COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels, 15.10.1997
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COMMUNICATION FROM THE COMMISSION

TO THE COUNCIL, THE EUROPEAN PARLIAMENT,
THE ECONOMIC AND SOCIAL COMMITTEE
AND THE COMMITTEE OF THE REGIONS

STRATEGY AND POLICY ORIENTATIONS WITH REGARD TO THE FURTHER DEVELOPMENT OF MOBILE AND WIRELESS COMMUNICATIONS (UMTS)

OUTCOME OF THE PUBLIC CONSULTATION AND PROPOSALS FOR CREATING A FAVOURABLE ENVIRONMENT

The development of the telecommunications market is driven forward at a great speed, in part by the liberalisation of the telecommunications sector in major parts of the world and in part by the advances in technology in areas such as information processing and multimedia communications over the Internet Protocol.

Two main trends will prevail over the years ahead: the rapid Internet expansion and the huge growth of mobile and cordless terminals. This development is not confined to Europe but takes on a global dimension and will lay the foundation for a global Information Society without frontiers where information is stored and communicated electronically.

A great opportunity exists for the mobile communications industry to foster that development by its ability to provide easy and ubiquitous access. Mobile communications offers everyone the ability to make phone calls, receive faxes, check e-mail or use the Internet whilst on the move.

The huge potential for expansion that this market holds explains the rapidly growing interests of industries world-wide in the standardisation process for next generation mobile communications in the ITU (under the name IMT-2000). In Europe, these developments take place under the umbrella of UMTS (the Universal Mobile Telecommunications System) and are driven forward by the UMTS Forum and ETSI.

But also other parts of the world have woken up after the success of GSM[1]. Japan is preparing for a mass consumer market, a market where Japanese industry traditionally has strength, and industry momentum is building up. In the USA, new satellite based concepts are being developed (e.g. the Teledesic) whilst CDMA is heavily promoted by its industry as an alternative and competitive radio access technology for terrestrial mobile cellular communications.

The European market of the year 2005 is expected to represent over 100 BECU of annual revenues and some 200 million subscribers. The global market is anticipated to grow even faster, in particular in Asia. This means that any development in Europe in that area must take into account the global nature of this market. To that end, a strong home market would seem to provide the best conditions for European industry to compete in other parts of the world.

In order to set out strategy and policy orientations for Europe in this important but also very complex growth sector, the Commission issued a Communication[2] in which it

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[1]   The success of GSM is generally attributed to the fact that it was an open standard and provided full cross border roaming functionality. GSM has become the de-facto world standard for mobile communications with now close to 250 operators operating or building a network, the majority of them outside Europe. It is estimated that the total investment in GSM infrastructure will exceed 100 B$ by the turn of the century. GSM has delivered a great net export result for Europe and created a lot of new employment within the industry.

requested responses from Member States and sector players to a number of key questions related to the further development of mobile and wireless communications in Europe.

This Communication provides a synthesis of the comments and contributions that were received. In particular, clarification of the licensing regime that will be used for granting UMTS licenses and certainty that radio frequency spectrum will be made available in good time were seen as critical areas where action by authorities is required as a matter of urgency. There was an almost unanimous view of Member States and industry that this would create favourable conditions for the development of UMTS and thus help preserve the competitiveness of European industry. At the same time, Member States and operators felt that it would be necessary to secure basic customer interests such as Europe-wide roaming for mobile multi-media services on the basis of a common, open and internationally competitive air-interface standard in order that the European citizens can benefit from the "wireless Information Society" without frontiers as they can do today with voice using GSM.

On the basis of the responses received, the Commission sets out action lines for creating a favourable environment for the further development of this sector. These action lines are summarised in the table below:

Action Plan for the Community:

action	by
WRC-97: preparation of agenda WRC-99 (to include UMTS spectrum allocation)	Oct.97
Council Resolution on present Communication setting out the political priorities	Dec.97
Proposal of a UMTS Decision on spectrum and licensing conditions	Jan. 98
Implementation of 5th Framework Programme for Research and Development	98
Adoption of UMTS Decision	early 99
Mandate to ERC on further spectrum allocation	Feb. 99
MRA negotiations	continuous
WRC-99: extension of UMTS spectrum allocation	Oct.99
Review of telecommunication regulatory environment	end 99

This Communication is intended to present strategy and policy orientations for the development of third generation mobile communications (UMTS) to the European Parliament and the Council; the Economic and Social Committee and the Committee of the Regions. It responds to the specific call from the Council and the European Parliament following the Mobile Green Paper[3] for additional action to ensure a continuing support for the evolution towards third generation mobile communications.

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1. INTRODUCTION

The Commission's Communication on the further development of mobile and wireless communications[2] was published on 29 May 1997. It presented an overview of developments in mobile and wireless communications within the European Community since the 1994 Green Paper on mobile and personal communications[3] and examined the future direction of mobile and wireless communications. In particular, it invited comments on a number of core issues linked to the further development of mobile and wireless systems:

- Is this the right moment to define a strategy for the introduction of the Universal Mobile Telecommunications System (UMTS) or would regulatory action today be premature?

- Is there a consensus in Europe on the notion of UMTS or third generation mobile communications? Will it be a new single technology, or a number of interoperable solutions based on different technologies ?

- What should be the respective roles of the private sector and of public authorities in the transition towards UMTS?

- How can UMTS impact on the competitiveness of Europe's industry?

- How do we ensure that the broader social and societal interests are secured in the development of the "wireless information society"?

Additionally, the Communication invited comments on the need, if any, for action by governments, the European institutions or other regional or global bodies. The Communication asked for responses by 15 July 1997. However, this period was extended into September at the request of the Telecoms Council at its meeting of 27 June. More than 50 written comments were received (see Annex I for list of contributors)[4] from telecoms operators, equipment manufacturers and from Member States. Comments from business and user interests were limited to a comment from a national user association and from UNICE.

