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OPINION
Cris da Silva
All the right technologies are coming together to make telecoms convergence more than just a “single bill”, but operators must first get VoIP right.

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president of Siemens’ Mobile Networks Division, the deals will “ready the

WiMAX revenues, with the rest coming from data services. Small and medium-

market for fixed WiMAX equipment will grow from $597 m in 2006 to $1.4 bn in

WiMAX: Opportunities, Strategies & Forecasts, 2006–2011,

Two Chinese GSM operators will buy

Siemens gets €140 m in two Chinese deals

Two Chinese GSM operators will buy €140 m worth of network equipment

from Siemens. China Mobile will expand its GSM network using €90 m worth

of Siemens equipment by the end of 2006, while China Unicom has agreed to

buy equipment valued at €50 m. According to Christoph Caselitz, president of Siemens’ Mobile Networks Division, the deals will “readi

the networks of China Mobile and China Unicom for the migration to 3G wireless

and [will] also strengthen our starting position for the award of 3G licences”. China is expected to issue 3G licences sometime in 2006 and Western equipment suppliers are jostling to secure lucrative contracts.

WiMAX vendors must watch Qualcomm

The WiMAX industry must be mindful of Qualcomm patents covering OFDM

and OFDMA technologies, warn analysts at ABI Research. Qualcomm acquired significant OFDM-related intellectual property when it acquired Flarion Technologies in 2005. According to ABI’s Philip Solis, “the company will enforce [its OFDM patents] vigorously”. Soma Networks was the first company to enter into a WiMAX-related royalty agreement with Qualcomm, signing an agreement in April 2006. Soma’s chief executive Yatish Pathak said: “It is crucial that Soma Networks guarantees our customers that we have rights to key patents essential for OFDMA standards.”

Qualcomm and Nokia in UK patent dispute

Qualcomm has initiated legal proceedings in the UK against Nokia, alleging that the Finnish handset maker has infringed upon Qualcomm patents. The action follows similar litigation against Nokia that was brought in the US. Qualcomm is seeking an injunction against Nokia in addition to damages covering handsets already sold. The action covers patents related to phones operating on GPRS and EDGE technologies, but not CDMA technology.

MEMS handset market continues to grow

The use of micro electromechanical systems (MEMS) in mobile handsets will continue to grow, with the market reaching $1 bn in 2010, says a report from analyst firm In-Stat. In 2005 the market was worth $157 m and is dominated by microphones and bulk acoustic resonators. However, RF MEMS components may emerge in the future. According to In-Stat, this could occur as early as 2007 with the expected debut of MEMS RF switches, followed by MEMS oscillators in 2008. The report, MEMS – Making Their Mark in Mobile Handsets, also notes that the ongoing drive to make handsets thinner and cheaper is boosting demand for MEMS microphones. In-Stat’s Frank Dickinson believes displays, fuel cells and other types of MEMS could appear in mobile phones, but cautioned “suppliers of these devices may find a quicker path to profit in other markets that have less demanding cost and size requirements”.

Fixed WiMAX will be stalled by mobile version

The market for fixed WiMAX equipment adhering to the 802.16d standard will be restricted by the emergence of mobile WiMAX technology according to a report from Juniper Research. Conforming to the 802.16e standard, certified mobile WiMAX products are expected in 2007. Juniper’s Aditya Kaul says that when compared to its fixed counterpart, “mobile WiMAX offers a superior standard, a fixed-wireless option and an immense value-add in mobility”. The report, Fixed WiMAX Opportunities, Strategies & Forecasts, 2006–2011, predicts that the market for fixed WiMAX equipment will grow from $597 m in 2006 to $1.4 bn in 2011. The report says voice services will account for a maximum of 11% of fixed WiMAX revenues, with the rest coming from data services. Small and medium-sized businesses will account for the bulk of fixed WiMAX users in the developed world, while residential use will dominate developing markets.

Siemens gets €140 m in two Chinese deals

Despite all the talk about data services and fixed-mobile convergence (FMC), traditional circuit-switch voice-over-cellular continues to dominate mobile-phone usage seven years after the first 3G licence was awarded. And it is now becoming clear that voice – in the guise of voice-over-IP (VoIP) – will play a crucial role in encouraging consumers to use converged data services.

On page 13 Cris da Silva argues that the cost-effective delivery of VoIP services must be part of any convergence strategy. He concedes, however, that delivering a full range of voice services over packet-data networks is going to be a real challenge for operators. Voice services are subject to a broad range of very strict regulations covering everything from availability to legal interception, and all eventualities must be covered by VoIP.

It is not surprising, therefore, that operators are reluctant to move on convergence – especially while traditional mobile voice services continue to fill their coffers. There is a general consensus, however, that increased competition in the mobile industry is forcing a long-term downturn in voice revenues.

On page 10, Richard Hubble implores mobile operators to move on FMC as a way of maintaining or even boosting voice revenues. Hubble argues that FMC will help operators retain customers as well as deliver a range of new data services – especially VoIP.

Both da Silva and Hubble agree that the 3GPP’s IP Multimedia Subsystem (IMS) will provide the core network technology to converge a wide range of wireless and wireline services. Unfortunately, IMS technologies are still in the early stages of development and operators are finding it very tempting to put off any plans for convergence until the technology is more mature. Hubble believes that this is a big mistake and operators that follow this course could lose out to those that take an earlier and more aggressive stance on FMC.

UMA hinders convergence

Operators could move on FMC by using Unlicensed Mobile Access (UMA) technology. While UMA supports IP-based voice communications via Wi-Fi and Bluetooth, da Silva warns that it is not compliant with converged core networks.

As a result, the widespread deployment of UMA could actually hinder FMC in the long term.

Instead, da Silva argues that true FMC will require both IMS and the deployment of air interfaces that can serve large numbers of VoIP users. This could be done on UMTS networks by deploying high-speed uplink and downlink packet-access technologies (HSPA) – or by deploying new mobile WiMAX networks. But HSPA rollout is in its very early stages and mobile WiMAX deployment has yet to happen – so mobile operators will continue to delay on convergence at their peril.

Hamish Johnston, Editor
Motorola will buy TTPCom for £105 m

Motorola will buy UK-based TTPCom Communications in a deal worth £105 m (£153 m). The directors of TTPCom have agreed unanimously to accept the offer, citing disappointing financial performance as the main reason for the sale of the company. TTPCom revenues for the year ending 31 March 2006 were £37 m, down from £58 m the previous fiscal year.

Motorola intends to buy all shares in TTPCom, which is currently listed on the London Stock Exchange. TTPCom Communications comprises two core businesses and two joint-ventures. It owns TTPCom Ltd, which develops and licenses technologies for use by chipmakers and mobile-phone manufacturers. It also owns ip.access Ltd, which produces cellular base stations for indoor use. The company is involved in a joint venture called 7 Layers UK Ltd, which provides testing and certification services for handset makers. TTPCom Communications also owns a 12% share in Blaze, which creates mobile-entertainment products.

TTPCom chief executive Tony Milbourn said that Motorola is an “ideal partner for TTPCom”. He added: “This is an outstanding transaction for our company.” According to the president of Motorola’s Mobile Devices business group Ron Garske: “TTPCom is a leader in wireless software platforms, protocol stack and semiconductor solutions and is a highly complementary addition to Motorola’s mobile device technology portfolio.”

