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Test methods of network layer of LTE-based vehicular communication

基于 LTE 的车联网无线通信技术 网络层测试方法

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Test methods of network layer of LTE-based vehicular communication

1 Scope

This Standard specifies the test methods of network layer of LTE-based vehicular communication, and regulates the test parameters and indicators, test methods, and test cases of network layer of LTE-based vehicular communication.

This Standard applies to the network layer of LTE-based vehicular communication.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only the dated version applies to this document. For undated references, the latest edition (including all amendments) applies to this document.

YD/T 3340-2018, Technical requirements of air interface of LTE-based vehicular communication

YD/T 3400-2018, General technical requirements of LTE-based vehicular communication

YD/T 3707-2020, Technical Requirements of Network Layer of LTE-based Vehicular Communication

3 Abbreviations

The following abbreviations apply to this document.

AID	Application ID
DUT	Device Under Test
DME	Dedicated Management Entity
DSM	Dedicated Short Message
DSMP	Dedicated Short Message Protocol

LLC	Logical Link Control
LTE	Long Term Evolution
LTE-V2X	LTE Vehicle to Everything
MIB	Management Information Base
MAC	Media Access Control
OBU	On Board Unit
RSU	Road Side Unit
SAP	Service Access Point
TS	Test System
TTCN-3	Testing and Test Control Notation-3
TCP	Transmission Control Protocol
UDP	User Datagram Protocol

4 LTE vehicular communication technology network layer detection environment

4.1 Test system architecture

The test system architecture of the LTE-based vehicular communication is shown in Figure 1. The test system is mainly composed of a PC host and a system simulator; the two communicate via Ethernet.

The PC host is the upper computer in the test system, which implements equipment operation, system self-checking and TTCN-3 executable test case operation, and can realize automated testing and control of the tested terminal through the relevant command interface.

The system simulator implements the underlying protocol stack function of the LTE-based vehicular communication; the system simulator and the terminal communicate through the air interface.

If the test system requires the device under test to feed back relevant information of test status or test result during the test, the device under test feeds back relevant information through the Ethernet.

Figure 2 – Test process status

5 DSM message test

5.1 DUT sends DSM message test

5.1.1 Adaptation layer protocol type test

Test number: TC_NL_DSM_MST_BV_01
Test item: DSM message test
Test purpose: to verify whether the adaptation layer frame header protocol type information in the DSM message sent by DUT is correct
Preconditions: 1) DUT has been powered on and started; 2) DUT has locked the GNSS-based position, and completed clock synchronization with GNSS; 3) There is no other equipment of the same type within the range of the wireless signal capture tool of DUT or the test system; 4) DUT does not actively send messages except for receiving related instructions from the test system
Test structure: see 4.1 test system architecture
Test steps: Step 1: Configure DUT to send a DSM message. Step 2: Verify whether DUT sends a DSM message. Step 3: Verify the DSM message adaptation layer protocol type information value
Expected results: In step 2, the TS system receives the DSM message; In step 3, the DSM message contains the adaptation layer frame header, and the frame header protocol type field value is 4 (DSMP)

5.1.2 DSMP version number information test

Test number: TC_NL_DSM_MST_BV_02
Test item: DSM message test
Test purpose: to verify whether the DSMP version information in the DSM message sent by DUT is correct
Preconditions: 1) DUT has been powered on and started; 2) DUT has locked the GNSS-based position, and completed clock synchronization with GNSS; 3) There is no other equipment of the same type within the range of the wireless signal capture tool of DUT or the test system; 4) DUT does not actively send messages except for receiving related instructions from the test system
Test structure: see 4.1 test system architecture
Test steps:

Step 1: Configure DUT to send a DSM message. Step 2: Verify whether DUT sends a DSM message. Step 3: Verify whether the Version value of the DSM message version is correct. Step 4: Verify whether the DSM message ‘reserved domain’ value is correct
Expected results: In step 2, the TS system receives the DSM message; In step 3, the Version value of the DSM message version is '0'; In step 4, the value of "reserved domain" in the DSM message is '0';

5.1.3 Application identification information test

Test number: TC_NL_DSM_MST_BV_03
Test item: DSM message test
Test purpose: to verify whether the application ID (AID) information in the DSM message sent by DUT is correct
Preconditions: 1) DUT has been powered on and started; 2) DUT has locked the GNSS-based position, and completed clock synchronization with GNSS; 3) There is no other equipment of the same type within the range of the wireless signal capture tool of DUT or the test system; 4) DUT does not actively send messages except for receiving related instructions from the test system
Test structure: see 4.1 test system architecture
Test steps: Step 1: Configure DUT to send DSM messages, where the AID information length is 1 byte, and the value is pAID1. Step 2: Verify whether DUT sends a DSM message. Step 3: Verify whether the AID value in the DSM message is correct. Step 4: Configure DUT to send DSM messages, where the AID information length is 2 bytes, and the value is pAID2. Step 5: Verify whether DUT sends a DSM message. Step 6: Verify whether the AID value in the DSM message is correct.
Expected results: In step 2, the TS system receives the DSM message. In step 3, the AID length in the DSM message is 1 byte, and the value is pAID1. In step 5, the TS system receives the DSM message. In step 6, the AID length in the DSM message is 2 bytes, and the value is pAID2.

5.1.4 Data length information test

Test number: TC_NL_DSM_MST_BV_04
Test item: DSM message test
Test purpose: to verify whether the Length information in the DSM message sent by DUT is correct
Preconditions: 1) DUT has been powered on and started;

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