The application of TTCN-3 in M2M Testing

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Outlines

Introduction

- What is M2M?
  - Machine to Machine (M2M) - key part of the ‘Internet of Things’
  - Allows both wireless and wired systems to communicate with other devices of the same ability
  - Involves communication without (or only limited) human intervention
  - Enable the flow of data between machines and machines and ultimately machines and people
- Four basic operations for M2M
  - Collection of data
  - Transmission of selected data through a communication network
  - Assessment of the data
  - Response to the available information

Introduction

- M2M Applications
  - Security
    - Surveillance, alarms, people tracking
  - Transportation
    - Traffic monitoring, fleet management, toll payment
  - Health care
    - E-health
  - Manufacturing
    - Production chain monitoring and automation
  - Utilities
    - Measurement, provisioning and billing of utilities, such as oil and water
  - Facility control
    - Home, building, campus

Introduction

- TTCN-3 based M2M Testing Platform
  - Object: To develop a testing platform so that M2M device manufacturers can quickly and efficiently obtain regulatory and approval for their products
  - Initiator: ChinaMobile
  - Developer: BUPT
  - SUT: 5 companies

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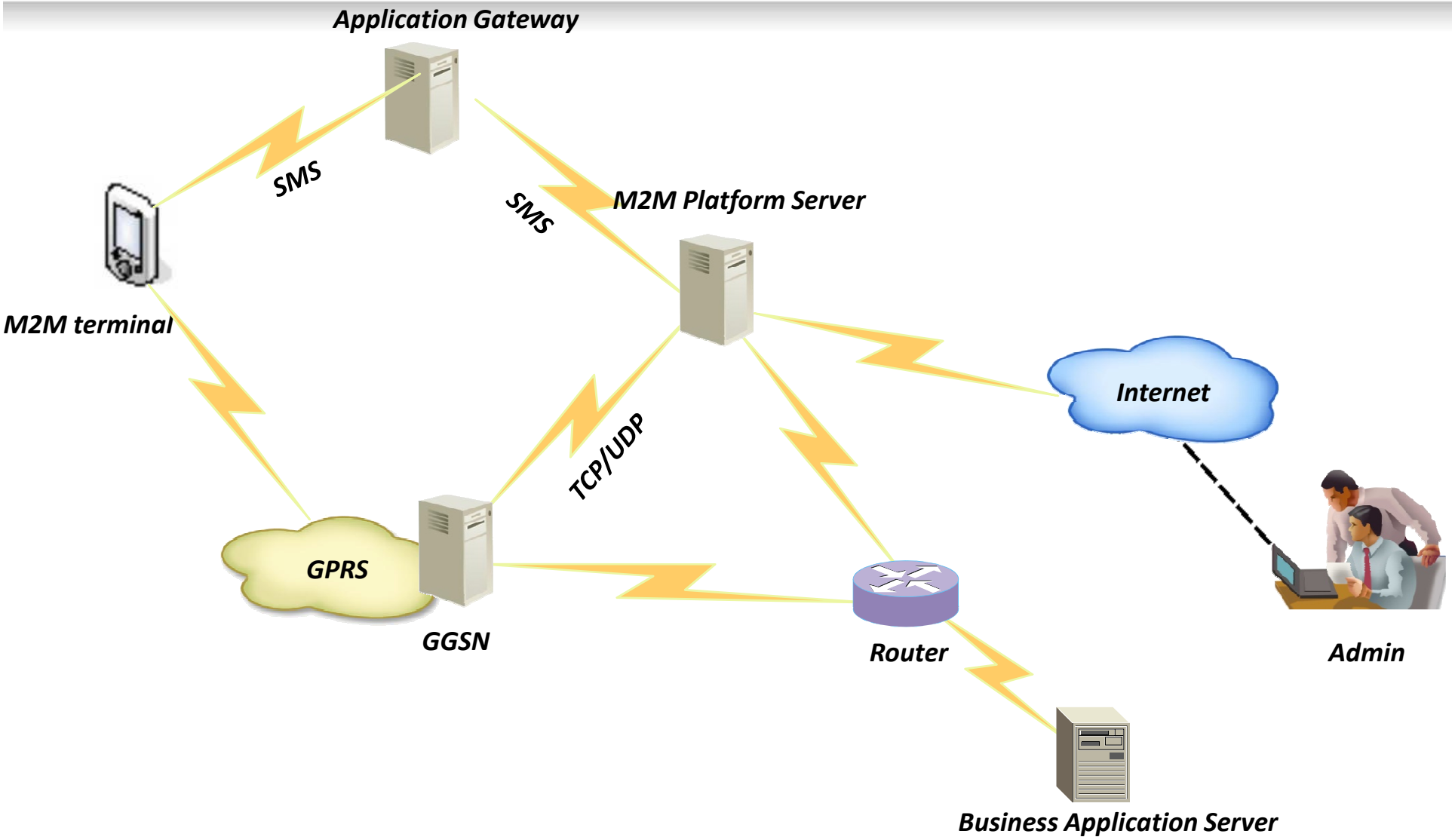
Outlines

