MBT TO TTCN-3 TOOL CHAIN: THE ONEM2M EXPERIENCE

Presented by Abbas AHMAD (abbas.ahmad@eglobalmark.com)
Contents

• IoT platform testing : Introducing MBT

• The oneM2M MBT use case

• MBT breaking its barriers in oneM2M

• Results

• Conclusions
IoT PLATFORM TESTING:
INTRODUCING MBT
Why are we testing the IoT?

• It’s BIG
  • How “BIG” is it? (Sources: Gartner)
    • 6.4 Billion devices by 2016, 21 Billion by 2020!
    • 63 new devices connected/second (~5.5 Million devices/day)

• It’s VULNERABLE
  • Cost of data breaches will reach $2.1 trillion globally by 2019
    (Juniper Research, May 2015)
  • And this is “just” one example of vulnerability...
How and why are we testing IoT?

- We use Model Based Testing (MBT)
  - Demonstrated in 2015 UCAAT Poster “IoT interoperability Model Based Testing”: scalable & suited for IoT platforms
  - Automatic generation of executable tests
    - TTCN-3
    - Soap-UI
    - ...
  - Targets IoT platforms rather than devices
- Why targeting IoT Platforms?
  - Devices are Heterogeneous → Interoperability Issues
  - IoT platforms tend to be standardized
oneM2M MBT use case
oneM2M IoT Standard use case

- EGM has an active contribution in oneM2M testing topics:
  - Contributor & reporters on oneM2M security tests specifications within oneM2M TC TST
  - Active member of oneM2M test tool group

- MBT for oneM2M
  - Difficulties to find correct abstraction level
  - Requires pre-configured TTCN-3 code
  - Adaptation not user friendly on existing test environment
oneM2M use case previously demonstrated in oneM2M second interop event (South Korea May 2016)
Publishing & Executing TTCN-3

- MBT tool offers publishing abstract test cases in many different formats such as XML, HTML, JUnit and others
- We created with the help of the MBT tool API a custom TTCN-3 Abstract Test Suite (ATS) publisher
- Automated TTCN-3 code generation implies a lower maintenance cost
TTCN-3 Test example

MBT Abstract Test

Published TTCN-3 Test
MBT breaking its barriers in oneM2M
Current status & Common Issues

• Complex oneM2M organization: Steering Committee, Technical Plenaries, 6 Working Groups,…
• Long and expensive manual work: test purposes production and TTCN-3 writing
• High maintainability cost
• Expensive quality control (manual traceability of tests against standard requirements)
• Overall huge resources investments
The MBT process

• MBT is an automated and cost efficient test generation process and provides high quality test suites

• Easy maintenance: modification ripple through the entire automated TTCN-3 code generation

• MBT enables the **TRACEABILITY** of requirement coverage: tests quality control achieved at low cost
Results
oneM2M Second interop Results (South Korea May 2016)

- 20 participating oneM2M standard implementers
- 12 sessions with 11 oneM2M implementations tested
- 22 MBT generated Test Cases provided
- Our experience at Seoul:
  - Showed the feasibility of the MBT process
  - We confirmed that the MBT approach provided a level of service better or identical to manual testers
### TTCN-3 test tool execution results overview

