Part 1: Fast networking & transport layer protocol (FNTP)".

[2] ETSI TS 102 985-1: "Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for non-IP networking (ISO 29281); Part 1: Protocol Implementation Conformance Statement (PICS) proforma".

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

[i.2] Void.

[i.3] ISO 24102-3: "Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 3: Service access points".

[i.4] ISO 24102-4: "Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 4: Station-internal management communications".

[i.5] ISO 21217: "Intelligent transport systems -- Communications access for land mobiles (CALM) -- Architecture".

[i.6] Void.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in ISO 29281-1 [1], TS 102 985-1 [2] and EG 202 798 [i.1] apply.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in ISO 29281-1 [1], TS 102 985-1 [2], EG 202 798 [i.1] and the following apply:

FNTP	Fast Networking & Transport Protocol
IUT	Implementation Under Test
SUT	System Under Test

4 Test suite structure

In general, the conformance test system architecture presented in the ITS testing framework [i.1] extended as illustrated in Figure 1 applies.

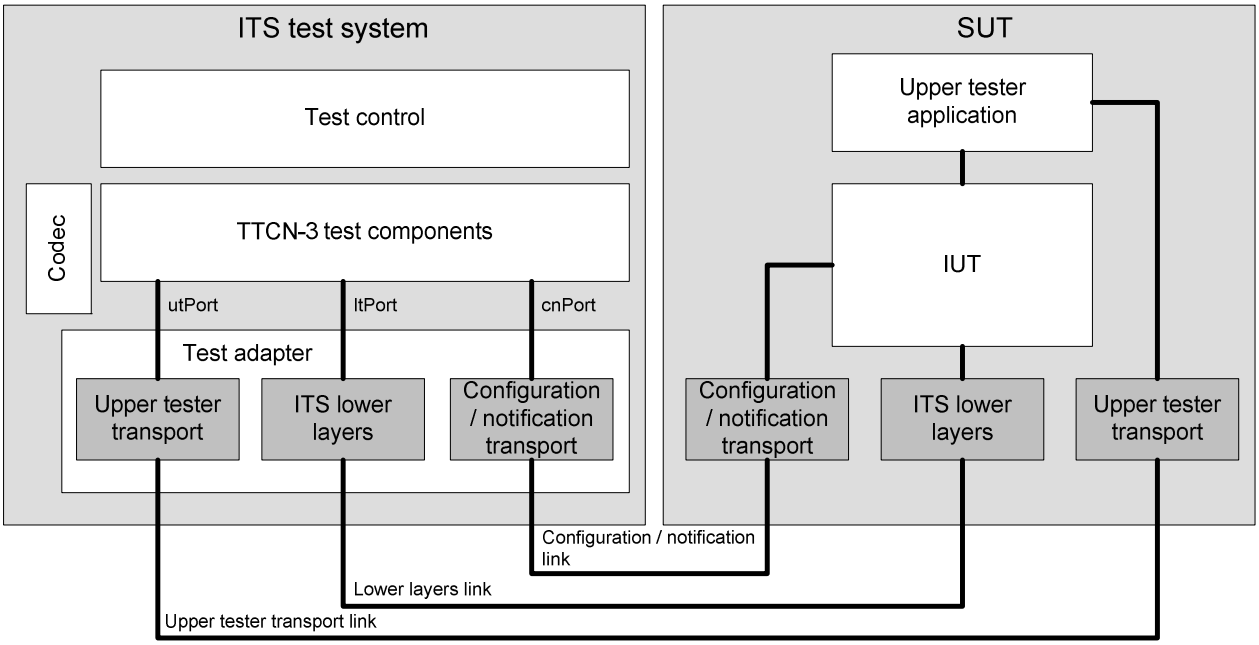

Figure 1: General conformance test system architecture for SUTs

Such SUTs which support ITS station-internal management communications [i.4] may benefit from the conformance test system architecture illustrated in Figure 2, where the access to the IUT from top, i.e. in general via the "Upper tester application", is performed via the MN-SAP.