M2M Network Architecture

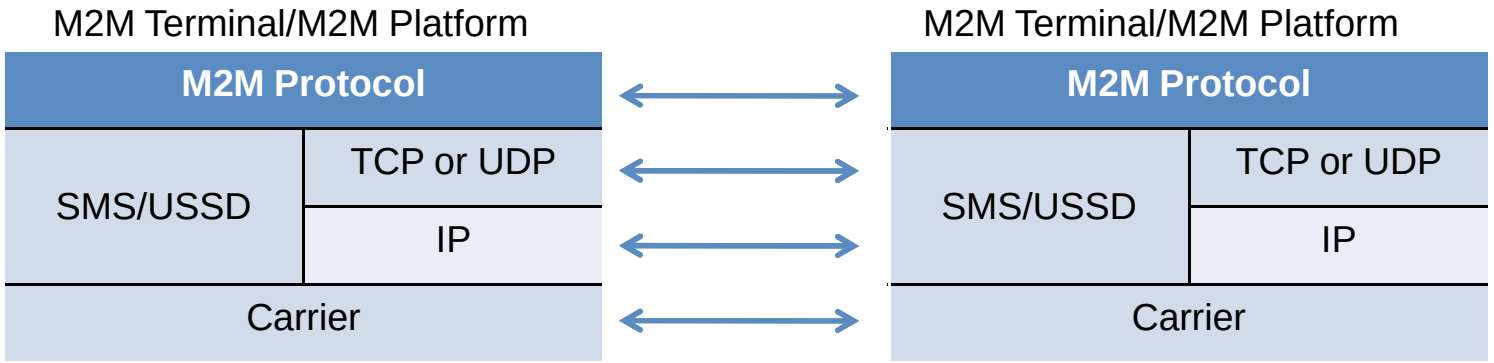


Key Elements

- M2M terminal
  - A device capable of replying to request for data contained within those devices or capable of transmitting data contained within those devices automatically
- M2M platform
  - Provides different access methods for terminals and uniform M2M terminal management and authentication functions
- Application gateway
  - Service authentication for SMS communication
- GGSN
  - Supports GPRS communication between M2M terminal and platform
- Admin
  - Configuration, Performance, Fault, Security Management

