

The LTE Supplement



Sponsored by

ZTE中兴

Welcome letter

EDITORIAL

Editorial Director

Mike Hibberd

Deputy Editor

James Middleton

Editorial enquiries:

Mobile Communications International Editorial
Mortimer House, 37-41 Mortimer Street,
London W1T 3JH, UK
Tel: +44 20 7017 5495
Email: mike.hibberd@informa.com

WORLDWIDE MEDIA SOLUTIONS

Account Managers

Michael Butcher

Email: michael.butcher@informa.com

Suki Bains

Email: suki.bains@informa.com

All advertising enquiries to:

MCI Media Solutions,
37-41 Mortimer Street London W1T 3JH, UK
Tel: +44 20 7017 5218
Fax: +44 20 7017 5647
Email: tim.banham@informa.com

PRODUCTION

Design & Production Manager

Joanne Lowe

Email: joanne.lowe@informa.com

HEAD OF MARKETING

Sophie Burdajewicz

Email: sophie.burdajewicz@informa.com

PUBLISHER

Tim Banham

Email: tim.banham@informa.com

© 2010 Mobile Communications International

While every care has been taken to ensure that the data in this publication are accurate, the publisher cannot accept and hereby disclaims any liability to any party to loss or damage caused by errors or omissions resulting from negligence, accident or any other cause. All rights reserved. No part of this publication may be reproduced, stored in any retrieval system or transmitted in any form electronic, mechanical, photocopying or otherwise without the prior permission of the publisher.

Printed in the UK

informa
telecoms & media

Dear Reader,

The Long Term Evolution standard is firmly established as the as the number one choice for 4G networks. And thanks to TeliaSonera launching the first commercial operations in Stockholm and Oslo at the end of 2009, the technology is already with us. Although some leading operators are still to announce detailed plans to introduce LTE, it is a matter of 'when' and not 'if', with several factors creating the need for deployment.

Now in its third year the LTE Special is established as the primary magazine for the Informa series of market leading LTE events. In addition to distribution at the LTE World Summit in Amsterdam, a second edition of the supplement will be distributed at the regional events later in the year in Asia and America.

In addition to this highly targeted event distribution, the supplement will also be sent to a select group of senior mobile industry executives with the market leading magazine Mobile Communications International. A digital version will also be available on www.telecoms.com where you can also find all the latest news and developments on LTE in addition to key industry news and features. New for 2010, telecoms.com will feature an LTE Newsroom dedicated to showcasing the content, interviews and features from the event.

So with spectrum allocation well underway and in some markets already complete, 2010 and 2011 will see more testing and deployment and indeed will see LTE becoming a commercial reality for operators and subscribers worldwide. By the time we bring out the second edition later in the year, the first networks will have developed even further, giving us the opportunity to take a closer look at the benefits and challenges that LTE will bring.

I hope you enjoy reading it.



Tim Banham, publisher

Contents |

02 | Introduction

The first LTE networks have already been launched and there are more commercial rollouts planned for this year. But the industry would do well to keep the hype machine in check.

06 | Operator Interview

In December 2009, TeliaSonera became the first operator to launch a commercial LTE service. Håkan Dahlström, president of mobility services talks to Mike Hibberd.

10 | Sponsor's Interview

Chinese vendor ZTE has said that it plans to be one of the top three wireless infrastructure vendors within the next three years.

12 | Opinion

The industry should be wary of expecting more of the technology than it was designed to deliver, says Bengt Nordstrom.

14 | Viewpoint

Kasim Alfalahi, vice president and chief intellectual property officer at Ericsson, says that the industry needs licensing terms for LTE patents.

16 | Spectrum

Auctions for LTE spectrum have already begun, with carriers looking at the digital dividend, the 3G extension band and, the spectrum currently occupied by GSM services.

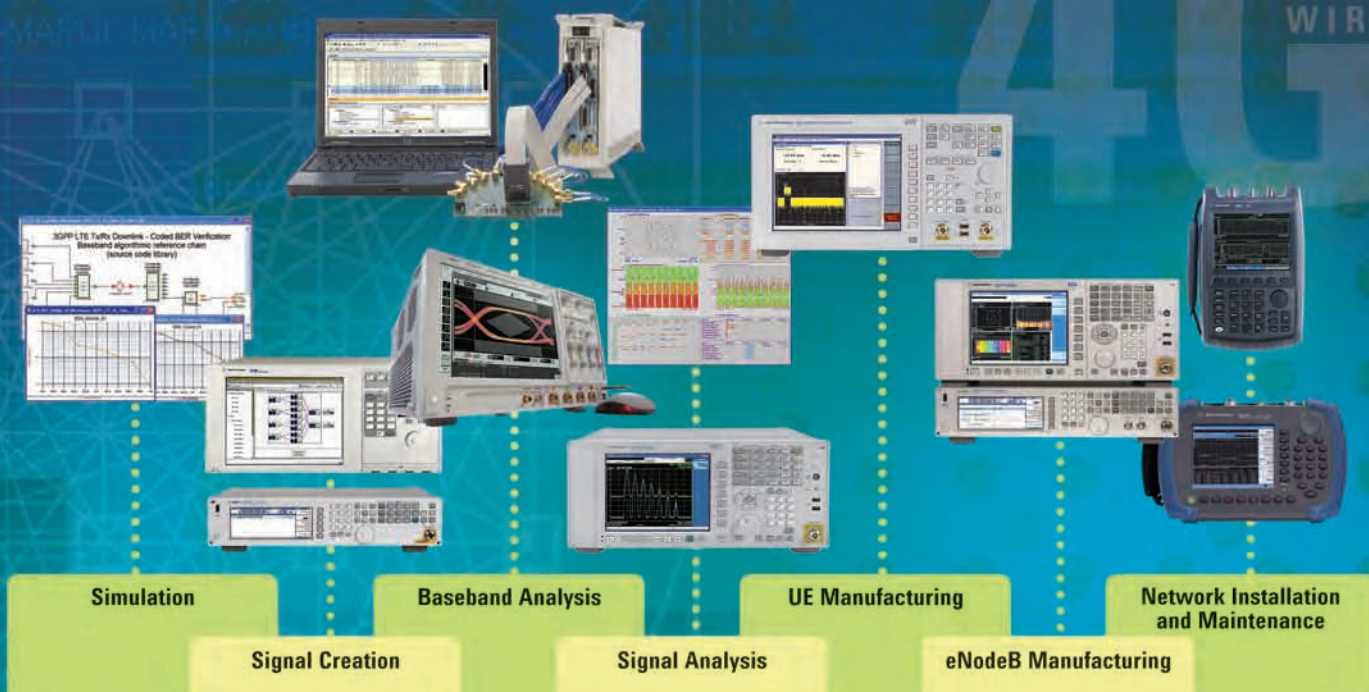
18 | Vendor View

Motorola's Bruce Brda says two 4G standards can coexist.

20 | Case study

Leading Hong Kong operator CSL has its 4G plans well underway, aiming to launch commercial LTE services within the next year.

Industry's most comprehensive line of LTE design and test products



Agilent gives you the right test equipment at the right time so your products and network meet the latest LTE standards and your project schedule.

"The company's LTE product range spans the entire technology life cycle, from early R&D through manufacturing to network deployment and service assurance."
(Frost and Sullivan, 2009)

www.agilent.com/find/lte

Visit Agilent on stand #30
at LTE World Summit 2010,
Okura Hotel, Amsterdam, 17-19 May



Build your LTE knowledge with our library of FREE resources—authored by LTE experts

www.agilent.com/find/LTE-forward

And, order your copy of Agilent's NEW LTE book

www.agilent.com/find/LTEbook



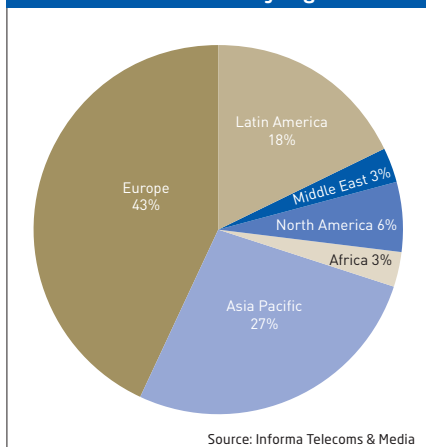
© Agilent Technologies, Inc. 2010



Agilent Technologies

Introduction |

Planned LTE networks by region



However, having established its position, the system now needs to prove itself in a tough economic climate that has led many operators to slash spending plans.

TeliaSonera became the first carrier to plant a flag for commercial LTE at the end of 2009. But the deliberate limiting of the service offering has meant that the commercial proposition has offered little reflection of true demand. This is soon to change, however (see the interview with TeliaSonera's head of mobility, Håkan Dahlström, on page six).

Elsewhere around the world there were 225 operators planning to deploy LTE as of 1Q10, up from 119 in 1Q09, with all regions represented, according to Informa Telecoms & Media research. Europe is the leading region for operators planning to deploy LTE, with 96 carriers from the continent having announced plans to deploy. Of these, the majority (51) plan to launch in 2012, with 23

planning to go live in 2010 – 2011 and 20 not looking to launch until after 2012 (the other two of the 96 have already launched).

This is partly due to the success of HSPA mobile broadband services in the region, and operator plans to upgrade services to HSPA+ before moving to LTE. It is also partly due to other factors, such as the economic downturn and resulting pressure on investment budgets.

A variety of factors has led to a similar picture in other regions, with a small number of operators in major developed markets planning to deploy LTE in 2010-11 and the bulk waiting until 2012-13 and beyond. For example, as of 1Q10 in Asia Pacific there were three operators planning to launch LTE in 2010-11 and 65 aiming for launches in 2012 or later. Not surprisingly, the number of LTE launches planned worldwide increases over time, hitting 30 in 2011 and 116 in 2012 before falling back to 53 in 2013, 15 in 2014 and just two in 2015.

Although the number of operators planning to deploy LTE almost doubled during 2009, the number of operators still planning 2010 launches more than halved. In April this year, the Global Mobile Suppliers Association was forecasting that as many as 22 LTE networks could be in commercial operation by the end of 2010, but Informa Telecoms & Media research puts the number significantly lower as of 1Q10, with only seven operators remaining committed to 2010 launches. However, TeliaSonera's LTE launches in Sweden and Norway were good news for LTE backers as these two launches were planned for 2010 and went live ahead of schedule in December 2009.

Of course, the further in the future an

operator sets its LTE launch date, the more flexible that date is likely to be. Operators planning to launch LTE in 2010 include heavyweights such as Verizon Wireless in the US and Japan's NTT DoCoMo, as well as smaller players such as US regional operator MetroPCS.

Motivation for early launches varies from operator to operator. Verizon is suffering

as it reaches the end of its CDMA evolutionary path, and faces stiff competition from HSPA operators. NTT DoCoMo, meanwhile, already has more than 80 per cent of its total subscriptions on WCDMA/HSPA, one of the highest proportions of 3G versus 2G subscribers of any operator, and so has more potential demand for next-generation services based on LTE.

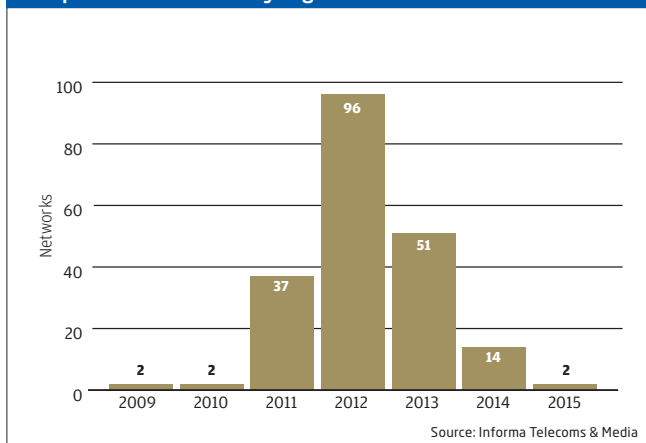
One interesting aspect of the six early deployments is that they are planned in four different frequency bands, ranging from 700MHz in the US to 2.6GHz in Sweden and Norway. This will create challenges for device makers, which will have to pick which frequencies to support in early devices, as well as operators, which will have to wait for devices supporting multiple frequencies before offering widespread LTE roaming.

While the technology to support early deployments appears to exist, carriers are approaching LTE warily. This, taken together with the geographic spread of the planned launches and many other factors such as device availability and mobile broadband market maturity, leads Informa Telecoms & Media to forecast that the number of global LTE subscribers will increase from just under 110,000 at the end of 2010 to 63.8 million at the end of 2014. Asia Pacific and North America will be the leading regions for LTE subscribers throughout the forecast period, led by NTT DoCoMo in Japan and Verizon Wireless in the US, respectively.

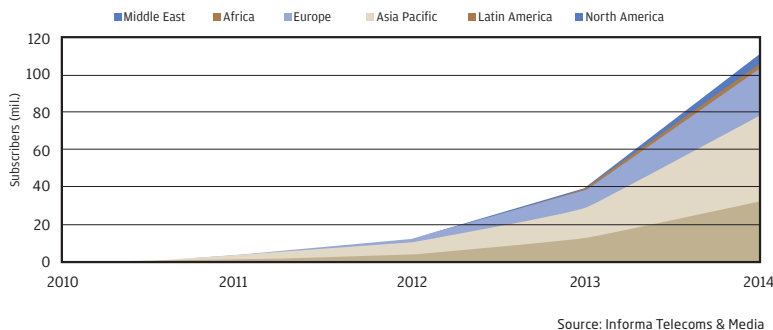
While LTE backers may argue that these forecasts are too pessimistic, it is worth noting that they suggest LTE will be one of the most successful of all the mobile technologies. It will be the quickest to go from standard publication to 50 million subscribers globally, and will be second only to HSPA in the time it takes from commercial launch to reach 50 million subscribers. This is largely because the mobile broadband boom, which started in earnest with the launch of HSPA, has created a large base of data subscribers that can rapidly migrate to LTE services, given that LTE data devices such as USB modems will be available at launch. Most previous technologies such as GSM, CDMA and WCDMA were largely focused on voice services and so had very slow adoption rates initially, due to a lack of quality handsets.

As we have seen, early commercial LTE offerings will revolve around portable devices with USB dongles or embedded connectivity. Several factors will lead portable devices to dominate the LTE market between 2010 and

LTE planned networks by region



Global LTE subscribers, by region, 2010-2014



2013, according to our research. First and most obviously, LTE will focus largely on data services initially, since there is still significant debate over how and when to implement voice over LTE. Second, portable devices are larger and tend to have more powerful batteries and are better able to cope with data access usage patterns. Third, portable devices encourage nomadic rather than mobile usage, which operators will prefer as they continue to work on making handover between 3G and 4G networks a reality.

The variety and number of portable devices will naturally expand in 2011 and beyond as the technology matures.

The outlook for LTE mobile devices is less certain, partly because they are at an earlier stage of development. On the one hand, major operators such as Verizon Wireless are confident of having LTE mobile devices in 2011. In addition, the US regional operator MetroPCS is convinced it can launch commercial LTE services in 2010 with a mobile device—a dual-mode CDMA/LTE handset from Samsung.

On the other hand, Informa Telecoms & Media has spoken to senior executives at major handset vendors and they feel that it may not be possible to bring robust LTE handsets to market in 2010-11, and that a more realistic timeframe is 2012-14.

In any case, it is obvious that LTE will initially be used mainly for mobile broadband internet services, where some operators are already struggling to cost-effectively support booming traffic. This helps to explain Informa's view that a larger proportion of LTE subscribers will be using portable devices until 2014, when LTE mobile devices will be mature and affordable enough to attract a growing number of subscribers.