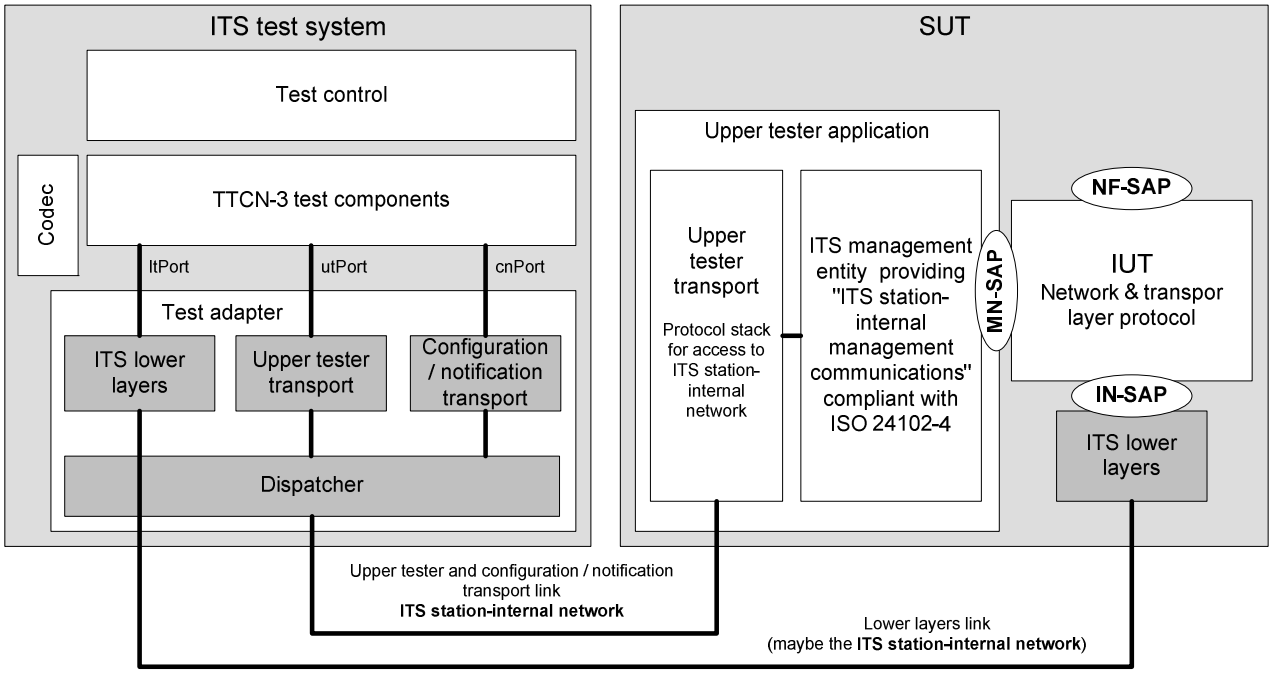

Figure 2: Conformance test system architecture for SUTs compliant with [i.4]

In general, the upper tester application [i.1] allows to access the NF-SAP of the IUT. Access to the full functionality of the NF-SAP is also possible via the MN-SAP, applying the MN-Command "SimNFcmd". Similarly, access of the networking and transport layer protocol to the ITS facilities layer (Upper tester application) is possible via MN-SAP, applying the MN-Request "SimNFreq". Similarly, as specified in [i.3] and [i.4], access to the IN-SAP can be simulated with functions of the MN-SAP; this allows avoiding the ITS lower layers.

5 TP basics

5.1 TP definition conventions

The TP definition is built according to the guidelines provided in the ITS testing framework [i.1], applying a formalized language with pre-defined keywords for the behaviour description.

5.2 TP identifier naming conventions

The identifier of the TP is built according to Table 1 as recommended in the ITS testing framework [i.1].

Table 1: TP naming convention for FNTP [1]

TP/<root>/<gr>/<sgr>/<x>/<nn>		
<root> = root	FNTP	Fast Networking & Transport Layer Protocol
<gr> = group	TXP	Transmit Packets
	RXP	Receive Packets
	CIP	CIP Management
	SEC	Secure Communications
<sgr> = sub-group	BP	Basic Procedure
	EP	Extended Procedure
	FP	Forwarding Procedure
<x> = type of testing	BV	Valid Behaviour Tests
	BI	Invalid Syntax or Behaviour Tests
<nn> = sequential number		01 to 99
NOTE 1: CIP management is only tested in the TPs of group "CIP". NOTE 2: The groups TXP and RXP are restricted to "transmit to / receive from an ITS peer station", i.e. the group TXP also includes TPs to test reception of an FNTP station-internal forwarding NPDU from another local ITS-SCU, and the group RXP also includes TPs to test transmission of an FNTP station-internal forwarding NPDU to another local ITS-SCU. NOTE 3: A sub-group may not apply for all groups.		

TPs for FNTP are specified in clause 6.

5.3 Rules for behaviour description

The description of the TP is built according to the guidelines provided in the ITS testing framework [i.1].

5.4 Sources of TP definitions

All TPs are specified according to [1].

5.5 TP proforma

[i.1] proposes a TP proforma which is used in the present document. The fields of this proforma as used in the present document are explained in table 2.