Communication Protocol Stack

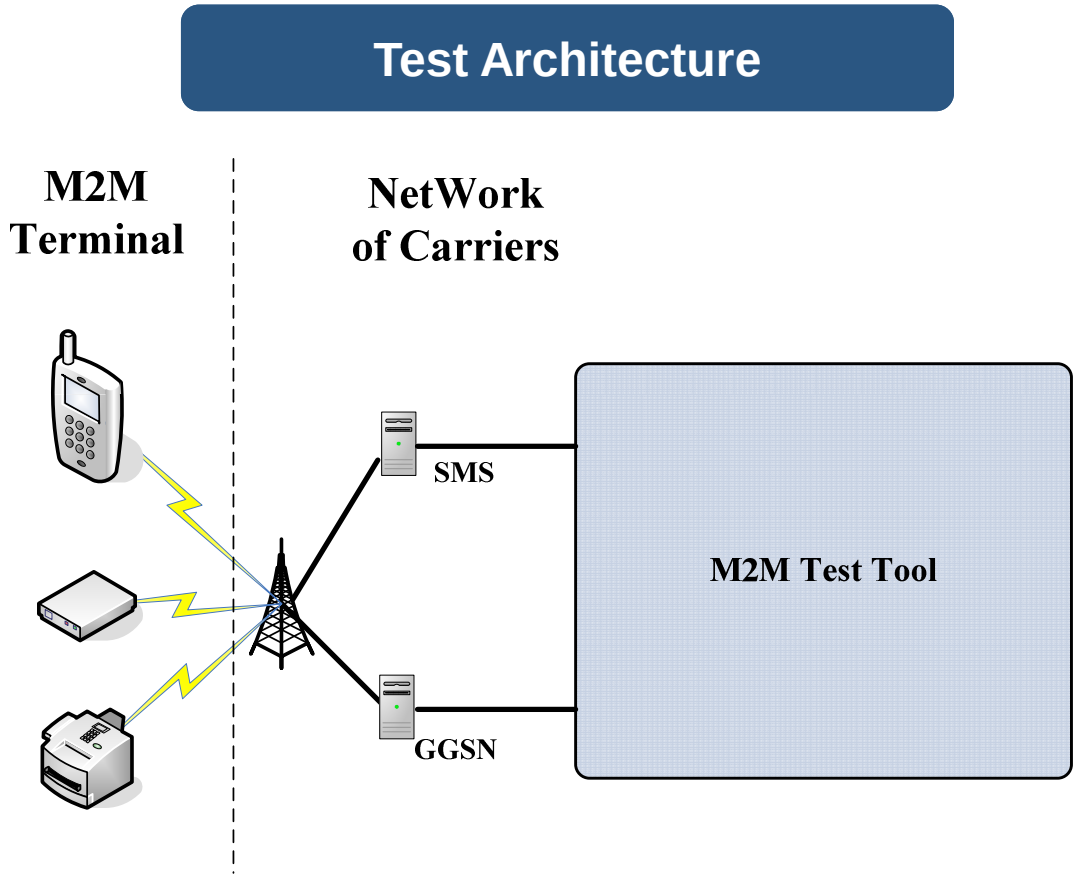
- Communication Protocol Stack between M2M terminal and M2M Platform