Intel ups WiMAX investments

Intel will provide funds to two telecoms operators to assist in the deployment of WiMAX networks and services. Intel is investing in Orascom Telecom WiMAX Ltd, which is a joint venture between the chipmaker and Egypt’s Orascom Telecom. The venture intends to acquire licences for the deployment of WiMAX services in the Middle East and parts of Asia. Orascom Telecom currently operates seven GSM networks in the Middle East, Africa and South Asia.

Intel is also providing funds to Worldmax, which is a joint venture between Intel and Enertel Holding of the Netherlands. Worldmax intends to deliver WiMAX services in the Netherlands using a nationwide 3.5 GHz licence, which is being supplied by Enertel. Enertel sells wholesale telecoms services to operators and businesses in the Netherlands and is also supplying funding and personnel to Worldmax.

Both ventures will be majority owned by Orascom and Enertel respectively, with Intel Capital assuming the role of lead investor in both businesses.

Intel is a leading proponent of WiMAX technology, which promises to deliver both fixed and mobile broadband wireless services in wide-area networks. The company has already invested in several aspiring WiMAX operators worldwide, including PIPEX Wireless in the UK and DBD in Germany.
UK awards low-power licences

Twelve companies have been awarded provisional licences to operate low-power wireless services in the UK by sharing 6.6 MHz of bandwidth at 1800 MHz. While licence holders are not required to deploy a specific technology it is expected that they will use the spectra to deliver low-power indoor GSM services. A key benefit of deploying GSM is that services can be delivered to most existing mobile phones.

The spectra comprise 3.3 MHz bands starting at 1781.7 MHz and 1876.7 MHz. These bands had been reserved as guards between DECT and GSM services.

The licences were issued on the understanding that licensees will work together to develop a code of practice to minimize interference between services, rather than having a code enforced by the UK regulator Ofcom. While this is a global first for the GSM industry, the relatively high frequency of the spectra, a 200 mW limit on transmission power and mainly indoor deployment should limit the possibility of interference between services. In areas where interference is likely – such as large public buildings or outdoor hotspots – operators could agree to a frequency planning scheme.

According to Chis Cox of ip.access – which makes low-powered GSM picocellular base stations – most early deployments will be in business premises. Licensees could offer businesses a private local mobile network that delivers PBX-like services such as short-code dialling on conventional GSM phones. When handsets leave the premises, they would be handed over to a standard wide-area GSM network.

Motorola and InterDigital resolve IP dispute

Motorola is buying BenQ's R&D centre

Mobile-phone maker BenQ is selling its research and development centre in Aalborg, Denmark, to Motorola. The deal includes the transfer of about 250 employees to Motorola’s Mobile Devices business unit along with related development and test equipment.

The transaction is expected to be completed in June 2006, when the Aalborg facility will become a product development centre for Motorola.

Taiwan-based BenQ acquired Siemens’ mobile-phone business in 2005 and is in the process of restructuring its R&D and product-development operations in Europe.

In the first quarter of 2006, 229 million mobile phones were shipped, putting the industry on target to exceed an annual production of 1 billion units, claims a report from the analyst firm Strategy Analytics.

According to Neil Mawston, an associate director at the firm, the number of handsets shipped in Q1 2006 was 31% greater than the same quarter in 2005. Mawston said this is the “highest rate for almost two years”, and growth is “driven largely by emerging markets such as India”.

According to Q1 2006 Global Handset Market Share Update Report, Nokia continued to increase its market share by commanding 32.8% of the global market in Q1 2006, up from 30.9% in Q1 2005.

Second place Motorola also boosted its market share from 16.5% in Q1 2005 to 20.1% in 2006.

According to the report, Samsung was the only major handset maker to lose market share, dropping 1.4%.

PCTEL closes Dublin antenna facility

PCTEL is closing its Irish manufacturing facility, which produces variable electrical tilt base-station antennas. The US company plans about 65 redundancies, but will continue its design and engineering activities at the Dublin facility. The production of its iVET antennas will be outsourced to Elcoteq, which will use its facility in St Petersburg, Russia.

Nokia opens Mass. research centre

Nokia and the Massachusetts Institute of Technology (MIT) have opened a joint research facility near Boston, US. The Nokia Research Center Cambridge will draw on expertise from MIT’s Computer Science and Artificial Intelligence Laboratory to develop technologies that can be commercialized in five to ten years. The centre is focused on how mobile devices could become elements within a pervasive information-based environment.

Nokia will pay InterDigital $253 million in outstanding royalties as part of a deal to end a dispute over intellectual property rights between the two companies. The royalties are related to patents on TDMA technology that are held by InterDigital and are alleged to cover GSM/GPRS/EDGE handsets and infrastructure equipment produced by Nokia. The two companies have agreed to withdraw from various legal and arbitration processes related to the patent dispute.

The two companies have also agreed to terminate their existing patent licence agreement. According to a statement from InterDigital, 3G equipment currently produced by Nokia is unlicensed with respect to InterDigital patents. “We remain hopeful that the resolution with Nokia will be in business premises,” said William Merritt, InterDigital’s President and Chief Executive.

The dispute began in 2003 when Nokia refused to accept terms similar to those defined in a licence agreement struck between InterDigital, Ericsson and Sony-Ericsson. Commenting on the settlement, Nokia’s Vice President for Intellectual Property Rights Ilkka Rahnasto said: “This case demonstrates that legal disputes are sometimes necessary in order to lower unrealistic demands.”

InterDigital is embroiled in a similar dispute with Samsung. An InterDigital spokesperson told Wireless Europe: “We believe that the resolution with Nokia could help to facilitate discussions with Samsung.”

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WiMAX is playing catch-up to 3G

Chris Tunsley argues that mobile WiMAX has a long way to go before it can compete with 2G/3G cellular.

WiMAX has attracted much attention thanks to its unique position in the wireless-technology market. Many fixed-wireless and wired telecoms companies see it as the way to stake their claim on a share of the mobile broadband market. Some cellular operators view WiMAX as a threat to their plans to deliver true mobile broadband services. So it is not surprising that an intense information war has broken out with a broad range of opinions being exchanged. Even industry analysts who follow the progress of WiMAX have published projections varying from “great success” to “niche market at best”.

Its proponents argue that WiMAX will be a better and cheaper alternative to cellular networks because it will deliver greater bandwidth. However, this view is flawed because it compares the 2G/3G systems of today with mobile WiMAX systems of the future.

The truth is that mobile WiMAX is in its infancy. The 802.16 standard was originally developed as a fixed broadband wireless access (FBWA) system. Like most IEEE standards, WiMAX includes a basic standard plus multiple variations. The FBWA system has limited support for mobility so a project was launched to specify the 802.16e mobile WiMAX standard. Mobile WiMAX will be considerably more complex than other 802.1x or WLAN standards and the specification won’t be complete until 2007 or 2008. Indeed, the first truly mobile systems will require mobility support beyond that provided by the 802.16e standard and will probably not emerge until the end of 2008. Then WiMAX will likely have more in common with cellular networks than with FBWA.

This timescale could have a significant impact on the ultimate success of the mobile WiMAX standard because by 2008 it will have to contend with intense competition from established 3G W-CDMA networks. While W-CDMA alone cannot deliver data rates comparable to WiMAX, the high-speed downlink/uplink packet access (HSDPA and HSUPA respectively) upgrades will give 3G data rates a sufficient boost.

