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## 1 UMTS extending the vision

by Dr Bernd Eylert, Chairman, UMTS Forum

While 1999 will be remembered as a watershed for successful agreement on radio access methods for UMTS/IMT-2000, this year looks as if it will be characterised by an increased focus on applications and services to support the successful global market launch of third generation networks.

Last year's agreement on IMT-2000 radio specifications has offered us a way forward to the future goal of interoperability between mobile systems worldwide, with the promise of "use anywhere" terminals at an affordable cost to the subscriber. This historic work by the ITU enables current operators to evolve their existing GSM and other pre-IMT-2000 networks toward third generation service capabilities. Meanwhile, thanks to intense preparatory work by regulators, we have entered the new millennium with the stage set to capitalise on the opportunity of more than one billion users that UMTS/IMT-2000 will enable over the next five years. First licences have been granted, spectrum is being identified and experimental systems from leading manufacturers are already in advanced field trials. Against this highly positive regulatory backdrop, it looks certain that commercial operation of the first UMTS/IMT-2000 networks will begin on schedule in 2002.

And what of 2000 for the work of the UMTS Forum itself? Having already played a highly effective role in ensuring the availability of adequate spectrum and promoting a sound regulatory framework for the 3G licensing process worldwide, the vision of the Forum is set to extend further still this year. In order to embrace the full opportunities presented by 3G's new Mobile Multimedia value chain, we must understand better the critical issues that will determine the success of incumbent operators and new entrants alike. These range from content creation and management to Quality of Service, integration between fixed and mobile networks with the Internet, new numbering schemes and logical names, service portability, billing and Virtual Home Environments.

The UMTS Forum is now turning its attention to address these vital questions, and through the promotion of cross-industry dialogue and consensus we are confident of playing an even more valuable role in informing and energising the market for 3G services. At UMTS 2000 in particular, we can all look forward to hearing exciting answers to many of these questions from the IT and content industries, whose role in ensuring the success of IMT-2000 will become increasingly apparent in the coming months. Our shared future is just around the corner!

## 2 The great leap forward

The coming of UMTS will bring about the collision of two of the world's fastest growing markets-mobile telephony and the Internet-and will generate more change in the world of wireless communications over the next three years than has been seen in the last ten.

By Martin Heath

Within five years, most Europeans will be using mobile communications as part of their everyday lives, for communicating with others, for accessing information services, for leisure and for education. The mobile revolution will not be confined to communications between people-it is equally likely to encompass communication between machines. The Universal Mobile Telecommunications System (UMTS) will provide the wireless access networks for this new information society. UMTS will offer the advanced services that will drive up penetration and usage, surpassing the limited range of voice and slow data services currently available on second generation networks. UMTS will offer a range of mobile services that have, until now, been available only on fixed networks. In short, UMTS will provide the platform for the mobile Internet. New broadband wireless technologies will supplement the mobile capabilities it provides.

This fusion of wireless telephony and the Internet is the key to understanding the power and breadth of UMTS.

The two technologies will converge in terms of price, service, functionality, user applications and transmission technology. UMTS will provide access to this huge converged market but will provide it 200 times faster than today's mobile telephones. In just five years the Internet has attracted a staggering 200 million users and traffic carried over the net is doubling every 90 days. Revenues generated from the Internet are predicted to grow by 700 per cent per annum. It's a similar story in the mobile telecoms industry. Europe has already notched up 150 million users, with leading European countries planning for more mobile than fixed telephone subscribers and growth rates in the region of 60 per cent per annum. Against this background, it is not surprising that there is unprecedented interest in UMTS, especially as all fifteen European Union governments are preparing to award operating licences over the next three years. Interest is not confined to traditional telecoms operators-it comes from all sorts of industries. Banks, building societies, broadcasters, newspaper publishers, retailers and manufacturers are all asking the question, "What impact will mobile Internet have on my business model?". The prize for those awarded licences is not only a vastly increased supply of frequency and capacity but also the first-mover advantage needed to prosper in the new wireless digital economy.