Although early LTE services will focus on data, operators are naturally concerned with how voice services, which still generate the bulk of their revenues, will eventually migrate to LTE. Certainly most vendors agree that, ultimately, the best way to carry voice over an LTE network will be to use IMS architecture. But the current debate centres on the need for an interim solution.

The announcement in February that the OneVoice initiative's IMS-based solution for voice over LTE had been selected by the GSMA as its favoured solution reflected the industry-wide backing the proposal has received. Partners in OneVoice—which is technically similar to Nokia Siemens Networks' Fast Track voice-over-LTE offering—say that going directly for IMS is the best method of delivering a high quality of service, reliability and availability when moving from existing circuit-switched telephony services to IP-based LTE services. They say such a strategy would also ease the path toward convergence with fixed-line and cable networks. The programme's backers include AT&T, Orange, Telefonica, TeliaSonera, Verizon, Vodafone, Alcatel-Lucent, Ericsson, Nokia Siemens Networks, Nokia, Samsung Electronics and Sony Ericsson.

But the idea does have its detractors, and few are more vocal than telecoms-software vendor Kineto, a leading light in the Voice over LTE via Generic Access (VoLGA) alliance, which advocates using a UMA client as an interim measure until IMS-based technology becomes available to more than just the wealthiest tier-one operators.

Kineto argues that, for many smaller operators in particular, migration to IMS would be prohibitively expensive for the foreseeable future and that an interim solu-

tion would enable these operators to offer voice-over-LTE for as long as it takes IMS to become affordable for everyone.

There are other options for providing voice services, the most widely supported of which seems to be circuit-switched fallback, in which the LTE network is used purely for data and voice, and in which SMS services are carried over existing 2G and 3G networks. This is likely to be popular with operators because it doesn't require any extra investment beyond the installation of an LTE data network.

LTE faces many challenges, and 2010 will be the year when the hype about LTE will give way to the realities of these challenges. Among them will be ensuring networks have reasonable coverage and performance, devices are user-friendly and affordable, and services are competitive with other mobile broadband offers. While TeliaSonera's early launch of LTE commercial services in December 2009 is good news in one way, it also puts the pressure on the operator to prove that LTE services and devices can work as advertised, and can avoid the costly mistakes of early WCDMA services.

However, Informa Telecoms & Media feels that the mobile industry is aware of the challenges of successfully rolling out LTE, and simply cannot afford to repeat the same mistakes it made with WCDMA. This explains why early LTE services are focused on data services and will only offer data devices.

Informa Telecoms & Media expects LTE to struggle initially but to have a bright long-term future, given that the mobile industry is migrating to broadband, and that the vast majority of mobile operators are planning to deploy LTE. Put simply, the mobile industry has bet its technological future on LTE, so it will have to deliver. □

Intelligence Centres are powerful information services designed to provide you with up-to-the minute market comment, intelligence, data and analyst access, via a single, convenient online platform.



Find out more at:
www.intelligencecentre.net
 Email: telecoms.enquires@informa.com

Northern Lights

Håkan Dahlström, president of mobility services at TeliaSonera talks to Mike Hibberd about the operators LTE launch, its experiences with the technology so far and its plans for the future.

The Nordic markets have a pioneering pedigree. The first cellular network system that enabled roaming across national boundaries was built there. And the first GSM phone call was initiated in the region, which is home to some of the most prominent and groundbreaking manufacturers the industry has had. It could never be said that the industry was born in one place or another, but it's certainly true that many of its key developmental steps took place in these Northern European markets.

Over the years, though, the geographic focus has shifted as the industry has evolved. For the most technologically advanced markets, many now look to Asia, where from where a new breed of vendor also hails. The lust for growth has made stars of populous emerging territories, while the power in the wider industry is shifting to US-based internet firms and handset and software developers.

But TeliaSonera's launch of two metropolitan LTE networks, in Stockholm and Oslo, propelled the region back into the industry spotlight in December 2009. These were the first networks built on the new standard to enter commercial service, some years before the majority of leading operators are expected to introduce the technology.

Not that the launches were full-scale, of course; nor were they intended to be. The firm took delivery of only a few thousand of the Samsung single mode modems for the initial phase of the service, which rules out a capacity crunch as the driver for the early move to LTE. And with HSPA+ still provid-

ing plenty of headroom, TeliaSonera was not motivated by the evolutionary dead end that will see US vendors like Verizon among the first carriers in the world to look to LTE.

Instead, says Håkan Dahlström, president of mobility services at TeliaSonera, and responsible for the firm's mobile operations in the Nordic and Baltic regions and Spain, TeliaSonera stole a march on the rest of the industry purely to prove technological prowess to its customers. "LTE gives us the opportunity to give our customers high quality access and to really prove to our customers that going with TeliaSonera is a future-proven choice," he says.

You can't showcase something that people can't see, so TeliaSonera all but gave away the modems and the first six months' service for free. But the prices are set to rise soon to a level more commensurate with the service that's being delivered. Users in Sweden will be charged a monthly subscription of SEK599 (€62.27) for the data-only service. And that's quite a jump.

Dahlström doesn't believe it is excessive, though. "For this marvellous service, this is still a very good bargain," he says. "It's SEK300 more for the 4G service than the 3G service and that gets you much higher access speeds and much lower latency," he says.

So exactly what kind of service will that SEK599 be buying? Dahlström concedes that current performance is not necessarily a perfect means of predicting speeds from loaded networks in the future, but argues that all the signs are positive. "Since it's a shared medium, performance depends on what's around you," he says. "In Stockholm

we have a few hundred base stations and, if you take the average in that network, the user is getting 20 – 40Mbps today.

Dahlström says that LTE in itself is unlikely to address the capacity crunch driving some operators to deployment. This is an increasingly prevalent view throughout the industry and is largely responsible for the realisation that flat rate pricing is an unsustainable model. It is widely held that LTE will usher in a new era of dynamic, tiered pricing strategies but Dahlström says that TeliaSonera has already set off on this path.

"Flat rate is not the way forward," he says. "Already with 3G we are differentiating the prices based on the speed of the access we provide to the customer and the volume that they consume. That's something that we'll continue with, and my understanding is that we have acceptance in the market for this. On 3G networks you get average speeds around 6Mbps. If they're getting ten times that, then I think that customers understand they should pay a premium," he says.

In Sweden a government sponsored portal allows users of fixed and mobile broadband services to get a real world assessment of the speeds they are receiving from their service providers. It's a popular site with users, who have become accustomed to holding their service providers to account, says Dahlström. He is hoping that users of the LTE service will use this portal to verify the high speeds afforded by the service and that TeliaSonera will prove more attractive and more sticky to customers as a result.

At this early stage, Dahlström says, it is difficult to derive any meaningful data on »

LTE and the Air Interface – Real Conditions vs. Conformance Tests

From eruption to disruption - The recent eruption of the Eyjafjallajökull volcano in Iceland and the disruption it did cause to the air traffic showed us how a well-designed and operating system handling millions of users/passengers per day can have its capacity and throughput highly decreased just because of a ash cloud in the air. The air traffic or interface is essential for a system like air transportation to function. It is exactly the same for a wireless system to properly operate and deliver services to millions of users. The design of the wireless transceivers needs to be robust enough to fight against fading, not only due to a cloud of volcanic ash, interferences or any disturbance which could impact a proper transmission through the air, the air interface, the physical layer. Like any standard, LTE comes with its specifications and unique attributes providing wider bandwidth and higher data rate than any other format still in use on the cellular networks. Not only it will have to co-exist with GSM, EDGE, W-CDMA, HSPA+ and many other wireless standards, but LTE will also use new techniques to achieve and deliver the promised enhancements to the consumers.

Evolution and new implementation - As companies rush to get Long Term Evolution (LTE) products to market, engineers face tough challenges in testing these often complex devices. The mandate to include Multiple-Input Multiple-Output (MIMO) means many engineers are working to optimize their multi-antenna architectures. To achieve time-to-market goals, the MIMO solutions under development need to work correctly in real-world situations. Defining situations when MIMO transmissions will improve system performance can be complicated, but it is a critical aspect of successful implementation.

Multi-antenna wireless systems have been shown to improve data capacity through spatial multiplexing and improve system reliability through antenna diversity and spatial coding such as Space-Time Block Coding (STBC) and Space-Frequency Block Coding (SFBC). The suitability of a MIMO wireless system for spatial multiplexing is largely dependent on the characteristics of the wireless channel, the antenna configuration and the ability of the receiver to accurately recover the channel coupling matrix coefficients. The complexity of the wireless channel including channel correlation, interference and noise rate may create difficulties when measuring the operation and



Renaud Duverne, EMEA Wireless R&D Market Initiative Manager for Agilent Technologies

troubleshooting a MIMO system. Fortunately, the operation of a LTE MIMO system with application to spatial multiplexing can be quickly verified with a calculation of the channel matrix "condition number" using a vector signal analyzer (VSA) such as the Agilent 89601A. The condition number is a deterministic calculation for evaluating the performance of the wireless channel and estimating the associated increase in SNR required for successful signal demodulation in the LTE MIMO system. For example, a condition number close to the ideal value of 0 dB would imply perfect channel conditions for the application of spatial multiplexing, while values greater than 10 dB would point to the need for a dB per dB improvement in the relative SNR in order to properly demodulate the MIMO transmission. It can also be shown using the Agilent 89601A VSA that the channel matrix and associated condition number is a function of subcarrier frequency and time which may be a useful tool when studying the effects of banding subcarriers at the evolved Node B (eNB) for the highest performance.

Data recovery in a spatially multiplexed system requires accurate knowledge of the channel coefficients at the receiver. In a real-world environment, the channel coefficients are affected by correlations and noise in the

wireless channel. The channel coefficients may also change rapidly over time as a result of mobility in the transmitter and receiver, or both, and the effects of changing multipath and interference in the surrounding environment. As a result, the receiver or test equipment must be capable of rapid measurement of the channel coefficients.

From simulation to real conditions - A typical configuration for measuring the performance of a LTE 2x2 MIMO receiver is made of signal generators, channel emulator and multi-channel receiver for the analysis. The 3GPP LTE signal is generated using the Agilent N7624B Signal Studio software, and the waveform files are downloaded into the Agilent N5106A PXB internal baseband generators. The N5106A PXB channel emulator and baseband generator is used to replicate real-world MIMO conditions including multipath fading, noise, interference and channel correlations. The N5106A PXB outputs the baseband I and Q signals for upconversion by a pair of Agilent MXG-series RF signal generators. The I and Q waveforms from the PXB can be connected to the MXG generators over an analog or digital bus. The upconverted signals from the MXG generators are connected to the MIMO receiver under test. To verify the LTE signal performance, an Agilent 90000-series oscilloscope configured with 89601A software can be substituted for the actual MIMO receiver. The 89601A VSA can test the quality of the signal applied to the MIMO receiver under a variety of multipath conditions, beyond what conformance tests require.

The test and measurement equipment needs to be flexible enough to go beyond what's required by conformance tests in order to stress the different elements of a wireless system under real-life conditions, which can appear to be harsher and more disruptive to the air interface crucial for any kind of transmission not reduced to ashes! ■

More information on the Agilent Technologies products mentioned in this article can be found at: www.agilent.com/find/lte.



Agilent Technologies

Interview | TeliaSonera

We are a telecom operator and our ambition will always be to be a telecom operator. Access is our core business and we see that LTE gives us the opportunity to give our customers access of the highest quality.”



consumer behaviour in an LTE world. It has yet to become a mass market service and when it does the user profile will probably evolve. Technically, though, he claims that: “It’s been no more complicated adding 4G than it was adding 3G, although there’s still a long way to go before we can say that the 4G network is integrated in our mobile infrastructure in the same way as the 3G network is.”

Among the technical challenges that TeliaSonera has yet to solve is handover between LTE and the 3G network. This has not been an issue so far, given that the modems available on the new network have been single mode. But the firm is expecting to take delivery of dual mode 3G and 4G modems before the end of the second quarter, with the equipment arriving in large volumes during Q3. So there will soon be a greater urgency to enable handover.

However, with dongle-enabled laptops, usage is nomadic rather than mobile, leading Dahlström to judge handover as “not mission-critical”. He says the firm has a timeframe for introducing handover into the network, but will not be drawn on what that timeframe is.

It is not currently popular among mobile operators to focus on providing transport more than on the carrier’s role as a brand and developer and provider of a consumer facing portfolio of services and applications. So it is revealing when Dahlström describes TeliaSonera’s LTE network as a “killer application”.

People are addicted to the internet, he says, and improving their access to it

is among the stickiest services a carrier can provide. “We see unlimited demand for bandwidth for our customers and it becomes more and more important for them how they access the internet and use data services,” he says. “We are a telecom operator and our ambition will always be to be a telecom operator. Access is our core business and we see that LTE gives us the opportunity to give our customers access of the highest quality.”

While starting in the major metropolitan areas will be a strategy almost universally embraced by carriers for LTE deployment, users outside of those centres still need to be provided with services that will enable operators to retain their custom. TeliaSonera has advanced plans for the expansion of LTE coverage in the two countries where it has launched so far. “During this year we will roll out to the 25 largest cities in Sweden and the four largest cities in Norway, including Oslo,” says Dahlström. “So by the end of the year quite a big portion of the population will be able to use this service in both Norway and Sweden.” The firm has not yet publicised plans

to deploy LTE in any of its other markets.

Pioneering can be a lonely business and being the first in any technical evolution can, in hindsight, provide significant learning benefits to competitors who follow in your footsteps. So it remains to be seen just how much LTE will benefit TeliaSonera in the ongoing battle for customer retention. But the firm’s rollout does demonstrate at least that the technology works well at launch, which could not be said for 3G services when they were initially deployed.