HSDPA is already delivering higher downlink data rates in a small but growing number of 3G networks. The HSDPA standards define 12 categories corresponding to different maximum data rates in the 1.8 to 14.4 Mbit/s range, which are all a significant improvement over the 384 kbit/s delivered by W-CDMA.

Of course, like most technologies, the theoretical maximum is rarely achieved in practice. Indeed, in the foreseeable future it is likely that networks will not support all HSDPA categories. Operators are expected to target categories 6 and 8, which deliver 3.6 and 7.2 Mbit/s respectively and rates approaching 3.6 Mbit/s have already been achieved on live networks with category-6 terminals.

Improvements in the uplink will be achieved by HSUPA, which brings greater symmetry to uplink/downlink data rates. HSUPA now figures highly in operators’ roll-out plans and should be operational in 2008.

Relative costs

Beyond speed, the relative cost of WiMAX is an important consideration. Mobile WiMAX networks will require licensed spectrum, which will increase the overall cost of deployment. While mobile WiMAX spectrum will probably be cheaper than the original 3G licences, W-CDMA operators should be able to acquire additional spectra at much lower rates. As a result, the long-term price advantage for WiMAX will be minimal.

Several technical challenges must also be overcome before mobile WiMAX can be implemented. Today the specification is limited to the physical and medium access control (MAC) layer standards for the radio interface. These cover mobility-related functionality, such as paging reception and handover signalling. But they do not include specifications related to mobility management within the network. Indeed, traditional 802.x specifications are limited to the radio-interface functionality for layers 1 and 2. This is sufficient for simple wireless local-area or personal-area networks where network management functions are not needed – or where simple management is distributed among ordinary nodes.

Mobile WiMAX network nodes must communicate and exchange information with users who are on the move. Multiple registers must be interconnected; routers must relay the user data; and intelligent network nodes must perform several functions including controlling the power of subscriber units.

In effect, all elements of the network infrastructure and related equipment for mobile WiMAX must be developed or acquired outside of the traditional 802.x specifications. This could be achieved by implementing an entire mobile WiMAX system, which may closely resemble a cellular network. Such a system would have to deliver the same quality of service as a cellular network with low latency make-before-break handovers and no packet loss. Indeed, the only practical way of creating a core network may be to use existing 2.5G/3G network technologies. In this scenario mobile WiMAX would coexist with and enhance part of existing mobile networks as defined by 3GPP or 3GPP2.

Mobile WiMAX’s ability to compete with 2G/3G cellular services is hindered by the fact that it will be deployed several years after 3G and because the standard does not define the entire network infrastructure. Instead, WiMAX will not compete directly with 2G/3G services but will form part of future cellular networks. For example EUTRAN – the 3GPP’s vision of an evolved 3G radio access network – will share many features with the 802.16e physical layer. As a result many WiMAX technologies – if not the standard itself – could be an important part of 3G/4G cellular networks of the future. It is also possible that WiMAX access points will be connected to the 2G/3G core network, allowing WiMAX to be an additional access network technology.
Converged mobile services will change the telecoms world forever. Operators that ignore this reality face an uncertain future, while those that embrace convergence could benefit from a wide range of opportunities that lie ahead. Fixed mobile convergence (FMC) will enable operators to offer truly differentiated services to subscribers regardless of their location, their access technology, or the device they choose to use.

The ability to offer mobile services is allowing fixed-line operators to fill the growing financial void created by the ongoing drop in their voice revenues. FMC could also help mobile operators, which are also struggling to maintain voice revenues while competing in an ever-crowded arena of established players and upstart mobile virtual network operators (MVNOs). While some cellular operators seem prepared to gamble heavily on the success of 3G to replace these falling voice revenues, 3G network coverage (which remains sporadic) and performance have yet to emerge as powerful service differentiators.

While voice revenues face decline, there is growing interest in Internet protocol (IP) services such as voice-over-IP (VoIP) and rich multimedia services. These services are enabled by converged infrastructure and network agreements that will lift forward-thinking service providers above the competition and allow them to differentiate their services beyond price.

FMC will allow a wide range of service providers to extend their traditional offerings, while allowing them to deliver more advanced services over IP networks. This is much more attractive than the more costly alternative of installing multiple purpose-built networks for different applications or traffic types. Convergence allows a provider to deliver services on their own network as well as to subscribers roaming on other networks or even on private networks.

Strategy goals
An effective FMC strategy should achieve two important goals – increase subscriber retention and allow operators to develop new and richer service opportunities such as VoIP or intelligent content delivery. By achieving these goals, operators can deliver truly differentiated services, more robust voice services and enjoy genuine revenue growth.

In the US, for example, mobile operators are promoting “in-network plans”, which offer free mobile-to-mobile calls for subscribers on the same network. Gradually these plans are being extended to include landlines, or even home VoIP phones. To generate revenue from such services, operators could provide subscribers with a single identity or number broadly applied not only to voice services, but across a variety of networks and devices covering applications including multiple messaging formats and other services.
Service providers that ignore the realities of declining voice revenues will suffer financial strife

content. Subscribers could also be given the ability to optimize the delivery of these services by selecting the highest performance network or the lowest cost alternative, depending on the specific application or usage scenario.

In European markets such as the UK, operators are facing other business pressures. While these markets are competitive, the relatively high cost of mobile services presents an ideal environment for insurgent operators. UK mobile subscribers are very experienced in buying and using mobile services and therefore, by offering the right products, an insurgent could command a very large and lucrative market.

Competition
While large incumbent operators are in the best position to capitalize on these new opportunities, they will quickly become exposed to competition from new players if they fail to deliver desirable services. This is especially true for more traditional operators, which stand a very real chance of being relegated to lower cost bit pipe providers with simple voice minute or data usage bundles.

The intense pressure on voice revenues is evident in financial statements from leading global operators. Vodafone, for example, recently declared voice-revenue growth of 3.9%—compared with 5.6% for messaging and 28.1% for data services. These figures make it very clear where the new revenues will come from in the future. As time progresses, revenues from basic data services will level off only to be surpassed by growth in revenues associated with content and applications.

Service providers must follow a practical and graceful migration path towards converged services. This migration must allow them to reap all of the benefits of introducing richer and differentiated services to their customers today, while making full use of existing networks to deliver a rapid return of investment.

While the next-generation network, IP multimedia subsystem (IMS) standard provides the right long-term direction for evolution, operators cannot wait for IMS. Instead they must begin with technologies that deliver results today, while gracefully migrating to a more flexible IMS infrastructure over time.

Service providers that ignore the realities of declining voice revenues will suffer financial strife in the long term, whereas those who embrace new opportunities could reap impressive returns on their investment. Indeed, not participating in this brave new converged world of telecommunications is no longer an option for any operator. Unfortunately many operators make their first steps towards IMS in a defensive reaction to a competitor— but it does not have to be this way.

Richard Hubble is EMEA Director for Tatara Systems.
Igor Leprince navigates the network-upgrade maze from 2G to HSDPA.

Third-generation networks and services are starting to make their commercial mark in Western Europe. In the UK alone, about 4 million 3G handsets were estimated to be in use by the end of 2005. Meanwhile in the US, Cingular has pushed the boundaries of 3G by launching commercial HSDPA services in late 2005.

