Competitive pressure in the emerging 4G market is placing tough demands on reducing the time-to-market of related products. Consequently, managers are facing the challenge to reduce the time required for product test & verification. As a result, test and measurement tools are needed that help engineers avoid long searches when problems occur by providing an end-to-end view over all critical parts of the LTE / EPC network.

With the introduction of the K2Air probe for the LTE air-interface and the ability of the industry-leading Network & Service Analyzer (NSA) to cover all key interfaces in 4G networks, Tektronix Communications is providing test engineers with exactly the tools needed to achieve today’s demanding goals in 4G testing.

**K2Air/NSA for eUTRAN (Uu, LTE) and EPC**

Tektronix K2Air enables comprehensive Uu Interface Monitoring by providing detailed analysis of Physical and MAC Layers, including required HARQ and Resource Management for both Uplink and Downlink directions. A unique benefit of the K2A is that the decoding and analysis is performed in real-time for multiple UEs.

**Gain full insight into LTE and EPC networks with one all-encompassing solution**

- Fully integrated monitoring of air and wireline interfaces for LTE radio access and EPC core network performance analysis
- Five correlated solutions within the same environment for top-down and bottom-up analysis of the Uu interface
- Rapid root cause analysis with control-plane and user-plane KPIs correlated across multiple interfaces
- Real-time decoding of Uu traffic for instant feedback on function and performance of the air-interface in the Downlink and Uplink
K2Air connects to the eNB CPRI Interface through the Network Service Analyzer (NSA) which allows full access to the Air Interface Control Plane and User Plane information. While the Baseband, HARQ and Scheduling processing is done on K2Air, MAC, RLC, Layer3 and User Data analysis is provided by NSA.

The NSA tool chain guides the user to Air Interface, Baseband and Protocol problems by offering specific problem oriented applications, such as IQ-Vector & Spectrum Analyzer, Resource Assignment Diagram, Call Trace, and Frame Analysis, and at the same time enables Functional & Load Verification in LTE environments.

The network roll-out will be optimised by reducing Troubleshooting and 1st Level Characterization time down to a minimum. The complete Uu-Functionality can be used together with the comprehensive wireline analysis capabilities of NSA to provide a unique fully correlated view into the Evolved Packet System.

GTCE/NSA for eUTRAN (Uu, LTE)

Vendor eNodeBs provide trace ports containing copies of specific protocol layers of the Uu interface which can be used for further protocol analysis. The objective of the new “trace port” product is to take aggregated traffic from one or more trace ports and to provide Uu protocol analysis, including call trace and call table filling, and allowing drill-down via the frame monitor. The trace port allows analysis of

- RRC (and NAS) layer transactions
- Selected data from the RLC/MAC layer

Additionally, trace port traffic may also include S1 and X2 related transactions, which are also covered by the trace port product. The trace port acts as an alternative probe from the perspective of the NSA software. Therefore, the eNodeB trace port connects directly to the port of the NSA server’s NIC. Typically, the traffic from multiple eNodeBs will be concentrated via a single RAA (Radio Access Aggregator). The software that is installed together with the trace port package enables the traffic received from the eNodeBs via the NIC port to be analyzed by the NSA software.
Performance Analysis & Benchmarking

The NSA monitoring system combines world class Troubleshooting with sophisticated User Plane & Performance Analysis and Benchmarking capabilities. This helps Mobile Network Operators as well as Network Equipment Manufacturers to analyze LTE-Signaling together with User Plane Data, for instance for VoLTE or Data Traffic like HTTP.

NSA provides dedicated QoS/QoE analysis to calculate KPIs like Throughput, Processing Time (Delay), Jitter and PacketLoss to identify performance bottlenecks of each single network element along the way.

Additionally, Handset and Network Element Analysis is performed to benchmark different vendors and/or software loads against each other from a vendor independent neutral perspective.
Deployment Setup and Scenarios

K2Air/NSA Deployment Setup for advanced eUTRAN and Core Analysis incl. Uu-Interface

gTCE/NSA Deployment Setup for eUTRAN Analysis

NSA Deployment Setup for advanced eUTRAN and Core Analysis
K2Air Key Features

- Real-time processing of PHY, MAC, RLC as well as relevant and necessary parts of RRC protocol layers
- Real-time Analysis of PHY- and MAC-specific Channels, Parameter and Procedures including HARQ and Resource Assignment
- RACH preamble format 0
- Bandwidth Support for 5, 10 MHz
- Support for FDD Mode
- Support up to 20 UEs per K2AIR depending upon traffic conditions
- Support of 1 eNodeB Cell per K2AIR

LTE Uu Analysis and KPI's

- PHY/MAC Layer Support
  - Message Decode
  - TPC command statistics
  - PHY/MAC Benchmarking
  - Decoding Analysis
  - Retransmission Analysis
  - HARQ Analysis
  - Throughput Analysis
  - DCI Analysis
  - CQI Analysis
  - Timing Advance Analysis
  - Physical & Traffic Channel Decode

- RLC Protocol Support
  - Message Decode
  - Retransmission Analysis
  - Throughput Analysis

- RRC Protocol Support
  - Connection setup analysis
  - Connection re-configuration analysis
  - Connection release analysis
  - Connection re-establishment analysis
  - Measurement reports:
    - Event counter
    - RSRP/RSRQ
    - IRAT information