<table>
<thead>
<tr>
<th>Timestamp</th>
<th>Test Case</th>
<th>Verdict</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016-05-11 16:27:32.510000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_003_13f4d3</td>
<td>pass</td>
<td>f_createAccessControlPolicy: Resource type 1 created successfully</td>
</tr>
<tr>
<td>2016-05-11 16:27:33.547000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_004_33f2d4</td>
<td>pass</td>
<td>f_createAccessControlPolicy: Resource type 1 created successfully</td>
</tr>
<tr>
<td>2016-05-11 16:27:34.791000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_003_49fbd3</td>
<td>pass</td>
<td>f_createAccessControlPolicy: Resource type 1 created successfully</td>
</tr>
<tr>
<td>2016-05-11 16:27:35.508000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_002_53f0d3</td>
<td>pass</td>
<td>f_createAccessControlPolicy: Resource type 1 created successfully</td>
</tr>
<tr>
<td>2016-05-11 16:27:36.058000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_002_73f0d3</td>
<td>pass</td>
<td>f_createAccessControlPolicy: Resource type 1 created successfully</td>
</tr>
<tr>
<td>2016-05-11 16:27:35.846000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_002_38fcb3</td>
<td>pass</td>
<td>f_createAccessControlPolicy: Resource type 1 created successfully</td>
</tr>
<tr>
<td>2016-05-11 16:27:37.393000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_001_93f0d3</td>
<td>pass</td>
<td>f_createAccessControlPolicy: Resource type 1 created successfully</td>
</tr>
<tr>
<td>2016-05-11 16:27:37.564000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_001_11f3d3</td>
<td>pass</td>
<td>f_createAccessControlPolicy: Resource type 1 created successfully</td>
</tr>
<tr>
<td>2016-05-11 16:27:38.661000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_001_12f2d3</td>
<td>pass</td>
<td>f_createAccessControlPolicy: Resource type 1 created successfully</td>
</tr>
<tr>
<td>2016-05-11 16:27:39.610000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_001_17f593</td>
<td>pass</td>
<td>f_createAccessControlPolicy: Resource type 1 created successfully</td>
</tr>
<tr>
<td>2016-05-11 16:27:40.077000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_001_19f114</td>
<td>pass</td>
<td>f_createAccessControlPolicy: Resource type 1 created successfully</td>
</tr>
<tr>
<td>2016-05-11 16:27:41.070000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_001_20f3ed</td>
<td>pass</td>
<td>f_createAccessControlPolicy: Resource type 1 created successfully</td>
</tr>
<tr>
<td>2016-05-11 16:27:41.761000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_001_21f3db</td>
<td>pass</td>
<td>f_createAccessControlPolicy: Resource type 1 created successfully</td>
</tr>
<tr>
<td>2016-05-11 16:27:42.217000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_004_26f3cb</td>
<td>pass</td>
<td>f_createAccessControlPolicy: Resource type 1 created successfully</td>
</tr>
<tr>
<td>2016-05-11 16:27:42.570000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_004_28f3cd</td>
<td>pass</td>
<td>f_createAccessControlPolicy: Resource type 1 created successfully</td>
</tr>
<tr>
<td>2016-05-11 16:27:43.771000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_004_29f3cd</td>
<td>pass</td>
<td>f_createAccessControlPolicy: Resource type 1 created successfully</td>
</tr>
<tr>
<td>2016-05-11 16:27:44.064000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_004_13f3d3</td>
<td>?</td>
<td>f_createResource: Error while creating resource type 1</td>
</tr>
<tr>
<td>2016-05-11 16:27:44.547000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_004_15f4d3</td>
<td>?</td>
<td>f_createResource: Error while creating resource type 1</td>
</tr>
<tr>
<td>2016-05-11 16:27:45.640000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_004_16f3d3</td>
<td>?</td>
<td>f_createResource: Error while creating resource type 1</td>
</tr>
<tr>
<td>2016-05-11 16:27:48.543000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_003_22f3d3</td>
<td>?</td>
<td>f_createResource: Error while creating resource type 23</td>
</tr>
<tr>
<td>2016-05-11 16:27:49.594000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_003_24f1ed</td>
<td>?</td>
<td>f_createResource: Error while creating resource type 19</td>
</tr>
<tr>
<td>2016-05-11 16:27:49.620000</td>
<td>TC_ONEM2M_TP_oneM2M_CSE_DMR_CRE_BV_003_25f35d</td>
<td>?</td>
<td>f_createResource: Error while creating resource type 23</td>
</tr>
</tbody>
</table>
Conclusion
Conclusion

- MBT is suited for IoT Platforms testing
- Increased quality & traceability of generated tests
- High initial cost compared to manual testing
- Mid term return on Investment

© All rights reserved
Thank YOU

Questions and comments?

Contact: abbas.ahmad@eglobalmark.com