Since the publication of the Communication, a number of developments can be highlighted which reveal a rapid evolution of the UMTS debate and confirm the timeliness of the consultation launched by the Communication of last May:

- In July 1997, the UMTS Forum[5] produced its first report on a "Regulatory Framework for UMTS"[6]. The report examines those political and regulatory actions which are

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2   Communication to the European Parliament, the Council, the Social and Economic Committee and the Committee of the Regions on the further development of mobile and wireless communications - Challenges and choices for the European Union - COM(97) 217 final, 29.05.97

3   Green Paper on a common approach to mobile and personal communications in the European Union, COM(94) 145 final, 27.04.94

4   Copies of the comments are available on request (to be sent to umts@dg13.cec.be or by fax to Secretariat, DGXIII / A1D, +32-2-2968395)

5   The UMTS Forum counts now about 100 members. Memberships includes all major European manufacturers and mobile communications operators. The Administrations of France, Germany and the UK are also a member of the Forum.

considered essential for the successful development of UMTS, as well as the following timetable for such actions.

MAJOR MILESTONES FOR THE DEVELOPMENT AND INTRODUCTION OF UMTS AS PROPOSED BY ETSI AND THE UMTS FORUM	
1 October 1997	ERC Decision on UMTS core band becomes effective; Member States expected to sign up for its implementation.
31 December 1997	Plans for the licensing of UMTS and for the provision of adequate frequency spectrum must be clear in order to reduce the risks and uncertainties for industry
First quarter 1998	Operators identified; drafting of licences commences.
31 December 1999	Agreement by ETSI on UMTS Phase 1 standard.
Early 2002	Start of commercial UMTS service.

- The UK in a consultative document[7] has become the first Member State to announce a timetable for granting several UMTS licences with a view to services starting in 2002.

- Within ETSI, intensive discussion is taking place to reach a common understanding about the basic technical characteristics of UMTS, and a number of announcements have recently been made by some of the major actors in the European mobile manufacturing industry.

- Internationally, there have been a number of announcements from industry and Governments concerning third generation systems, for example in the USA, Japan and Korea. Work in ITU IMT-2000[8] has provided a forum with wide global participation, whilst contacts between regional standardisation bodies have been established and are strengthening, particularly in areas related to the development of a single radio air-interface.

In preparing this Communication, the Commission has drawn conclusions from the public comments received in response to the May Communication, and from the Report of the UMTS Forum as well as other ongoing developments.

The objective of the present Communication is to establish policy objectives in the areas of UMTS; to clarify how certain aspects of the current regulatory environment impact its

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6   A Regulatory Framework for UMTS, Report No. 1 from the UMTS Forum, 25 June 1997. It can made available by the secretariat of the Forum, Russell Square House, 1- 12 Russell Square, London WC1B 5EE, UK, fax +44 171 331 2040, e-mail umtsforum@fei.org.uk

7   Multimedia communications on the move, a consultative document from the UK Department of Trade and Industry, 31 July 1997.

8   IMT-2000 (International Mobile Telecommunications 2000) is the name designated by ITU-T (the Telecommunications sector) to the standardisation efforts for third generation mobile communications. The corresponding acronym FPLMTS (Future Public Land Mobile Telecommunications System) is up till today still used by ITU-R (the radio frequency sector) to designate the radio frequency spectrum allocated to third generation mobile communications.

development and to propose further action in key areas, as well as a timetable for such steps.

The Communication proposes to confirm the commitment at Community level to ensuring an environment conducive to a successful preparation and implementation of UMTS.

2. INDUSTRY AND ADMINISTRATION VIEWS ON THE FURTHER DEVELOPMENT OF MOBILE AND WIRELESS COMMUNICATIONS

The launching of a debate within the European Union on the future strategy for UMTS was widely welcomed though it was clear that industry and Member States had different expectations for the process. Section 2.1 below is structured along the main lines of the comments that were received to the core issues identified in *section 3.3 of the May Communication*, whilst section 2.2 presents additional comments on the key regulatory issues raised in *section 3.4 of the May Communication*.

2.1. Main lines of comments on core issues

2.1.1 An overall strategy is urgently needed to provide regulatory certainty for UMTS

Industry looked for the rapid development of a clear regulatory framework in the key areas, such as: the impact of competition rules on UMTS; the way licences would be issued and the conditions to be attached to them, and the future frequency allocations within the 2 GHz band. Lack of timely decisions on these issues will deter the sector actors to take the required investment decisions without which the further development of UMTS will be seriously compromised.

Industry believes that an approach at European level is essential to maximise the opportunities for European players within the global market for third generation mobile communications[9]. With other technologies on the horizon (e.g. the development by Japanese and North American industry of new air interfaces), it was felt that Europe had a narrow window of opportunity in which to develop a clear and winning strategy.

At the same time a number of comments pointed to the difficulty of taking decisions at a stage where UMTS has not been clearly defined in system terms and users had yet to indicate what level of demand there would be for the next generation of services.

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[9] The European market for third generation mobile communications is a small part of the potential global market. The UMTS Forum forecast for the world-wide growth of mobile communications is shown in the table below. The North American and European markets are expected to reach saturation first as can be seen in the table. But even in 2015, markets in Asia, Africa and South America are expected to be far from saturation, even without taking population growth into account.

Customers in millions at year end	1995	2000	2005	2010	2015
EU 15	22	113	200	260	300
North America	36	127	190	220	230
Asia Pacific	22	149	400	850	1400
Rest of World	7	37	150	400	800
Total	87	426	940	1730	2730

The key message from the Member States that responded to the consultation (see Annex I) was that the development of UMTS should be market-led with industry playing a predominant role. Regulators should not substitute themselves for market forces. As a result some Member States (United Kingdom, Finland and Germany) suggested that the combination of competition law and the Licensing Directive offered the necessary basic regulatory framework within which UMTS could be introduced. Beyond this, Member States generally supported industry in seeking further clarification with regard to the impact of competition rules, and with regard to how the Licensing Directive would apply to UMTS.

The UK indicated that whilst it saw the possible need for additional regulation for UMTS, it questioned the need for those rules to be developed within a Community framework. France highlighted in this context the 1999 Telecoms Review which would adapt the telecoms regulatory framework, if required, in the light of two years of competition.

2.1.2 A clear picture with regard to frequencies lies at the heart of the debate

Member States attached importance to the current work within the ERC which had led to a Decision on UMTS bands[10]. At the same time, Finland and France both expressed concerns that should the ERC mechanism fail to produce timely and binding results, the European Community should consider adopting a Frequency Directive.