Outlines

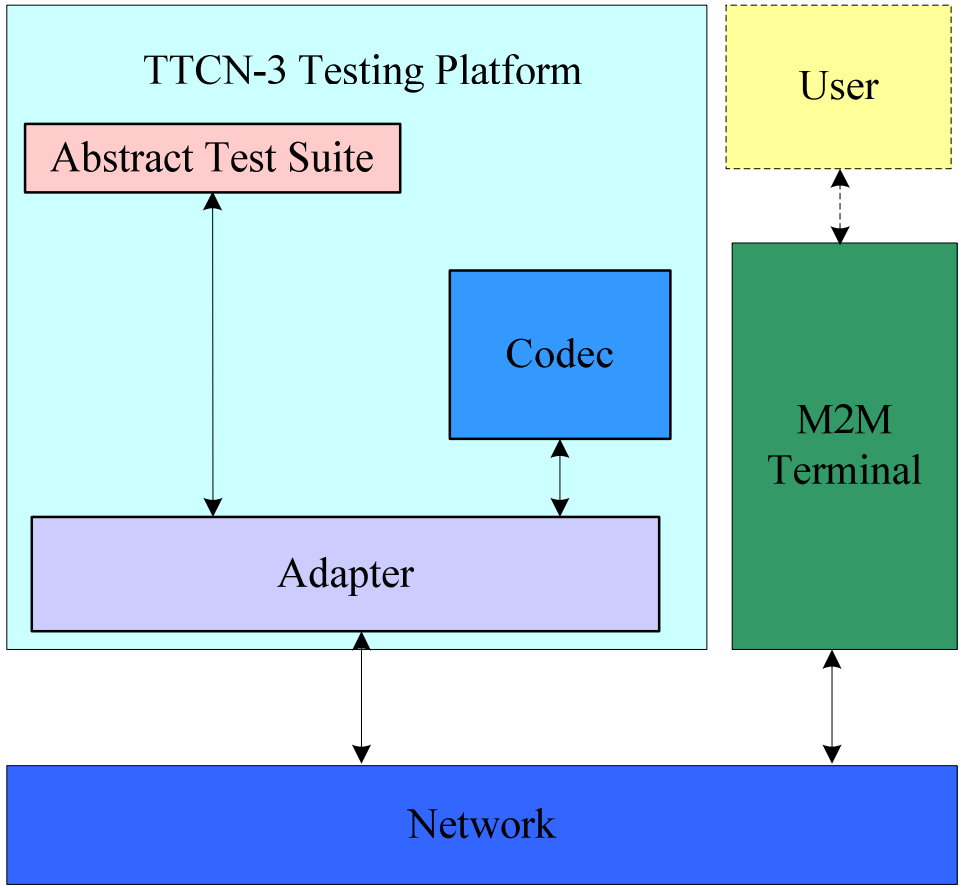
TTCN-3 based M2M Testing Platform

- Requirements
  - SUT: M2M Terminal
  - Conformance testing
  - Testing language: TTCN-3
- Reference Specification
  - <Protocol Interface Specification for M2M>
  - <The Test Specification of M2M Terminal>