The most exciting dimension of UMTS is its ability to meet the growing demand not only for voice services, but for data and multimedia applications and for machine-to-machine transactions. Non-voice services fall into three broad categories: machine-to-machine, person-to-machine and machine-to-person. The biggest growth is expected in the machine-to-machine category, which includes e-commerce, e-procurement, e-messaging and application hosting. All these areas represent massive cost savings to industry, given their growth to date on terrestrial networks. Already we can buy Pepsi, chocolate bars and car washes via the mobile phone, and trials will be extended to a vast array of other products and services. Credit cards will become a thing of the past. Restaurant bills will be paid by dialling

an electronic financial transaction (EFT) number and inputting a PIN: the cost of the meal will appear on the next telephone bill. The transaction will be quicker, cheaper and more secure than using a credit card. By the early part of the century mobile phone operators will have become banks and credit card companies. They will have no choice in this: if they don't they will remain just mobile phone operators. UMTS will not only provide a platform for handheld devices, it will be embedded in laptops, TVs, PDAs and radios. It is a virtual certainty that in five years' time every new laptop shipped will have a wireless modem embedded in its motherboard, allowing end-to-end, IP-based communications. No longer will corporate intranets and LANs be fixed to the desk. The desktop will become truly mobile, giving the knowledge worker of the future access to corporate data, e-mail and knowledge systems, any time and any place. This will spawn a generation of smaller, lighter products which will have less in-built processing power but, thanks to UMTS networks, will be many times more powerful than devices currently on the market.

The development of the short radio range Bluetooth chip is another exciting prospect for local mobile connectivity. Such chips can be used by shops, airports or hotels, for example, to download purchase information in a similar way to a credit card-but again, at a fraction of the cost. The customer would be billed for the purchase via the next telephone bill. There is an amazing yet so far untapped array of other possible uses for the Bluetooth chip. As well as the more obvious retail applications, it could be used to monitor household appliances, to allow 'ticketless' travel or to create electronic wallets. For viewing the Internet, an amazing new range of clever, flexible screens which can be rolled up and kept in a jacket pocket is being developed. The concept of audio or voice-enabled web browsing is also set to become a reality. No longer will the listener be limited to 10 or 20 radio stations-UMTS in broadcast mode will allow a customer to browse hundreds of radio sites using voice commands. Web radio will become a reality.

And this is only scratching the surface-already a variety of 'killer applications' are under trial. UMTS Internet/mobile telephony has all the hallmarks of success, bringing together two industries with mass popular appeal and stratospheric growth. It is convenient to use, and the development of new applications will only accelerate these trends. The drive for additional frequency for UMTS has been fuelled by incumbent operators who are rapidly running out of capacity for their existing GSM networks as a result of the huge explosion in demand for mobile telecommunications services. Major European city networks are already straining to meet demand and are now facing capacity constraints during peak periods. Short-term forecasts indicate the situation is set to worsen: over the next 10 years the number of mobile users will quadruple while voice usage will triple. Operators will need to provide networks with 12 times today's capacity, just to meet voice demand. The growth of data traffic will place an additional burden on the network.

UMTS does not simply offer greater functionality-its wireless IP architecture also gives a significant cost advantage. A fixed, switched-circuit network is inherently inefficient. About 60-80 per cent of the assets in a fixed network comprise of nothing more than holes in the ground, filled with plastic drainpipe and copper wires-hardly high-tech. Moreover, these assets are only in use about 0.01 per cent of the time. In other words, 99.9 per cent of the time they do nothing but depreciate and generate costs. Even the other 20 per cent of the asset base-the network, the systems and the switches-are designed solely for circuit-switched voice traffic. Radio IP-based networks have fundamentally different cost drivers. The radio loop is a dynamically allocatable resource, which means that as soon as a user stops using a channel it becomes available for use by someone else, unlike its fixed equivalent. Utilisation rates on UMTS networks are likely to be orders of magnitude higher

than on fixed networks. UMTS is also likely to be the first system to be designed and implemented as an end-to-end IP network, giving further cost savings in network construction.