Industry and the UMTS Forum also attached importance to the ERC's work as the basis for the management of the spectrum for UMTS/IMT-2000. Some industry comments, however, preferred the use of a binding Community measure to allocate frequency, together with a clear identification at a political level of Community priorities and objectives in relation to UMTS.

Several respondents focused on how much fees companies would have to pay for spectrum and whether it would be allocated by auctions, with some comments arguing that high fees acted as a market barrier.

2.1.3 The notion of third generation mobile communications

A number of comments focused on the need for a migration strategy from existing second generation systems, so that a degree of backward compatibility would be guaranteed. In this regard, some comments highlighted the current evolution of the GSM standard, in particular the development of the General Packet Radio System (GPRS, as part of the GSM Phase 2 package, to support a limited form of mobile multimedia) as an important test bed for future developments. Many commentators argued that UMTS should constitute a multimedia evolution of GSM.

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[10] ERC Decision on the frequency bands for the introduction of Universal Mobile Telecommunications Systems (UMTS), ERC/DEC/(97)07, 30 June 1997. CEPT Administrations had until 1 October 1997 to sign up for the Decision. On that date, the following EU Administrations had committed themselves to implementing the Decision: Austria, Finland, Germany, the Netherlands, Portugal, Spain, UK. Furthermore, the following non-EU countries had signed up: Lithuania, Norway, Turkey.

Several industry players and the Member States emphasised that ETSI provides the best platform for translating the notion of UMTS into key open standards and that technology choices should come from industry through the standardisation process in ETSI.

The issue of whether or not existing fixed or mobile operators should be able to operate third generation systems was seen to raise competition issues. The UMTS Forum suggested that existing operators should not be excluded from bidding for UMTS licenses, because of the huge investment costs required for UMTS, whilst a number of GSM operators staked a claim to the automatic grant of UMTS licences, in order to allow users to benefit from their skills and experience. Member States considered that there should be neither an automatic granting of licenses to, nor an a priori exclusion of GSM/DCS operators.

2.1.4 The broader impact of UMTS on Europe's society and global competitiveness

Industry presented UMTS as a test of Europe's ability to rise to the challenge of the communications markets in the next century and the development of a "wireless information society". Industry argued in this context that UMTS must offer nation-wide coverage within Member States and be priced at a level (both services and equipment) which reflected a mass consumer market rather than a premium business service. In this respect, it was argued that high valuations placed on spectrum would lead operators to focus on high profit business customers and could put European users and the industry at a serious disadvantage vis-a-vis other global players.

To this end, UMTS was also perceived as having a direct impact on the competitiveness of Europe's economy as part of the fabric of advanced communications which was bringing down business costs. It could also play an important role in continuing the success of Europe's mobile communications industry, offering manufacturers and operators a strong home market from which to expand. This assessment was largely shared by Member States. Stress was placed on the fact that by developing products which responded to market demand and which competed successfully with other technologies, systems were likely to emerge which could compete on a world stage.

In this respect, the UMTS Forum emphasised that the global potential of this market has two major implications, firstly that it is even more necessary to set regulatory and technological frameworks which will provide the greatest impetus to UMTS in Europe, and secondly that UMTS developments need to take into account trends in other parts of the world. Such trends include a greater use of wireless for all telecommunications services, particularly in emerging market.

2.1.5 Other factors related to the take up of UMTS

Strong support was found for a Community co-ordinated research programme into the possible health effect of mobile phones.

There were no calls for extending current concepts of universal service to include UMTS as a means of securing its wider deployment.

Other issues were identified in the comments as being important for the take up of UMTS services, namely: security and encryption issues, the protection offered against fraudulent use, the need for adequate levels of privacy and protection of personal data, the protection

of intellectual property, the integration of UMTS in teleworking and teleteaching initiatives and access for the content industry.

A range of initiatives are underway at a Community level in relation to these areas, therefore they are not considered further in this Communication.

2.2. Comments on key regulatory issues

2.2.1 The regulatory framework for UMTS

The development of UMTS should be market-led

There is broad recognition that the private sector must take the lead and should design, build and deliver mobile and wireless multi-media services. Such action should be driven by market demand. Comments suggested that the role of public authorities was one of "political leadership", creating an appropriate regulatory environment through rules which promote innovation and flexibility.

Many comments whilst emphasising the need for a predictable regulatory environment, confined calls for regulatory action to the issue of grant of licences for UMTS and the need for early frequency decisions, in order to avoid over-regulation. One manufacturer stated that Member States must set a global example by committing to early spectrum licenses. Emphasis was also placed on the need for rapid progress on a minimum degree of standardisation i.e. only the critical interfaces. A number of comments stressed the need for early decisions if Europe was not to be overtaken by developments in other parts of the World and if the current technological lead based on GSM was not to be squandered.

A unique solution or interoperability and interconnection for competing technologies?

Some comments highlighted the risks of multiple wideband air-interfaces, allowing users to be connected to a multi-media environment, undermining the objective of Europe-wide roaming and connectivity. This led for calls for action to be focused on ETSI and the UMTS Forum, in order to facilitate a single technological solution. Such a solution would minimise the risk of multiple standards being adopted or implemented in Europe. The importance of European standardisation efforts was stressed as a means of influencing global developments.

Others stressed the need for competition, preferring work to focus on interoperability and interconnectivity rather than a single technology. Stress was also placed on the need for UMTS to allow operators to innovate and to use their technology of choice, reflecting a concern that over-specified standards tend to make businesses less flexible, preventing competition based on differences in products and services. In their view the current agreement on key characteristics of third generation systems was adequate for investment decisions and for the limited regulatory action required. Any attempt to establish a consensus around a more detailed concept of UMTS was unrealistic, particularly if the aim was to develop a level of detail similar to that found within the GSM standard. This view was supported in particular by the UK and France.

On the issue of whether UMTS should be service- or technology orientated, the UK suggested that it should be technology based. The UMTS Forum report states that UMTS spectrum should be reserved for systems using UMTS as defined in standards adopted by ETSI. Flexibility of the UMTS standard as defined by ETSI would be an advantage. Several Member States and operators felt that open standards were needed to ensure that a variety of manufacturers will be able to supply equipment and that this equipment will be inter-operable.