Table 2: TP proforma field description

TP Header	
TP ID	The TP ID is a unique identifier according to the TP naming conventions in Table 1.
Test objective	Short description of test purpose objective according to the requirements from the base standard.
Reference	The reference indicates the clauses of the reference standard specifications in which the conformance requirement is expressed.
PICS selection	Reference to the PICS statement involved for selection of the TP. Contains a Boolean expression. May contain PICS acronyms specified in Table 3. This section is only used in case an optional or conditional behaviour needs to be selected. Mandatory behaviour is not identified here.
TP Behaviour	
Initial conditions (optional)	The initial conditions define in which initial state the IUT has to be to apply the actual TP. In the corresponding "Test Case" (TC), when the execution of the initial condition does not succeed, it leads to the assignment of an Inconclusive verdict.
Expected behaviour (TP body)	Definition of the events, which are parts of the TP objective, and the IUT are expected to perform in order to conform to the base specification. In the corresponding TC," Pass" or "Fail" verdicts can be assigned there.

5.6 PICS mnemonics

The PICS mnemonics presented in Table 3 are used in the TP proforma.

Table 3: PICS mnemonic for ISO 29281-1 [1]

Mnemonic	PICS item
PICS_ROLE_RONLY	[2] A.2/1
PICS_ROLE_HONLY	[2] A.2/2
PICS_ROLE_RH	[2] A.2/3
PICS_EXT	[2] A.3/2
PICS_ITS_S_INW	[2] A.4/1
PICS_SEC	[2] A.4/2
PICS_NHOPBC	[2] A.4/3
PICS_LPP	[2] A.4/4
PICS_CIP	[2] A.4/5
PICS_15628	[2] A.5/1

6 TPs for FNTP

6.1 Transmit packets

6.1.1 Basic Procedure

6.1.1.1 Valid behaviour tests

TP Id	FNTP/TXP/BP/BV/01
Test objective	Single hop broadcast transmission request with known VCI
Reference	ISO 29281-1 [1], clause 7.6.1 and clause 7.6.2
PICS Selection	PICS_ROLE_RH
Initial conditions	

with {
the IUT having an FNTP forwarding table with proper entry in support of the local port number of the ITS-S application
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted single hop BC transmission request
}
then {
the IUT generates a basic FNTP NPDU, and forwards it to the BC-VCI(s) for transmission
}
}	

TP Id	FNTP/TXP/BP/BV/02
Test objective	Single hop unicast transmission request with known VCI
Reference	ISO 29281-1 [1], clause 7.6.1 and clause 7.6.2
PICS Selection	PICS_ROLE_RH
Initial conditions	

with {
the IUT having an FNTP forwarding table with proper entry in support of the requested local port number of the ITS-S application
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted single hop UC transmission request
}
then {
the IUT generates a basic FNTP NPDU, and forwards it to the proper UC-VCI for transmission
}
}	

6.1.1.2 Invalid behaviour tests

Invalid test purposes will be defined once ISO has implemented the concept of path and flow management in the architecture standard ISO 21217 [i.5] and subsequently in ISO 29281-1 [1].

6.1.2 Extended Procedure

6.1.2.1 Valid behaviour tests

TP Id	FNTP/TXP/EP/BV/01
Test objective	N- hop broadcast transmission request with known VCI
Reference	ISO 29281-1 [1], clause 7.6.3
PICS Selection	PICS_EXT AND PICS_ROLE_RH AND PICS_NHOPBC
Initial conditions	

with {
the IUT having an FNTP forwarding table with proper entry in support of the requested local port number of the ITS-S application
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted N-hop BC transmission request
}
then {
the IUT generates an extended FNTP NPDU, and forwards it to the BC-VCI(s) for transmission
}
}	

6.1.2.2 Invalid behaviour tests

TP Id	FNTP/TXP/EP/BI/01
Test objective	N- hop broadcast transmission request with invalid FNTP control field, and with known VCI
Reference	ISO 29281-1 [1], clause 7.6.3
PICS Selection	PICS_EXT AND PICS_ROLE_RH AND PICS_NHOPBC
Initial conditions	

with {
the IUT having an FNTP forwarding table with proper entry in support of the requested local port number of the ITS-S application
}	

Expected behaviour	

ensure that {
when {
the IUT having received an N-hop BC transmission request with non-supported bits in "controlField" also set to 1
}
then {
the IUT reports failure of delivery
}
}	

6.1.3 Forwarding Procedure

6.1.3.1 Valid behaviour tests

TP Id	FNTP/TXP/FP/BV/01
Test objective	TX from ITS-S host
Reference	ISO 29281-1 [1], clause 7.6.4
PICS Selection	PICS_ITS_S_INW AND (PICS_ROLE_HONLY OR PICS_ROLE_RH)
Initial conditions	

with {
the IUT having an FNTP forwarding table with proper entry in support of the requested local port numbers of the ITS-S application
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted single hop BC transmission request for delivery via a VCI contained in a different ITS-SCU
}
then {
the IUT generates an FNTP forwarding NPDU, and forwards it to the BC-VCI for transmission to the selected ITS-S router
}
}	