The lure of low-cost networks and healthy additional revenue streams is whetting the appetites of existing and potential new mobile operators, international operators, broadcasters and IT providers alike. However, the initial investments are high and the market and technical risks are clear. But this initial pain is very much in the short term-the long-term advantages look impressive and compelling.

UMTS will have a unit cost structure that is closer to, or even lower than, that of fixed-line operators. This will place UMTS operators in a strong competitive position by giving them lower operating costs than those associated with second generation mobile or GSM, together with the ability to target the fixed replacement markets. Substitution of fixed services will be a key strategy in filling UMTS networks and offsetting the high fixed costs of establishing them. Success in winning licences to operate these high-speed, broadband networks will depend on getting to grips with the complicated licensing approach that each of the European countries is adopting.

UMTS is not just third generation mobile telephony, it is first generation convergence. Telephone operators must grasp the significance of this as it will fundamentally change the way they operate. Those which adapt stand to reap great rewards, those which don't face an uncertain future.

How customers are billed for the new range of services is one of the key areas, and one that needs to be completely overhauled. We have already seen the death of premium rates for long-distance calling and are about to see the end of billing by units of time. This, of course, prompts the question of what exactly operators are going to be billing for. The proliferation of new products and content that will be available over UMTS networks means that telephone operators will become more like digital supermarkets. This explosion of services has major implications for billing systems. For a start, a system must be flexible enough to select the few products a customer may use from a menu of many thousands. At the same time, customers are unlikely to want individual bills from different billing systems for each service. This would be like a multi-product supplier, such as a supermarket, presenting the customer with an individual bill for each item in their trolley.

Telephone operators' billing systems were designed for the limited number of services they offer. Bolting on new systems is unlikely to solve the problem and could lead to further operational problems. As content and products will be the key drivers of growth for UMTS operators, billing becomes pivotal to their success. Products cannot be offered if there is no method of charging the customer.

European countries will award UMTS licences either by competitive assessment (the so-called beauty contest) or by auction. Although many countries have not yet stated a preference, the European Commission favours the auction as the preferred method. The licence award mechanism will have a considerable impact on the value of the licence and the extent to which new entrants will be able to participate. The process has already started, with Finland awarding UMTS licences to four operators in May 1999. The UK is in the next wave of countries, with the auction process starting in January 2000.

These licences will be a major income generator for participating European governments. Even with price estimates as low as \$10 per head of the population, valuing British licences at US\$580 million and German ones at \$800 million, entering the race is not for the faint-hearted. Some observers estimate values ten times higher than these. This, coupled with the fact that major operators will want a presence in not just one but several of the major European countries, will mean that companies should carefully consider which licences they apply for. A licence for each of the fifteen member states may call for too much management bandwidth for even the mightiest of companies to deliver. The mobile telecoms sector exploded into life during the early 1980s with promises of revolutionary, futuristic devices that would change the way we live. This may well become a reality with UMTS-the regulatory, financial and technological factors are in place to make it so. But with the financial stakes so high, would-be players need to assess which bidding opportunities represent the best prospect for creating shareholder value. Companies should be selective in deciding where to bid-and with whom. The obvious way forward is the formation of consortia with competence in each of the key areas of the valuechain. Although the value of the opportunity will vary by country, licence and place in the value chain, a basic model is emerging.

A successful 3G player must undertake the core functions of a telecoms operator, establishing, operating and maintaining its network, as well as developing new technical services. Other vital strengths for a successful consortium include the provision of top-quality services, including content creation, e-commerce application development, transaction management and customer service management. Very few, if any, of the current players have all the skills required to provide mobile Internet services on their own.