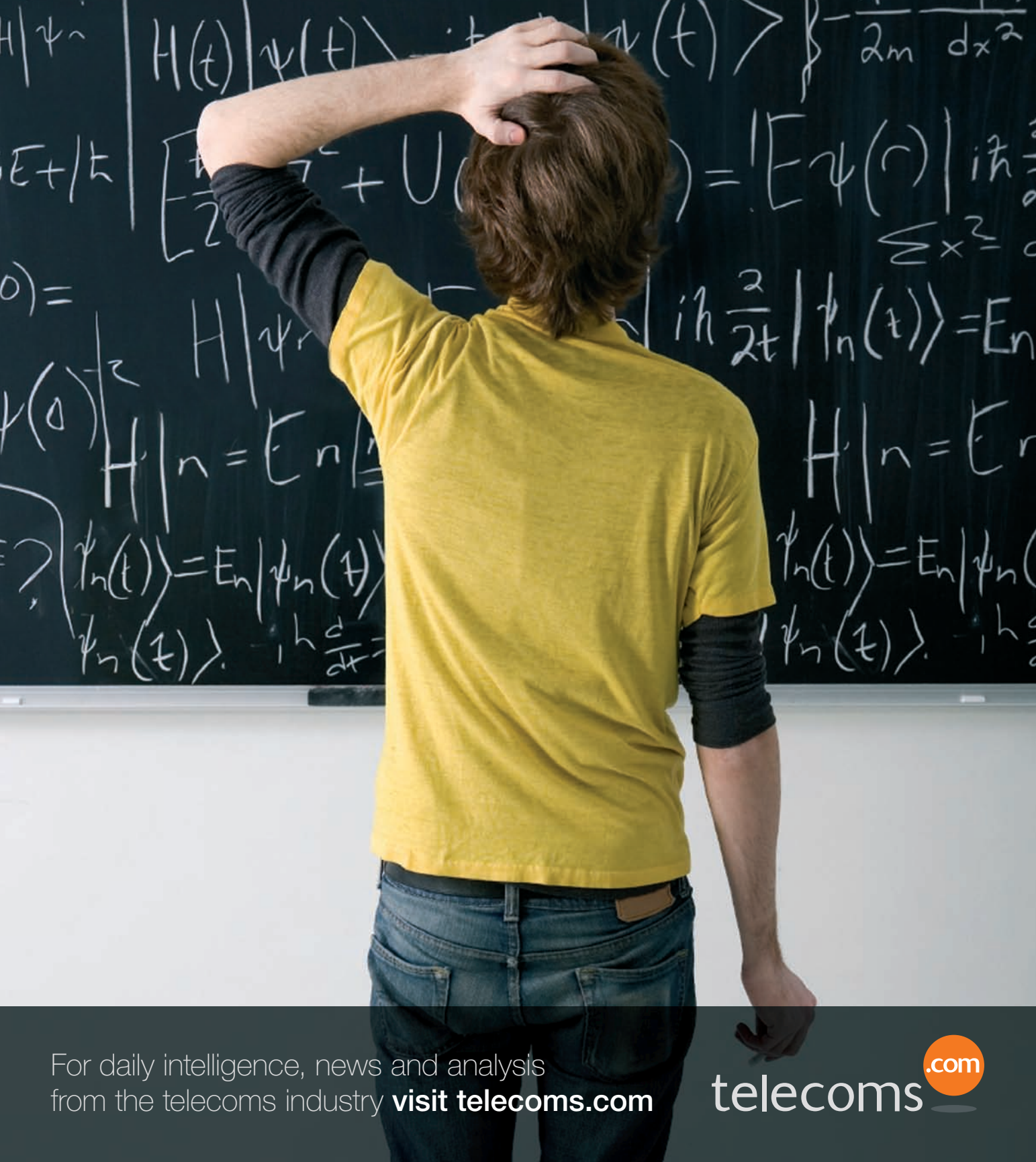
Dahlström remains convinced, however, that his firm’s success in stealing a march on its competitors, and in so doing planting the Nordic flag in LTE territory, will prove to be a winning decision. “For us 4G is an excellent opportunity to help our customers enjoy different kinds of entertainment and services as consumers and to improve their way of working and increase their efficiencies in their professional lives,” he says. “The LTE launch was a milestone for us; we have shown the market that we have leadership in this part of the world and we will keep it.” □



TeliaSonera keynote presentation

TeliaSonera’s VP for system development in the Mobility business area, Tommy Ljunggren, will be delivering a keynote presentation at the LTE World Summit. Responsible for the introduction of 4G services for TeliaSonera in Denmark, Finland, Lithuania, Norway and Sweden, Ljunggren will be sharing more information on the firm’s LTE launches, its experience of the live network, the firm’s LTE offers and customer reactions to them and the next stages in deployment. Ljunggren will be speaking at 9am on Tuesday May 18th.

What's your formula for success?



For daily intelligence, news and analysis
from the telecoms industry visit telecoms.com

telecoms.com

Aiming for the top

Chinese vendor ZTE has said that it plans to be one of the top three wireless infrastructure vendors within the next three years. The firm's Marketing Director, Richard Lihe Ye talks about the firm's progress in the market, and in LTE in particular.

Q: What does being one of the top three vendors mean to ZTE? How will ZTE judge its success?

A: Generally, as a leading provider in wireless infrastructure, the company shall provide leading technologies and solutions with lower TCO. The networks we deliver will match the developing requirement of the market (the network itself and the users), including leading evolution mechanism. The company shall also provide leading engineering and services for network implementation, management and upgrading. Furthermore, the company shall take relative social responsibility, devoted to sustainable green communication network.

There are many ways of ranking performance, including number of contracts, revenue, BTS/Node B shipment and population coverage. ZTE aims to be among the top three wireless infrastructure vendors and in newly added networks in emerging markets, we already achieved this in 2009.

Q: What progress has ZTE made in the LTE contract market to date?

A: As of March of 2010, ZTE has won five commercial contracts for LTE deployment, and we're cooperating with 40 operators on LTE trials. In 2009 Gartner released a report for LTE industry evaluation. In the report, ZTE was ranked in the top three of all infrastructure vendors.

Q: ZTE has made much of its credit facilities from state banks. To what extent will these facilities play a role in helping ZTE win LTE contracts?

LTE Technology Deployments

LTE	<ul style="list-style-type: none">› 5 commercial trials› Cooperating with over 40 leading operators
GSM/UMTS	<ul style="list-style-type: none">› Delivered 9,000,000 carrier-sectors worldwide in 2009› Newly added market share ranked Top 3
CDMA	<ul style="list-style-type: none">› No.1 in global market› 250 million lines global application› No.1 of newly added shipment (2006-2009)
TD-SCDMA	<ul style="list-style-type: none">› Over 33% market share in China Mobile› Presence in 125 cities of 26 provinces, 52.5% city coverage.
WiMAX	<ul style="list-style-type: none">› Serving 53 operators in 38 countries› Newly added market share ranked Top 2 in 2009
CN	<ul style="list-style-type: none">› No.1 in Global NG-HLR market.› Serving 1.34 billion subscribers in 110 countries.
Microwave	<ul style="list-style-type: none">› More than 380% YOY growth in 2009.› Serving 30 countries and over 60 operators.

A: ZTE has very good relations with finance organisations and banks and has many years' experience in supporting developing countries' communication construction. It's a big challenge for operators to leverage the investment and performance of the network. With suitable long-term financing support, operators will have a much better development environment and sustainable strategy for communication network.

Q: Managed services is an increasingly important element of the vendor offering. How is ZTE performing here and do you believe it is an area in which the firm needs to improve its offering?

A: ZTE has a complete range of services for its customers, from network planning and delivery to optimisation and after-sale services. ZTE

provides managed services to operators as part of long-term partnerships. To many operators, managed services can offer savings in OPEX and help them to optimise the performance of their network. It's important for a vendor to provide cost-effective network solutions and deploy them within the agreed timeframes and ensure high quality performance.

Q: In 2008 66 per cent of ZTE revenues came from the overseas market. How does ZTE see that share changing with the adoption of LTE?

A: This number shows how important the global economic environment is to ZTE. After fast growth in 2008 and 2009, ZTE will certainly in the leading group for LTE. PLSA" ZTE received invitations for LTE trials and commercial projects from more than 40 operators, who

not only will deploy LTE but also optimize 3G networks. The operators consider ZTE as one of the best choice because of our low TCO and future-proof leading solutions."

Q: ZTE owns around 36 per cent of the Chinese 3G infrastructure market. How does ZTE see that market share changing as LTE, or TD-LTE in this case, is deployed?

A: As of Q1 2010, ZTE's TD-SCDMA market share at China Mobile was 35 per cent, covering 52 per cent of the cities where TD-SCDMA was deployed. In China Unicom, which as readers may know is a WCDMA operator, ZTE's market share is 22 per cent. ZTE provides an SDR-based Uni-RAN solution to the operators, which can be smoothly evolved to LTE. This makes it more economical to upgrade than it would from networks from other suppliers. ZTE is co-operated with China Mobile in its TD-LTE trial and matched its commercial launch roadmap. It is possible for ZTE to enhance the market share in China in next 3 years.

Q: ZTE claims to be number one in the SDR (software defined radio) space. Do you think the company can hold onto that position as other vendors adopt SDR? Do you have a strong head start?

A: ZTE is the leading vendor in SDR base station shipment as of Q1, 2010. More than 350,000 SDR distributed base station are running among our customer base. But that does not mean that ZTE has stopped innovation and the improvement its Uni-RAN solution. We have already released the roadmap for the new version of our SDR Node B. The new version will have more capacity and higher integration and it will bring more benefits to the operators.

Q: ZTE has had some significant infrastructure wins, such as CSL in Hong Kong, where the company completely replaced rival NSN. Do you anticipate more rip and replace wins as LTE kit is rolled out?

A: Yes, to grow fast and keep leading in the market, many operators need to swap out their legacy equipment by future-proofed solutions that can be easily upgrade to LTE.

Q: Where in the world do you see the strongest potential for LTE wins? ZTE is due to start a trial with Telefonica in Spain and said it will sign an LTE deal with a Tier one Latin American operator this year.

ZTE provides an SDR-based Uni-RAN solution to the operators, which can be smoothly evolved to LTE. This makes it more economical to upgrade than it would from networks from other suppliers ??

A: Generally, leading operators like to deploy LTE so as to strengthen their relations with high-tier subscribers. Meanwhile some other tier-3 operators prefer to catch up with or surpass their competitors by offering larger bandwidth. ZTE has cooperation with all these kind of operators to help them realise their operational targets.

Q: How important does ZTE consider the TD-LTE flavour of LTE?

A: Chinese companies have most of the TD-LTE patents and the government supports the TD family. It's important to strengthen China's status in global communication industry.

NGMN and the operators involved in it are working for a converged network of dual mode, TDD/FDD-LTE. As one of standards of LTE, TD-LTE is operated by China Mobile, who's the largest operator in the world in terms of subscribers. Besides China, the frequency for TDD is available in many countries. To deploy TD-LTE is not just a China's topic, but a global convergence theme. NGMN and telcos involved in TD-LTE industry deems to build a converged network of dual mode in LTE, so as to simplify the infrastructure and terminals. The progress of TD-LTE strongly propel the evolution and convergence.

Q: There have been problems with the LTE ecosystem, particularly a lack of terminals. How and when do you see this problem being resolved? Are there any other problems with the LTE ecosystem?

A: From Q3, 2010, we'll see more vendors able to provide LTE modems. The chipset and terminal providers will cooperate closely and open their work to infrastructure vendors. However, ROI of LTE is still a challenge for many operators who just deployed HSDPA or HSPA+. There are many other questions that need to be answered: How can the industry provide better, more attractive content? How do we match data flow with cash flow? When the cost of network and terminal is best for launch?

Q: Operators seem keen to keep sweating their existing infrastructure assets. ZTE says that 10 – 20 per cent of users will be heavy mobile data users, so will carriers need to invest in LTE to meet this demand?

A: To keep leading, the operator shall offer different subscribers with customized service package. It's important to provide ideal bandwidth for high-tier subscribers. Certainly, LTE is a way to match increasing need of soaring data application. It takes time to have a mature LTE ecosystem, not only for vendors, but also for wireless frequency resources. Before LTE, with modulation technologies like 64QAM and MIMO, HSPA+ can also provide downlink data more than 21Mb/s. It's a good path for operators to create more value by HSPA+ before next generation. □

ZTE中兴

Reality Bytes

LTE offers the chance for operators to evolve in a truly elegant way. But the industry should be wary of expecting more of the technology than it was designed to deliver. **BY BENGT NORDSTROM, CEO, NORTHSTREAM**

Over the past year, as is always the case in this industry, there have been numerous predictions centred on the growth of wireless communications. 'At least 20 billion connected devices by 2020 and a 300-fold increase in traffic' said Intel. 'Mobile traffic is doubling every year...the industry is looking at carrying 1,000 times more traffic in a decade' said Ericsson. The GSMA weighed in with '50 billion connected devices by 2025'. And Verizon suggested that wireless penetration of 500 per cent is possible.

So this huge market is set to get even more massive, whichever way you cut the figures. And just as GSM evolved through its iterations to 3G, and as HSPA developed to deliver mobile broadband, we are now seeing the arrival of the next generation of technology that will carry the mobile market into the future. After 20 years, the mobile industry has finally agreed on one global standard, which is a significant milestone in itself.

Long Term Evolution (LTE), or 4G if we want to continue the generation game, looks like it will live up to the promise of its name. LTE is set to enable the mobile industry to meet the increasing demand for data with higher speeds and more efficient use of bandwidth and spectrum. If 3G enabled the mobile internet, and HSPA brought us true mobile broadband, then LTE will deliver the completely connected broadband world.

Not only will LTE technology be instrumental in furthering the market for mobile communications, it will be so in a much more elegant way than other technologies introduced to date. LTE has arrived at precisely the right time for operators that

need the ultimate broadband network architecture, but are struggling with decreasing margins, lower ARPU and general economic malaise. LTE will enable operators to build on the success of mobile broadband to date by gracefully evolving their network assets in a steady migration to LTE service. If, of course, that is what the operators want.

There is no identifiable business case for standalone LTE—but what it will do is provide a faster route to realising the end-to-end service capability that has been promoted for so long. Although the media is already creating a 'race to launch' for LTE networks, the reality is that LTE is not a big differentiator in itself. It will likely not create new markets; the markets ready for wireless exploitation have already been identified. But it will enable a greater number of services by being a bigger, faster, and more efficient transport network. Smart operators will be planning their evolution to LTE as a stepped investment funded by the increasing growth of mobile broadband.

LTE is a migratory strategy for existing operators who can pace their launch in line with the revenue from their existing business. There is no business case for a standalone LTE license—meaning that there is nothing in LTE as a technology that warrants a greenfield launch attempting to outperform current operators. Existing operators have been in the game for at least ten years, some for more than a quarter of a century. They own sites, towers and infrastructure. They have billing systems, distribution networks and global roaming agreements. They have customers, brand loyalty, and public presence. They have cashflow from their existing operations. All of these

assets have been leveraged over the years as new technologies have been adopted. And with declining revenues, the operator market is already beginning to consolidate, leaving no chance for newcomers.

A steady approach to LTE launch will enable operators to become familiar with the new technology and ensure its stability. Existing networks will remain in place for many years, allowing LTE to be deployed in selected areas with high demand for data and therefore the greatest revenue potential.

Carefully planned migration will enable operators to increase the throughput and capacity of mobile broadband as the market continues to grow. Operators are finding it is far more cost effective to replace infrastructure elements with all-IP LTE-ready equipment, rather than try to service the increasing demand for mobile broadband by trying to upgrade legacy equipment. Network operational expenditure will be reduced through the more efficient use of spectrum and a gradual reduction in the number of technologies supported by each site.

Few operators want to repeat the experiences from early 2G and 3G launches—building networks and discovering that there are no compelling devices for the customers to buy. Elegant evolution of existing networks means that there will be no disruption to service, and therefore revenue—and a gradual step-change means that devices will be ready at the same time as the networks. More and more operators are including LTE in their RFQs for network modernisation programmes. This has the effect of making the vendors more proactive and competitive,



Bengt Nordstrom, CEO of Northstream, was one of the first users to experience TeliaSonera's Stockholm LTE network

and strengthens the knowledge base for the new generation technology.

The LTE market is already moving forward at this measured pace. In December last year, TeliaSonera became the first operator to launch LTE, with service in Stockholm and Oslo. Its Scandinavian colleague Telenor also holds licences in Sweden and Norway, and has established a joint venture in Tele2 to build out networks and share spectrum, with LTE implementation expected late this year in Sweden, and in Norway in 2011.

Optimistic projections suggest that as many as 25-30 LTE networks could go live during 2010. Bidding for licences in Germany is under way between T-Mobile, E-Plus and Vodafone D2, while Verizon's choice of LTE over WiMAX in the US is nudging other North American operators forward. M1 in Singapore is replacing its legacy 2G network over the next two years, and will be all-IP and ready for LTE deployment.

LTE will enable operators to fully exploit the mobile broadband market, and the vast majority of existing operators are expected to bid for LTE licences. With its variable bandwidth capability the technology is a candidate for all frequency bands we use today, at least over time.

Enabling fast access to data is central to the mobile market of the future—and operators who have not secured spectrum from the bidding so far will be strengthening their HSPA offerings to ensure they too can remain competitive in the mobile broadband space until they are able to migrate to LTE.

The rapid growth of mobile broadband has demonstrated the strength of demand for data to the wider telecommunications

market—and has shown that the mobile variety can compete fairly comfortably with fixed broadband over DSL. This demand has created intense competition, not only between mobile operators but with fixed line operators too. This 'whole market' competition has in turn put significant pressure on prices.