TP Id	FNTP/TXP/FP/BV/02
Test objective	RX at ITS-S router
Reference	ISO 29281-1 [1], clause 7.6.4 and clause 7.7.7
PICS Selection	PICS_ITS_S_INW AND (PICS_ROLE_RONLY OR PICS_ROLE_RH)
Initial conditions	

with {
the IUT having an FNTP forwarding table with proper entry in support of an ITS-S application in an ITS-S host
}	

Expected behaviour	

ensure that {
when {
the IUT having received an FNTP station-internal forwarding NPDU containing a correctly formatted FNTP basic NPDU for single hop BC transmission
}
then {
the IUT extracts the FNTP basic NPDU, and forwards it to the BC-VCI for transmission via the IN-SAP
}
}	

TP Id	FNTP/TXP/FP/BV/03
Test objective	TX from ITS-S host - increment of Counter
Reference	ISO 29281-1 [1], clause 7.6.4
PICS Selection	PICS_ITS_S_INW AND (PICS_ROLE_HONLY OR PICS_ROLE_RH)
Initial conditions	

with {
the IUT having an FNTP forwarding table with proper entry in support of the requested local port numbers of the ITS-S application
}	

Expected behaviour	

ensure that {
when {
the IUT having received a sequence of correctly formatted single hop BC transmission requests for delivery via a VCI contained in a different ITS-SCU, with the number of requests such that at least once the "Counter" value before increment is different to 255, and at least once it is equal to 255
}
then {
the IUT generates an FNTP forwarding NPDU for every request, with the "Counter" value in an FNTP forwarding NPDU equal to the "Counter" value from the previous FNTP forwarding NPDU incremented by one with a wrap around from the value 255 to 0
}
}	

6.1.3.2 Invalid behaviour tests

TP Id	FNTP/TXP/FP/BI/01
Test objective	TX from ITS-S host - unknown access to ITS station-internal network
Reference	ISO 29281-1 [1], clause 7.6.4
PICS Selection	PICS_ITS_S_INW AND (PICS_ROLE_HONLY OR PICS_ROLE_RH)
Initial conditions	

with {
the IUT having an FNTP forwarding table with no entry related to an ITS-S internal network
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted single hop BC transmission request for delivery via a VCI contained in a different ITS-SCU
}
then {
the IUT reports failure of delivery
}
}	

6.2 Receiving packets

6.2.1 Basic Procedure

6.2.1.1 Valid behaviour tests

TP Id	FNTP/RXP/BP/BV/01
Test objective	Single hop unicast reception from peer station
Reference	ISO 29281-1 [1], clause 7.7.1, clause 7.7.2 and clause 7.7.3
PICS Selection	PICS_ROLE_RH
Initial conditions	

with {
the IUT having a proper entry in the FNTP forwarding table with Service Port such that no ITS station-internal forwarding is needed
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted unicast packet from the peer station via the IN-SAP
}
then {
the IUT delivers the message to the local ITS-SP selected by the Service Port
}
}	

TP Id	FNTP/RXP/BP/BV/02
Test objective	Single hop unicast reception from unknown peer station
Reference	ISO 29281-1 [1], clause 7.7.1, clause 7.7.2 and clause 7.7.3
PICS Selection	PICS_ROLE_RH
Initial conditions	

with {
the IUT having an entry in the FNTP forwarding table for a Service Port such that no ITS station-internal forwarding is needed, but no entry for the peer station
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted unicast packet from the peer station via the IN-SAP
}
then {
the IUT delivers the message to the ITS-SP selected by the Service Port,
the ITU informs the management about the new peer ITS-S
}
}	

TP Id	FNTP/RXP/BP/BV/03
Test objective	Single hop broadcast reception from peer station
Reference	ISO 29281-1 [1], clause 7.7.1, clause 7.7.2 and clause 7.7.3
PICS Selection	PICS_ROLE_RH
Initial conditions	

with {
the IUT having an entry in the FNTP forwarding table for a Service Port such that no ITS station-internal forwarding is needed
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted broadcast packet from the peer station via the IN-SAP
}
then {
the IUT forwards the message to the ITS-SP selected by the Service Port
}
}	

6.2.1.2 Invalid behaviour tests

TP Id	FNTP/RXP/BP/BI/01
Test objective	Single hop broadcast reception to unknown Service Port
Reference	ISO 29281-1 [1], clause 7.7.1 and clause 7.7.2
PICS Selection	PICS_ROLE_RH OR PICS_ROLE_RONLY OR PICS_ROLE_HONLY
Initial conditions	

with {
the IUT having an entry in the FNTP forwarding table for Service Port = port1, but not for Service Port = port2
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted broadcast message with a destinationPort port2, with port2 different to port1
}
then {
the IUT discards the message
}
}	