K2A Interfaces

- 2 x CPRI V4.0 supporting SFP modules for optical interfaces
- 1 x 1Gbit Ethernet Interface (connection to NSA and remote access)
- MMC Card Slot

Physical characteristics

- 19" 2HE rackmountable or available as desktop
- Net Weight: 5 kg (lbs. 11.02)

Power supply

- AC Input: 200W 100-240VAC 50/60Hz
- Fuse Data: 4A 2A

Regulatory and Certifications

- Safety: EN61010-1: 2001
- EMC: EN61326-1 Class A or B
- ROHS Compliant
- VCCI

Environmental characteristics

- Temperature: +5 °C to +20 °C.
- Altitude Operating: 6,561 ft. (2,000 m).
eUTRAN Analysis based on eNB Traceports (gTCE based Analysis)

gTCE is the Tektronix Communications implementation of the Trace Collection Entity (TCE) defined by 3GPP. TCE describes a probeless way of Network Monitoring currently focused on eNodeB Traceports which provide Uu-Signaling data, and may include also S1- & X2-Signaling data.

gTCE based eUTRAN analysis is possible without the use of highly specialized air-interface traffic capturing probes for a subset of Uu interface related information.

This enables:

• Live Network Analysis&Troubleshooting scenarios on a large scale
• Optimization of traffic from a large number of eNodeBs respectively Cells (Uu interface) at an attractive pricing level.

gTCE can be combined with K2Air for Advanced Uu Analysis, Troubleshooting and Root Cause Analysis.

Analysis Tools

• Frame Monitor with correlated protocol decoding of all at gTCE available protocols
• Call Table and Call Trace for all at gTCE available Interfaces

Protocol Support

• eNodeB traceports are always vendor-specific. Current support
  - NSN RL20
  - NSN RL30
  - NSN RL15

• 3GPP Support
  - RRC- Rel.8 April 2010, Rel.9 Dec 2010
  - RLC- Rel.8 June 2010, Rel.9 Dec 2010
  - MAC- Rel.8 June 2010, Rel.9 Dec 2010
  - S1AP- Rel.8 Dec. 2009, Rel.9 Dec 2010
  - X2AP- Rel.8 March 2010, Rel.9 Dec 2010
  - Trace Concept&Requirements - Rel.8 April 2010, Rel.9 Dec 2010
  - Trace Control&Configuration&Management- Rel.8 Oct. 2009, Rel.9 Dec 2010
  - Trace Date Definition&Management - Rel.8 Oct. 2009, Rel.9 Dec 2010

Key Feature Overview

• Protocol Decode
• Single Interface Call Trace incl. Flow Diagram
• Multi-Interface Call trace incl. Flow Diagram
• Interworking Support for 2.5G, 3G and CDMA2000 networks
• IRAT (3G ↔ 4G)
• CSFB (2G/3G ↔ 4G)
• Auto Configuration Support
• Detailed User Plane Analysis including Delay and PacketLoss
• Customizable Control-plane and User-Plane KPIs
• Analysis of message statistics
• Analysis of cause value statistics
• Drill-down from Call Table via Flow Diagram to individual message parameter value
• Drill-up from parameter value to all related calls
• Supported interfaces: X2, S1, S3, S4, S5/S8, S6a, S10, S11, S12, S101, S103, SGi, SGs, Gx, Gxc, Rx and Z1

LTE/EPC KPIs (Sample)

• Authentication success ratio
• Attached success ratio
• Attached Time/Delay
• Activate default EPS bearer success ratio
• Activate dedicated EPS bearer success ratio
• De-activate EPS bearer success ratio
• Detached success ratio
• Security success rate
• Tracking area update success ratio
• Modify EPS bearer context success ratio
• Initial context setup success ratio
• Initial context setup time
• UE context release
• S1 setup success ratio
• Call drop ratio
• X2 setup success ratio
• Handover preparation success ratio
• Handover preparation time
• X2 reset
• X2 Setup
• X2 enode B update
• Throughput
• Delay/Latency hop by hop
• PacketLoss hop by hop

A full List of KPIs is available on request.
About Tektronix Communications:

Tektronix Communications provides network operators and equipment manufacturers around the world an unparalleled suite of network diagnostics and management solutions for fixed, mobile, IP and converged multi-service networks. This comprehensive set of solutions support a range of architectures and applications such as LTE, fixed mobile convergence, IMS, broadband wireless access, WiMAX, VoIP and triple play, including IPTV. Tektronix Communications is headquartered in Plano, Texas.

Learn more about the company’s test, measurement and network monitoring solutions by visiting www.tekcomms.com.

For Further Information:

Tektronix Communications maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology.

Please visit www.tekcomms.com

Contact Tektronix Communications:

Please visit www.tekcomms.com

Phone:
1-800-833-9200 option 1
+1-469-330-4000

About this Document:

The information contained in this document is subject to change without notice and does not carry any contractual obligation for Tektronix Communications. Tektronix Communications reserves the right to make changes to any products or services described in this document at any time without notice. Tektronix Communications shall not be held responsible for the direct or indirect consequences of the use of the information contained in this document.