A group comprising a key content provider, an experienced mobile network operator, a broadcaster, an IP backbone-reliant operator, an Internet service provider and a bank would present a mouth-watering prospect of first generation convergence rather than just third generation mobile. Add to this an organisation with a major consumer brand and you get a new entrant with enough presence to take on even the biggest incumbent in the target market. A dream-ticket consortium would ensure the financial and management skills as well as the technical competencies were in place, protecting and enhancing opportunities to maximise shareholder value. But it is vital that companies do not lose sight of the end game in the rush to win the licences. Creating shareholder value must be a priority at all times, and it can be enhanced by carefully matching company goals, aspirations and competencies with each opportunity. This kind of discipline and groundwork will generate a shortlist of the key and appropriate opportunities for each company, which should then become the focus of senior management. To make money in this environment, prospective bidders need to understand the dynamics of the new UMTS world. Will the traditional mainstay of the telecoms industry-the network operator-be sufficiently robust? Such operators may become expensive dinosaurs, with high costs and low margins. In the new UMTS world, the winners will be those who have developed strong brands and strong relationships with their customers. Companies must understand the whole process of taking their products to market. Where will the costs be? What are the likely revenues? Which products will sell? Users in all the convergent industries have the same priority: content. This will become key to the UMTS value chain.

Arguably the fundamental factor in ensuring a successful bid is the creation of a powerful consortium, with the right partners with the right complementary skills. Management teams must be committed to the project, and should at all times be aware of the objectives of the stakeholders involved. A credible and consistent business plan can help cement strong relationships and commitment from suppliers, financiers and the channels to market. Bidders

must be prepared to lobby to ensure that the regulatory framework is favourable and that the emerging UMTS technology is protected, so that a strong business base can be established. KPMG has been working with domestic and international operators, regulators, service providers, content providers and financial institutions to help them shape communications in a converging world. This experience shows that, although there are pitfalls, the opportunities to create value from UMTS are significant. No player in the information, communications and entertainment industry should overlook it.

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### **3 New Players Hold the Key to UMTS Strategy**

by Mark Newman, Group Editor, 3G Mobile

By the time the ITU had reached final agreement on standards for IMT-2000 late last year, the focus of the mobile community had shifted away from 3G and the Ericsson versus Qualcomm holy wars to data matters closer at hand - WAP, GPRS and strategies for mobile portals. Over the course of 1999, it dawned on the big players that mobile Internet would not wait for 3G. Vendors have known this for some time, but operators only got caught up in mobile Internet frenzy when WAP became a reality and GPRS started to take shape.

As they have begun to formulate detailed strategies for WAP and GPRS, operators have also begun to understand that even if they had UMTS capability in their networks today, it's not clear how they would use it. The speeds promised by wideband CDMA are only of any use if operators have a clear idea of the services and applications it can support. As of today there seem to be more network technologies than there are applications.

Unfortunately for 2G operators, this does not mean that they can let GPRS and EDGE run their course and only commit to 3G licence and roll-out costs (and strategies) when it is clear what the mobile data and Internet market will look like. Regulators are forcing today's cellular operators, and the wireless Internet operators of the future, to put together long term business plans and to map out the evolution of WAP and GPRS to EDGE and 3G. European governments will award between 40 and 50 UMTS licences during the course of 2000. Even though most cellcos would have trouble explaining to their shareholders precisely why they need 3G licences, few have any doubt about the need to bid. They will do so because they want to future-proof their businesses and not lose out - or be seen to risk losing out - to their existing and future competitors.

If 2G operators were the only bidders for the licences, they could probably afford to bid what is needed to secure the frequencies, then put them to one side and get on with the business of running wireless data businesses based on GPRS and EDGE. UK cellular operator Orange, for example, reckons that the 3G market will not take off until 2005 - three years after the European Commission's recommended start-up date.

But the hope of many national governments is that the UMTS licence opportunity will be seized upon by new players from the Internet, entertainment and information industries and

that it will lead to the creation of a whole new dynamic business rather than the extension of the existing cellular sector.

Justin Jameson, senior Manager at Spectrum Strategy Consultants in London, reckons that the strategies of the new players - in most cases governments are keeping at least one licence for a greenfield operator - will determine how, and at what speed, incumbents develop their 3G businesses.

"For a greenfield 3G operator neither a niche strategy (pursuing high end customers only) nor a slow roll-out approach make any economic sense. Neither generates a volume of business sufficient to pay back the significant capital expenditure on network build and licence fees." New entrants will, he acknowledges, aggressively pursue the incumbents voice telephony business (by 2002, western European cellular penetration will likely be in the range 50% to 60%). But mass-market voice alone will not deliver a sufficient return on investment, he argues. "Therefore, entrants will also aggressively develop new 3G services that can be used to provide differentiation and to attract high end, business customers. In short, a new 3G entrant will only be profitable if it can aggressively build its customer base throughout the market (with voice as the most important service) and attract significant data usage."