Roaming is a key regulatory issue for UMTS

Roaming is considered by most of Member States and operators as a key issue for the successful take up of UMTS, particularly as it seeks to compete with current GSM networks. Concerns were expressed about the uncertain regulatory position today as to whether all aspects of roaming would be caught by the Community's Interconnection Directive.

Some Member States take the view that third generation operators should be encouraged to enter into roaming agreements with each other, whilst others went further suggesting that legal measures to oblige UMTS operators to negotiate roaming arrangements where required, where this was not covered by the Interconnection Directive.

The need for global as well as regional roaming was also highlighted in the context of ITU work on IMT-2000.

The need for regulatory action to be co-ordinated at a European level

The majority view supported the case for a clearer concept of UMTS to emerge as a pre-requisite for action at the European level. Most Member States called for a co-ordinated approach with regard to the introduction of UMTS, on the basis of discussion at Community level and/or within the CEPT. This view is supported by several industry players who argue that the piecemeal issuing of licenses will create instability and that therefore licenses and spectrum should be made available in a co-ordinated manner. Stress was also placed on the need to ensure a solution which was consistent with IMT-2000, so that global roaming could be ensured. Given that the available spectrum is limited, some Member States argued that UMTS should be constrained to a single technology, with possible legal requirements to support roaming, perhaps through an obligation established at a Community level.

Role for public authorities to secure a broad competitive basis for UMTS

Member States saw a clear role for action by public authorities in order to safeguard the general public interest by ensuring that regulatory environment did not hold back the development of a competitive environment offering a broad range of services.

2.2.2   Frequency issues related to UMTS

The issue of spectrum pricing

Several industry contributors argued that high pricing of spectrum would distort the market and damage the uptake of UMTS services. Little support was expressed for the use of market mechanisms, in particular, auctions, since these tend to overprice spectrum, create uncertainty and undermine the development of a healthy industry. Some also felt

that auctions risked favouring the entry of non-European players into the European market place. On the other hand, some Member States consider that spectrum pricing should reflect its economic value.

Estimates of how much spectrum is required

Industry players argued that the 2 x 40 MHz currently designated by the ERC[11] will prove to be insufficient for the needs of a competitive market place to start up. The UMTS Forum identified a minimum requirement of 2 x 40 MHz to be released now, together with another band of 20 MHz which will be needed for non-public, in-building, low mobility systems. In the longer term, the Forum considered current market forecasts justify a claim for the full 155 MHz identified for terrestrial mobile communications by WARC-92 to be available by the year 2005, with a further 185 MHz required for terrestrial services by the year 2010. It was suggested that steps should therefore be taken by the CEPT to place the subject of additional spectrum for IMT-2000 on the WRC-99 agenda.

Additionally, the ITU has identified 60 MHz for the satellite component of IMT-2000, with forecasts of a need for a further 30 MHz by the year 2010.

The idea of sharing a common pool of spectrum was rejected by industry who argued that it would be a significant disincentive for operators, whilst others doubt whether it would be technically possible or indicated that it would create monopoly structures.

In terms of the UMTS market, several comments stressed that the development of the UMTS market makes it necessary that sufficient spectrum is available to cover the needs of all operators seeking a license. This would also have an effect on the future development/evolution of the UMTS standard.

When and how should decisions on spectrum be taken?

The UMTS Forum called for a co-ordinated approach by all relevant authorities in Europe to ensure a timely approach to identifying, liberating and allocating UMTS spectrum. Nevertheless, some argue that the detailed planning of the spectrum can only be done at a later stage when a clearer picture of UMTS has emerged.

2.2.3   Standardisation related questions

General characteristics for UMTS

In general terms there was agreement on some of the key service characteristics of UMTS. As a system it would have to represent an improvement over current mobile systems, for example, by offering extended coverage (preferably global), higher bit rates (to support multi-media), better spectral efficiency and greater flexibility for the customer, both in service offering and price.

Some manufacturers suggest that UMTS is effectively mobile Internet. Other more traditional operators viewed UMTS as a means of achieving ISDN type services on a

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[11] ERC Decision on the frequency bands for the introduction of Universal Mobile Telecommunications Systems (UMTS), ERC/DEC/(97)07, 30 June 1997

mobile platform and facilitating fixed-mobile convergence. Furthermore, a few comments drew links between UMTS and Digital Audio Broadcast (DAB) as well as TETRA.

UMTS is likely to involve both an evolution of GSM and the development of a new air interface

Several comments stressed that the path to UMTS is likely to involve both an evolution of the GSM backbone infrastructure for call control and mobility management and the development of a new radio air-interface supporting data rates up to 2 Mbits/s and multi-media services[12].

Industry is apparently prepared to accept, given the significant investments in current mobile networks and the need for evolution, that at global level different regional systems will be developed supporting different air-interfaces. Consequently multi-mode terminals would be required for global roaming services. Some felt that that more complex multimode terminals would slow down the development of the market.

Comments from current mobile operators stressed that GSM covers a spectrum of narrow-band services and that UMTS would be the natural complement, offering advanced high bandwidth services. Existing operators recognised that, if UMTS is optimised for wideband services, it will be easier for them as providers of existing narrow band systems to claim licenses in the UMTS band. Some operators question whether the financial power in the market is sufficient to make third generation a success if it would be a stand-alone technology and stress the need for a smooth migration from GSM by adding modular components.

Finally, ETNO made the point that focusing the resources of many operators, manufacturers and service providers on a single standard (i.e. GSM) leads to high-quality, low-cost products and demonstrated market satisfaction. It stressed roaming as a key issue to service delivery that has played a pivotal role in the development of the market across Europe and many other countries of the world. Besides meeting an important market demand, Europe-wide roaming was identified as an important factor that has contributed to the global success of GSM. Technologies or standards (or any mix of them) which inhibit or constrain such roaming may prove less attractive to the world's operator community than those that facilitate roaming functionality through a single standard.

A central role for ETSI

Standardisation is, and will remain, a key factor in providing quality services for a reasonable price and in enabling roaming between systems. The success of UMTS depends upon the flexibility of interfaces and the capacity to evolve in parallel with technology. Continued close co-operation between operators, manufacturers and regulators in the standardisation of UMTS is crucial for UMTS to be as successful as GSM.

