

## Easing the Shift to LTE with Advanced Testing

By Rafael Andrade

The technical challenges to shifting from 3G to LTE are stiff. However, the shift is inevitable – traffic volume is rapidly increasing, and exacting users will migrate to other providers if speed and Quality of Service (QoS) standards aren't met. How do carriers meet the challenges of monitoring and troubleshooting LTE services while minimizing capital expenditures and operating costs? How do they retain customer loyalty and strengthen their brand for the long term?

The answer is the adoption of efficient LTE test solutions that enable both effective trials and the ability to maintain high QoS over the long term.

LTE is quickly gaining ground. Although the actual number of current LTE subscribers is low, this number will change drastically very soon. In Europe and the U.S., 17 commercial LTE networks are online and 73 more will be operating by the start of 2013<sup>1</sup>. Additionally, 140 carriers are committed to LTE deployment and 56 have pilots underway. The competitive pressures driving the upgrade are much greater than when 3G technology was deployed and



the increasing demand for bandwidth is continuing unabated.

LTE offers significant performance gains thanks to major changes to the existing radio-access and core networks relative to previous-generation CDMA and 3GPP deployments. These changes include the replacement of base station by the new eNodeB and the replacement of the core network by a new evolved packet core (EPC). The downlink uses orthogonal frequency division multiplexing (OFDM) radio access while the uplink uses signal-carrier frequency-division multiple access (SCFDMA). Both the uplink and the downlink use multiple-input multiple-output (MIMO) antenna technology.

Not for distribution or reproduction.

## New Multimedia Research Center



**Search OSS/BSS topics across various media types**  
Company Brochures, Analyst Reports, Whitepapers, Videos and more

[Click here](#)

**Pipeline Research Center - Start Your Search Today!**

Other important LTE capabilities include:

- peak downlink data rates up to 326 Mbps with 20 MHz bandwidth
- peak uplink data rates up to 86.4 Mbps with 20 MHz bandwidth
- time-division duplex (TDD) and frequency-division duplex (FDD) operation modes
- scalable bandwidth covering 1.4, 3, 5, 10, 15 and 20 MHz
- increased spectral efficiency of between two and four to one relative to HSPA
- no more than 10 milliseconds round-trip latency between user equipment and the base station

Service providers are striving to be first-to-market, but several factors make time-compressed LTE deployments complex. First adopters tend to have exacting QoS demands, requiring more troubleshooting and issue management. There are more test points requiring monitoring and huge volumes of data that need to be correlated across the network. For more interfaces must be tapped, and the signaling that goes with service delivery is much more complex.

#### **Importance of successful trials**

The logistics of successfully planning and executing LTE trials and then getting to first deployment are complex. The trial team must:

- set the framework
- communicate with all network equipment manufacturers (NEMs)
- police the NEMs during the trial
- run test cases in a uniform way
- capture and evaluate huge volumes of data
- adapt when something goes wrong

Successfully managing these trials will let service providers move out of initial deployments in time to beat competitors to market.

**140 carriers are committed to LTE deployment and 56 have pilots underway.**

To provide measurements during LTE trials, fully integrated test platforms that provide on-the-fly measurements from the radio access network to the network core are needed. These platforms let trial teams replicate services in as many different scenarios and environments as are practical for all relevant standards and on different frequency bands. Testing can verify all functions critical to future LTE services, including data capacity and throughput, network coverage, end-to-end network latency, seamless handover with legacy networks, interoperability of multi-vendor devices, and QoS. The latest testing tools support the rapid execution and analysis of LTE field trial tests with flexible key performance indicators (KPIs), correlation of user plane and control plane data, interactive measurements with preferred UE devices, and the latest permutations of LTE standards. The tools work for all vendors' equipment and enable "apple to apple" comparisons. The result is that operators can make LTE equipment purchasing decisions based on objective criteria.

#### **Working through QoS issues**

QoS issues are more problematic with LTE than with 3G because of the complexity of LTE technology and the inherent challenges of introducing new services. Service providers must ensure that they can identify and troubleshoot any user, service, or network problem in a very short period of time in order to deliver the highest possible standard of customer care. Potential QoS issues for LTE networks include massive increases in data usage, new radio access network infrastructure, and complexity of the network core. KPIs that provide real-time information on LTE performance and an end-to-end view that enables fast root-cause diagnosis are important factors that help resolve problems before they affect customers. To this end, network monitoring is a vital tool.

For example, a leading provider of telecommunications solutions in Europe is using JDSU's services to provide end-to-end, real-time monitoring and troubleshooting of its LTE network, ensuring QoS while managing growing volumes of high-bandwidth traffic and increased network complexity.

A new generation of service-assurance solutions lets mobile operators track an extensive set of KPIs that include network performance and data service quality. These solutions also help operators manage network infrastructure and deliver an outstanding customer experience with easily configured KPIs and thresholds that pinpoint critical service and network problems— complex network-wide service information is automatically interpreted and correlated. Clear, simple presentations of this information along with guided analyses can help installation and maintenance teams resolve problems efficiently.

To maximize the efficiency of network assurance and minimize operating expenses, operators need to focus on the right KPIs and the essential data. Carriers should look to monitor just the service-focused KPIs that are important to their business rather than hundreds of available KPIs that will overwhelm operations teams. They should be attentive to KPIs, such as network functionality and data service quality, to evaluate how to resolve service-affecting issues. Composite KPIs can reduce the number of KPIs without losing detail. Operators will most likely need to capture all of the control plane data but can be more flexible about the user plane. An intuitive interface makes it easy to understand signaling messages and clearly highlights failures.

Going a step further, next-generation assurance tools can analyze subscribers' networks and service interactions, correlating these transactions into a single context and tracing them from real time to several weeks in the past. As an example, many different individual transactions must be completed across the entire network to successfully set up a call. Effective troubleshooting demands that this series of inter-related transactions be presented in a single end-to-end view of the complete LTE network. With this comprehensive view, an operations team can diagnose complex issues quickly and reliably. And, this approach moves a large volume of troubleshooting from a niche area occupied

## QoS issues are more problematic with LTE than with 3G because of the complexity

by handful of specialists into one in which less-experienced technicians are able to effectively diagnose problems.

Monitoring and troubleshooting mobile data services is substantially more complex with shifts from 3G to LTE. Carriers will need to plan and execute LTE trials and solve a number of problems that will inevitably occur during deployment. New equipment requires evaluation; new services need verification; and problem-resolution times need to be shortened. Fortunately, advanced test solutions help minimize these challenges and help operators substantially speed and improve LTE deployments.

### Sample Key Performance Indicators (KPI) for LTE networks:

- Transition time idle -> active state
- Single user throughput
- Cell throughput
- Throughput variations during handover
- Cell edge performance
- Handover success rate
- Handover interruption time
- Latency
- Voice quality
- Video quality

<sup>1</sup>Global Mobile Suppliers Association (GSA)