So although LTE makes mobile broadband a better experience for the end-user, it doesn't change the overall market situation for the mobile operator. Average revenues per user are declining in most markets although there have been, and continue to be, many efforts to develop new revenue generating services. Revenue is also under threat from the internet players who can, and are, providing services to the end user that were previously exclusively in the operator domain. Governments and regulators are continuing to chip away at roaming and termination charges, thus creating another assault on the operators' revenue.

Services that can be monetised over mobile broadband have been clearly identified. The LTE providers need to ensure that they are enabling the market to capitalise on where the most lucrative services growth will be found—and they need to shift their focus in terms of how they approach the services market.

In the future, as is already happening now, services and applications will to a large extent originate from internet and device players. Operators need to shift their product and service strategy from enhancing expertise in building and operating service platforms. The way forward in the mobile data world is to create and seal partnerships and sourcing strategies

to identify and secure best in breed services. As consumer voice and messaging revenues decline through ARPU erosion, it will be the connected device opportunity that will have to compensate, and realise both the technical and commercial promise of LTE.

As the mobile broadband market matures, the current key revenue streams from voice and messaging (80 per cent or so) will migrate to broadband fees that are throughput (Mbit/s) and quality related, and will include as many voice and messages as any user could possibly consume. Mobile broadband is the new must-have.

LTE is bigger, better mobile broadband. It will make the operators even more dominant in their role as the route to market, and will ensure that all the opportunities that have been discussed for the mobile market can finally be realised. The consumer market is now largely driven by third party application and services developers. LTE will open up the delivery of services from machine to machine, enabling the exploitation of industry verticals that have long been the subject of 'Future Services' PowerPoint presentations—smart utility meters, vehicle telematics, security services, wireless health monitors—the list goes on.

With one agreed standard, mobile connectivity will become increasingly cost-efficient to implement on large numbers of devices, further catalysing the app, content and device markets and making the 500 per cent penetration market a real possibility. The commercial benefits of mobile communications will spread across industries leading to new ways of working. Not a revolution, but a steady evolution—over the long term. □

It's patently obvious: FRAND terms are essential

Kasim Alfalahi, vice president and chief intellectual property officer at Ericsson, says that fair, reasonable and non-discriminatory licensing terms for LTE patents are essential for the lasting health of the industry.

The 3GPP family of standards has been hugely successful and that owes a great deal to the fact that those standards have been open to many players, helping to create the ecosystem that makes our mobile services a reality today. But long before a technology launches commercially, companies like Ericsson and our competitors are working on the research and development programmes that make it happen. We've been working on LTE for many years now, and the technology is only just coming to market.

If that early R&D work does not happen, if that early investment is not made, then there will simply be no future. LTE, or 4G, would not have happened and 5G would never appear. But in order for that research to take place, the companies undertaking it need to protect their investments. Without the assurance that they can recoup the costs of the research, they would not be able to carry it out. Patent royalties are an important revenue stream for vendors like Ericsson; they are a way of protecting our investment and enabling us to continue funding our R&D work.

But it is very important that companies within the industry are not motivated by the short term maximising of profits from their patent portfolios. Across the standards that we have used for the last two decades, from GSM through WCDMA and now into LTE, Ericsson is the number one player in terms of essential patents. We believe we have around 25 per cent of

patents or more for these technologies and we are taking the lead in establishing an industry practice to promote healthy market growth. We are championing industry practice on fair, reasonable and non-discriminatory (FRAND) licensing. We believe very strongly that companies should get a fair return on their patent portfolios, but not one that is excessive.

One of the most important reasons for this is that excessive royalties threaten the entrance of new companies to our ecosystem. For the industry to be successful in creating everything from base stations to handset platforms it is crucial that the accumulated royalties which a new player has to pay are not a hindrance. We welcome new players and want to see more of them come into this business. There are examples of companies who had not even looked at the telecoms industry four years ago that are today very successful. Without a reasonable royalty regime, their success would not have been possible.

We do not believe this industry is or will be, like the pharmaceutical sector, or even certain parts of the IT world, where patents are used as blocks, to stop other organisations from making progress. It is very much about profit and, often, if you are a new player coming in, you have very little chance of success. In the telecom industry we are open. Companies that enter the ecosystem can see within a very short period how the technology has been implemented and how it should be implemented to make it work. That's why

the growth in our industry has been so impressive.

From our perspective it's very important that all players realise that they are not alone in this industry. There are more and more companies coming into it and no single organisation should demand excessive royalties. We all need to understand that we can take our share of royalties, but not more than that.

This is not to suggest that any organisation should license its technology for less than it is worth. There needs to be a balance between the return on investments made, and the cumulative costs for new market entrants.

Unfortunately there are organisations in the industry which are deliberately confusing the entire situation, either by claiming to have more patents than is really the case, or by using the ones that they do have purely as a profit making exercise. Non-practising entities, or NPEs, tend to buy patents to just use to generate income. They drain the market because the money they get in licence payments for those patents will not be invested in further R&D.

They are at one end of the spectrum, and companies committed to FRAND licensing are at the other. As always there is a grey area, though. There are companies that have tried to develop products and simply haven't been very successful. They no longer develop product lines and have become dependent on their patents. It is nobody's place to suggest that this is

“We need to be honest and open about the patents that we have so that the firms that we are licensing to know that they can trust us.”



an illegitimate business model, but it does create challenges. If they focus purely on maximising profit and ignore the fact that there are many other contributors to that technology, then that's a concern.

It is more difficult to motivate companies like these to sign up to a FRAND licensing strategy because they don't need anything in return from the companies they are licensing their patents to. In general, though, not a worryingly large number of essential patents are held by companies like these. If they have not been successful with products, they tend not to be successful with essential patents either.

Also, as I have mentioned, we have a challenge in the industry with declared patents. The issue is that anyone can declare a patent. Anyone could go out and declare 5,000 at random tomorrow if they wanted to, but that wouldn't be worth anything. Declared patents aren't necessarily patents that have been awarded, and they might well prove not to be essential. We have no way of knowing how many declared patents are actually essential. Another problem is that some firms fill the introductory descriptions for their patents with certain buzzwords that might cause misconceptions as to their worth.

We need to be honest and open about the patents that we have so that the firms that we are licensing to know that they can trust us. Let's take a newcomer in mobile broadband as an example. They don't need to worry about a technology like LTE

until it becomes a success. They wait until it is into the market and then they start developing compatible products. When we have a deal with a company like this, they know that the revenues we get from them will go back to our research, which means that we will make LTE happen and that will benefit them the next time they are going to launch a product.

Licensing royalties are decided on a case by case basis, through extensive bilateral negotiations. When the two parties cannot agree on whether a patent is essential or not, or on the royalty, then the process moves to litigation. There were some high profile disputes over licensing with WCDMA. But if you consider the number of companies who are involved in standardisation, the number of companies claiming IPR or patents and then consider the number of large battles, you see that only a small percentage of discussions end up in disputes. So many agreements are signed without noise or litigation.

But those fights have to happen because the companies that are being unreasonable—and this can be either the company holding the patent or the company wishing to license it—need to learn to be reasonable. We are confident that all the companies that were involved in 3G licensing processes have learned the lesson and so, while we will still see litigation over LTE licensing, we expect there to be less than there was during the 3G process.

So, in summary, there are three key elements to ensuring that the LTE licensing process is successfully managed and benefits the industry as a whole as well as the individual companies involved in the process. First we need to work to overcome the misconceptions that are out there. A lot of people believe that, just because a patent is declared, it must be valid. That is simply not correct and it is very important that these misconceptions are overcome because they hurt the whole system.

Second, the players that are putting products into the market need to respect the fact that they have to have licences from the companies that have contributed to the standard, regardless of who they are. That has to be respected and it is crucial in order to continue the cycle of innovation.

Third, and perhaps the most important, is that the strong patent holders, like Ericsson, have to be fair in setting their licensing rates. We all need to look at what we think the accumulated royalty market should be, look at the percentage of patents that we think we hold and work out what our share of that accumulated market should be and take no more out of it.

As more companies join the industry and put their own R&D efforts into the standards on which mobile communications are built there will be gradual shifts in terms of patent market share. Fair, reasonable and non-discriminatory licensing processes adapt to these shifts, which is why they are of profound benefit to us all. □

Battle of the bands

Auctions for LTE spectrum have already begun, with carriers looking at the digital dividend and the 3G extension band. **BY MATTHEW HOWETT, SENIOR TELECOMS ANALYST AT OVUM**

On April 12th this year Germany became the first country in Europe to start the award of the 800MHz spectrum—the so called ‘digital dividend’. While amounts bid will not reach anything like the dizzying heights of 3G licensing that we witnessed in 2000, it should prove to be a valuable band. All eyes will be on Germany, as over the next few years other national regulators around the world are set to follow and release a significant amount of some of the most valuable spectrum that exists. How much will be released in each country and what it will be used for are key questions on everyone’s mind. Ovum has recently developed, and will continuously update, an internal database of spectrum awards around the world to help answer these questions. To kick-off our new research in this area we have looked at what spectrum is likely to be used for LTE services and where in Europe these awards are taking place.

We can’t see it, touch it, or hear it, but radio spectrum is central to our lives. It is the essential raw material for all mobile services and, like many raw materials, it is a finite and therefore extremely valuable resource for which demand is increasing all the time.

As consumers demand broadband on the move and governments outline ambitions for ubiquitous broadband, more capacity will be required to support the huge demands placed on the network. Eventually, network operators will need

to upgrade their infrastructure to next-generation (or 4G) technologies, meaning that more of this valuable resource will be required.

There are currently two main competing technologies that will be deployed for next-generation mobile services: mobile WiMAX and LTE. Each has its own benefits and the choice in many cases will come down to local market circumstances. From a spectrum policy point of view, however, there is a key difference between the two. Mobile WiMAX is currently TDD-based (using unpaired spectrum) whereas LTE will primarily be FDD in the short to medium term and uses paired spectrum. The TDD version of LTE, TD-LTE, will appear in Europe later on. By deciding how spectrum is packaged, when it is released, and the conditions attached to its use, regulators and policymakers have the ability to influence which technology is deployed.

However, it is not for national regulators to pick winners; that is something that the market must decide. Instead they must concern themselves with getting the enabling factors right. These include taking the necessary steps to ensure that adequate spectrum is available and packaged in such a way so that either technology can use it. Crucially, they must also design and structure rollout obligations in a way that complements the spectrum being offered and encourages bidding.

While the auctions will be more sober affairs than the bidding frenzies that

characterised the 3G spectrum auctions in the early part of the last decade, regulators will still be keen to ensure that spectrum is awarded only to those who value it most. Only then can governments and regulators work towards creating an environment where the availability of mobile broadband is increased, and where it can play an important contributory role in achieving near-universal broadband.

While the common principles of technology and service neutrality will apply, a certain amount of harmonisation is both desirable and necessary. Spectrum policy is one of the few remaining areas where there is still a heavy-handed regulatory approach. Recognising the importance of market-based principles is a prerequisite for effective regulatory policy and will eventually dictate when auctions take place, how much spectrum is made available, how it is packaged, and the rules around how it should be used.

Slowly but surely, national regulators are implementing market mechanisms in the belief that the best way to secure the optimal use of spectrum is to limit regulation to the essentials, for example preventing harmful interference and ensuring fair competition. However, spectrum does not respect national borders and so, if one country uses a particular band for one purpose and a neighbour uses it for another, problems will quickly develop. For this reason, harmonisation between countries is encouraged and also serves to increase the size of the potential market

and scope for economies of scale for equipment manufacturers.

The rationale for a coordinated approach is largely derived from the fact that next-generation technologies require large blocks of spectrum (either operated by a single party or multiple parties working collectively with contiguous spectrum) for their potential to be fully realised. Best performance for LTE FDD is achieved using 2 x 20MHz blocks, and truly national high-capacity networks will require spectrum at both low and high frequencies. Addressing these requirements in an integrated way, if achieved quickly, should give operators greater certainty over their future spectrum holdings, while continuing to support a competitive market outcome.

The digital dividend (800MHz) and 2.6GHz bands are set to be favourites for LTE. Taken together, they represent a very significant increase in the amount of spectrum that will be available for mobile broadband. It is here where operators will be looking to deploy next-generation technologies, in particular LTE, as no profile has yet been defined for mobile WiMAX at 800MHz. It is where all the efforts around standards and the efforts of the vendors in terms of developing equipment is being focused, not least because the existing 900MHz and 1800MHz bands are heavily used by existing GSM services and, before you are able to reuse those frequencies, you have to clear them of existing users. In the longer term, these bands can be re-farmed, but at the moment there has been limited interest.

The 2.6GHz spectrum band, which has been identified globally by the ITU as the “3G extension band”, will be vital in satisfying the demand for greater capacity for mobile broadband and supporting networks such as LTE, which have already started to be deployed commercially around the world. However, progress so far has been slow, with the 2.6GHz band having been awarded in only a handful of countries (Finland, Hong Kong, Norway, and Sweden). That is set to change in 2010 with at least another seven countries (Austria, Denmark, France, Germany, Netherlands, Portugal, and Spain) scheduled to auction this band.

While higher frequencies are particularly suited to significantly increasing data capacity in high-demand zones such as dense urban areas, in rural areas the costs associated with deploying a network using this band are mostly prohibitive. The natural propagation characteristics of

Progress in European 4G spectrum allocations

Austria	800MHz	RTR initiated a study on digital dividend in December 2009 and plans to issue a public consultation during Q2 2010 on harmonizing this band with the EU-wide approach.
	2.6GHz	The tender was launched on 21 April 2010 to auction a block of 50MHz (unpaired) in the 2570-2620MHz band and 2x70MHz (paired) in the 2500-2570MHz and 2620-2690MHz bands. The auction is expected to be held in September 2010.
Denmark	800MHz	To harmonize with the EU approach, the regulator decided to use 823-831MHz for wireless microphones, and the remaining frequencies in 790-862 MHz can be used for services other than television broadcasting, in particular for mobile broadband. However, frequency allocation timelines have not been decided yet.
	2.6GHz	The auction process was launched on 3 February 2010 to auction a block of 50MHz (unpaired) in the 2570-2620MHz and 2x70MHz (paired) in the 2500-2570MHz and 2620-2690MHz bands. The auction is expected to be completed by mid-May 2010.
Finland	800MHz	The 790-822MHz and 854-862MHz bands were allocated for radio microphones and can continue to be used for this purpose until further notice. The regulator is currently studying the other frequencies in the 790-862MHz band which can be used for purposes other than TV broadcasting, and to harmonize with the EU approach.
	2.6GHz	In November 2009, FDD spectrum was awarded to Elisa (2x25MHz), TeliaSonera Finland (2x25MHz) and DNA (2x20MHz); 50MHz of TDD spectrum was awarded to Pirkanmaa Verkkö.
Germany	800MHz	The 790-862MHz band has been harmonized with the EU approach. At the time of writing the auction is ongoing.
	2.6GHz	BNetzA has made available 14 blocks each of 2x5MHz (paired) in the 2500-2570MHz and 2620-2690MHz bands and ten blocks of 5MHz (unpaired) in the 2570-2620MHz band. At the time of writing, the auction is ongoing.
Norway	800MHz	In September 2009, NPT decided to make available the 790-862MHz band for mobile communications and mobile broadband. During 2010, it plans to study the regulatory conditions and possibly auction these frequencies.
	2.6GHz	In November 2007, 190MHz of spectrum was auctioned in the 2.6GHz band. Netcom (TeliaSonera Norway) was granted 2x20MHz FDD; Telenor 2x20MHz FDD and 40MHz TDD.
Netherlands	800MHz	The 790-862MHz band was allocated in 2006, to KPN and public broadcasters. Licenses are valid until 2017 and should be used for digital terrestrial television. In September 2009, the Ministry of Economic Affairs issued a public consultation on harmonizing the 790-862MHz band with the rest of the EU.
	2.6GHz	In April 2010, OPTA auctioned 190MHz of the 2.6GHz band (38 blocks of 5MHz). The winners were: 2x20MHz paired spectrum each for KPN and Vodafone, 1x10MHz for T-Mobile, 4x40MHz for Tele2, and 4x40MHz for Ziggo 4.
Sweden	800MHz	How to allocate the 790-862 MHz frequency band is currently under consultation, with an auction expected to take place during Q1 2011.
	2.6GHz	In May 2008, the PTS auctioned 190MHz of the 2.6GHz band. 50MHz of TDD was won by Intel Capital Corporation; 2x20MHz FDD were awarded to Tele2, Telenor and TeliaSonera; H3G won 2x10MHz FDD.
UK		Awards of both the 800MHz and 2.6GHz have been delayed indefinitely owing to a dispute between operators over how Ofcom should implement the spectrum refarming decision to allow UMTS900. A statutory instrument was put before Parliament following the work of an independent spectrum broker. However, the decision to hold a general election has interrupted this. It will now be up to the next government to decide how to proceed.

spectrum mean that, at lower frequencies, airways travel further and can penetrate buildings well.

