Requirements and Challenges for 3G mobile terminal Test

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Agenda – A Heuristic Approach

🔹 WCDMA Tester Product Requirements
  - I: Lucent experience (Network Equipment)
  - II: Wiscom Tech experience (mobile terminal)
  - III-III: ITRI, III experience (Baseband, protocol)
  - V-VI: Customer experience (operators, manufacturers)

🔹 WCDMA Tester Product Challenges

🔹 Meet the Challenges
  - The fourth year SysAir venture experience
WCDMA Tester Product
Requirements

SysAir Inc.
Requirement I: Network Simulator is not Network Equipment!

We can not afford Over-Engineering the product

• 1996-2000: WCDMA BTS and RNC Product design
• 80 millions annual investment from Lucent, 16 millions from DoCoMo
Requirement II: Understand 3G mobile terminal Test Criteria

We can not afford test mobile initially

- 2000-2001 of Wiscom Tech: WCDMA BB HW and air interface protocol design
- 10 millions investment from AMD, and Wall Street, 30 staffs
- IPR acquired by INTEL
Requirement III: Network Simulator is much more than a UMTS/WCDMA simulation (Neither MATLAB or OPNET is a suitable product platform)

- MATLAB, OPNET are good simulation tools, but not suitable for product software realization
- UE PHY, MAC, RLC
- DEV API
- UE Thin RRC (34.108)
  - PCCH
  - BCCH-BCH
  - BCCH-FACH
  - Message decoding
  - DL-CCCH
  - UL-CCCH
  - DL-DCH
  - UL-DCH
  - Message CODEC

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Requirements IV: Understand Customer’s needs

Product 1: FTA Tester for chipset and protocol design company and handset manufacturer

Product 2: Manufacture Tester for handset manufacturers

Product 3: Network IOT Tester for operators and handset manufacturer

Product 4: Application IOT Tester for operators, handset manufacturer, and ASP
Requirement V: Circuit Switched Application Test
Requirement VI: Packet Switched Application Test

- Protocol elements necessary in the terminal
- Protocol elements necessary in the Tester
- Additional protocol elements necessary to interface with Packet Application Servers
WCDMA Tester Product Challenge for small company

SysAir Inc.
Challenge I:
1. TTCN tool expensive
2. Test mobile expensive
3. Test Tool integration requires more resource than small company can handle

Challenge II:
1. ASN.1 tool expensive
2. RRC CODEC extremely complex
3. Test SW Platform (MATLAB is too slow)
Challenge III:
1. Real Cellular network is very complex, what is the suitable model for network simulator
2. Network and Application IOT provision
Challenge IV:
1. How to build the HW?
2. FPGA Vs DSP
3. Digital I/Q, Analog I/Q, RF options
4. We can not afford to design ASIC
5. PC and embedded HW communication
6. Embedded HW and RF integration
Meet the challenge

SysAir Inc.
SysAir 2002-present

Project 2002: WCDMA BB HW design from ITRI

Project 2003: WCDMA air interface protocol design from III

Project 2004: WCDMA Handset Conformance Tester platform from III

Project 2005: WCDMA Handset Network Interoperability Tester for operators
SysAir HW Design

- UE WCDMA Baseband
- LVDS Analog I/Q FPGA
- DSP Board
- HostPort Ethernet FPGA
- PC Platform
- UE Test Simulator SW
- HostPort Ethernet FPGA
- PC Platform
- NB Test Simulator SW
- NB WCDMA Baseband
- LVDS Analog I/Q FPGA
SysAir Lower Tester SW Platform Architecture

Mobile Manufacturing Test

Mobile Protocol Test

Mobile Application Test

Base Station Simulator

RNC Simulator

Network Optimization Tools

NAS Message

SIB and RRC Message

UE L1C (34.108 test scenarios)

LT ASN API: CPHY, CMAC, CRLC

DEV C API

UE PHY, MAC, RLC

Affordable Third party Test Automation and TTCN Tool

SysAir Test SW

DEV C API

NB L1C (34.108 test scenarios)

LT ASN API: CPHY, CMAC, CRLC

SIB and RRC Message

NB PHY, MAC, RLC

SysAir Platform SW

Affordable Third party ASN Tool

SysAir Test SW