Whether or not players outside the cellular sector bid for these licences will only become clear during the course of this year. The indications so far are that the likes of Microsoft and America Online will not enter the bidding. Maybe if the licence competitions were taking place a year or two later they would. But even Microsoft's wireless data strategy is still embryonic and for the time being at least, it is more comfortable with the lower cost, lower risk strategy of partnering cellcos around the world to develop wireless portals and working with handset manufacturers to supply Microsoft browsers and operating systems. As for the media giants, the same rationale applies, although national players may pursue opportunities in their home markets.

It is more likely that 3G licences will be contested by existing telcos and cellcos. In Europe, a number of pan-European players and wannabes have emerged - Vodafone AirTouch, Mannesmann/Orange, France Telecom, Deutsche Telekom, BT, KPN/BellSouth and Telefonica. They will bid wherever they have gaps in their European 2G coverage. Then there are those smaller telcos with slightly lesser ambitions - the telco which feels under threat from a larger neighbour.

Jorgen Lantto, a senior partner in Northstream, a wireless data consulting company based in Sweden, reckons that Internet Service Providers are more natural bidders than cellular operators because they already have customer relationships with Internet users. Why should Internet users want to switch accounts just because they want wireless access? If Lantto is correct, this may mean that the cellular operators in the best position to capitalize on the mobile Internet will be those whose parents are already powerful ISPs. Typically, these tend to be national telcos such as Deutsche Telekom, Telefonica, France Telecom or BT. If these companies were to adopt Lantto's approach, they could decide to house their 3G licences and networks in their Internet businesses. For example, Deutsche Telekom could use T-Online as its 3G bid vehicle outside of Germany; Telefonica would use Terra and Finland's Sonera, its Sonera Zed portal business. They may decide against this, however, because in each case, the telcos mentioned are either planning to spin off their Internet businesses (or in Telefonica's case, has done so already). If these new listed vehicles housed the new 3G businesses, they may risk diluting the value of the existing cellular business.

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## 4 The 3G Air Interface Standard

By Guy Daniels, Editor, Mobile Communications International

When the ITU first announced that it would be championing a single global standard for the air interface of the next generation of wireless networks, the industry's optimists applauded wholeheartedly. We should have listened to the dissenting pessimists. The ITU did its best, but commercial and political interests crashed the party and threatened to destroy the whole process.

What has just been agreed at a meeting of the ITU-R 8/1 task group in Helsinki is a single standard, but with five optional modes. However, market reality may yet mean that one or two of these modes will prove dominant, relegating the rest to history. A lot depends on the US operators and their choice of migration strategies.

In the words of the ITU, "the IMT-2000 terrestrial standard consists of a set of radio interfaces which allow performance optimization in a wide range of radio operating environments". The IMT-2000 radio specifications, together with related recommendations on quality of service issues and the use of 'high altitude platform stations' was presented to ITU-R Study Group 8 for endorsement in Geneva in mid-November. This meeting also discussed the role of the group in ongoing IMT-2000 standard developments and preliminary studies of systems beyond third generation.

Formal approval of these recommendations will take place at the ITU Radiocommunication Assembly in May 2000, along with final approval by the other standards development organisations who have been working alongside the ITU. This should now clear the way for commercial operation of IMT-2000 services in 2001.

"The ITU has delivered on its commitment to provide the international community with a standard that enables full interoperability of third generation mobile systems," said ITU secretary-general, Yoshio Utsumi, at the close of the meeting.

"The extent to which the promises of this new wave of communication can become a reality for every consumer now depends on the delivery of the IMT-2000 implementation."

Ericsson was amongst the first vendors to comment. Jan Uddenfeldt, senior vice president of technology, said: "the decision represents the very positive culmination of more than a decade of work by groups and individuals from across the telecoms industry".