It is for this reason that the digital dividend—the spectrum that is freed-up on switchover from analogue to digital TV—is also of interest. As such, in the medium term, we expect the digital dividend frequencies to be used for wide-area and in-building coverage, achieved with a small number of base stations, complemented by the 2.6GHz band to achieve a good amount of capacity for large numbers of end users in dense (urban) environments.

On the whole, the 2.6GHz and 800MHz bands will be the most popular, but in some instances (such as in Finland, France, and the UK) operators are considering re-farming existing bands—notably the 900/1800MHz bands. However, both these bands are heavily used by existing technologies and clearing them will not be straightforward (the UK provides a good example of the challenges that will be faced). As such, LTE will coexist with legacy mobile network technologies for at least the next ten years, particularly since GSM will still provide the backbone of voice communication. □

**MOTOROLA**

4G Double Vision: Why Two 4G Standards Can Coexist

In an industry that makes a habit out of squabbling over technology standards, the move to 4G wireless networks is no different. But Motorola's Bruce Brda explains that two standards can coexist peacefully and more importantly work together to meet market needs.

Nearly a decade ago, the wireless industry was in search of the "killer app." What compelling applications would spur end users to adopt mobile data services? Operators were looking for ways to fill their 3G networks with subscribers. Today, it's the Internet experience that has customers flocking to 3G networks, and generating demand is no longer the issue. People on the go want access to the same content they experience on their tethered computers, while people in many developing countries are connecting to the Internet for the first time via their mobile devices.

The trend is certainly boding well for the world's 3G operators. Wireless broadband demand is skyrocketing. Operators now look to the next generation of mobile technology to enable them to meet this demand—all-IP 4G networks that dramatically boost data speeds and offer greater capacity to handle the increasingly heavy load brought on by users shifting their landline Internet habits into the mobile world. Most importantly, 4G networks will usher in the network architecture required to drive down the cost per bit to ensure that operators can continue to meet the heavy demands of their users.

Video consumption is a prime example of data traffic that is outstripping revenue. Thanks to flat-rate 3G data tariffs, end users are watching YouTube, movies, clips and anything else they can get their hands on at a rate that is astonishing to mobile operators. Recent data released from The Nielsen Company reveals that more than 15 million Americans were viewing video from their devices in the

second quarter of 2009—a 70 percent increase year over year. "The Internet has taught us that video is going to be one of the prime applications going forward," said Bruce Brda, senior vice president and general manager of Motorola's Networks Business. "Networks that are optimized for video performance will do the best."

The reduction in the cost per bit in the 4G world coupled with enhanced data speeds will drive a wider audience for broadband, making it an essential part of economic growth, noted Brda.

"Governments are beginning to view broadband as an essential utility comparable to road and rail infrastructure," Brda said. "They support broadband because it can be an engine for economic growth, educational opportunities and even lower the cost of delivering key government services."

The European Union, for instance, estimates that greater broadband access will create one million European jobs and boost the economy by 850 billion euros between 2006 and 2015.

The cost metrics of 4G will also expand applications beyond consumer broadband access to include e-readers, machine-to-machine communications, telematics and mobile IPTV.

But the key question on a lot of minds is: What technology will usher in this new network paradigm? The answer, according to Brda, is two technologies, coexisting side by side and serving the different business needs of operators around the world.

In an industry known for its technology standards squabbles, the debate over 4G standards has been no different. Mobile WiMAX technology, otherwise known as

802.16e, and Long Term Evolution (LTE) technologies have emerged as the two 4G choices. However, one standard, mobile WiMAX, is available today, while the other, LTE, will begin commercial launches in 2010 but will not hit the market in a meaningful way until roughly 2012. As such, evaluating the 4G network options isn't really a technology analysis at all—it's a business decision for operators.

Brda is urging operators to change their mindset by focusing on the market need they are trying to fulfill with mobile broadband and adopt the technology platform that best fulfills that need without becoming tangled in the technology debate.

"The LTE customer base already knows who they are, while the WiMAX customer base also knows who they are," explains Brda. "LTE will be the natural upgrade path from today's networks by mobile operators. WiMAX will be a factor in any other decision, namely amongst green-field operators or those that want a time-to-market advantage. Both technologies are viable."

Indeed, mobile WiMAX, which now has a global footprint with more than 500 deployments in 145 countries, is filling a business need for a variety of different mobile players—many of which are not traditional mobile operators at all.

In Malaysia, REDTone is using mobile WiMAX to bring broadband access to the underserved while Unwired in Fiji is offering educational resources in remote areas. Australian energy company SP AusNet is using mobile WiMAX to deliver advanced metering capabilities. According to the WiMAX Forum, 25 percent of all applications for U.S. federal broadband

"The reality is, we will connect more people at a faster pace with more than one viable solution. Fundamentally, operators need to do what they do best: use the most appropriate combination of technologies to solve their business problems and enhance their market success."



Bruce Brda
Senior vice president
and general manager,
Motorola networks

stimulus money were from applicants that intend to use WiMAX.

The momentum mobile WiMAX is experiencing is actually pushing the development of LTE. "And that is okay with us," Brda pointed out. "We have taken what we've learned from the past two years of commercial WiMAX deployments and field experience and tailored that knowledge for the LTE marketplace."

In fact, about 70 percent of Motorola's mobile WiMAX research and development spend and equipment is reusable in LTE networks. Also, Motorola has developed a portfolio of LTE products that build on its existing WiMAX products, stated Brda.

"We are well down the learning curve due to WiMAX and it will directly impact our early LTE deployments because the concepts are reusable between the two technologies," Brda emphasized. "As we roll out our first commercial LTE networks, they will be based on the same hardware as our third-generation WiMAX platforms."

Motorola's experience with WiMAX networks has enabled the company to identify and solve mobile broadband issues that have not yet surfaced in the LTE world. For instance, large-scale voice traffic is running over Axtel's mobile WiMAX network in Mexico, while voice over LTE has yet to be standardized. "We've solved a lot of challenges around QoS related to voice over WiMAX," Brda said.

Another key element that has yet to be solved on the LTE front is the scheduler, which determines what data services – such as real-time voice and video – are given priority in a mobile broadband network. Brda revealed Motorola is also well down the learning curve in that area,

and is working with key customers to optimize their scheduler requirements.

Mobile WiMAX expertise will also be leveraged in Time Division Duplex (TDD), or unpaired spectrum, implementations of LTE. TDD spectrum is increasingly being viewed as ideal spectrum for heavy data consumption as operators can allocate more capacity to either the downlink or uplink, depending on the applications. Frequency division duplex (FDD), used by voice networks today, have uplink and downlink allocations that are balanced, which isn't the most efficient way to transmit data, Brda explained. Mobile WiMAX is a TDD-based technology, and several operators, including China Mobile, are keen on deploying TD-LTE because of their spectrum allocations.

Motorola recently deployed the world's first pre-commercial TD-LTE showcase network at World Expo 2010 in Shanghai. China Mobile Communications Corporation (CMCC) selected Motorola to be the main equipment supplier to provide indoor TD-LTE coverage for pavilions at the Expo. During the Expo which runs May 1 – October 31, Motorola is providing an advanced end-to-end TD-LTE solution and the world's first TD-LTE USB dongles. Motorola is also leveraging its orthogonal frequency division multiplexing (OFDM) expertise with professional services to deploy, maintain and optimize these leading-edge networks. Visitors will be able to experience applications such as high-definition video on demand, remote monitoring and high-speed Internet access services.

"With the demand for data that exists around the world, TD-LTE will be part of

the ultimate solution set that solves the equation," Brda said. "There is a requirement for a wide set of technology solutions and TD-LTE will play an increasingly important role, likely coexisting in the same network as FDD LTE."

He indicated that Motorola is in discussions with a number of European operators that envision TD-LTE and FDD LTE coexisting. "You could have one set of services carried over the TDD network and another set going over FDD," he suggested. "It would create a more efficient use of the network, but I also think that TDD spectrum will become available at much more affordable prices."

In the end, the 4G world will be characterized by a combination of solutions to meet end users' demand for data services. However, adopting that mentality means the mobile industry as a whole needs to move away from the technology debate.

"The reality is, we will connect more people at a faster pace with more than one viable solution," Brda concluded. "Fundamentally, operators need to do what they do best: use the most appropriate combination of technologies to solve their business problems and enhance their market success. As the only vendor in the industry that has expertise in, commitment to and investment in all technology options—licensed and unlicensed, WiFi, WiMAX, FDD-LTE and TD-LTE, Motorola offers the broadest set of alternatives to deliver 4G. This is what operators need to fulfill the demands of data hungry users, improve their media experience and generate a profit in the process." ■

A radical approach to the future

Leading Hong Kong operator CSL has its 4G plans well underway, aiming to launch commercial LTE services within the next year.

Hong Kong operator CSL is, much like its chief executive, philosophical and practical when it comes to preparing for the future. The carrier launched a commercial trial of LTE in November 2009, and already has 40 cell sites where LTE is operational. The technology works too—during a recent trip to CSL's headquarters, *MCI* experienced a live demonstration of the system, which CSL hopes to make commercially available by late 2010 or early 2011.

It's an ambitious turnaround, taking an entirely new network technology from testing to commercial deployment in around 16 months, and it's not been without its lessons.

In October 2006, CSL parent Telstra marked a world first with the launch of its Next G-branded HSDPA network, offering customers throughput speeds of 14.4Mbps. Around the same time, Telstra executive Tarek Robbiati was appointed chief executive of CSL (and more recently head of Telstra International), and given the task of reproducing Telstra's 3G business model in a new, and very different, market.

"When I came to Hong Kong I intended to replicate the Telstra model and success, using the same design and engineering principles," he says. "I tried to do that for a few months before realising that the challenge in Hong Kong was a little different, and we needed to replace our infrastructure in the country."

It's a realisation that many mobile operators may well have reached that but the difference with Robbiati is that he acted upon his own conclusion without hesitation. CSL

discontinued its long standing relationship with Nokia Siemens Networks (NSN) and ripped out all of the NSN supplied infrastructure, replacing it with an all-IP 3G platform provided by Chinese vendor ZTE.

It was a move that would be deemed risky by some but Robbiati is dismissive of what he calls the "sentimentality" of engineers and managers to their legacy network infrastructure. "You have your legacy infrastructure and you have engineers who are too enamoured with that legacy infrastructure, so they don't want to take the bold steps of removing that legacy infrastructure. It's what I call the opportunity cost of legacy," he explains. "So you end up sticking with the old technology and just making incremental improvements, but if you want to do something radical then just change the way you do it."

What CSL ended up with, according to Robbiati, is: "A data network optimised for voice, not a voice network sub-optimised for data. It's an important distinction to make because, prior to this, 3G networks were effectively voice networks operating in 2100MHz—they over-promised and under-delivered."

As a result, says Christian Daigneault, CTO of CSL, says the operator does not have the capacity constraints suffered by O2 in the UK and AT&T in the US in the wake of the launch of data hungry devices such as the iPhone, as the network is designed from the ground up for heavy data usage. In the future, when 4G is providing the throughput required, "latency will be the differentiator," Daigneault says.

CSL launched its HSPA network, under the same 'Next G' branding as Telstra, in March 2009. The company progressively replaced its old 2G network with HSPA+ capable equipment offering headline speeds of 21Mbps on its all IP network. Since then, CSL has launched UMTS900, by refarming its 2G spectrum, giving it a very powerful network, with much better in-building coverage, outdoor coverage and speed. Given the design, Daigneault claims CSL doesn't need to roll out LTE everywhere, as HSPA+ will pick up the slack in areas of less demand.

The CSL CTO reveals that at present, only 20 per cent of its current data usage comes from handsets. The other 80 per cent comes from dongles, which are turning into a significant success story.

Spectrum is key to CSL's business model, both current and future, and Robbiati openly admits that CSL was "lucky" with the timing of the 4G licence auction in Hong Kong in January 2009, winning 2.6GHz of 4G spectrum and ending up with more than twice the amount of spectrum (127MHz) than its closest competitors—the closest rivals being PCCW and 3 with 89MHz of spectrum apiece. According to Daigneault, this translates into less congestion and higher data throughput, and is also where ZTE's experience in SDR (software defined radio) comes in useful as it gives CSL the advantage of being able to exploit multiple spectrum frequencies. "Radio was a limitation in the past, but not anymore," Daigneault said. "If you have all this spectrum and software defined radio you can do a lot of things with it." »



The Importance of Subscriber, Service and Policy Control in LTE

by David Sharpley
Senior Vice President, Bridgewater Systems



The mobile data industry has evolved rapidly over the past two years, with the impact of growing 3G penetration, lower-cost smartphones, and USB laptop dongles, the popularity of mobile applications, and flat-rate data plans. This has resulted in huge growth in data traversing operators' networks.

Mobile operators are realizing the need to optimize their 3G networks and transform to 4G to manage mobile data growth.

The LTE Opportunity

LTE technology has emerged as the next generation technology that will lead the growth of mobile broadband services in the next decade. It is expected to generate unprecedented economies of scale as it becomes the universal 4G mobile platform used by both HSPA and EVDO operators.

It is critical to delivering the lower cost per bit, higher bandwidth, and subscriber experience needed to address the challenges of mobile broadband. It offers:

- ▶ **Significant speed and performance improvements** for multimedia applications at a lower cost;
- ▶ **Enhanced applications** such as video blogging, interactive TV, advanced gaming, mobile office, and social networking; and
- ▶ **A wider variety of devices** such as smartphones, tablets, and video devices as well as machine-to-machine devices for healthcare, transportation, and other industries.

To be a significant contributor to end-to-end service creation and enrich the subscriber experience, the LTE network must support an agile, scalable, and open approach. This will depend on:

- ▶ The network's capacity to support peak user data rates, high average data throughputs, and low latency;
- ▶ The ability to leverage existing 3G infrastructure investments with a network migration path to LTE;
- ▶ Ensuring service continuity for existing revenue-critical 3G services, while supporting the rollout of new 4G services;
- ▶ Balancing insatiable demand for mobile data services with LTE dependencies on spectrum, and a supporting devices and applications ecosystem; and
- ▶ Innovative and personalized service plans that encourage mass market adoption.

The LTE Evolved Packet Core (EPC) plays an important role in meeting these challenges and is a fundamental shift in mobile networks towards a service-aware, all-IP infrastructure. It has the potential to deliver a higher quality of experience at a lower

cost, and improved management of subscribers, applications, devices, and mobile data traffic.