TP Id	FNTP/RXP/BP/BI/02
Test objective	Single hop broadcast reception to invalid port PORT_NON
Reference	ISO 29281-1 [1], clause 7.7.1
PICS Selection	PICS_ROLE_RH OR PICS_ROLE_HONLY OR PICS_ROLE_RONLY
Initial conditions	
none	
Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted broadcast message with a destinationPort PORT_NON
}
then {
the IUT discards the message
}
}	

TP Id	FNTP/RXP/BP/BI/03
Test objective	Single hop broadcast reception from invalid port PORT_NON
Reference	ISO 29281-1 [1], clause 7.7.1
PICS Selection	PICS_ROLE_RH OR PICS_ROLE_HONLY OR PICS_ROLE_RONLY
Initial conditions	

with {
the IUT having an entry in the FNTP forwarding table for Service Port = port1
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted broadcast message with a destinationPort port1 and a sourcePort PORT_NON
}
then {
the IUT discards the message
}
}	

TP Id	FNTP/RXP/BP/BI/04
Test objective	Single hop broadcast reception from invalid port PORT_NON to invalid port PORT_NON
Reference	ISO 29281-1 [1], clause 7.7.1
PICS Selection	PICS_ROLE_RH OR PICS_ROLE_HONLY OR PICS_ROLE_RONLY
Initial conditions	
none	
Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted broadcast message with a destinationPort PORT_NON and a sourcePort PORT_NON
}
then {
the IUT discards the message
}
}	

TP Id	FNTP/RXP/BP/BI/05
Test objective	Single hop broadcast reception with invalid pair of ports, one of which is PORT_RTR and the other one is different to PORT_HST
Reference	ISO 29281-1 [1], clause 7.7.1
PICS Selection	PICS_ROLE_RH OR PICS_ROLE_HONLY OR PICS_ROLE_RONLY
Initial conditions	
none	
Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted broadcast message with a destinationPort PORT_RTR and a sourcePort different to PORT_HST
}
then {
the IUT discards the message
}
}	

TP Id	FNTP/RXP/BP/BI/06
Test objective	Single hop broadcast reception with invalid pair of ports, one of which is PORT_HST and the other one is different to PORT_RTR
Reference	ISO 29281-1 [1], clause 7.7.1
PICS Selection	PICS_ROLE_RH OR PICS_ROLE_HONLY OR PICS_ROLE_RONLY
Initial conditions	
none	
Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted broadcast message with a destinationPort PORT_HST and a sourcePort different to PORT_RTR
}
then {
the IUT discards the message
}
}	

6.2.2 Extended Procedure

6.2.2.1 Valid behaviour tests

TP Id	FNTP/RXP/EP/BV/01
Test objective	N-hop broadcast reception with forwarding
Reference	ISO 29281-1 [1], clause 7.7.5
PICS Selection	PICS_ROLE_RH AND PICS_NHOPBC
Initial conditions	

with {
the IUT having an FNTP forwarding table with proper entry in support of the local port number of the ITS-S application
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted broadcast packet from the peer station via the IN-SAP with FNTP hop count set to a value greater than 0
}
then {
the IUT forwards the message to the ITS-SP selected by the Service Port, and
the IUT transmits the received packet in broadcast mode with FNTP hop count decremented by one
}
}	

TP Id	FNTP/RXP/EP/BV/02
Test objective	N-hop broadcast reception with no more forwarding (last hop test)
Reference	ISO 29281-1 [1], clause 7.7.5
PICS Selection	PICS_ROLE_RH AND PICS_NHOPBC
Initial conditions	

with {
the IUT having an FNTP forwarding table with proper entry in support of the local port number of the ITS-S application
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted broadcast packet from the peer station via the IN-SAP with FNTP hop count set to 0
}
then {
the IUT forwards the message to the ITS-SP selected by the Service Port, and
the IUT does not transmit the received packet
}
}	

TP Id	FNTP/RXP/EP/BV/03
Test objective	N-hop broadcast reception to unknown Service Port with forwarding
Reference	ISO 29281-1 [1], clause 7.7.5
PICS Selection	PICS_ROLE_RH AND PICS_NHOPBC
Initial conditions	

with {
the IUT having no entry in the FNTP forwarding table for Service Port
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted broadcast packet with unknown destinationPort from a peer station via the IN-SAP with FNTP hop count set to a value greater than 0
}
then {
the IUT transmits the received packet in broadcast mode with FNTP hop count decremented by one
the IUT discards the packet
}
}	

TP Id	FNTP/RXP/EP/BV/04
Test objective	N-hop broadcast reception to unknown Service Port without forwarding
Reference	ISO 29281-1 [1], clause 7.7.5
PICS Selection	PICS_ROLE_RH AND PICS_NHOPBC
Initial conditions	

with {
the IUT having no entry in the FNTP forwarding table for Service Port
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted broadcast packet with unknown destinationPort from a peer station via the IN-SAP with FNTP hop count set to 0
}
then {
the IUT discards the packet and does not transmit the received packet
}
}	