The industry is now eagerly anticipating a string of HSDPA commercial launches throughout Europe. Despite real progress, there is still much work to be done before HSDPA can be declared a commercial reality. Indeed, network operators still face significant challenges as they upgrade their network infrastructures from 2G to 3G.

While some commentators liken the current migration process to the mid-1990s evolution from first generation analogue services to 2G digital technology, such comparisons are misguided. In reality, the European cellular landscape has changed radically over the last decade. In many markets, more than 90% of the population are mobile subscribers and customers' expectations regarding the quality of service (QoS) have risen dramatically. On the network side, a decade of expansion means that many prime base-station sites are already taken, and environmental regulations governing base stations in Europe are now among the most stringent in the world.

While the challenges are many, QoS is a clear priority for 3G operators. When building next-generation networks operators must ensure that the new network can deliver a QoS that at least matches that of existing technologies – today’s sophisticated customers will accept nothing less.

Quality does not come cheap, so cost is another important issue related to the migration process. Overhauling all 2G sites requires massive investment to make extensive improvements to their technology infrastructure. Operators may even need to renegotiate leases on buildings in the networks. Throughout this upgrade process operators must also deal with significant constraints on their capital and operating expenses.

It is natural therefore, that operators with 2G networks seek to make use of existing infrastructure by collocating new 3G equipment within an existing 2G site. While attractive on the surface, there are often significant complications with this approach. Sometimes upgrading an existing 2G facility is simply not possible due to space limitations or issues related to site acquisition. The differences between 2G and 3G networks extend well beyond technology and include subscriber behaviour. 2G phones are used primarily for voice calls, while a typical 3G customer would also be downloading video, sending emails or listening to music.

Demanding users

And even when possible, upgrading a 2G network may not provide the operator with the necessary QoS levels to satisfy its subscribers. Indeed most operators still have a great deal of work to do in upgrading and optimizing their existing networks to deliver the appropriate QoS. This is best achieved by drawing on the services of an independent company with the experience of working on a broad range of networks from different vendors, based on multiple technologies and located in numerous regions.

Once 3G has been implemented, the next step is the addition of high-speed downlink packet access (HSDPA) functionality. HSDPA has the potential to boost downlink data rates by up to five times that of current 3G networks. HSDPA is very attractive to 3G operators because it allows them to boost throughput across the network by making an incremental investment in new technology that is estimated to be no more than 5% of the cost of their original 3G network. However, to benefit fully from HSDPA, operators must also ensure that their backbone and transmission networks can cope with increased data traffic.

HSDPA is a new technology and therefore one of the key challenges facing operators is determining what service levels can be achieved. HSDPA network performance can vary significantly as a function of network design and optimization or even the layout of the building being covered. In practice,
extensive initial trialling is the only way to determine what service levels can be attained.

Operators can make a direct comparison with 3G performance by performing trials that determine the HSDPA customer experience. While HSDPA can theoretically boost 3G downlink data rates by up to five times, this might not be possible in all local environments. Variables such as the location of the user (including their distance from the base-station antenna), whether the user is moving or stationary, and the presence of shadowing effects can all have a major impact on downlink performance.

Operating costs

As ever, money is another key concern for operators planning HSDPA upgrades. Additional operating expenditure (opex) will be low if the network is not heavily loaded with traffic. However, as more subscribers switch to 3G, and high-speed services are added, operators may need to upgrade their network infrastructure further and ultimately install new backhaul links – which would lead to a dramatic increase in opex.

HSDPA-related increases to opex could be significant. Each new E1 backhaul transmission link would cost about £1500 (€2200) to install and about £2500 per year to lease. For a large network with 10 000 base-station sites, this could end up costing £30–40 million. Operators must prepare for high expenditure to ensure their networks can support the traffic that will be generated by new technologies and associated services.

There are several important steps that an operator can take to ensure that their network is upgraded to accommodate new technologies. Perhaps the most important is the need to take advantage of expert consultancy throughout the upgrade process. To add real value, operators must choose a consultancy that has a comprehensive understanding of the relevant technologies. The consultancy must act as a genuine business partner, explaining what the relevant technologies can deliver and making them relevant to their customers’ needs. Crucially, all advice must be independent and vendor and technology neutral.

In the long run, taking advantage of expert advice should enable carriers to save significant sums of money and, critically, will also allow them to ensure the delivery of high QoS on their networks. Ultimately, success will be measured in terms of happier customers, lower rates of churn, increased use of services and revenue per user and the competitive edge over other operators.

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Fixed-mobile convergence (FMC) and convergence within fixed networks are driving a wide-ranging transformation of the telecoms industry. Both are underpinned by the triumph of Internet protocol (IP) and related technologies, which are the most effective way to create and deliver new value-added services. However, voice is still the “killer application” and therefore the cost-effective delivery of voice-over-IP (VoIP) services will be crucial to the success of any convergence strategy.

Convergence within fixed networks is being driven by the triple-play service offering of high-speed Internet, fixed-line telephony and IPTV/video-on-demand. Today these services are usually delivered via three different networks – indeed, voice services are often provided by reselling public switched telephone network (PSTN) services from incumbent operators. Although today’s triple-play services are based on primitive technologies and minimal network integration, their growing popularity suggests significant revenues that can be unlocked by offering truly converged services over next generation networks (NGNs).

NGNs will merge the traditional PSTN and the new IP-based video and data networks. They will allow operators to reuse network elements to provide basic functions such as session control, billing, QoS policy, authorization and authentication across all IP-based services. However, supporting a full range of voice services over a packet network is going to be difficult. Voice is not just any other service because it is subject to strict regulations on availability, emergency calls and legal interception. In addition, legacy “dumb” terminals must continue to be supported.

As a result NGNs must provide costly PSTN emulation services (PES), which will erode the already slim profit margins associated with traditional voice services. To offset this cost, and generate new higher-margin revenue streams, fixed-line operators must introduce new and advanced multimedia communication services.

This is where the 3GPP’s IP Multimedia Subsystem (IMS) comes to the fore. Although developed for mobile networks, IMS provides a core network that supports the introduction of a completely new set of IP-based services as well as supporting a PES. However, its greatest asset is that IMS is largely access-network independent, which leads nicely to the other convergence trend – FMC.

Unlicensed Mobile Access (UMA) technology is currently at the vanguard of FMC. UMA allows a multi-radio handset to switch between a GSM network and a Bluetooth or Wi-Fi access point. When the handset switches to a local access point all GSM traffic is carried as IP packets and GSM protocols are used in conjunction with GSM circuit-switched core networks. However, UMA is not compatible with converged core networks and therefore UMA will ultimately hinder FMC. Indeed, only IMS can deliver a wide-ranging transformation that is access-network independent. True, FMC also requires an air interface that can serve large numbers of VoIP users in a macro cellular environment – something that both HSPA and mobile WiMAX are in a good position to deliver.

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The growing trend to specify thresholds for distance-to-fault performance levels is worrying RF practitioners worldwide. Joerg Springer explains.