However, bandwidth is a limited resource in much the same way as electricity is. In the utility sector, smart meters are being used to manage electricity consumption by encouraging increased usage during off-peak hours with lower rates and decreased usage at peak hours with higher rates.

Operators will need to adopt a similar approach by supplementing capacity improvements with controls that manage the flow and demand for data. This is where the key control components of the EPC including the Home Subscriber Server (HSS), Policy Controller (PCRF), and inter-working functions (3GPP AAA) come into play. Together they form the central control plane and include the main repository for subscriber and device information, provide authorization and authentication functions for services, apply policies to manage network resources, applications, devices, and subscribers, and ensure inter-working with other access networks such as EVDO, WiMAX, and Wi-Fi.

As the cornerstone for mobile personalization and network optimization, these 'smart' subscriber, service, and policy controls enable mobile operators to moderate data traffic and entice subscribers with innovative, personalized services. Examples of smart controls are shown in Table 1.

Getting Ready for LTE

Operators are deploying subscriber, service, and policy controls in 3G networks today and not waiting for LTE. In this way they can derive the full benefits of these capabilities and easily evolve to LTE. Benefits include smoother service migration and better management of mobile data traffic and applications such as the ability to direct traffic and applications to the optimal access network. This can result in significant capital and operating cost savings.

LTE represents a significant opportunity for mobile operators to meet the challenges and opportunities of exponential mobile data growth by complementing capacity and infrastructure investments with smart subscriber, service and policy control. This approach enables operators to control capital costs, manage the flow of data traffic, and create innovative and personalized service offers that entice subscribers and ensure profitability.

Table 1: Smart Controls

Network Policies	Application and Device Policies	Subscriber Policies
Apply Smart Caps™ – flexible, real-time bandwidth caps that ensure fair usage. Implement tiered services using policy controls to ensure quality of service. Apply service controls to offload data traffic to a Wi-Fi network to optimize network resource usage.	Design service plans that give priority to certain applications over others depending on personal preferences. Provide incentives to use applications at certain times of day, or in certain locations. Charge a premium for application usage during peak times or busy locations. Use device policies to direct applications to the most appropriate device.	Give subscribers control by allowing them to manage their mobile data usage, set limits and notifications, and prioritize applications. Provide special offers based on subscriber location such as a roaming day pass.

Case study | CSL

Daigneault claims that since the operator launched its Next G offering, mobile data traffic has increased 23-fold. ”



Both Robbiati and Daigneault wax lyrical about the possibilities afforded by SDR. “ZTE’s superior technology in SDR was very important in our decision making and particularly relevant for Hong Kong because spectrum here is technology neutral,” Robbiati says. “This means you can reuse 2G spectrum (900MHz in this case) for 3G services because the radio access network is software configurable. It’s the perfect technology for the Hong Kong environment because you can refarm the spectrum at zero cost of spectrum, although you need to invest in technology (infrastructure) but not in spectrum.”

In general, Robbiati is critical of the regulation binding technology to spectrum across the rest of the world, saying it, “needs to evolve.” He continues:

“Most licenses that were issued in Europe around 900MHz mean that if you got the spectrum you were only allowed to offer 2G services. It was forbidden to use that spectrum for 3G. It may be that governments want to sell another licence, a 3G licence to operators, but the reality is that spectrum is finite and you need to use it in the most efficient way possible. So you need to relax the regulation around the spectrum, and licence the spectrum to operators so they can use it in whatever way they see fit,” he says, acknowledging a similar proposition from the UK’s Lord Carter in the Digital Britain report.

“What worries me on a macro level is that, if you look at the Western world over the last 25 years, infrastructure investment as a percentage of GDP has gone down, and that goes for telecoms, energy, water, airports,

railroads. If you look at China they have taken a very different approach. You could argue the telecoms market is less competitive, but at least they’ve invested in infrastructure to spur economic growth. In India, the government still issues one licence at a time to create funds and as they raise funds there is less opportunity to invest. So you attract players that are not in it for the long term and not committed to an investment mandate. It’s very concerning. So you end up with infrastructure that’s not capable of handling this new type of demand and you end up with lots of consolidation.”

The CSL chief is also quick to note the unsustainability of flat rate ‘unlimited’ data packages with the explosive adoption of mobile broadband services and dongles.

“Saying data is ‘unlimited’ is disingenuous. If you have a car that is only driving in first gear, yes you can drive it in unlimited fashion but you can’t get very far,” Robbiati says. “All the conventional networks are poor quality and poor coverage, so we’ve changed the game. In Hong Kong, lots of people in remote areas don’t have broadband, and the terrain is not easy to deploy in, so their only option is wireless. We are betting that customers value the speed we offer, and if they do value the speed then we win.”

CSL’s wireless broadband offering differs from pretty much every other offering in the world, because it’s based on speed, not usage. “We have gone with speed-based pricing, which no one else in the world has done. If you want to be running a Fiat you pay one price, if you want a Ferrari you pay more,” Robbiati says. “It’s all about expe-

riencing the different network experience without facing bill shock. Because you have a flat rate with certain bandwidth available.” Daigneault claims that since the operator launched its Next G offering, mobile data traffic has increased 23-fold.

Again, Robbiati links CSL’s pricing model for mobile broadband to the decision to rip and replace its old network. “Traditional networks were designed for small data consumption. We were left with no choice but to provide speed-based pricing,” he says.

“You need to get the customer to value the experience. If the customer is used to poor service you need to change the perception of the customer and that is a huge challenge. In Hong Kong we can sell 850 minutes for HK\$35, that’s less than US\$5 per month, then I’ve got bad debt and all sorts of other costs I need to recover, that’s how crazy things have become. People in the Hong Kong market have trashed it to the point where it is insane. As Confucius said: “Quality is not cheap and cheap is not good”. So when you get to the point where your infrastructure is going to collapse because it has been underinvested in and that’s where the trouble starts.”

So how does an operator address this issue? “We can’t stand still, we have to add intelligence to the network. There are a lot of things you can do, like platform services that have applications, and services in the cloud are also very interesting,” Robbiati says, indicating that, for CSL, the future will be all about the service offering. “We’ve done all the hard work on the infrastructure already so now we can concentrate on the services,” Robbiati says. □

The world's only globally-focused WiMAX trade show

PLATINUM SPONSORS



GOLD SPONSOR



BRONZE SPONSORS



3rd Annual...

2000+ Attendees

125 Countries

60+ Speakers

40+ Exhibitors

100% WiMAX Forum



60+ SPEAKERS

Leveraging the Global WiMAX Ecosystem
to Deliver Profitability and Subscriber Growth
16th - 17th June 2010 • RAI, Amsterdam

FREE
TO ATTEND
EXHIBITION



Official Event of:



Produced by:

informa
telecoms & media

BOOK NOW! www.wimaxforumglobalevents.com/global

COMPRION

LTE - everything under control ?

LTE test cases:

- 3GPP TS 31.121 Rel-8 USIM
- 3GPP TS 31.124 Rel-8 USAT



Get stable with COMPRION test tools -
for the Long Term.

www.comprion.com

From strength to strength



Sabah Hussain, senior conference researcher at Informa Telecoms & Media, looks forward to the 2011 LTE World Series.

The LTE World Series has seen an incredible amount of growth and support from across the industry in 2010 so far. It is now seen as the global event series where operators and vendors come together to discuss the future of next generation of mobile networks. The series in 2011 will be bigger and better in terms of operator announcements, deployment case studies and presentation on business models and strategies for LTE. The LTE World Series will also grow to include a conference specifically for the Middle East and North Africa region.

Key topics for 2011:

With trials taking place across the world and 22 LTE launches expected this year alone, various operators from across the world will be at the conference to give their feedback on real LTE user experiences, an analysis of the cost per bit of running an LTE network and to reveal whether it really is possible to charge more for higher speeds and for better QoE.

With spectrum auctions expected to be ongoing in 2011, discussion on key bands for LTE and equipment availability in those bands will be an important point of discussion. A range of multi-mode devices are also likely to become available in a year's time and the conference is expected to focus once again on SDR (software defined radio), how to bring down the cost and complexity of multi-mode devices to encourage

mass adoption of LTE and how to ensure roaming across the world. Profiting from connectivity in a wide range of devices such as cameras is a key issue that needs to be discussed. The LTE World Series will bring together handset and consumer electronics companies to discuss their business models as embedding mobile broadband into their devices becomes an attractive proposition.

The technology challenges with O&M and migration paths to LTE will also be a hot topic for discussion. As SON (self organising networks) is becoming a must have for operators looking to deploy LTE, the conferences will include case studies on how to optimise LTE to improve network performance and employing SON to manage the network, reduce cost and increase efficiency.

With work already underway with LTE-Advanced specifications, presentations giving us an idea of what is beyond LTE and how and when operators should upgrade to true 4G will also be made.

Expanding the conference series:

The LTE World Summit conference 2011 will be the largest event of the conference series. Over 150 speakers from operators and vendors alike will set out their vision for the future of mobile broadband and the challenges that the industry faces over the coming years. As the business models for LTE develop, the conference in 2011 will include in depth presentations and discussions on how mobile operators can continue

to create new revenue streams in the world of mobile internet, machine to machine communication, how they can increase the ROI for LTE and continue to reduce the cost of running the network.

The LTE World Summit 2011 will also feature its largest ever exhibition. Over 100 stands, meeting rooms and pods will showcase the latest LTE products and solutions, making the event the best place to meet, do business, learn and make buying decisions. As the exhibitions are not free for just anyone to attend, Informa Telecoms & Media can ensure that everyone at the event will be relevant to LTE in some way.

The series will continue to have conferences in Asia, North America, Latin America and a new event for the Middle East and North Africa region.

LTE Asia will continue to focus on key themes such as the progress with TD-LTE with case studies from China and possibly from other operators in Asia that will have access to TDD spectrum by the time of the conference. WiMAX and CDMA to LTE migration, spectrum fragmentation, device evolution and delivering innovative new services over LTE will be just some of the topics that will feature on the agenda. Over 80 speakers from the region will present at the conference and give their views on the challenges facing the Asia-Pac region.

The LTE North America will be the second largest conference in the series, after the LTE World Summit. It will have over 100 »

INFORMA CERTIFIED

LTE RADIO PLANNING PROFESSIONAL

4-Day Technology Training Programme

London, Amsterdam, Dubai, Dallas, Hong Kong

The Informa Certified LTE Radio Planning Professional programme provides a detailed look at LTE, concentrating on RF network planning, design and implementation, but also giving valuable insights into LTE efficiency, cost analysis against service propositions, and the effect of LTE adoption on the overall business plan. The Mentum Planet® LTE radio planning tool and Symena Capesso™ optimization tool add real value to the hands-on planning and analysis exercises.

11 Reasons to Attend:

This highly practical programme includes extensive hands on experience. Over the course of the 4 days you will:

1. Learn how to plan an efficient LTE radio network
2. Gain a clear understanding of the OFDMA principle of operation and how it is applied within LTE
3. Identify LTE modulation and coding schemes and explain how system performance is determined
4. List the logical, transport and physical channels of LTE and describe their function – relating the channels to service delivery and Quality of Service
5. Describe the way in which spatial multiplexing and spatial diversity is applied to LTE radio systems
6. Fully understand the role of MIMO and Adaptive antennas, and how they can be used to improve system performance
7. Use models to calculate path loss and nominal cell radius, and estimate the capacity required in a typical LTE cell – and factor capacity issues in to the radio planning process
8. Apply planning and optimisation processes using the industry leading software modelling tools Mentum Planet and Symena Capesso™
9. Use the tools to analyse and assess system performance under different implementation options
10. Relate performance and planning scenarios to service provision and relative implementation cost
11. Take the end of programme exam and demonstrate you have the skills and knowledge required to contribute significantly to the planning and implementation of your organisation's LTE strategy

"Excellent course, exactly what I was looking for"
AL, Airspan

Radio Planning and Analysis Tools:



symena



For more information and to register, contact us on:

Tel: +44 (0)20 7017 4144

Email: training@telecomsacademy.com

Web: www.schooloflte.com

Lte

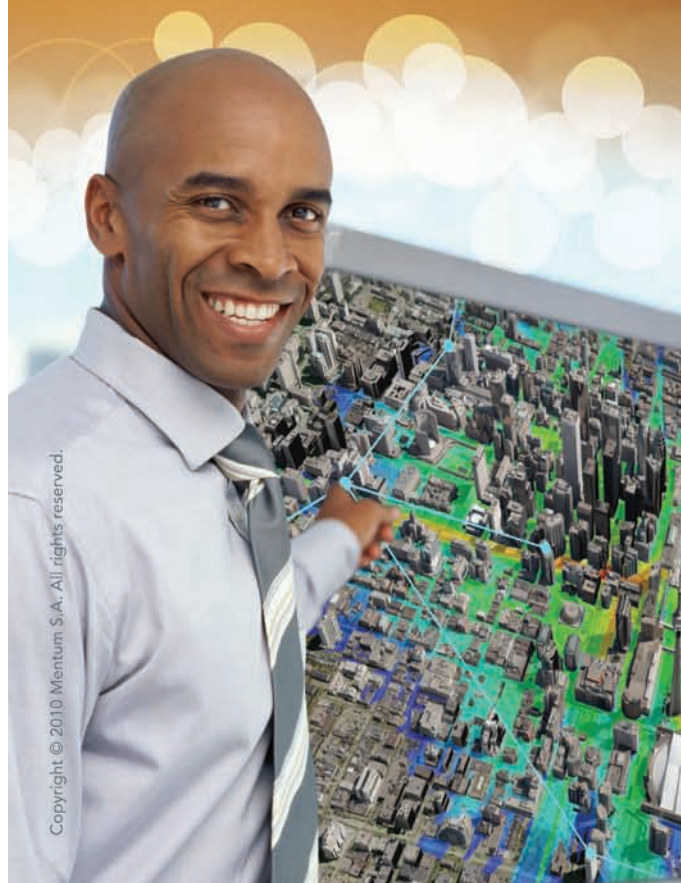
THE SMARTEST PATH TO SUCCESSFUL LTE DEPLOYMENT

Mentum is committed to driving innovation and providing operators with best-in-class network planning solutions. That's why we're pioneering advanced yet intuitive software that enables operators to make the right decisions.

Visit Mentum at booth 29 to learn how our solutions create more profitable wireless networks.



www.mentum.com



Show preview |



The LTE World Series will also include a spin off conference on SON (self organising networks). This conference will focus on the O&M challenges and how operators will have a more efficient way of optimising the network. ”

speakers from across the ecosystem, from operators, government officials, academics and vendors. As there is a vast amount of innovation happening in the North America region and operators choosing to replace their CDMA networks to join the GSM family of standards, the market is far more advanced when compared to the rest of the world. The conference will cater for the large tier one operators, but also the regional tier 2 and 3 operators that are looking at deploying LTE and see it as the best way to compete in a highly competitive market that has a huge demand for data. Rural broadband, net neutrality, devices and business models for LTE will be key themes on the agenda. The impact of Verizon Wireless's LTE Innovation centre and the development of new devices and business models involving MVNO's will also feature on the agenda.

There will also be a large exhibition around the LTE North America conference, as the event has become the place where anyone involved in LTE converges and it is seen as a key point in the calendar for people in the industry to network and learn about the status of LTE in North America.

Informa's LTE Latin America conference will be in its second year and will continue to focus on the challenges that the region faces with providing mobile broadband to the mass market and delivering a complimentary service to fixed line broadband and to WiMAX networks. Various trials have already taken place in the region by Entel PCS in Chile, Telefonica and Telmex expects

to launch LTE by 2011. Many other operators have committed to LTE trials and to deploying LTE at some point in the future. Network cost and deployment models - hotspot urban coverage or blanket coverage will be a key point of discussion.