6.2.2.2 Invalid behaviour tests

TP Id	FNTP/RXP/EP/BI/01
Test objective	Reception of packet with not supported FNTP control field value
Reference	ISO 29281-1 [1], clause 7.7.4
PICS Selection	PICS_EXT AND PICS_ROLE_RH
Initial conditions	

with {
the IUT having setup properly the FNTP forwarding table
}	

Expected behaviour	

ensure that {
when {
the IUT having received a broadcast packet with a single but not supported option indicated in the FNTP Control field from a peer station via the IN-SAP
}
then {
the IUT discards the packet
}
}	

6.2.3 Forwarding Procedure

6.2.3.1 Valid behaviour tests

TP Id	FNTP/RXP/FP/BV/01
Test objective	TX from ITS-S router to ITS-S host
Reference	ISO 29281-1 [1], clause 7.7.8
PICS Selection	PICS_ITS_S_INW AND (PICS_ROLE_RONLY OR PICS_ROLE_RH)
Initial conditions	

with {
the IUT having set up properly the FNTP forwarding table
}	

Expected behaviour	

ensure that {
when {
the IUT having received a packet from a peer station requiring local forwarding via the ITS station-internal network
}
then {
the IUT constructs an FNTP forwarding NPDU and transmits it via the BC-VCI connected to the ITS station-internal network
}
}	

TP Id	FNTP/RXP/FP/BV/02
Test objective	TX from ITS-S router - increment of Counter
Reference	ISO 29281-1 [1], clause 7.7.8
PICS Selection	PICS_ITS_S_INW AND (PICS_ROLE_RONLY OR PICS_ROLE_RH)
Initial conditions	

with {
the IUT having set up properly the FNTP forwarding table
}	

Expected behaviour	

ensure that {
when {
the IUT having received a sequence of packets from a peer station requiring local forwarding via the ITS station-internal network, with the number of packets such that at least once the "Counter" value before increment is different to 255, and at least once it is equal to 255
}
then {
the IUT generates an FNTP forwarding NPDU for every request, with the "Counter" value in an FNTP forwarding NPDU equal to the "Counter" value from the previous FNTP forwarding NPDU incremented by one with a wrap around from the value 255 to 0
}
}	

TP Id	FNTP/RXP/FP/BV/03
Test objective	RX at ITS-S host
Reference	ISO 29281-1 [1], clause 7.7.6
PICS Selection	PICS_ITS_S_INW AND (PICS_ROLE_HONLY OR PICS_ROLE_RH)
Initial conditions	

with {
the IUT having set up properly the FNTP forwarding table
}	

Expected behaviour	

ensure that {
when {
the IUT having received an FNTP station-internal forwarding NPDU containing a correctly formatted FNTP basic NPDU
}
then {
the IUT extracts the FNTP basic NPDU, and notifies its reception to the required port
}
}	

TP Id	FNTP/RXP/FP/BV/04
Test objective	RX at ITS-S host - wrong ITS-SCU-ID
Reference	ISO 29281-1 [1], clause 7.7.6
PICS Selection	PICS_ITS_S_INW AND (PICS_ROLE_HONLY OR PICS_ROLE_RH)
Initial conditions	

with {
the IUT having an ITS-SCU-ID different to the requested one
}	

Expected behaviour	

ensure that {
when {
the IUT having received an FNTP station-internal forwarding NPDU containing a correctly formatted FNTP basic NPDU, but the ITS-SCU-ID indicates a different ITS-SCU,
}
then {
the IUT discards the packet
}
}	

6.2.3.2 Invalid behaviour tests

TP Id	FNTP/RXP/FP/BI/01
Test objective	RX at ITS-S host - unknown Service Port
Reference	ISO 29281-1 [1], clause 7.7.2
PICS Selection	PICS_ITS_S_INW AND (PICS_ROLE_HONLY OR PICS_ROLE_RH)
Initial conditions	

with {
the IUT having no entry for the required Service Port
}	

Expected behaviour	

ensure that {
when {
the IUT having received an FNTP station-internal forwarding NPDU containing a correctly formatted FNTP basic NPDU, but the Service Port is not known or no more known,
}
then {
the IUT discards the packet
}
}	

6.3 CI parameter management

6.3.1 Basic Procedure

The sub-group BP is not applicable for the group CIP.