Bruce Holsted has been troubleshooting and repairing antennas and feed lines for 15 years and is of the firm opinion that the new trend towards setting thresholds for distance-to-fault performances is a move in the wrong direction. An increasing number of operators and consultants across Europe and North America are specifying a minimum level of performance in the DTF test. Holsted says that this trend demonstrates a misunderstanding of the nature of the test, which he believes is inherently qualitative rather than quantitative. Holsted says his company, which is based in Arkansas, US, has a firm policy: “We ask at the front end about the customer’s testing specification, and if they demand a particular DTF figure with the antenna connected, then we generally don’t do the work.”

While maturity and experience allow Holsted and his team to make such decisions, he believes less experienced RF test and maintenance technicians are responding to thresholds in a worrying way. He says some site-construction representatives are encouraging technicians to loosen cable connectors until the specified DTF figure is achieved. He describes this practice as “absolutely insane” and contrary to the purpose of the DTF test, which is to provide information to help locate the source of the high VSWR,” Benevento says. “This avoids randomly changing out components to find the fault.” The DTF test can also provide a “birth record” for the transmission line. This allows maintenance crews to compare current performance with that achieved at installation.

Advances in the data processing power of site-testing equipment have permitted VSWR and DTF to be combined into a single frequency-domain based test instrument. “The modern network analyser uses frequency-domain reflectometry to actually simulate the time-domain DTF test,” says Benevento. This is done using the inverse fast Fourier transform technique, which uses data obtained during a return loss or VSWR sweep test to calculate the DTF response.

The procedure for the VSWR or return loss sweep test is fairly straightforward and well-understood. “What you see in the VSWR test is a functional check of the entire transmission system as it shall be operated in later life,” says Gerhard Wunder, Director International Business Development Transmission Lines at RFS. Wunder recommends the installation should first undergo a visual inspection followed by a test that sweeps across the entire operational frequency band to ensure that the reflected power is within specifications. “It’s a highly repeatable test,” he says.

Field loss can be measured with a 50-ohm standard load put in place of the antenna. “Typically, with the 50-ohm load in place of the antenna, we’d expect to see a return loss of better than 23 dB. This depends, of course, on the length of the line. If we don’t achieve these minimums, then we VSWR-test the line in sections to isolate the problem.”

Check list
Bruce Holsted says that the first step is to check that cable connectors are tight and free of moisture. Then the antenna and any tower-top amplifiers are then disconnected while VSWR is used to prove the feed line. Finally, a RF series adaptor is placed between the jumpers and the antenna is proven.

While the all-in-one site network analyser is convenient, it is important to recognize the limitations of the DTF test results obtained – particularly the erroneous application of a pass/fail threshold. “There are a number of parameters that impact on the quantitative results that come out of a modern DTF test,” says Wunder. “From this point of view, it is illogical and simplistic to apply a site-wide DTF performance threshold.”
Indeed, even the cable length will affect the DTF reading. The longer the cable, the narrower the bandwidth sweep that can be performed. This reduces the resolution of the instrument and reduces its ability to resolve closely spaced reflections. As a result, transmission lines of identical diameter and installation quality, but of differing lengths, can produce different DTF results.

However, of greater concern is that the DTF is not being measured directly, but is calculated. As a result it represents an estimate of the average return loss over the frequency range being swept. “This really explains the ‘non-repeatable’ nature of DTF,” Wunder says, adding: “It is this inherent calculated and averaged nature of the DTF test that can result in dramatic differences in the measurements taken just by varying test conditions such as test bandwidth or cable length.”

Random thresholds

Vincent Benevento points out that one of the most tedious aspects of dealing with thresholds is the somewhat nominal manner in which they are selected. A number of operators, he says, are applying a DTF measure that can be difficult to achieve with the specified transmission line components.

“The cable connectors might be specified at 30 dB. Now our connectors generally perform better than [this] so an average connector DTF performance level might be, say, 36 dB,” Benevento says. “The problem is that some carriers are taking this performance level of 36 dB and applying it as a blanket threshold!” He also points out that gaining another 1 or 2 dB of DTF performance at such a low level has little or no impact on the overall system performance.

Benevento cites a recent installation in the US state of New Jersey, where his team was asked to inspect several connections that were apparently failing DTF tests. “The site DTF threshold specification was ‘34 dB or better’, so the installation crew was cutting these connectors and changing them out,” he says. “When they opened the ‘failed’ connectors they found they were perfect – nothing was done wrong and they looked great.”

A DTF sweep of all transmission lines on the site revealed the true purpose and value of the test. “The connectors were all running at the same sort of level, between 32 and 34 dB. Then we hit one running at 26 dB. Sure enough, when we opened it up, the flare inside the connector was all bent over and crushed. Now that is what the DTF test is supposed to be used for.”

Such incidents make it clear why Bruce Holsted describes DTF performance thresholds as “the bane of the industry right now. Why they establish this DTF threshold is beyond me – I don’t know whose idea that was. It’s just ignorance.”

While Benevento is adamant that the DTF test has a vital diagnostic role to play, he believes that it is misused when a threshold is arbitrarily defined as a pass/fail criterion. “The threshold should not be a pass/fail requirement, but one that triggers an investigation into whether connectors are properly installed or if there is cable damage,” he says. Gerhard Wunder emphasizes the cost and waste associated with the misuse and misinterpretation of the DTF test results, which has site testing crews out “chasing ghosts [and] trying to achieve DTF values that are impossible or unachievable”.

Bruce Holsted cites the “push-button” nature of the modern network analyser as the root cause of some DTF-related problems. He believes that it is now simply too easy to achieve what appears to be an accurate plot of DTF versus line length. Indeed, Holsted recommends that engineers go back to basics and gain a true understanding of the test being carried out.

Joerg Springer is at Radio Frequency Systems.
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Fuel cells could power mobile TV handsets

Wireless service providers have seen the future – mobile TV to your handset. But such a power-hungry application drains batteries quickly. Hamish Johnston finds portable fuel cells could be the solution.

Mobile TV is shaping up to be the next big thing for mobile phones. Commercial services are already available in South Korea and Japan, with network operators poised to launch in Europe and North America. Yet while mobile TV is here today, there are technological, standardization and regulatory hurdles that must first be overcome in order for commercial services to flourish. Many of the problems relate to the fact that mobile TV is a very power-hungry application, something that worries Hitomi Murakami, vice-president, corporate technology sector at KDDI Japan. As the second largest cellular operator in one of the most advanced markets for mobile telecoms services, KDDI already offers mobile TV services via the One Segment Broadcasting (One Seg) standard.

On the upside, it’s clear that mobile TV services could ultimately make money – and lots of it – for telecoms operators in Japan and elsewhere. The downside is that these new video services also pose a threat to the telcos’ bottom line. For starters, TV viewing quickly drains the handset’s battery, leaving users unable to access other broadband services. Murakami believes that traditional lithium-ion batteries are reaching the limits of their capability – so much so, in fact, that they are unsuitable for mobile TV and other digital broadcast services. He estimates that a typical mobile phone will only be able to offer about two hours of TV viewing per battery charge.

While mobile subscribers are not likely to watch several hours of TV at a time, Murakami believes that it will still further erode the useful lifetime of a mobile handset. He cites a 2004 survey in Japan, carried out before mobile TV services were available. At this juncture, about 80% of respondents had already experienced difficulties caused by battery shut-down. The survey revealed that most users recharge their handset batteries daily, but would rather do so every second day. The feedback also suggested that limited battery life was preventing subscribers from using their handsets as frequently as they would like.