Informa will also be launching its first ever LTE conference specifically for the Middle East and North Africa region. With commitments to deploy LTE from the likes of Zain, STC, Etisalat and Qatar Telecom, the region is becoming a hotbed of activity for LTE and other operators in the region are expected to follow and to begin trials soon.

All of the LTE conferences will feature all of the top analysts, including key individuals from Informa Telecoms & Media's Industry Research team. All of the analysts will have conducted in depth studies of the LTE market place and have detailed knowledge of the opportunities and challenges that operators face. Each analyst will lead a roundtable discussion in the Analyst Breakfast Briefing Session, which will be taking place on the morning of day two of the conference, just before the morning keynote session. The roundtables will run in parallel and each will be on a different topic chosen by the analyst, reflecting their area of expertise. Delegates already registered for the conference will be able to attend this session for free and take part in the discussion.

Spin off events:

The LTE World Series will also include a spin off conference on SON (self organising networks). This conference will focus

on the O&M challenges and how operators will have a more efficient way of optimising the network. Key themes for this conference will be self-configuring base stations, fault management and correction, automatic neighbourhood relations, interference and power control and load balancing.

For those interested in LTE, but who are more involved in the core networks side, the Next Generation Core Networks Summit will focus on the important area of SAE (System Architecture Evolution) and the EPC (Evolved Packet Core). Delegates attending this conference will learn and discuss how to simplify the core network to reduce latency and increase efficiency in the network. The programme will also focus on how to implement policy control, local turnaround and building an intelligent network.

The main highlight of the LTE World Series of conferences will be the keynote sessions, which will feature the top tier one operators from across the world that will be setting out their vision for LTE. -TeliaSonera, Verizon Wireless, Net4Mobility, eMobile, MetroPCS, T-Mobile International, China Mobile, AT&T, CSL, NTT DoCoMo, Telenor, France Telecom, Vodafone, KDDI, Cox Communication and even Sprint are just some of the big name operators that have given keynote presentations at the LTE conferences already. The industry can expect more announcements and be inspired by the vision of some of the most important thought leaders in the industry. □

Your Worldwide LTE Testing Partner

LTE™ Test Systems

- Early development, R&D and Conformance Testing
- Broad range of scenarios: RF, Protocol, Multi-RAT, Multi-Cell Testing
- Common hardware across the complete LTE test product family:

S3110B - LTE Mobile Test Application

T4010 - LTE RF Tester

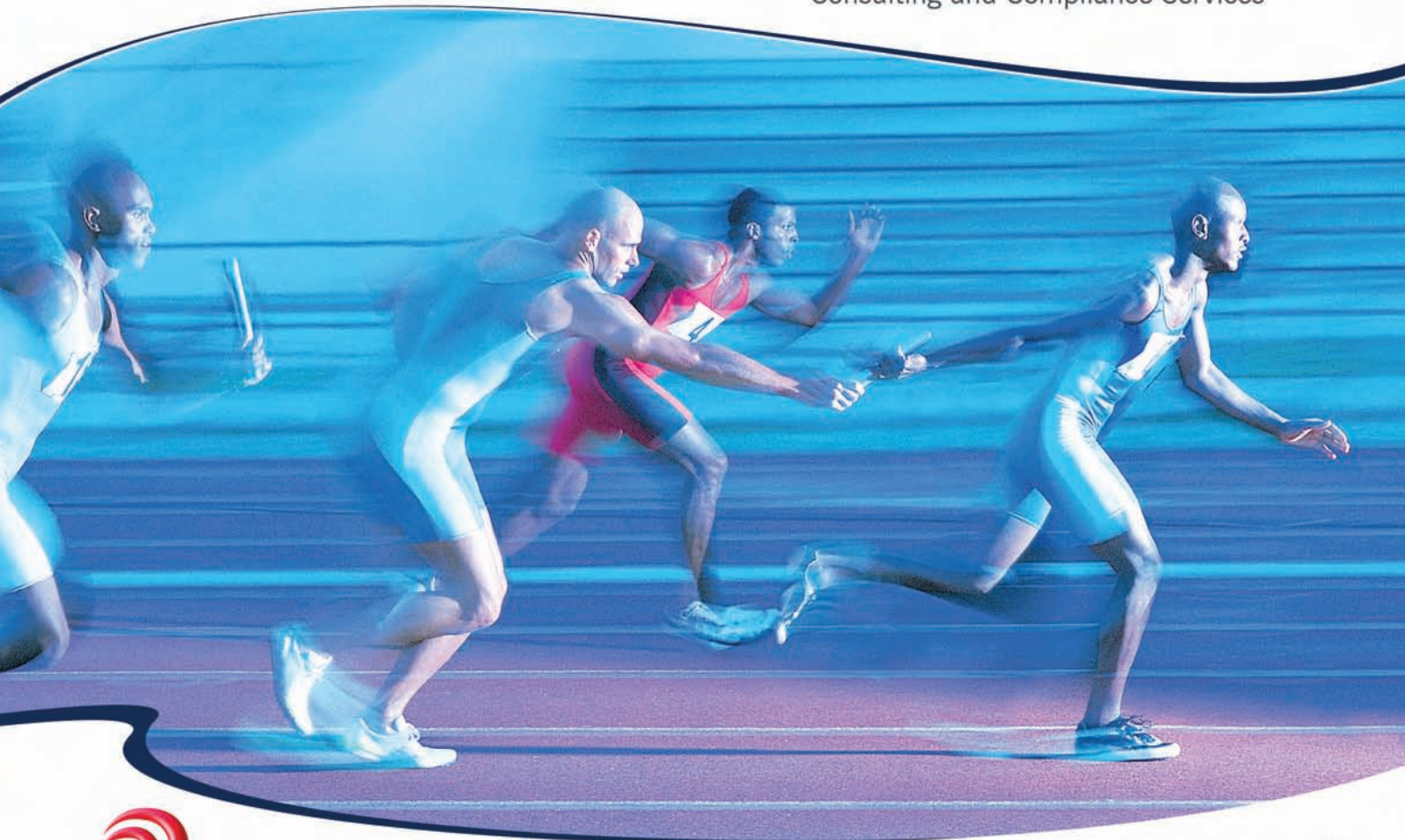
T4110 - LTE Protocol Tester

T4020 - LTE RRM Tester



LTE Testing Services

- Certification and Regulatory Testing
- Performance Testing
- Consulting and Compliance Services



www.at4wireless.com





Celebrating Innovation and Excellence in LTE

The first-ever Awards for the LTE industry looks set to highlight all the major achievements of the past 12 months.

2010 is a key year for the LTE technology. With initial deployments soon to be rolled out by operators including TeliaSonera, Verizon Wireless and China Mobile, the road towards 4G is now gathering speed at a staggering pace across the globe.

With this in mind, Informa Telecoms & Media, the organisers of the leading LTE World Series of events, and the 3GPP, have launched the LTE Awards 2010, taking place on the first evening of the LTE World Summit on Tuesday, 18th May 2010 at the Okura Hotel, Amsterdam.

The LTE Awards 2010 have been estab-

lished to celebrate excellence in the global LTE industry. The Awards recognise and celebrate excellence in the LTE community and will culminate in a Gala Dinner in the Grand Ballroom of the Okura Hotel during LTE World Summit 2010. These prestigious Awards also give winners and shortlisted companies a mark of quality, innovation and leadership.

The Award Winners will be announced at the LTE Awards Gala Evening, hosted by TV and Radio personality Paul Ross. The LTE Awards are also independently judged by our panel of regional experts:

» **Adrian Scrase**, VP International Partnership Projects, 3GPP, France

- » **Caroline Gabriel**, Head of Research, Rethink Wireless, UK
- » **Phil Marshall**, Senior Research Fellow, Technology Research, Yankee Group, USA
- » **Andrew Houghton**, Deputy Head of Unit, Future Networks, European Commission, Belgium
- » **Simon Saunders**, Chairman, Femto Forum, UK
- » **Dan Warren**, Director of Technology, GSMA, UK
- » **Thomas Wehmeier**, Principal Analyst, Informa Telecoms & Media, UK
- » **Ajit Jaokar**, Managing Director, Future-Text, UK



The LTE Awards 2010 Entries Shortlist is as follows:

1. Best Network/Device Testing Product for LTE

This award recognises network and/or device testing products that are exceptional in their area. Entrants are required to describe their testing products and state why their product is different to others in the market and also what the impact has been to measure true LTE performance in real life conditions.

Shortlisted:

- »  Agilent Technologies (Entry 1)
- »  ROHDE & SCHWARZ (Entry 1)
- »  ROHDE & SCHWARZ (Entry 2)
- »  Tektronix (Entry 1)

2. Best Contribution to LTE Standards (Individual or company)

This award recognises the contribution made to LTE standardisation. Entrants are required to state the contribution made to the development of standards and specifications and their contribution to helping the industry to standardise LTE technology.

Shortlisted:

- »  Nokia Siemens Networks
- »  ERICSSON
- »  HUAWEI
- »  GSM

3. Significant Progress for a Commercial Launch of LTE by an Operator

This award recognises the progress by operators in preparing to the deployment of LTE. Entrants will need to state the progress being made in launching LTE, in which markets will LTE be deployed, how they have developed the ecosystem to get it in place, what services are being developed alongside the network rollout, what are the strategies to educate customers and attract them to LTE and how will LTE be branded.

Shortlisted:

- » 
- » 
- » 

4. Significant Progress for a Commercial Launch of LTE by a Vendor

This award recognises the activities by vendors in making the case for a commercial rollout of LTE, including the launching of trials, commitment and investment into LTE development over other technologies and customer contracts awarded as a result. Entrants are required to explain the activities undertaken and the impact that this has had on making LTE a commercial reality.

Shortlisted:



- » 
- » 
- » 
- » 
- » 

5. Best Enabling Product/Technology for LTE

This award recognises the achievements in producing enabling technologies for LTE. Entrants are required to describe the enabling technology and how it contributes to making LTE more attractive to an operator to deploy, explain how it contributes to improving the network QoS and/or QoE for the user, how has this been measured and how the product/technology is different to anything else on the market and the commercial success of the technology so far.

Shortlisted:

- » 
- » 
- » 

- » 
- » 
- » 
- » 

6. Best Contribution to Research & Development for LTE

This award recognises the contribution towards the research and development of LTE. Entrants are required to describe the investment made into R&D for LTE, opening of labs, the results from research, number of patents that have been filed and describe how the R&D activities have had a positive impact on making LTE commercially successful.

Shortlisted:

- » 
- »  (Entry 2)
- » 

7. Best Green LTE Product or Initiative

This award recognises the achievement to make LTE more environmentally friendly.

Shortlisted:

- » 
- » 
- » 

8. Award for Individual Contribution to LTE Development

This award is for an individual who has made a significant contribution to the development of LTE. Entrants are required to explain the work that has been done and the impact that this has had on the development of LTE and making it a commercial reality.

The winner of Category 8 will be announced on the night!

List of Judges



Adrian Scrase, 3GPP

Adrian Scrase played a central role in creation of the 3rd Generation Partnership Project (3GPP) and is responsible for the operations of the 3GPP Project Co-ordination Group.

He also Heads 3GPP's Mobile Competence Centre (MCC) which is an International team of 20 experts who provide comprehensive support to the Project.

Adrian has more than 25 years experience in the telecommunications field, which includes more than 20 years of experience in International standardization. He is Vice President within ETSI with responsibility for International Partnership Projects.

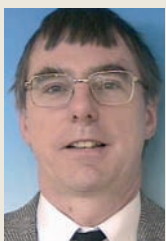


Ajit Joaker, FutureText

Ajit is the founder of the London based publishing and research company FutureText which focusses on emerging Web and Mobile technologies. His thinking is widely followed in the

industry and his blog, The OpenGardens-Blog, was recently rated a top 20 wireless blog worldwide and he is best known for his books Mobile Web 2.0, Social Media Marketing.

He has also worked with a range of commercial and government organizations globally including The European Union, Telecoms Operators, Device manufacturers, social networking companies and security companies in various strategic and visionary roles.



Andrew Houghton, European Commission

Andrew Houghton is Deputy Head of the Unit "Future Networks" in the Directorate-General Information Society and Media of the European Commission, in Brussels,

Belgium. After five years with BT Research Labs, he joined STC /Northern Telecom Optoelectronics, in production of compo-

nents for optical communications systems. He then joined the European Commission as a Project Officer, initially in the area of optical networks and subsequently in the area of "Broadband for All" and the area of "Mobile and Wireless Beyond 3G".

He is currently responsible for projects of the ICT FP7 Research Programme, in the "Network of the Future" Objective.



Caroline Gabriel, Rethink Technology Research

Caroline Gabriel is the co-founder and research director of Rethink Technology Research, a London-based analyst and consulting firm, which

specializes in operator business models using emerging technologies. In particular, the company's research and consulting focus on advanced wireless technologies such as WiMAX, LTE and 4G, and on the economics of the quad play. Caroline has been analysing the telecoms and technology sectors for over 20 years and was previously European content director at VNU Business Publishing, one of the world's largest technology publishers.



Dan Warren, GSMA

Dan Warren joined GSMA in 2007 as Director of Technology, with the remit to provide technical expertise for both Project and Working Group activities within GSMA, as

well as to be the technical reference point for the broader scope of GSMA's work. Dan has a particular focus on matters relating to IMS, LTE and SAE, HSPA and the development of the IPX. Dan also leads GSMA's activity and strategy in Standards Groups and acts as the Industry Relations Director for interactions with Standards Organisations and other fora.



Philip Marshall, Yankee Group

Philip Marshall, Ph.D., is a senior research fellow at Yankee Group. His research is currently focused on service provider transformation strategies and advanced

wireless technologies. Dr. Marshall joined Yankee Group in 2000, holding various roles including managing Yankee Group's technology research.



Simon Saunders, FemtoForum

Professor Simon Saunders is one of the world's leading authorities on femtocells and is currently chairman of the Femto Forum. As chairman, Simon works to

drive the uptake of femtocell technologies through open standards, market education and ecosystem development. He is an independent wireless communications specialist with more than 20 years industry experience.



Thomas Wehmeier, Principal Analyst, Informa Telecoms & Media

Thomas Wehmeier is a Principal Analyst within Informa Telecoms & Media's Industry Research division, where he heads

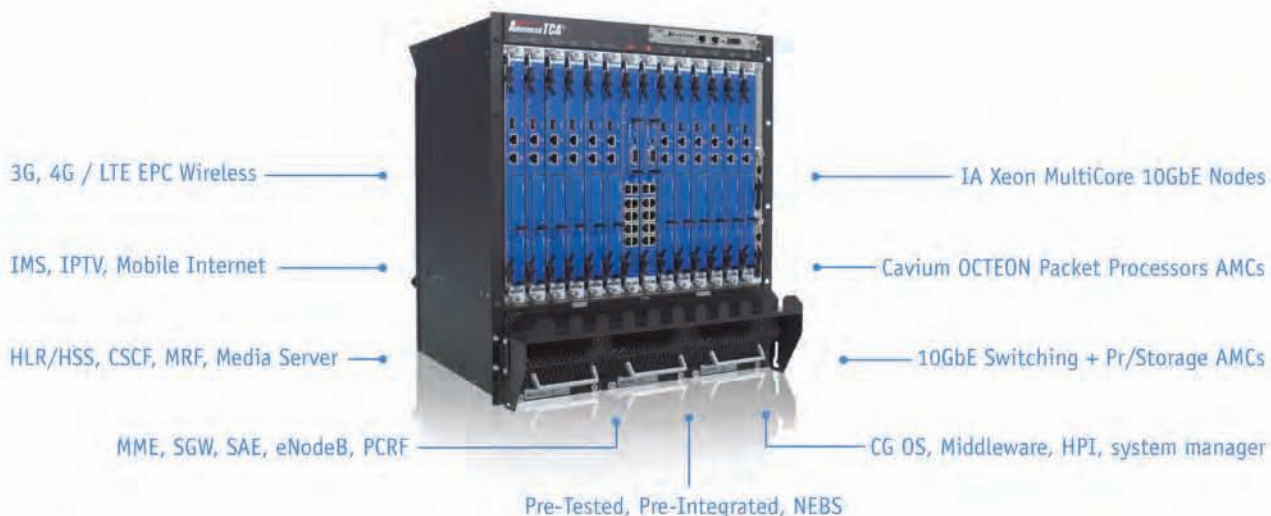
up its regionally-focused research team. His specialized interests lie in analyzing mobile operator strategies, in particular looking at the impact of technological evolution from 2G through 3G to 4G from an operator perspective. Thomas also looks closely at the impact of regulation on mobile operator business models. Thomas has presented frequently at international events and is regularly quoted in the mainstream and trade press.