6.3.2 Extended Procedure

6.3.2.1 Valid behaviour tests

TP Id	FNTP/CIP/EP/BV/01
Test objective	CIP in NPDU for single-hop BC transmission
Reference	ISO 29281-1 [1], clause 7.10.1
PICS Selection	PICS_CIP AND PICS_ROLE_RH
Initial conditions	

with {
the IUT having setup properly the FNTP forwarding table
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted single hop BC transmission request with CIPs indicated in the NF-FNTP-COMM.request service primitive
}
then {
the IUT generates an FNTP extended NPDU with CIPs included, and forwards it to the proper BC-VCI with access_parameters in the IN-SAP service primitive set equal to the CIPs
}
}	

TP Id	FNTP/CIP/EP/BV/02
Test objective	CIP in NPDU for N-hop BC transmission
Reference	ISO 29281-1 [1], clause 7.10.1
PICS Selection	PICS_CIP AND PICS_ROLE_RH
Initial conditions	

with {
the IUT having setup properly the FNTP forwarding table
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted N-hop BC transmission request with CIPs indicated in the NF-FNTP-COMM.request service primitive
}
then {
the IUT generates an FNTP extended NPDU with CIPs included, and forwards it to the proper UC-VCI with access_parameters in the IN-SAP service primitive set equal to the CIPs
}
}	

TP Id	FNTP/CIP/EP/BV/03
Test objective	CIP in NPDU for UC transmission
Reference	ISO 29281-1 [1], clause 7.10.1
PICS Selection	PICS_CIP AND PICS_ROLE_RH
Initial conditions	

with {
the IUT having setup properly the FNTP forwarding table
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted UC transmission request with CIPs indicated in the NF-FNTP-COMM.request service primitive
}
then {
the IUT generates an FNTP extended NPDU with CIPs included, and forwards it to the proper UC-VCI with access_parameters in the IN-SAP service primitive set equal to the CIPs
}
}	

TP Id	FNTP/CIP/EP/BV/04
Test objective	Reception of CIP in NPDU for N-hop BC transmission
Reference	ISO 29281-1 [1], clause 7.10.1
PICS Selection	PICS_CIP AND PICS_ROLE_RH
Initial conditions	

with {
the IUT having setup properly the FNTP forwarding table
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted FNTP extended NPDU with CIPs included and with the FNTP hop count set to 1
}
then {
the IUT notifies reception of the NPDU to the required port,
the IUT removes CIPs from the received NPDU and forwards the remaining NPDU to the BC-VCI for next hop transmission
}
}	

6.3.2.2 Invalid behaviour tests

None.

6.3.3 Forwarding Procedure

6.3.3.1 Valid behaviour tests

TP Id	FNTP/CIP/FP/BV/01
Test objective	TX from ITS-S host to ITS-S router with CIPs
Reference	ISO 29281-1 [1], clause 7.10.2
PICS Selection	PICS_CIP AND PICS_ITS_S_INW AND (PICS_ROLE_HONLY OR PICS_ROLE_RH)
Initial conditions	

with {
the IUT having set up properly the FNTP forwarding table
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted single hop BC transmission request with CIPs for delivery via a VCI contained in a different ITS-SCU
}
then {
the IUT generates an FNTP forwarding NPDU containing an FNTP extended NPDU with CIPs, and forwards it to the BC-VCI for transmission to the selected ITS-S router
}
}	

TP Id	FNTP/CIP/FP/BV/02
Test objective	RX at ITS-S router from ITS-S host with CIPs
Reference	ISO 29281-1 [1], clause 7.10.2
PICS Selection	PICS_CIP AND PICS_ITS_S_INW AND (PICS_ROLE_RONLY OR PICS_ROLE_RH)
Initial conditions	

with {
the IUT having set up properly the FNTP forwarding table
}	

Expected behaviour	

ensure that {
when {
the IUT having received an FNTP station-internal forwarding NPDU containing a correctly formatted FNTP extended NPDU with CIPs for single hop BC transmission
}
then {
the IUT extracts the FNTP extended NPDU, and forwards it to the BC-VCI for transmission via the IN-SAP with access_parameters set equal to the CIPs
}
}	

TP Id	FNTP/CIP/FP/BV/03
Test objective	RX at ITS-S router from access layer with TX CIPs
Reference	ISO 29281-1 [1], clause 7.10.3
PICS Selection	PICS_CIP AND PICS_ITS_S_INW AND (PICS_ROLE_RONLY OR PICS_ROLE_RH)
Initial conditions	

with {
the IUT having set up properly the FNTP forwarding table
}	

Expected behaviour	

ensure that {
when {
the IUT having received a packet from the IN-SAP containing a properly formatted FNTP NPDU with TX CIPs, and no RX CIPs are available
}
then {
the IUT forwards the TX-CIP information to the implementation-specific destination in the ITS-S router, and constructs an FNTP forwarding NPDU containing the received FNTP NPDU including the CIP header, and transmits the FNTP forwarding NPDU via the BC-VCI connected to the ITS station-internal network
}
}	