- Development platform
  - IBM Tester



System Architecture

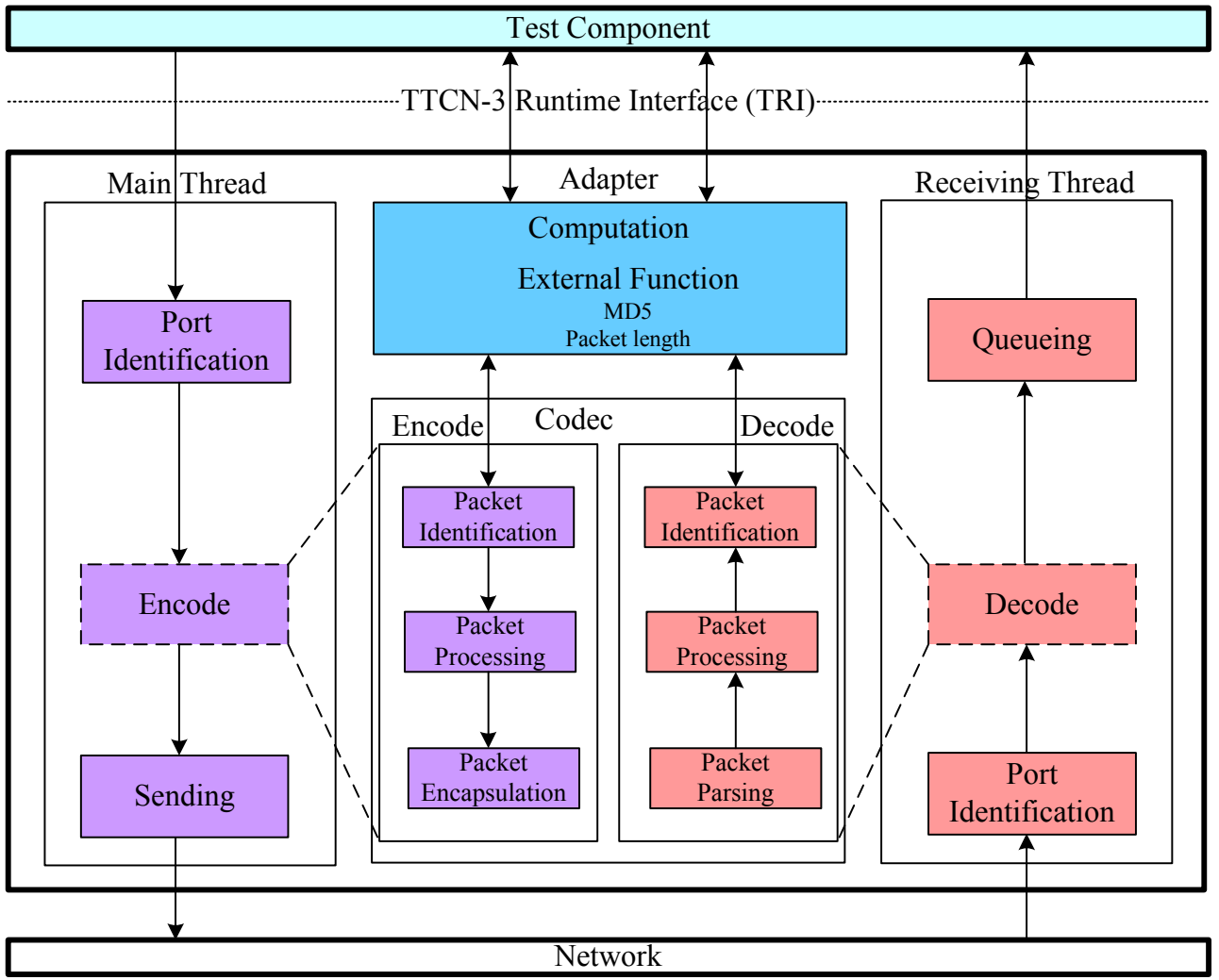
- Abstract Test Suite
  - Covers most functions of M2M
- Adapter
  - Supports TCP/UDP, SMS communication
- Codec
  - Data format: TLV
- CRC,MD5, 3DES supported