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12 Where the UMTS Forum elaborated the UMTS vision in broader conceptual and market terms, ETSI is working out the more detailed technical picture of UMTS. ETSI is expected to take a decision on the air-interface standard for UMTS during the first half of 1998.

There was general support for ETSI playing a role in developing an open and transparent approach to standardisation for UMTS and for it to carry out the task of UMTS standardisation, with an aim of ensuring efficient use of the designated UMTS frequency bands. Several Member States and industry players emphasised that technology choices should come from industry through the standardisation process in ETSI where only UMTS standards approved by ETSI should be used in those bands.

A close co-operation between ITU, ETSI, and other regional standardisation bodies is essential to establish a framework for global compatibility. The Forum further places a great deal of importance in identifying UMTS as a part of the IMT-2000 family.

The need for redirection of the standardisation from telecommunications per se towards information technology is recognised in several contributions from Member States and industry. It is mentioned that a much greater participation of the IT industry in the standardisation process is highly desirable.

Several Member States had difficulty in seeing how competition amongst standards within the UMTS spectrum band could work without de-stabilising the market. It was recalled that one of the key factors in the success of GSM had been the stability of the standard and the large number of manufacturers supporting what is to a large extent an open standard. It was argued that competition between standards would invariably mean proprietary standards, which have the major drawback (as perceived by the operator and its financial backers) of locking an operator to one manufacturer for years.

2.2.4 Research and Development

The majority of the comments relating to R&D aim at improving the UMTS networks that will be deployed in the future, in terms of performance, capacity, Quality of Service (QoS) usability and cost.

The proposals for future R&D, in particular in the context of the 5th Framework Programme, indicate the need for research into the so-called Enabling Technologies. Under this term can be found technology concepts that have emerged during the last years. Their incorporation into current and future mobile communications networks promises considerable improvements of performance. Technologies such as Neural Networks, High Temperature Superconductivity (HTS) and Space Division Multiple Access (SDMA) fall under this category.

The need for further research on Software Radio Technologies (SRT) was highlighted in all contributions, as one of the technologies that will enable the introduction of service and content diversity and alleviate the problem of standards. The concept of software radio is seen as the basic technology that will allow a mobile network to adapt and reconfigure its radio interface and reallocate its resources, and to meet the characteristics of a variety of terminals.

A number of proposals indicated the need to further investigate the incorporation of Digital Audio Broadcasting (DAB) systems into the future generations of mobile communications systems. The argument behind those comments is the ability of the DAB standard to provide high capacity wireless links that in the context of mobile communications systems can be used for downloading the code necessary for the reconfiguration of the mobile terminals.

In light of the foreseeable penetration levels of UMTS, a number of contributions indicated the need to provide information on the issue of health hazards caused by the use of mobile terminals and base stations.

Also the ease of use of mobile terminals is considered as essential. Hence, issues such as Man Machine Interface (MMI), voice recognition, hands free operation, etc. need further research.

Research on tools for planning and allocation of resource, network management and interconnection of networks (e.g. UMTS and broadband W-LAN's), considered from the perspective of spectrum efficiency, network capacity as well as QoS, are a priority, given the increased complexity of future networks.

Further, the development of pilot platforms that provide the base for implementing and demonstrating new applications and services is considered as a valuable tool, in order to demonstrate to the consumers the flexibility and benefits of UMTS.

Taking into account that UMTS will be deployed using the 2 GHz frequency band, it is felt that research should also be oriented towards the utilisation of higher frequency bands, providing further opportunities to meet the requirements for broadband communications.

Comments were also expressed regarding the need to ensure that security and encryption techniques adaptable on the nature of the transmitted information over mobile communication channels (private or professional) are further researched.

2.2.5   International aspects

Comments stressed that the European market for UMTS will be a part of a global market. This has a number of implications for UMTS. For example, UMTS developments need to take into account trends in other parts of the world. But also the issue of access to the global market was seen as an important success factor for UMTS.

Free circulation and roaming in a global context were mentioned by Member States, the UMTS Forum and industry as main issues on which European Community action should focus. Spectrum and standardisation issues must be progressed through the appropriate international bodies and specifically with the ITU. To that end, it was felt that the European participation in IMT-2000 standardisation work should be strengthened.

In particular, the UMTS Forum report recommended that the European Union can undertake action to remove barriers to the use of UMTS beyond Europe. This includes an assessment to what extent UMTS might be covered by the commitments made in the Group on Basic Telecommunications of GATS/WTO. It is also recommended to take steps to ensure that UMTS products are explicitly covered by the Information Technology Agreement (ITA).

3. COMMISSION ASSESSMENT

3.1. Areas of consensus

In the light of the comments set out above, the Commission believes the following areas of consensus or strong support can be identified:

Regulatory framework

1. Broad agreement is found that now is the time to set out the strategy for the introduction of UMTS. The comments confirm the need to raise the UMTS to the forefront of a policy debate at the level of the European Union.

2. The development of UMTS must be market-led and driven by the private sector. The Government's role should be to ensure that the regulatory climate does not hold back innovation and investment.

3. The view that the current regulatory framework is broadly sufficient for UMTS is generally supported. Nevertheless, in order to enable investment decisions to be made, confirmation was requested that key aspects of that framework (e.g. licensing and interconnection rules) would apply to UMTS. Furthermore, clarification was sought on how decisions on licensing, frequency or standards could be accommodated within the existing rules.

4. There is agreement that existing GSM players should be allowed to migrate to UMTS, while at the same time ensuring an open and competitive market for new players.

Frequencies

5. A majority of commentators consider the present ERC decision for 2 x 40 MHz to be allocated by 2002 to UMTS out of the FPLMTS band identified by WARC-92 as insufficient to establish a broad competitive service offering for UMTS. General agreement was found that further radio frequency spectrum needs to be identified.

Standardisation

6. Member States and private sector players stress the need for industry co-operation in ETSI to arrive at common and open standards for critical interfaces such as the air-interface. Limiting standardisation to key interfaces would allow for a mix and match of vendors, without undermining the creation of a competitive market for equipment.

7. Ensuring roaming capability for future multi-media systems is regarded crucial. This would be facilitated by a consensus on a common, open and internationally competitive air-interface standard within Europe.

