AGILENT TECHNOLOGIES

WIRELESS TRENDS: COMMON GROUND AND CONFLICT

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Smartphone shipments grew ~40% in 2010, will double by 2014

Source: Infonetics, October 2010

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THE TALE OF THREE CALLERS

Frequent User

Essential User

Power User
THE COMMON GROUND

• Immediate Access to Network (Data or Social) Anytime, Anywhere
• Affordable Content Rich (Data Intensive) Services
• Ever-Improving Quality of Service (QoS) & Security
• Smarter Smartphones: Seamless Integration of Voice, Data, Video and Location Services
• Ubiquitous Interoperability and Roaming
• Continuously Improving Ease-of-Use
CAN YOU IMAGINE...
THE COMPLEXITY AND CONFLICT

Standards
- GSM/EDGE Evo
- W-CDMA
- C2K
- TD-SCDMA
- WiMAX™
- LTE FDD
- LTE TDD
- LTE Advanced
- 802.11a/b/g/n/ac/ad ...

Device Infrastructure
- Device Co-Existence Testing
- InterRAT Validation
- Multi-Vendor Inter-Operability
- Larger Display
- Lighter
- Longer Battery Life

Enabling Technologies
- OFDMA / SC-FDMA
- MIMO
- MIMO OTA Testing
- Wider BW 20 → 100 MHz
- Carrier Aggregation
- Femtocells or Equivalent
- MSR (Multi-Standard Radio)
- SDR (Software-Defined Radio)

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A User's Dream, The Engineer's Challenge

Job Security Nightmare
THE BALANCING ACT

Quality, Cost, Manufacturability, Power Management

Supplier Agnostic 2G/3G/4G iRAT Alternate Topologies

Complexity, Coexistence

Functionality and Capability
Data Users and Transceiver Counts [Radios/UE] Continue to Grow Geometrically

Driving Greater Signal Density in the Available Spectrum

Which In-Turn Drives More and More “Creative” Engineering Solutions
San Francisco to deploy the nation’s first public safety 700 MHz LTE interoperable broadband network
Increasing deployment of 2G/3G/4G technologies within military equipment, air, sea and ground forces (An Ongoing Challenge)

- Security/Encryption
- Link Robustness: Spread Spectrum, Frequency Agility, Jam Resistance, Fallback Modes
- Mobile Infrastructure
The Complexity: MIMO OTA
Spatial and Antenna Characteristics of the MIMO Channel

Tx0 Gain Pattern
Tx1 Gain Pattern
AoD Spatial Distribution

AoA Spatial Distribution
Rx0 Gain Pattern
Rx1 Gain Pattern

BS
Tx0
Tx1
LOS
Rx0
Rx1
MS/UE
Apply fading to a call while generating standards based custom interferers

1. 8960 generates unfaded signals and sends to PXB

2. PXB applies real-time fading and sends back to 8960; PXB generates custom interferer and sends to MXG

3. The faded signals and faded interferer are summed at RF and sent to the UE
The Conflict

Source: Deere & Co., LightSquared interference to GPS and Starfire

- High precision receivers are more affected than consumer grade receivers.
- Modern high precision receivers use filters that cover MSS, GPS, and GLONASS bands.
- Wideband filters are required for higher rate, precision codes.
SUMMARY

• Needs of our Users are More Similar than Different
• Good Fences Make Good Neighbors
  • Clear Standards
  • Judicious Regulation
  • Creative Engineering
• Manage the Ever-Increasing Growth in Complexity
  • Multi-format, Multi-Band Devices & Systems
• Engineers Make this Happen
• Early Engagement
  • High Quality Tools
  • Full Design Life-Cycle
  • Flexible
  • Creative
  • Timely
  • Easy-to-Use, Robust & Economically Viable Solutions
Agilent Wireless Test Portfolio

- **Signal Analyzers**
  - 89600B VSA SW
  - For Signal Analyzers, Scopes, LA, SystemVue and ADS
- **Scopes and Logic Analyzers**
- **RF Module Development**
  - **RF Proto**
  - **RF Chip/module**
  - **BTS and Mobile BB Chipset Development**
    - L1/PHY
    - FPGA and ASIC
  - **Protocol Development**
    - L2/L3
- **RF and BB Design Integration**
  - L1/PHY
  - DigRF v4
  - BTS or Mobile
- **System Design Validation**
  - System Level RF Testing
- **Pre-Conformance**
- **Conformance**
- **Manufacturing**
- **Network Deployment**

- **Design Simulation**
- **Battery Drain Test**
- **E6621A PXT Communications Test Set**
- **N6070A LTE signaling conformance test solutions**
- **N5971A IFT Software**
- **Systems for RF and Protocol Conformance**

- **EXT Wireless Communications Test Set for manufacturing**
- **Cable antenna tester & Spectrum analyzer**
- **GILENT WIRELESS TEST PORTFOLIO**

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• 140-MHz bandwidth option expanded to 160 MHz
• Investment protection for the installed base; license-key upgrade from 140- to 160-MHz BW
• Architected to support wider bandwidth in the future
• Solve new test challenges introduced by complex wireless standards

• Protocol-layer complement to the industry-leading 89600 VSA software

• Extends the existing LTE analysis provided by the 89600 VSA software
  – 89600 VSA software for RF test
  – 89600 WLA software for wireless link analysis
Agilent Technologies

Wireless Trends: Common Ground and Conflict

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