Abstract Test Suite Design

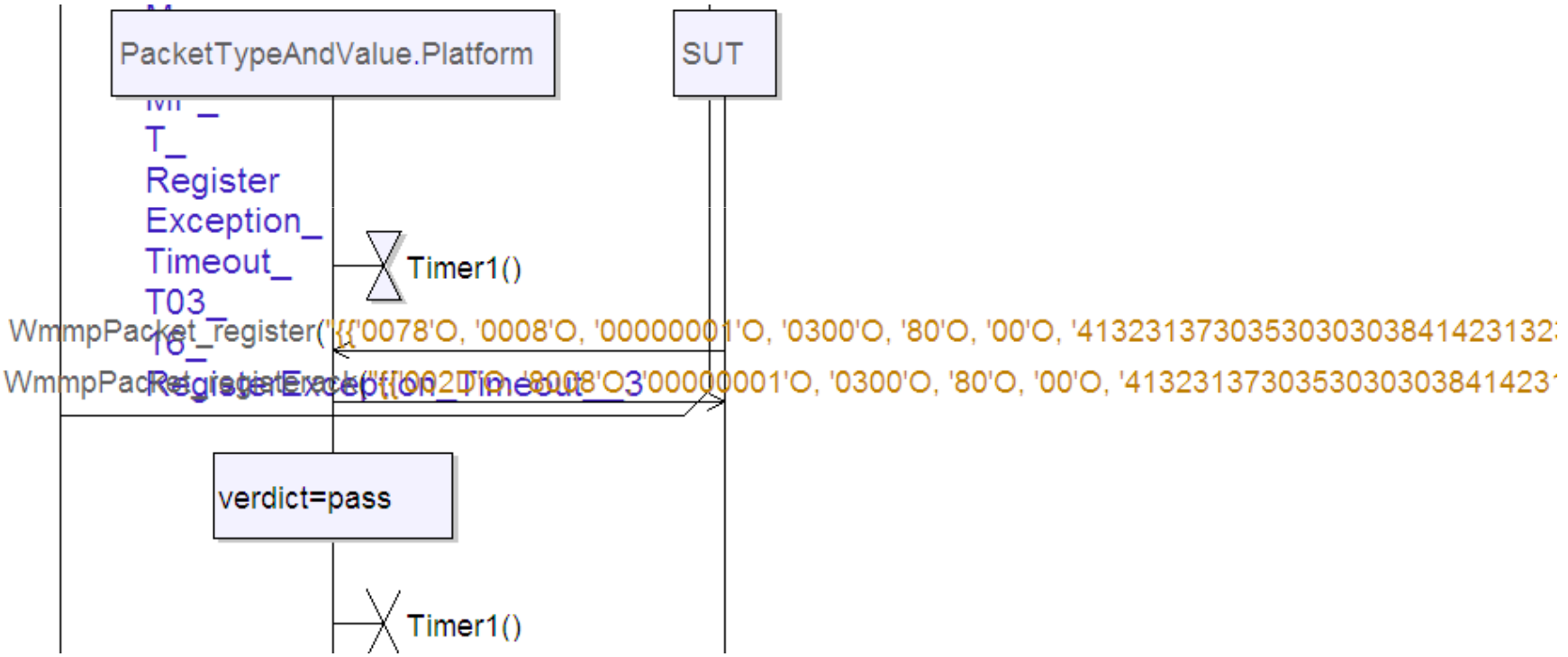
- Normal and abnormal cases
  - Different carriers (SMS, GPRS)
  - Authentication function
  - Sequence number management
  - Parameter setting
  - Terminal state monitor
  - Terminal to terminal data exchange
  - Terminal information report
  - Software download and terminal upgrade
  - Multi-package data transport
- So far 176 test cases developed