A solution where interoperability and roaming are provided through multi-mode handsets in an environment with multiple air-interfaces, even if technically possible, is not the preferred solution within Europe as it bears the risk of market fragmentation and/or higher costs. At a global level it remains possible that emphasis will be placed

on interoperability of a number of regional air-interfaces. The lack of a common and open air-interface in Europe would affect both the customer and the competitiveness of any UMTS standard.

8. UMTS is viewed as a crucial test to Europe's competitiveness, both for the mobile communications industry and because of the importance of mobile communications for economic players at large. A strong home market would seem to provide the best conditions for European industry to compete in other parts of the world.

Other issues

9. The contributions to the consultation resulted in a broad range of fringe factors that need to be addressed to safeguard the general public interest. Views expressed were largely complementary and included actions in such areas as research into possible health effects as well as measures to ensure the protection of privacy and personal data and against fraudulent use.

3.2. Issues for further discussion

From the comments, it is also clear that in a number of areas, either no clear consensus emerged or further work is required:

1. The extent to which further decisions concerning UMTS frequencies should be a matter for the European Community or for CEPT. Whilst many comments supported the use of CEPT/ERC mechanisms, concerns arose about the risk of those procedures failing to produce implemented results. Should that be the case a number of Member States and industry players saw a clear role for binding legislation within the Community.

2. There was a split between industry and Member States with regard to the issue of spectrum pricing, with the industry reluctant to face spectrum fees which they argued would put up their business costs. Member States, however, were more open to placing a market valuation on a scarce natural resource to ensure its efficient use.

3. Whilst there is agreement on the general *notion* of UMTS, the consultation has shown that it is not yet possible to describe UMTS in terms of *system* or *technology concepts* For Member States and operators a definition of UMTS, in particular its air-interface standard, is needed for regulatory action and indeed seems to be a pre-requisite for a co-ordinated introduction .

4. ORIENTATIONS FOR PUBLIC POLICY

While addressing a wide range of issues, the comments received can be structured along main challenges, allowing general principles and political priorities to be identified (section 4.1). These findings are translated into recommendations for action by public authorities to establish a suitable regulatory environment and to address certain flanking issues (section 4.2).

4.1. Policy objectives

In the light of the comments received and the consensus established, three key policy objectives can be identified which should underpin future action both by the Community and by industry. These are set out below. In section 4.2 areas for Community actions to further the attainment of these objectives is set out.

- *Fostering the development of a market with a broad competitive offering of mobile multi-media services through competition*

  This objective requires a legal and technical environment which will allow competing providers of UMTS services and networks. This requires an open licensing procedure and early decisions on the number of UMTS licenses. It requires sufficient spectrum to allow such competition and it requires standards which ensure that users can communicate with other users whilst not being so comprehensive as to prevent service providers from offering different service elements or facilities.

- *Enabling industry to meet user and societal needs*

  The success of UMTS in an environment in which second generation mobile technologies are already well established is closely linked to ensuring it responds to user's needs, for example, for mobile multimedia and mobile Internet functions or for Europe-wide and global roaming of these services. The pricing of UMTS services and equipment will also be crucial to whether it is seen as a mass-market product or a niche premium service. From a regulatory perspective, it is essential that any remaining artificial market barriers are removed and that a broader convergence between telecommunications and audio-visual sectors is promoted. It is also important to address the broader social and societal interests and secure access to the "wireless information society" for all citizens.

- *Creating a climate for investment and deployment of UMTS and fostering Europe's competitiveness*

  Investment and business planning requires early decisions as to the regulatory framework of UMTS, the spectrum availability and as to the standards, together with a longer term perspective on how further spectrum may be required. The application of the current regulatory environment to UMTS should be confirmed and, where appropriate, further steps taken to adapt or clarify that framework. Finally, in order to preserve the broader industrial interests, industry with, where appropriate, support

from the Member States and the Commission should aim at positioning UMTS in global markets, both through ensuring a strong home base within the internal market and by promoting the rapid development of mobile multimedia applications.

4.2. Recommendations for further action

Whilst industry and national Governments have a key role in achieving the policy objectives set out section 4.1, the Commission believes that all appropriate actions must be taken with particular attention being given at European level to the following five key areas: regulatory framework, frequency related issues, standardisation and system definition, research and development, and action at the international level.

4.2.1 Regulatory Framework

The Commission considers to propose a European Parliament and Council Decision ("UMTS Decision") with respect to roaming, frequencies and standards.

Licensing

How, when and by whom licences for UMTS service providers and operators will be granted, are questions of central importance. **The current framework for licensing is fully applicable to UMTS.** UMTS does not therefore require a new approach to licensing in order to respond to these questions. Nevertheless, three specific implications of the current licensing framework should be highlighted :

- The number of UMTS licences should only be limited, in line with existing Community law, by the spectrum[13] to be made available on the basis of the foreseeable market requirements (see below: "frequency issues", section 4.2.2). However, given the need for UMTS to be market-led, the Commission believes that planned demand for UMTS should determine the amount of spectrum allocated[14]. Additionally, UMTS service providers should be able to enter the market without unnecessary constraints to allow a dynamic market and broad competitive service offering to develop general authorisations or declaration procedures should be the rule, if an authorisation procedure is considered necessary. Individual licences should be confined to the operation of UMTS networks.

- UMTS licensing should seek to ensure the development of pan-European services through a co-ordinated introduction. This implies that the systems licensed should support roaming and operate in conformity with standards developed for UMTS by ETSI where these are available (see below: "standardisation", section 4.2.3).

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[13] Whilst the Licensing Directive also foresees limitations " *for the time necessary to make available sufficient numbers in accordance with Community* law", shortage of numbers represents only a temporary ground to limit licence numbers until a national numbering plans supporting competition have been put in place. These are linked to the liberalisation of the telecoms market and so would not be an acceptable basis to limit UMTS licences numbers, given the likely start date of 2002.

[14] In general spectrum allocation decisions seek to ensure that spectrum is allocated to high value uses in preference to lower value uses.

- Licensing procedures should not automatically exclude any organisation from the bidding process, nor should they automatically reserve UMTS licences for one or more existing players (e.g. GSM/DCS operators). Any assessment of applications should take into account the benefits of allowing current GSM/DCS operators into the UMTS market in terms of synergies and existing commercial experience.