TP Id	FNTP/CIP/FP/BV/04
Test objective	RX at ITS-S router from access layer with TX CIPs and RX CIPs
Reference	ISO 29281-1 [1], clause 7.10.3
PICS Selection	PICS_CIP AND PICS_ITS_S_INW AND (PICS_ROLE_RONLY OR PICS_ROLE_RH)
Initial conditions	

with {
the IUT having set up properly the FNTP forwarding table
}	

Expected behaviour	

ensure that {
when {
the IUT having received a packet from the IN-SAP containing a properly formatted FNTP NPDU with TX CIPs, and RX CIPs are available
}
then {
the IUT forwards the TX-CIP and RX-CIP information to the implementation-specific destination in the ITS-S router,
and constructs an FNTP forwarding NPDU containing the received FNTP NPDU including the CIP header extended by the RX CIPs,
and transmits the FNTP forwarding NPDU via the BC-VCI connected to the ITS station-internal network
}
}	

TP Id	FNTP/CIP/FP/BV/05
Test objective	RX at ITS-S host from ITS-S router with CIPs
Reference	ISO 29281-1 [1], clause 7.10.3
PICS Selection	PICS_CIP AND PICS_ITS_S_INW AND (PICS_ROLE_HONLY OR PICS_ROLE_RH)
Initial conditions	

with {
the IUT having set up properly the FNTP forwarding table
}	

Expected behaviour	

ensure that {
when {
the IUT having received an FNTP forwarding NPDU containing a correctly formatted FNTP extended NPDU and CIP
}
then {
the IUT forwards the TX-CIP and RX-CIP information to the implementation-specific destination in the ITS-S host, the IUT extracts the FNTP extended NPDU, evaluates it, and notifies reception to the ITS-SP selected by the Service Port
}
}	

TP Id	FNTP/CIP/FP/BV/06
Test objective	TX at ITS-S router to remote ITS-S with no transmission of CIP in the frame
Reference	ISO 29281-1 [1], clause 7.10.1
PICS Selection	PICS_CIP AND PICS_ITS_S_INW AND (PICS_ROLE_RONLY OR PICS_ROLE_RH)
Initial conditions	

with {
the IUT having set up properly the FNTP forwarding table,
the IUT is set to not transmit CIPs in a frame to a remote ITS-S
}	

Expected behaviour	

ensure that {
when {
the IUT having received the request to send an FNTP extended NPDU containing TX-CIPs
}
then {
the IUT removes the TX-CIP information from the extended NPDU and constructs the proper FNTP NPDU without TX-CIP, and forwards it to the BC-VCI for transmission via the IN-SAP with access_parameters set equal to the TX-CIPs
}
}	

TP Id	FNTP/CIP/FP/BV/07
Test objective	RX of an FNTP extended NPDU with CIP at ITS-S router which is due to a retransmission (N-hop).
Reference	ISO 29281-1 [1], clause 7.10.1
PICS Selection	PICS_CIP AND PICS_ITS_S_INW AND PICS_ROLE_RH)
Initial conditions	

with {
the IUT having set up properly the FNTP forwarding table,
the IUT is enabled to transmit CIPs in a frame to remote ITS-S
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted broadcast packet from the peer station via the IN-SAP with FNTP hop count set to a value greater than 0.
}
then {
the IUT forwards the CIP information to the implementation-specific destination in the ITS-S router,
the IUT retransmits the received packet in broadcast mode with FNTP hop count decremented by one, and with no CIP contained in the NPDU, and with access_parameters not set equal to the received CIP,
the IUT processes the "FNTP extended NPDU" and notifies reception to the proper ITS-SP
}
}	

TP Id	FNTP/CIP/FP/BV/08
Test objective	RX of an FNTP extended NPDU with CIP at ITS-S router which is due to a retransmission (N-hop).
Reference	ISO 29281-1 [1], clause 7.10.1 and clause 7.10.3
PICS Selection	PICS_CIP AND PICS_ITS_S_INW AND PICS_ROLE_RONLY
Initial conditions	

with {
the IUT having set up properly the FNTP forwarding table,
the IUT is enabled to transmit CIPs in a frame to remote ITS-S
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted broadcast packet from the peer station via the IN-SAP with FNTP hop count set to a value greater than 0.
}
then {
the IUT forwards the CIP information to the implementation-specific destination in the ITS-S router,
the IUT retransmits the received packet in broadcast mode with FNTP hop count decremented by one, and with no CIP contained in the NPDU, and with access_parameters not set equal to the received CIP,
the IUT forwards the "FNTP extended NPDU" to the proper ITS host
}
}	

6.3.3.2 Invalid behaviour tests

None.

6.4 Secure communications

None.

History

Document history		
V1.1.1	July 2012	Publication
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