Adapter and Codec Architecture



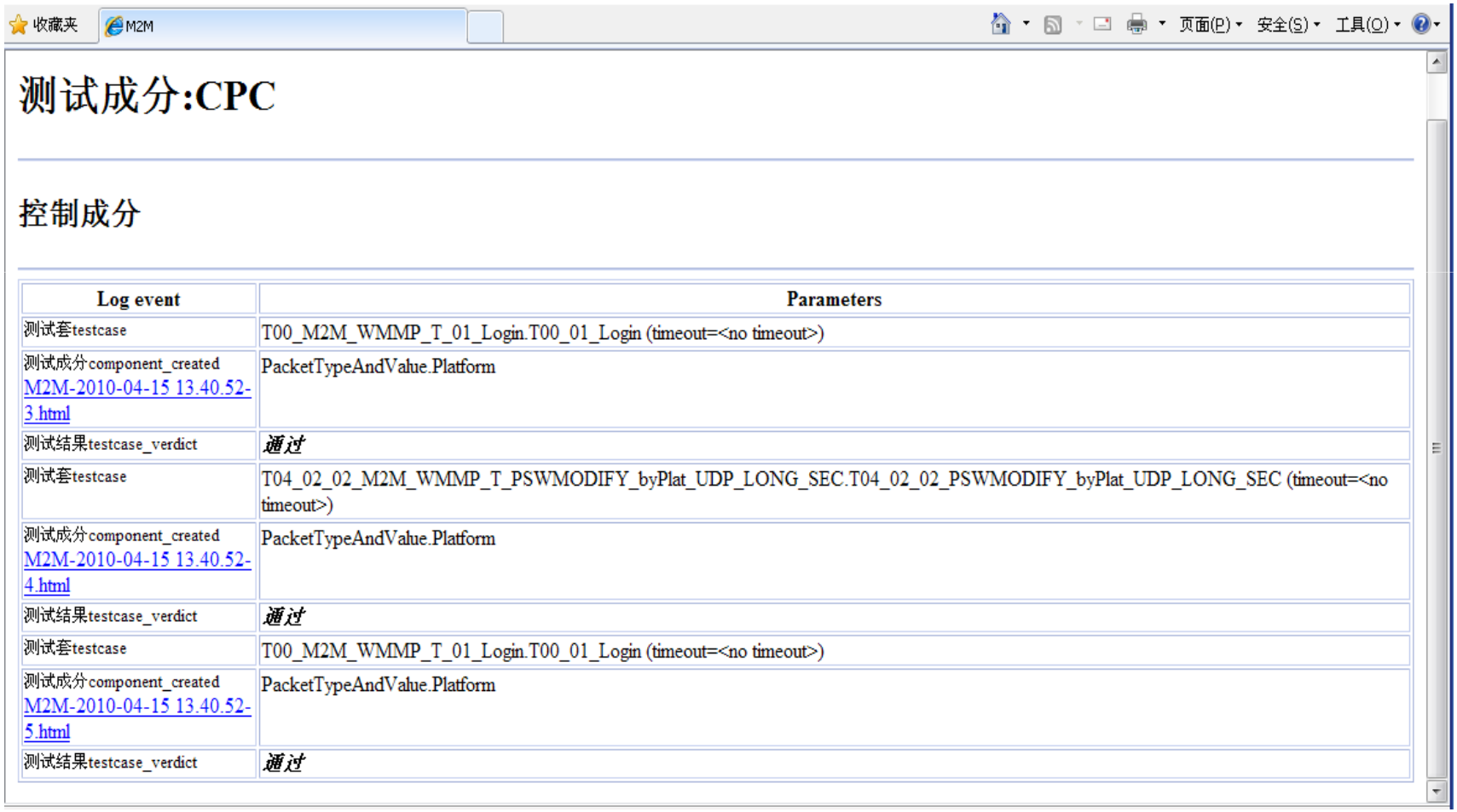
Testing Result Example 1

Testing Result in Tester



Testing Result Example 2

Testing Report



收藏夹 M2M 页面(P) 安全(S) 工具(O)

测试成分:CPC

控制成分

Log event	Parameters
测试套testcase	T00_M2M_WMMP_T_01_Login.T00_01_Login (timeout=<no timeout>)
测试成分component_created M2M-2010-04-15 13.40.52-3.html	PacketTypeAndValue.Platform
测试结果testcase_verdict	***通过***
测试套testcase	T04_02_02_M2M_WMMP_T_PSWMODIFY_byPlat_UDP_LONG_SEC.T04_02_02_PSWMODIFY_byPlat_UDP_LONG_SEC (timeout=<no timeout>)
测试成分component_created M2M-2010-04-15 13.40.52-4.html	PacketTypeAndValue.Platform
测试结果testcase_verdict	***通过***
测试套testcase	T00_M2M_WMMP_T_01_Login.T00_01_Login (timeout=<no timeout>)
测试成分component_created M2M-2010-04-15 13.40.52-5.html	PacketTypeAndValue.Platform
测试结果testcase_verdict	***通过***