Interconnection

With the adoption of the Interconnection Directive[15], a detailed harmonised framework for interconnection between fixed, mobile and fixed and mobile networks is in place. **This interconnection framework would be fully applicable to UMTS services.**

Roaming

The Commission attaches particular importance to the development of pan-European UMTS services, as a key element in an internal market for telecommunications and multimedia mobility services[16]. In this respect, but also to secure the attractiveness and credibility of European technology to the world's operator community, demonstrated Europe-wide roaming on the basis of a common, open and internationally competitive air-interface standard has its particular relevance for UMTS.

The proposed UMTS Decision will provide for rights and obligations to negotiate commercial roaming agreements with other UMTS service providers or network operators on the basis of a common, open and internationally competitive air-interface standard.

4.2.2 Frequency issues

The timely availability and allocation of spectrum is fundamental to UMTS's launch. The amount of spectrum made available will have a direct impact on how competitive the market place will be. While the Commission welcomes the recent ERC decision on UMTS spectrum allocation, it notes the concerns of industry that the amount of spectrum reserved is too modest, if current demand forecasts are correct, and considers that the allocation of further spectrum needs to be examined. On the basis of available information, the Commission believes that an assessment of the value of alternative spectrum allocations is required in order to assess whether UMTS service were being uneconomically "shut out" due to allocation of spectrum to lower value alternative uses. Spectrum must be allocated sufficient time before UMTS services are commercially deployed (2002) and a clear strategy should be developed for the release of such spectrum as demand for UMTS increases further. Spectrum could be drawn by exploiting the FPLMTS band identified by WARC-92 as well as by refarming in the 900, 1800 and 1900 MHz band[17]. Spectrum needed beyond this would have to be allocated by future

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[15] Directive 97/33/EC of the European Parliament and of the Council of 30 June 1997 on interconnection in telecommunications with regard to ensuring universal service and interoperability through the application of the principles of Open Network Provision (ONP), OJ L199, 26 July 97

[16] Council Directive 91/263/EEC addresses *inter alia* the mutual recognition of conformity and free circulation of terminals. A proposal for a European Parliament and Council Directive on connected telecommunications equipment and the mutual recognition of conformity of equipment (COM(97)257 of 30.5.97) is currently under review.

[17] In this respect, consideration should be given to Article 2(3) and (4) of Directive 96/2/EC

decisions within the WRC mechanism (see below: "UMTS in the international context", see section 4.2.5).

The Commission recognises the value of the current activity of the CEPT and the particularly relevant involvement of industry, through the UMTS Forum, in spectrum discussions.

The Commission shares the views expressed that spectrum allocation should be pursued in the context of the CEPT. Nevertheless, the Commission believes that action to support the timely implementation of decisions at a Community level can make an important contribution to the successful preparation and implementation of UMTS and that such action must be taken when needed.

In relation to the valuation to be attached to spectrum, the Commission considers that any fees charged must aim at ensuring efficient usage of a valuable resource. Where Member States choose to allocate spectrum via auctions, it will be important that the mechanisms put in place do not result in outcomes which adversely impact the public interest, in particular in respect of the competitive structure of the market. Where assignments are administered by officials, any fees beyond administrative costs will involve a subjective valuation of the resource, given that a market valuation can only be obtained through market mechanisms[18].

The proposed UMTS Decision will therefore set out a methodology, similar to the one applicable through the S-PCS Decision[19], for the timely implementation at Community level of the results of the CEPT ERC work in UMTS spectrum allocations.

wireless local loop

Although wireless local loop is not the subject of this Communication, the Commission considers it necessary to give its position on UMTS spectrum usage in relation to wireless local loop.

The Commission recognises that wireless local loop is a promising technique to bridge the gap between fixed and mobile cellular communications where strong interest is seen from existing operators -fixed and mobile- as well as potential new entrants. Wireless local loop could provide an economically attractive alternative to the wireline local loop and indeed to mobile communications.

The Commission considers that wireless local loop may develop on the basis of different technological solutions in national, metropolitan area or local markets. Although some

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[18] Where properly designed auctions are used to assign spectrum, the economic theory is that any fees paid will reflect the discounted present value of the excess profits the second highest bidder expects to receive. The bidding stops when the second highest bidder drops out. What the highest bidder would have been prepared to pay, is never discovered. However, a properly designed auction makes public much of the private information held by the bidders, thus reducing the margin between the second highest and highest bids.

[19] Decision 710/97/EC on a co-ordinated authorisation approach in the field of satellite personal-communication services in the Community, 24 March 1997, OJ L105/4

form of interoperability is desirable, the scope and need for harmonisation may not be as for mobile systems where full roaming functionality requires global or regional standards.

The Commission recognises that some Member States have allocated different bands of spectrum to wireless local loop services and supports the work of ERO to look into the possibilities for further harmonisation.

The Commission considers that the scarcity of UMTS/FPLMTS spectrum and the special value it has due to its Europe-wide (global) availability justify access restrictions to this band and therefore that wireless local loop systems should be allowed in this band only if a harmonised Europe-wide introduction can be agreed.

4.2.3 Standardisation

The Commission supports the UMTS standardisation efforts undertaken so far by ETSI, calls for all interested parties to contribute to this process and welcomes the fact that standards development is being led by the private sector and that a consensus seems to be developing on the issue of the core network. It considers that the results to be delivered by ETSI in time for the envisaged start up of UMTS should become an open technical reference for the future UMTS environment.

In order to allow for effective service competition and innovation, the Commission believes that the UMTS standardisation process should be limited to what is necessary to permit systems to be developed, while allowing a differentiation at service provision. Such an approach is consistent with the competitive telecommunications environment today, in contrast to the largely monopoly environment which existed at the inception of the GSM standard.

The Commission believes that the standardisation work should in particular aim at ensuring the end to end interoperability which is needed by a pan-European UMTS environment. This would strengthen the acceptance of UMTS by users (particularly, with regard to choosing whether to migrate from current systems supporting global roaming), as well as more rapidly securing a critical mass of UMTS equipment and services, within and beyond Europe.

