USING TDL FOR STANDARDISED TEST PURPOSE DEFINITIONS

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IEEE QRS/STV, 13th December 2020, Macau (China)
• Our Context

• ETSI Testing approach
  – TDL
  – TTCN-3

• Application samples within ETSI
  – TC INT projects
  – TC MTS standardisation
ETSI is a leading standardisation organisation for Information and Communication Technology (ICT) standards fulfilling European and global market needs.

ETSI test specifications are developed according to the well-proven methodology defined in ISO/IEC 9646. This framework recommends that the test specifications include: Test Purposes, Test Descriptions and Test Cases.
➢ Technical Committee “Methods for Testing and Specification”

➢ Working Group TDL provides and oversees roadmap for further development of TDL and the TDL open source project

➢ Working Group TST develops IoT test catalogues and specifications (not covered elsewhere)

• The types of testing include conformance, interoperability, security and performance testing

• The initial technical focus is:
  – IoT network layer (communication protocols, node connectivity, edge computing etc.),
  – Basic security of IoT devices
ETSİ TESTING APPROACH

Requirements Level

Test Design Level

Test Implementation Level

Test Execution Level

Source: https://tdl.etsi.org/index.php/introduction
QUALITY ASPECTS

1. Conformance
2. Robustness / Security
3. Performance

Black-Box perspective
Test Description Language

- Design, documentation, representation of formalised test descriptions
- Scenario-based approach

Testing and Test Control Notation

- Specification and implementation of all kinds of black-box tests
- Component-based approach
1) Test configurations

2) Test Suite Structure

3) Test purpose (catalogue)

4) Test implementation (TTCN-3)

<table>
<thead>
<tr>
<th>TP Id</th>
<th>TP_MQTT_Broker_CONNECT_001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Objective</td>
<td>The IUT MUST close the network connection if fixed header flags in CONNECT Control Packet are invalid</td>
</tr>
<tr>
<td>Reference</td>
<td>MQTT-2.2.2-1, MQTT-2.2.2-2, MQTT-3.1.4-1, MQTT-3.2.2-6</td>
</tr>
<tr>
<td>PICS Selection</td>
<td>PIC_BROKER_BASIC</td>
</tr>
</tbody>
</table>

Initial Conditions

Expected Behaviour

ensure that {
    when {
        the IUT receives a CONNECT message containing
        header_flags indicating value '1111'B;
    } then {
        the IUT closes the TCP_CONNECTION
    }
}

Final Conditions
Test Purpose {
    TP Id TP HELLO MSG SERVER /* Summary */
    Test objective "Establishing Connection with EndpointUrl"
    Reference "OPC-UA,Part-6-Mappings#section-7.1.3"
    Expected behaviour ensure that {
        when {...}
        then {...}
    }
}
1) Test configurations

2) Test Suite Structure

3) Test purpose (catalogue)

4) Test implementation (TTCN-3)

Did you know that YOUR PHONE...

...has been tested using ETSI specifications written in TTCN-3?
APPLICATION: INTEROPERABILITY TESTS

➢ Technical Committee “Core Network and Interoperability Testing (INT)”

➢ Specialist/Testing Task Forces on “Voice and video services over LTE”
  ✓ For multiple interfaces of the identified test configurations
  ✓ Packages with common domain definitions (library concept)
  ✓ More than 300 TDL-TO test purposes
  ✓ TDL Open Source Project (TOP) tools

Configuration {
  Interface Type defaultGT accepts DiameterMessage;
  Component Type DiameterComp with
gate g of type defaultGT
};

Test Configuration CF_VxLTE_INT containing
  SUT component EPC_PGW_A of type DiameterComp
  SUT component EPC_PCRF_A of type DiameterComp
  SUT component S_CSCF_A of type DiameterComp
  SUT component I_CSCF_A of type DiameterComp
  SUT component P_CSCF_A of type DiameterComp
  SUT component HSS_A of type DiameterComp
  SUT component EPC_MME_A of type DiameterComp
  SUT component IMS_AS_A of type DiameterComp
  connection between EPC_MME_A.g and HSS_A.g
  connection between EPC_PGW_A.g and EPC_PCRF_A.g
  connection between EPC_PCRF_A.g and P_CSCF_A.g
  connection between HSS_A.g and S_CSCF_A.g
  connection between HSS_A.g and I_CSCF_A.g
  connection between IMS_AS_A.g and HSS_A.g
};

Test Configuration CF_VxLTE_RMI containing
  SUT component EPC_PGW_B of type DiameterComp
  SUT component EPC_PCRF_A of type DiameterComp
  SUT component EPC_PCRF_B of type DiameterComp
  SUT component P_CSCF_B of type DiameterComp
  SUT component HSS_A of type DiameterComp
  SUT component EPC_MME_B of type DiameterComp
  connection between EPC_MME_B.g and HSS_A.g
  connection between EPC_PGW_B.g and EPC_PCRF_B.g
  connection between EPC_PCRF_A.g and EPC_PCRF_B.g
  connection between EPC_PCRF_B.g and P_CSCF_B.g
}; // End of Configuration section
APPLICATION: IOT-TESTWARE – THE TWO PILLARS

Legend:
TP: Test Purpose
TSS: Test Suite Structure
ATS: Abstract Test Suite
ETS: Executable Test Suite
SUT: System Under Test
### AVAILABLE TEST SPECS – MTS TST WORK PROGRAMME

<table>
<thead>
<tr>
<th>Work Item Monitoring - MTS TST</th>
<th>Displays</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Work item number</strong></td>
<td><strong>Version</strong></td>
</tr>
<tr>
<td>DTS/MTS-TSTSB (TS 103 645)</td>
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<tr>
<td>DTS/MTS-TSTCoAP-1 (TS 103 596-1)</td>
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<tr>
<td>DTS/MTS-TSTMQTT-3 (TS 103 597-3)</td>
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</tr>
</tbody>
</table>

- **IEC 62443-4-2**
- **CoAP**
- **MQTT**

BENEFITS OF TDL AS A TEST SPECIFICATION LANGUAGE

✓ Abstract → Keeps you focused on what to test

✓ Standardised → Helps you to produce repeatable results independently from a chosen certain tool or tool provider

✓ Application focus → Wide range of features for today’s interconnected, concurrent, embedded, real-time systems

✓ Semi-formal → Helps you to keep test specifications consistent over evolving systems (meta-modelling supported static code analysis)

✓ Multiple syntaxes → Provide test specifications in a language that different stakeholders understand best (graphical, textual, other)

✓ Tool support → The TDL Open source Project (TOP) offers tool support for the use of TDL
SUMMARY & OUTLOOK

✓ Standardised test purposes
  - Used in multiple **domains**: e.g. mobile, access/core networks, ITS
  - **Test types**, e.g. conformance, interop, security

✓ Advanced testing technology:
  - Used for **certification**: e.g. UMTS, LTE, 5G, oneM2M

✓ ETSI continues **maintenance** and **evolution**
  - TDL: [https://tdl.etsi.org/](https://tdl.etsi.org/)
Partially funded by

✓ ETSI in the context of the STF projects 454, 476, 492, 522, 574 and 577
✓ German Federal Ministry for Economic Affairs and Energy (IoT-T project)

Thank you for your attention!

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