Testing Result Example 2

测试成分:PacketTypeAndValue.Platform

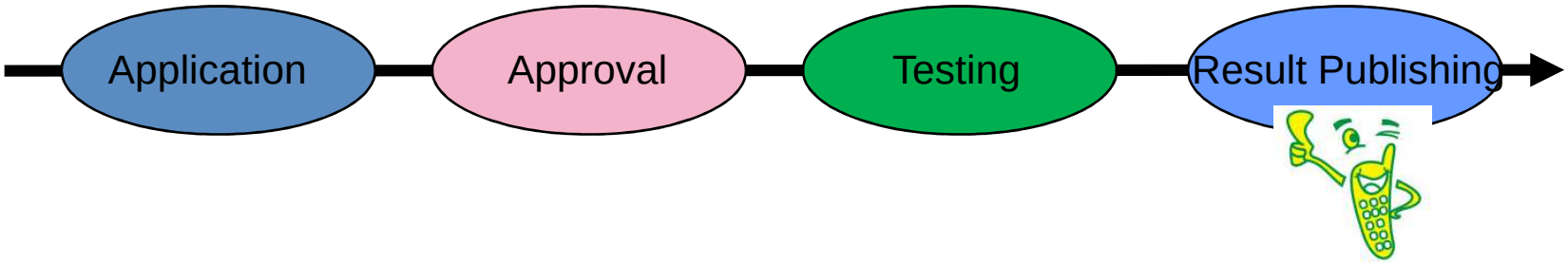
Detailed Info. in the Report

Log event	
进入测试区 scope_entered	"T04_02_02_PSWMODIFY_byPlat_UDP_LONG_SEC" 2
变量值发生变动 variable_modified	"tempLI" '0000'O
external_function_call	"ReadFromConfig" ReadFromConfig("timestamp") return
进入测试区 scope_entered	"ReadFromConfig" 1
message_encoded	"timestamp" '74696D657374616D70'H 0
message_decoded	'3442433641373336'H '3442433641373336'O 0
离开测试区scope_left	"ReadFromConfig" 1
变量值发生变动	"Timestamp"

变量值发生变动 variable_modified	"value_E021" '49B404EF8421CCE0078C3D4F71E55A04'O
message_encoded	{{'0030'O, '8002'O, '0000000F'O, '0300'O, '20'O, '00'O, '4148573130303031303841423132333 4'O}, { '003080020000000F03002000414857313030303130384142313233334E021001049B404EF8421CCE0 0
sut_message_sent	"platform_port_udp" '00010002'H {{'0030'O, '8002'O, '0000000F'O, '0300'O, '20'O, '00'O, '4148573130303031303841423132333 4'O}, { {{'0030'O, '8002'O, '0000000F'O, '0300'O, '20'O, '00'O, '4148573130303031303841423132333 4'O}, { '003080020000000F03002000414857313030303130384142313233334E021001049B404EF8421CCE0 17 '00020000'H '00020002'H <: address:'00010002'H status:enabled state:mapped :>
local_verdict_changed	pass pass
alt_left	
离开测试区scope_left	"T04_02_02_PSWMODIFY_byPlat_UDP_LONG_SEC" 2

Outlines

Testing Procedure and Results



- Testing site
  - ChinaMobile Research Institute
- Products have been tested
  - From 5 companies
- More than 80 test cases tested
  - Most of the SUT passed over 90% of the test
- 80 more to be tested
- Covers most of the normal and abnormal cases

Plugtests

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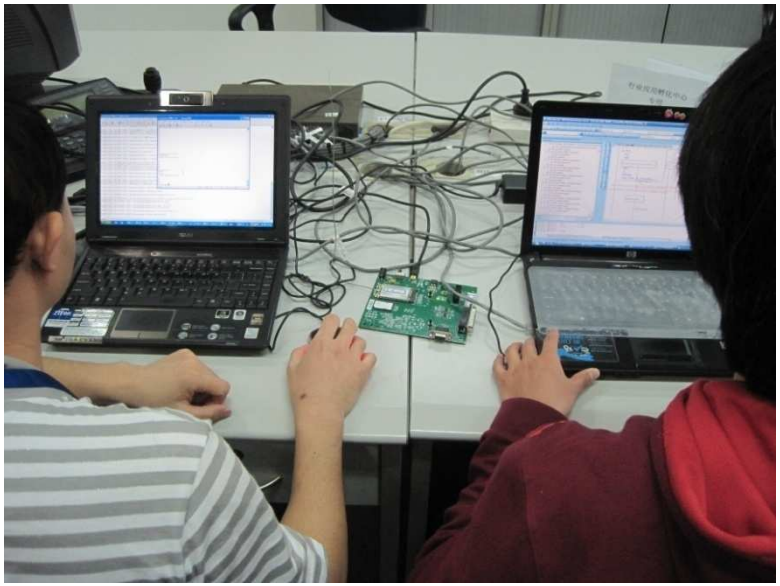

Outlines

Conclusion

- M2M technologies has become a key part of the ‘Internet of Things’.
- It is extreme important to deliver uniform testing platform, from which the M2M products can achieve a fast and automatic product testing.
- This work is a valuable experience for TTCN-3 users and the researchers of Internet of Things.
- Testing is able to help on the definition of M2M testing specification.
- More functions to be added, for example automatically testing.


Thanks!