Murakami is adamant that fuel cells are the only way to meet the increased power requirements that come with mobile TV. “I believe that all handsets will move to fuel-cell batteries,” he says. In addition to higher energy densities, Murakami says that fuel cells are a more environmentally friendly option than batteries, another factor that will encourage the shift towards fuel-cell adoption.

In terms of cost, Murakami concedes that fuel cells will be “a little bit higher priced” than lithium-ion batteries in the Japanese market. “However, within a few years, there will be no [cost] difference to that of existing lithium-ion batteries.” Murakami also remains adamant that handset makers will not have to introduce any significant changes to their handset design or manufacture, largely because portable fuel-cell systems have been designed to be compatible with existing batteries.

The power of video

Right now, KDDI is working with two handset makers, Toshiba and Hitachi, to develop direct-methanol fuel-cell (DMFC) power sources. The Hitachi prototype is based on the W32H handset and the DMFC is said to deliver 300 mW power output and about the same energy capacity as a conventional battery from a 3 ml charge of aqueous methanol. The addition of the fuel cell does not change the size of the handset, but adds about 24 g in weight.

Meanwhile, Toshiba has created a pilot model with a built-in DMFC. The fuel cell operates on concentrated methanol and has a fuel capacity of 7 ml. It has a 300 mW power output, with
Moving pictures, on the move

KDDI’s Hitomi Murakami is not alone in thinking that mobile TV will be a runaway success. Technology trials in Europe suggest that consumers are willing to pay up to $15 per month for TV services to their handset. That’s music to the ears of the wireless telecoms industry, which is currently struggling to get subscribers to pay for services beyond basic voice and text messaging.

Like many cellphone technologies, mobile TV is being pioneered in Japan and South Korea, though interest is growing in other markets. Korea-based Samsung recently released a mobile TV handset for the European market that uses the Terrestrial Digital Multimedia Broadcasting (T-DMB) standard. Commercial T-DMB services began in South Korea last year and German subscribers could watch World Cup highlights via T-DMB in June.

Samsung is also developing chips for the rival Digital Video Broadcast-Handheld (DVB-H) mobile TV standard. Championed by the leading handset maker Nokia, DVB-H is the subject of a number of trials in several European countries. Across the Atlantic, meanwhile, the cellular-base-station operator Modeo intends to launch DVB-H mobile TV services in several US cities.

Mobile TV can also be delivered using the digital audio broadcast standard and a major trial of this has been completed by BT in the UK. Other mobile TV standards include MediaFLO from Qualcomm and TDtv from IPWireless.

According to Murakami, Toshiba intends to commercialize this technology in 2008 by producing a DMFC that can deliver 1 W with a storage capacity around five times greater than that of conventional batteries. Murakami says that there are no technological barriers in the way of launching such a device. Instead, he says that KDDI is “investigating market needs such as price, standardization and how to sell [fuel-cell-powered handsets] in the Japanese market”.

Regulatory issues surrounding the transport of methanol onboard passenger aircraft are also in a state of flux. Currently, passengers are not allowed to carry methanol onboard aircraft. However, Murakami is confident that this will change by January 2007, when the International Civil Aviation Organization (ICAO) is expected to authorize airlines to allow passengers to carry fuel-cell devices onboard planes. “I understand that the standardization effort is now under way at the UN jointly with ICAO and IATA [International Air Transport Association],” he said, adding that he expects all airlines and countries to allow methanol-powered devices onboard planes.

Other regulatory and standardization issues include those surrounding the sale and storage of methanol and the standardization of the fuel and fuel cartridges. Murakami also notes that there are intellectual-property issues related to DMFCs that will need to be addressed before there is widespread commercialization.

Fuel cells are the only way to meet the power requirements of mobile TV.

Hamish Johnston is editor of Wireless Europe.

double the energy capacity of conventional batteries. The handset is based on Toshiba’s A5509T model and weighs 160 g. This is 47 g more than a standard battery-powered A5509T; the DMFC also adds 14 mm in thickness to the phone (when folded).

Commercialization

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Hamish Johnston is editor of Wireless Europe.
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Throughout the world, established mobile operators with high subscriber penetration rates face the same key challenges. These include how to address the continuous drop or possible reduction of the average revenue per user (ARPU) from voice services and how to boost ARPU by introducing a range of other services and applications. While operators don’t know what the next killer application will be, most are convinced that the most sensible way forward is to provide several interesting services and applications on the mobile devices and let consumers choose for themselves.

Operators must also plan for the emergence of possible disruptive technologies such as voice-over-Internet protocol (VoIP), which could be both a threat and an opportunity for mobile operators. VoIP-based services that are enabled and supported from within an IP Multimedia Subsystem (IMS) environment could allow operators to offer new applications and services that both business users and consumers are willing to pay for.

Many of the current and emerging services will put increased demands on network throughput and total available capacity. These high-bandwidth services include downloading games, person-to-person gaming, music download, video download, video sharing, video calls, video conferencing, web browsing, and multimedia broadcast multicast services (MBMS). To ensure the success of these and other services, operators are upgrading their networks with high speed downlink packet access (HSDPA) capability which can provide peak data rates of up to 14 Mbit/s in the downlink. HSDPA will soon be complemented by high speed uplink packet access (HSUPA), which will provide peak data rates of over 5 Mbit/s in the uplink.

### Capacity vs cost

While HSxPA technologies will deliver higher throughput and capacity in the radio access network, high capacity in itself is not sufficient. Extra capacity must be delivered in a cost-effective way, minimizing the cost-per-bit or the annualized cost-per-subscriber to maximize profits. Mobile operators must continuously evaluate the business case for individual or groups of services in terms of potential revenue and the additional network investment required. On the revenue side there will always be an upper limit on how much consumers and businesses can pay for services. Therefore operators must minimize the costs associated with delivering new services – particularly the cost-per-bit. Although not immediately obvious, the specific technologies used in mobile handsets can be a major factor in determining the cost-per-bit or annualized cost-per-subscriber. The HSDPA standard includes several different categories of implementation, which define specific configurations and performance levels. A technology and economic analysis carried out by InterDigital reveals that the lowest cost-per-bit can be achieved by deploying category 10.

Category 10 is the fastest mode of HSDPA. It can achieve downlink speeds of up to 14 Mbit/s, but it also requires the deployment of an advanced receiver design in mobile devices. By contrast, the first generation of HSDPA data cards and handsets will only support up to category 6 due to the inherent performance limitations of the rake-based receivers that are being used. This corresponds to a maximum data rate of 3.6 Mbit/s. HSDPA uses multiple codes with low spreading factor. This leads to multi-code and inter-symbol interference that limits the data rate that can be achieved with a rake receiver. An advanced receiver addresses this interference by using a chip-level equalizer that restores the orthogonality of the received codes and can ultimately support category 10 data rates of 14 Mbit/s.