» Now is the Time — To Buy «

Enjoy the Freedom to Design LTE EPC Systems Your Way.

Make vs. Buy? — no question now is the time to outsource your LTE EPC system design projects onto application-ready ATCA and/or MicroTCA (xTCA) open communication platforms. Why? Simply because time's a-ticking and carriers are evaluating LTE now to be first to launch and monetize higher bandwidth services. Work with Kontron to build scalable LTE EPC and IMS systems that shave up to half of your CAPEX and up to 12 months development time. What else can we do for you? Easy. Contact Kontron to find out more. More Choice. More Innovation. More Success.



OPEN COMMUNICATION PLATFORMS

Call, Email or Visit today.

EMEA + 49(0)8165 77 777
NA +1-888-294-4558

EMEA: info@kontron.com
NA: info@us.kontron.com
Catalogue, WhitePapers: Kontron.com/OCF

Lte™



WORLD SERIES 2010

(LTE is a trade mark of ETSI)

**DON'T MISS OUT ON THE REST OF THE
LTE WORLD SERIES IN 2010!**

**"Attendance is a must
for anyone in the
mobile industry"**

(SH, VODAFONE)

Strategic Partner:



A GLOBAL INITIATIVE

(3GPP is a trade mark of ETSI)

The 5th



ASIA 2010

(LTE is a trade mark of ETSI)

8-9 September 2010

Kowloon Shangri-La Hotel, Hong Kong

**50% Operator
Attendance at LTE
Asia 2009!**

- **500+** high-level attendees from across the region
- **80+** senior-level speakers
- **30+** exhibitors, meeting rooms & hospitality suites
- **Product showcases** and **live device demonstrations** from key vendors in this space

**LTE Asia 2009 attracted 250+ attendees
from over 100 organisations across 28 countries!**



*"...at this event we have visitors from 28
different countries with what I have noticed,
a very high number of actually operators"*

(RM, MR - WIRELESS BUSINESS, PCCW)



The Entire Ecosystem is here:

Operator	50%
Vendor	19%
Press	13%
Analyst/Consultant	5%
Service Provider	4%
Regulator/Govt Body	4%
Fixed Operator	3%
Association	2%

(Source: LTE Asia 2009)

The 3rd



NORTH AMERICA 2010

(LTE is a trade mark of ETSI)

9-10 November 2010

Dallas Marriott Quorum, Dallas, Texas, USA

Also endorsed by:



**400+ attendees
at 2009's event!**

- **600+** high-level attendees from across the region
- **100+** senior-level speakers
- **80+** exhibitors, meeting rooms & hospitality suites
- Representation from **ALL** the major industry carriers and players!

**31% Carrier
Attendance in 2009!**



*"You leave a conference like this with
new insights, with new perspectives, and to
go ahead and lead in your respective area"*

(TM, CTO, VERIZON WIRELESS)



The Entire Ecosystem is here:

Carrier	31%
Infrastructure Manufacturer	20%
Test & Measurement	16%
System Integration/IT Vendor	6%
Association/Govt Body	6%
Handset/Device	4%
Semiconductor	4%
OSS/BSS	4%
Consultant/Analyst	3%
Optimisation	3%
Research/University	2%
Other	1%

(Source: LTE Americas 2009)

For more information visit: www.lteconference.com

**For Speaking
Opportunities contact:**

Sabah Hussain, +44 (0)20 7017 5607,
sabah.hussain@informa.com

For Sponsorship & Exhibition contact either:

Caroline McColl,
+44 (0)20 7017 5719,
caroline.mccoll@informa.com

Daniel Jones,
+44 (0)20 7017 5259,
daniel.jones@informa.com

**For marketing and
press enquiries please contact:**

Daniel Cole, +44 (0)20 7017 4873,
daniel.cole@informa.com



Accedian Networks

4878 Levy, Suite 202, St. Laurent, Quebec, H4R 2P1, Canada

Tel: +1-514-331-6181 | Fax: +1-514-331-2210

Email: info@accedian.com

Contact: Bill Balmer, VP Business Development & International Sales

Accedian Networks™ Packet Performance Assurance™ solutions enable wireless operators and telcom providers to offer fully-assured Ethernet wireless backhaul, wholesale and business services. A complete platform for ultra-low latency networking, end-to-end monitoring and performance optimization, Accedian's unique solutions allow operators to deliver premium quality of service (QoS) to demanding customers. Accedian.com



Foundations for Converging Networks

ADAX

UK office:

Reada Court, Vachel Road, Reading, RG1 1NY, UK

Tel: +44 (0)118 952 2800

Fax: +44 (0)118 957 1530

Email: sales@adax.co.uk

Web: www.adax.com

USA office:

614 Bancroft Way, Berkeley, CA 94710, USA

Tel: 510-548-7047

Fax: 510-548-5526

Email: sales@adax.com

Web: www.adax.com

With over 25 years as signaling specialists, Adax offer a complete set of I/O controllers, blades & signaling gateways for SS7, ATM & IP packet processing, signaling & interworking. Adax high performance products meet today's challenges of I/O scalability, cost-effectiveness and high availability in LTE, IMS & NGMN networks.



AT4 wireless

C/Severo Ochoa, 2 - 29590 Campanillas (Malaga), Spain

Tel: +34 952 61 91 00

Fax: +34 952 61 91 13

Contact: Jacqueline Casini

Email: jcasini@at4wireless.com

Web: www.at4wireless.com

A global supplier of LTE™ test systems, supporting the lifecycle of LTE device testing and meeting the needs of early development, design validation, conformance and certification testing.

AT4 wireless Laboratories is the right partner for LTE Testing & Certification, offering conformance, certification, regulatory, interoperability and performance testing in Europe/USA and Taiwan.



Alcatel-Lucent

7/9 Avenue Morane Saulnier,

78141 Velizy-Villacoublay, France

Contact: Lydie Ait Hamouda

Email: lydie.ait_hamouda@alcatel-lucent.com

Web: www.alcatel-lucent.com

Alcatel-Lucent is the trusted transformation partner of service providers, enterprises, strategic industries such as defense, energy, healthcare, transportation, and governments worldwide, providing solutions to deliver voice, data and video communication services to end-users. Alcatel-Lucent achieved revenues of Euro 15.2 billion in 2009 and is incorporated in France, with executive offices located in Paris



Blueslice Networks

1751 Richardson St., Suite 7500
Montreal, Quebec, H3K 1G6
Tel: +1-514-935-9700
Fax: +1-514-932-9701
Email: info@blueslice.com

As the leading provider of evolved Subscriber Data Management (eSDM) solutions, Blueslice Networks' Portfolio serves a diverse mix of service providers, such as Mobile carriers, Multi-play, VoIP and FMC operators, MVNOs, and M2M providers. The carrier-grade, open-standard CSP3000™ is the only eSDM solution that hosts the ngHLR/AuC, LTE-HSS, IM-HSS, SIP-AS and AAA as a single logical entity.



Bridgewater Systems

303 Terry Fox Drive, Suite 500, Ottawa, ON, K2K 3J1, Canada
Tel: +613-591-6655 | Fax: +613-591-6656
Contact: Bridgewater Sales
Email: communications@bridgewater.com
Web: www.bridgewater.com

Bridgewater Systems enables service providers to efficiently manage and profit from mobile data services. Products include Bridgewater's Subscriber Data Broker™, the Bridgewater® Service Controller (AAA), the Bridgewater® Policy Controller (PCRF) and the Bridgewater® Home Subscriber Server (HSS). More than 150 service providers use Bridgewater's solutions to rapidly deliver mobile services.



Cambridge Consultants

Science Park, Milton Road, Cambridge, CB4 0DW, UK.
Tel: +44 (0)1223 420024
Fax: +44 (0)1223 423373
Email: info@CambridgeConsultants.com

Cambridge Consultants develops breakthrough products, creates and licenses intellectual property, and provides business consultancy in technology critical issues. With a team of 300 engineers, designers, scientists and consultants, Cambridge Consultants offers solutions across a range of industries including wireless communications, medical technology, industrial and consumer products, automotive and transport.



Camiant

200 Nickerson Road, 2nd Floor, Marlborough, MA 01752-4603, USA
Tel: +1 508 486 9996 | Fax: +1 508 486 9595
Contact: Sales
Email: sales@camiant.com
Web: www.camiant.com

Camiant-infused networks unlock the true promise of broadband. By transforming IP networks from "best-effort" delivery conduits to intelligently managed environments, Camiant's 3GPP-compliant Policy and Charging Rules Function (PCRF) enables network operators to deliver superior performance and achieve improved economics across the entire spectrum of applications and possibilities.

COMPRION

Test it. Prove it. Move it.

COMPRION GmbH

Technologiepark 25, 33100 Paderborn, Germany

Tel: +49 (0)5251-699-860

Fax: +49 (0)5251-699-8699

Contact: Kathleen Loeser

Email: kloeser@comprion.com

Web: www.comprion.com

COMPRION sells devices for testing terminals, Smart Card interfaces and Smart Cards. Our solution COMPRION SIMfony LTE for combined LTE-USIM handset testing consists of our (U) SIM simulator IT³ Platform (or IT³ Prove!) and the network simulator R&S@CMW500. The system assures a handset's LTE conformity to 3GPP TS 31.121 Rel-8 USIM and TS 31.124 Rel-8 USAT.



DesignArt Networks

Tel: +1-978-793-1221

Contact: Joachim Hallwachs, VP Marketing

DesignArt Networks' DAN3000 SoC platform integrates all processing layers for single-SoC designs of base station and radio head products, scaling to multi-carrier, multi-sector LTE Macrocells. Designed for unrestricted operation of multiple protocols, the DAN3000 supports in-field SW-upgrades from 2G/3G to concurrent LTE and even LTE Advanced services.



Gemalto SA.

rue de la Verrerie

92197 MEUDON CEDEX

Tel: +33 1 55 01 50 00

Contact: Jean Claude Perrin

Email: jean-claude.perrin@gemalto.com

Web: www.gemalto.com

Gemalto provides end-to-end digital security solutions, from the development of software applications through design and production of secure personal devices such as smart cards, SIMs, UICC cards, e-passports and tokens to the deployment of managed services for its customers. Our highly secure LTE solutions enable operators to open up premium mobile Internet services for subscribers. www.gemalto.com



InterDigital, Inc.

781 Third Avenue

King of Prussia, PA 19406

Tel: +1.610.878.7800

Contact: Mike Regensburg

Email: Mike.regensburg@InterDigital.com

Web: www.InterDigital.com

InterDigital® develops fundamental wireless technologies that are at the core of mobile devices, networks, and services worldwide. Our advanced solutions support more efficient wireless networks, a richer multimedia experience, and new mobile broadband capabilities. InterDigital has licenses and partnerships with many of the world's leading wireless companies.



Ixia

Corporate Center, 26601 W. Agoura Rd., Calabasas, CA 91302, United States of America
Toll Free North America: 1.877.367.4942,
Tel: Outside North America: +1.818.871.1800 Fax: +1.818.871.1805
Contact: Kelly Maloit, Director of Public Relations, Ixia, Tel: +1 818.444.2957
Web: www.ixiacom.com

Ixia is a leading provider of converged IP performance test systems and service verification platforms for wireless and wired infrastructures and services. Ixia's multiplay test systems address the growing need to test voice, video and data services and network capability under real-world conditions.



Motorola

13th Floor, City Tower 2, Sheikh Zayed Road,
Dubai UAE, PO BOX 33339
Contact: Yasmin Khaliq
Email: yasmin@motorola.com
Web: www.motorola.com/experience/te

Motorola Networks business delivers fully integrated and customizable media solutions enabling operators to offer personalized, rich media experiences to their subscribers. As a global wireless infrastructure leader, Motorola is committed to 4G with WiMAX and LTE solutions that provide a way for operators to profitably meet the ever-growing demand for mobile broadband.



Tektronix Communications

1500 N. Greenville Avenue, Richardson, Texas 75081, USA
Tel: +1 469 330 4000 | Fax: +1 469 330 4001
Contact: Virginie Daniel
Email: virginie.daniel@tektronix.com
Web: www.tektronixcommunications.com

Tektronix Communications is a leading worldwide provider of Communications Test and Network Intelligence Solutions for mobile, fixed, IP and converged multi-service networks. This comprehensive set of solutions support a range of applications and technologies including 3G Network Optimization, LTE, fixed mobile convergence, IMS. Tektronix Communications is headquartered in Richardson, Texas.



Tellabs

One Tellabs Center, 1415 West Diehl Road, Naperville, IL 60563, U.S.A.
Tel: +1.630.798.8800
Fax: +1.630.798.2000
Email: info@tellabs.com
Web: www.tellabs.com

Tellabs innovates to empower the mobile Internet. We offer LTE Evolved Packed Core support to enhance network performance. We help customers add revenue, reduce expenses and optimize networks. That's why 43 of the top 50 global service providers choose our mobile, optical, business and services solutions.

Aeroflex has LTE test covered

The dawn of a new technology, increasing demand for mobile wireless data and rapid adoption of LTE (Long Term Evolution) by network operators worldwide indicate that LTE will experience aggressive growth in the coming years.

LTE user and network equipment will require comprehensive and effective test coverage right through RF, baseband, protocol and applications layers.

The Aeroflex portfolio addresses all aspects of LTE test applications ranging from R&D through to manufacturing, from chipsets, handsets, base stations to end user services.

Download our **NEW** LTE Brochure. Inside you will find all the solutions to your LTE testing needs.



www.aeroflex.com/summit

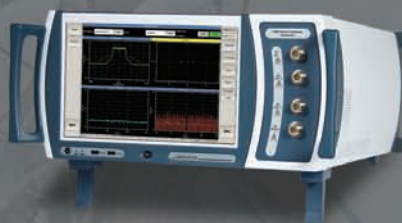
AEROFLEX
A passion for performance.

www.aeroflex.com



TM500 LTE MULTI-UE TEST SYSTEM

INFRASTRUCTURE



7000 VECTOR SIGNAL ANALYZER GENERATOR



7100 LTE DIGITAL RADIO TEST SET

R&D/CONFORMANCE



PXI 3000 SERIES



3410 SERIES SIGNAL GENERATOR

MANUFACTURING



LTE

**Now working
seamlessly
together.**

Taking a large step forward can be daunting. This is why we have based our LTE solutions on mature hardware designs for SDR centralized platforms – a field in which we are already leading global suppliers – and created systems that allow for truly seamless upgrades and, above all, super smooth performance. We also customize everything down to the last

detail and provide superior after-sales service so that you can be sure of receiving and relying on a solution that is a perfect fit for your unique needs. This way, a huge step doesn't have to feel quite so big.

www.zte.com.cn

ZTE中兴