An advanced receiver that uses a channel estimation-normalized least mean square (CE-NLMS) equalizer delivers superior performance in terms of throughput and capacity when compared with a rake receiver. Channel estimation enhances the performance of the NLMS equalizer in high-mobility environments. This advanced receiver is scalable and can support up to and

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**Advanced receiver maximizes HSDPA profitability**

**Fig. 1(a).** CE-NLMS equalization boosts data throughput when the ratio of cell power to background noise (Ior/Ioc) is greater, as occurs in the centre of a cell. No receiver diversity is used in this example. **(b).** Receiver diversity further boosts the performance of CE-NLMS equalization.
including category 10. Figure 1(a) shows how higher throughput can be achieved with an advanced receiver versus a traditional rake receiver for HSDPA categories 6, 8 and 10. The data are for a VA120 channel model corresponding to the user moving at a speed of 120 km/h.

Receive antenna diversity will also play a major role in mitigating the effects of inter-cell interference – thereby improving performance at cell edges. An advanced receiver that combines an equalizer with receive diversity will therefore deliver the highest performance as shown in figure 1(b).

The HSDPA advanced receiver is available as a co-processor chip that can be deployed with existing UMTS R99/R4 hardware. It can also be supplied as intellectual-property blocks, which can be licensed and integrated within a single R5 chip. The co-processor has been designed specifically to minimize the amount of customization at the interface between the HSDPA co-processor and the R4 chip.

**Economic network model**

An economic model of a complete W-CDMA/HSDPA network illustrates how an advanced receiver can reduce the cost-per-bit. This model covers the major urban areas of central London, encompassing 369 km$^2$ with a user density of 1000 users/km$^2$. The model describes the entire mobile network including base station sites, backhaul and the core network – both circuit-switched voice and packet-switched core networks. All other relevant capital and operating expenditures have also been accounted for in the model.

Particular attention was paid to modelling and costing the backhaul from base-station sites to the first node in the network. This is vital because operators must ensure that there is sufficient backhaul capacity to match the instantaneous throughput demanded by the highest HSDPA categories.

The London scenario is modelled over a 10-year operation period for one of five mobile operators in the UK market. The model assumes the highest penetration of HSDPA-enabled terminals in any given year in order to demonstrate the potential impact of an advanced receiver design on the cost-per-bit. The data and voice traffic loads used in the model were derived from projections from industry sources such as the UMTS Forum, Ovum, Strategy Analytics and Frost & Sullivan. Towards the end of a 10-year cycle, high-capacity scenarios are assumed where radio cells are filled with data only – or a combination of voice and data. Other assumptions include a data traffic mix of email, web browsing, FTP and streaming with 80% of the traffic in the downlink. Macrocells are first used to meet the traffic requirements. However, when additional capacity is required, the model introduces an underlay of over-the-rooftop microcells. The model computes the total cost of the network and then compares cost-per-bit for a scenario when the network is loaded with mobile devices equipped with an advanced receiver as against more traditional rake receiver-based terminals.

The economic benefits of an advanced receiver for both data-only and mixed voice and data scenarios are shown in figure 2. For a data-only scenario (including VoIP), a saving of up to 70% in cost-per-bit over UMTS Release 99/Release 4 can be achieved when using advanced receiver design in mobile terminals for higher HSDPA categories. Conversely, no economic improvements can be gained with rake-based terminals for categories higher than 6. As before, the best performance in throughput or the lowest cost-per-bit is achieved through a combination of NLMS equalizer and implementation of receiver diversity.

Figure 3 reveals that the lowest annualized cost-per-subscriber can be achieved with a combination of advanced receiver and category 10 HSDPA. The results also indicate that category 8 delivers most of the performance and could be a possible sweet spot for mobile operators before upgrading to category 10 for maximum performance. An advanced receiver provides this kind of scalability feature in mobile devices right from the beginning.

The higher throughput and capacity enabled by an advanced receiver also offers mobile operators more flexibility in deployment and allows them to trade off capacity for site separation or vice versa when required. For example, a new operator offering broadband wireless data services will be able to use larger site separations to achieve a given capacity. Alternatively, an incumbent mobile operator can get more out of its existing sites and reduce the need to deploy additional microcell sites.

These economic and performance benefits are just a few examples of the overall advantages of an advanced receiver. Other key user benefits include a more seamless experience across 3G and WLAN because of the higher data throughput and increased device battery life due to much higher power efficiency.

www.interdigital.com
Roamers refresh tired mobile markets

By Robin Burton of Sensustech

While mobile markets in most developed countries have reached saturation levels, roaming users provide a continually refreshed slice of roaming revenues as possible. Operators can see how many subscribers they are winning by making direct comparisons against competing local networks. The absolute quality of experience will determine the amount of time that a roamer spends talking and the degree to which he uses data services. Relative quality will determine his overall satisfaction with the service and the degree to which more experienced roamers are likely to manually switch networks. Good relative quality could ultimately allow a network to capture roamers who are dissatisfied with competing networks.

PAMs can also measure customer experience criteria such as overall coverage, dropped calls and call clarity. Data gathered from all networks can be compared to yield both absolute and relative measures of quality. A map of quality parameters can be produced with a focus on regions used by international business travellers and tourists. Vital areas can then be subjected to special attention – gaps can be plugged and key infrastructure can be made as resilient as possible. A PAM unit can also be placed in a roaming partner’s network to ensure that agreed levels of service are delivered and to troubleshoot and resolve any outstanding issues between partners.

www.sensustech.com
**Concerto v6 benefits from Culham merger**

By Hamish Johnston

Vector Fields has released version 6 of its Concerto software for the design and simulation of RF, microwave and optical components and systems. The release comes a year after Vector Fields was acquired by Cobham Plc and then merged with the electromagnetics arm of Cobham-owned Culham Electromagnetics and Lightning. Wireless Europe spoke to Vector Fields’ Chris Riley and Kevin Ward about the latest version of Concerto and how the merger has brought fresh investment and new skills to Vector Fields.

According to Ward and Riley, this latest version of Concerto offers several major improvements over version 5. These include the integration of Vector Fields’ Soprano eigenvalue simulation, which is based on the finite element method. “The finite element solver is extremely good for modelling high frequency design. Concerto already offers both finite-difference time-domain (FDTD) and method-of-moments solvers and according to Riley it is the only product on the market that offers all three capabilities. Version 6 also features an improved OptimiserPlus feature for Concerto’s Quickwave FDTD solver. OptimiserPlus links directly to Concerto’s 3D Geometric Modeller, which defines the geometry and associated properties of the model. Riley claims the improved optimization can reduce simulation times by a factor of two to five times.

Kevin Ward told Wireless Europe that a reduction in computation time is an important feature because users want to solve increasingly complex problems. To this end, Concerto v6 is available in a 64-bit Linux version, which removes any software limitations on the amount of memory available to Concerto. “This allows the modelling of larger and larger problems,” says Ward.

Ward says that Concerto is already very competitive with other software in terms of its ability to solve large benchmark problems – particularly large antenna models. “It is more memory efficient and often it solves problems faster,” says Ward. Concerto’s method-of-moments solver is called Clasp and it is updated in v6 with new pre- and post-processing tools. Clasp was originally developed at Culham and was integrated into previous versions of Concerto. According to Ward, this initial contact between the two companies eventually led to the acquisition and merger.

“The Culham people that have joined VF have expertise in high-frequency computational electromagnetics – whereas the expertise at VF tends to be at lower frequencies,” explains Ward. “So it was a very nice match to bring the two together. The Culham people also brought a lot of expertise in solving electromagnetic problems and that is one area that we are looking at for the future,” explains Ward.

www.vectorfields.co.uk
Surface-mount capacitors have very small footprint
A new family of leadframeless tantalum capacitors for use in mobile phones has been released by Vishay Intertechnology. Offering face-down terminations, the 298D MicroTan surface-mount capacitors are available in capacitance values from 1 µF at 16 V to 47 µF at 4 V. Supplied in 0603 and 0805 packages, the capacitors are said to occupy less space than competitors. The components are intended for use in signal processing and power management applications in mobile phones and other portable electronics. www.vishay.com

DC blocks boost tower amps
A family of DC blocks for wireless applications in the 0.4–3.0 GHz frequency range are new from MECA. The RoHS-compliant components are available in 7/16 DIN, N, BNC & TNC configurations with RF power ratings to 500 W and 2.5 kW peak power. The blocks have breakdown voltage ratings of up to 2.5 kV and MECA says that they are ideal for eliminating unwanted DC voltages or surges to tower-top amplifiers. www.e-meca.com

Base station operates on two standards
Siemens Communications has launched the Multi-Standard Base Station (MBS) system that enables mobile operators to integrate GSM and W-CDMA radio network elements on a single modular platform. According to Siemens the MBS can be used to upgrade installed GSM base stations and is said to deliver better return-loss results and improved intermodulation performance.

Jumper cables resist fire
Radio Frequency Systems (RFS) has unveiled a new line of jumper cables that can be used to make RF connections between main feeders, antennas and system equipment. Polyvinyl chloride (PVC) components have been eliminated from the cables and a new cable-to-connector union is used. According to RFS, this gives the cables superior performance in fires. Conventional jumper cables employ moulded PVC caps to provide mechanical support between the cable and connector. These have been replaced by an advanced new connector design that allows the direct coupling of the cable and end-connector. RFS says the new jumper cables have been optimized to provide improved electrical performance, while ensuring that the entire jumper assembly is flame-retardant. In addition, the new cable/connector interface is said to deliver better return-loss results and improved intermodulation performance.

PA is for linear EDGE handsets
RF Micro Devices (RFMD) has unveiled the RF3159 quad-band power amplifier (PA) module for use in EDGE handsets that employ linear transmit architectures. Described as a high linearity quad-band GSM/GPRS/EDGE PA, the module is fully matched for ease of implementation and is supplied in a 6 × 6 mm package. According to RFMD, the gain and linearity features of the RF3159 will enable handset manufacturers to optimize their designs in terms of linearity, efficiency and output power. The module is aimed at the final amplification stage in a dual-mode GSM/GPRS/EDGE mobile transmit line-up that operates in the 824–915 MHz and 1710–1910 MHz bands. www.rfmd.com

Transceiver chip is for HSDPA handsets
Sony has extended its range of transceiver chips for 3G handsets with the introduction of a single-chip multi-standard transceiver that operates in five frequency bands. Covering the 850, 900, 1700, 1900 and 2000 MHz bands, the CXA3361AGG is delivered in a 6 × 6 mm square package and is compliant to HSDPA category 6. The device is based on Sony’s SiGe BiCMOS technology and integrates upconverter and downconverter mixers, RF gain control amplifiers and a baseband PGA and LPF. Internal matching to the external SAW filters in both transmit (Tx) and receive (Rx) chains is achieved, which minimizes the number of external components required. A synthesizer circuit comprising a VCO, inductors and varactors is also integrated onto the chip. The Tx section features a direct modulation transmitter, integrated variable-gain amplifiers (VGA) and has a minimum dynamic range of 80 dB. The Rx section combines a direct conversion receiver, integrated channel filter and integrated DC offset compensation.

DSP is for 3G and beyond
A new multicore digital signal processor (DSP) from FreescaleSemiconductor is said to deliver high levels of performance that can be used to reduce system costs and boost channel densities in next-generation wireless infrastructure equipment. The new DSP can be used in various wireless applications including voice transcoding and baseband cards for layer-two processing in radio network controllers (RNCs). The device combines four StarCore DSP cores, which each operate at 1 GHz. The DSP includes 10.5 Mbyte of memory, which Freescale claims is the largest embedded memory available in a single DSP package.

www.freescale.com
How is HSDPA progressing at Agere?
In February we announced the sampling of our HSDPA chipset and we are now in the middle of the handset-development process with our lead customers. We have demonstrated layer-one HSDPA performance of 3.6 Mbit/s in parallel with standard 384 kbit/s on the uplink and downlink and voice calls – all on the chipset. Integration efforts are going on right now to build complete handsets with more than one handset manufacturer.

Why begin with 3.6 Mbit/s HSDPA rather than 1.8 Mbit/s?
We believe that 1.8 Mbit/s is just not good enough and the market needs precisely 3.6 Mbit/s. The reality is that 1.8 Mbit/s shared over a number of users does not really provide much of an advantage over the Release 99 data rate of 384 kbit/s. While HSDPA can achieve data rates higher than 3.6 Mbit/s, networks are not ready and will not be ready for a while. If HSDPA were deployed with 7.2 Mbit/s in the downlink and 384 kbit/s in the uplink, networks would struggle to deal with the highly asymmetrical nature of the uplink and downlink data rates.

Today, most backbone networks cannot support large numbers of high-speed data users. These networks were designed to provide voice channels and then were upgraded to accommodate data traffic. Deploying HSDPA at 3.6 Mbit/s allows operators to employ their current network. Once the network is upgraded, the backbone is improved and the servers are in place to deliver high-speed data services. 3.6 Mbit/s equipment will allow subscribers to take full advantage of these improvements. The next step is to roll-out HSUPA in conjunction with HSDPA at 7.2 kbit/s.

Are advanced receivers crucial to delivering HSDPA?
Advanced receiver technology can improve receive sensitivity by about 3 dB, which boosts the range of HSDPA transmission by 25%. Improved sensitivity gives the handset maker various options: they could deploy multiple receivers, create a more intelligent receiver, or implement receiver diversity methods.

There is much debate about whether a normal receiver can be used to achieve 3.6 Mbit/s – some say it’s possible and others say it isn’t. We have demonstrated 3.6 Mbit/s with our advanced receiver. It offers greater range and will make handsets more robust in real-life use, where signal conditions are rarely ideal. We believe that our technology can widely eliminate the dropped calls associated with normal receivers. This would boost network performance without the need for operators to install more base stations. I’m confident that a boost in receive sensitivity of 3 dB can be used to compensate if the cell planning is not very good.

Is the chipset aimed at handsets or datacards?
It’s aimed at both. Datacards are a natural application for higher data rates, whereas operators are eager to deploy HSDPA handsets because they can be used to improve spectrum utilization and reduce round-trip delay. Reduced delay can improve the quality of speech in conversations. Currently there is about 100–120 ms delay in W-CDMA but HSDPA will reduce this to about 50–60 ms range.

What applications will flourish thanks to HSDPA?
Music downloads are one application that could benefit from HSDPA. But operators must also ensure that digital music can be played on handsets and that digital rights management is implemented. HSDPA will also improve the general browsing capabilities of mobile phones. WAP is a cumbrous technology and I would like a real HTML browser on my phone – which is possible with HSDPA. I believe that the effect of HSDPA on mobile Internet usage will be similar to the changes in web usage that occurred when broadband connections replaced dial-up modems.

Interview by Hamish Johnston, editor of Wireless Europe.
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