The Commission therefore considers that work should aim at establishing a common, open and internationally competitive UMTS air-interface standard. It calls on manufacturers to work within the ETSI standardisation process towards this goal. The proposed UMTS Decision will identify conditions which may be attached to licenses in order to ensure pan-European services based on ETSI standards, where available.

4.2.4 Research and Development

Although the Community efforts under the RACE and ACTS Specific Research Programmes have already made a significant contribution to preparing the technological base for UMTS and in comparing the merits and disadvantages of competing technical solutions the Commission believes that there is a continued need for research in relation to UMTS. This effort will be pursued in the context of the forthcoming 5th Framework Programme and should in particular address work relating to network planning and management, realisation of intelligent networks (network agent techniques), network integration, quality of service, usability, cost/performance, spectrum efficient techniques,

software radio, adaptive allocation of network resources. Aspects relating to man-machine interfaces, terminal usability and the safe and secure use of mobile and wireless equipment[20] will also be considered.

Community and national research efforts should continue to support pre-competitive work in the area of UMTS and its further evolution, with the spin off that such investment ensures an expansion of the knowledge base for third generation systems and provides the experts which a UMTS industry will need.

Besides this technological oriented research, the broader social and societal effects of transitioning towards the "wireless information society" will need reflection and be addressed as a matter of priority.

4.2.5   UMTS in the international context

The Commission considers that the further development of UMTS should aim at establishing a global standard, much like what was done for GSM. The Commission calls on Member States and industry at large to join its efforts and take the following actions:

- Proposing and promoting the UMTS standard (under development within ETSI) as a key element of the IMT-2000 recommendation currently in preparation at the ITU.

- Securing spectrum availability for UMTS for its longer term needs by seeking adequate frequency allocations through the WRC process. In particular, the Commission supports the CEPT and the UMTS Forum position to propose the inclusion of the issue in the agenda of the WRC-99 conference, at the forthcoming WRC-97. The Commission also fully supports the concerted efforts of the UMTS Forum towards the world community to secure further spectrum for terrestrial mobile communications.

- Encouraging contact between interested industry organisations, standardisation bodies and administrations of Europe and those of our commercial partners in order to promote the goal of a globally interoperable UMTS system and to help in establishing co-operation and alliances among private partners at an early stage of UMTS development.

- Initiate at an early stage the discussion of market access and free circulation of UMTS systems and terminals building on the experiences of the GM PCS MoU.

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[20]   A research programme into the possible health effects related to the use of mobile phones is under preparation. This work will draw in particular on the recommendations of an independent multi-disciplinary group of experts which prepared a report last year for the Commission in this field; further, a Commission proposal for a Council Recommendation pursuant to Article 129 (public health) is under consideration which will address health concerns as regards public exposure to radio frequencies.

OVERVIEW OF RECOMMENDED ACTIONS

<u>Note</u> : The steps indicated in the regulatory area below are additional to the confirmation in this Communication that the current rules on licensing and interconnection apply to UMTS activities, in particular with regard to: (i) the limitation licence numbers; (ii) the need to support the take up of ETSI standards, where they exist, and (iii) the need to ensure that current operators are not automatically granted UMTS licences or excluded from bidding for such licences.

domain	*recommended actions*

Regulatory Framework	• Proposal by the Commission of a UMTS Decision which will :
	  • define rights and obligations to negotiate roaming arrangements, to the extent that these are not covered by the Interconnection Directive
	  • identify conditions which may be attached to licences in order to ensure pan-European services based on ETSI standards, where available
	  • set out a methodology for ensuring the co-ordinated allocation of frequencies in the Community for UMTS

Frequency issues	• Ensure co-ordinated and timely allocation of spectrum within the Community by referring to CEPT mechanism or, where necessary, through Community measures, in particular:
	  • Prepare the allocation of adequate spectrum to be made available by 2002 (start of UMTS service provision)
	  • Consider freeing of 900, 1800, 1900 MHz bands for mid-term UMTS usage (2005)
	  • Expand spectrum availability beyond the WARC-92 FPLMTS band for mid to long-term UMTS usage (2005-2010)
	  • Encourage efficient use of UMTS spectrum through pricing

Standardisation	• ETSI to work out critical interfaces for the UMTS environment to support competitive provision of products and services, while supporting interoperability and roaming • Key focus for standardisation should be the development of a common, open and internationally competitive standard for the air interface
Research and Development	• Pursue R&D support on technical solutions needed for UMTS (5th Framework Programme) • Dissemination of information and training on UMTS related technologies (to ensure adequate skill base for UMTS realisation) • Support R&D on possible health impacts of electromagnetic radiation
UMTS in the international context	• Submission of ETSI developed UMTS standard as option for the IMT-2000 standard (ITU) • Explore within WRC the expansion of FPLMTS band allocated for 3rd generation mobile applications • encouraging global dialogue among industry actors, standardisation bodies and administrations to promote interoperability of UMTS at global level • ensuring world-wide free circulation of UMTS terminals (MRA arrangements, MoU for multilateral rules)

4.3. Proposed targets, action plan and timing

The two tables below attempt to give an overview on targets, actors and timing as a general frame of reference, as well as a summarised action plan which identifies the concrete steps necessary to implement the actions proposed in the previous chapter.

Proposed targets:

target	main actor	by
UMTS standardisation phase 1	ETSI	end 1999
license award (first round)	Member States	end 1998
IMT-2000 standardisation	ITU	1999
start commercialisation	private sector	2002
extension spectrum allocation	spectrum administrations	2004-2005

Action Plan for the Community:

action	by
WRC-97: preparation of agenda WRC-99 (to include UMTS spectrum allocation)	Oct.97
Adoption of Council Resolution on present Communication setting out political priorities	Dec.97
Proposal of a UMTS Decision on spectrum and licensing conditions	Jan. 98
Implementation of 5th Framework Programme	98
Adoption of UMTS Decision	early 1999
Mandate to ERC on further spectrum allocation	Feb. 99
MRA negotiations	continuous
WRC-99: extension of UMTS spectrum allocation	Oct.99
Review of telecommunication regulatory environment	end 99

5. CONCLUDING REMARKS

The consultation has confirmed the need to actively pursue at this juncture the discussion of the conditions to prepare and establish the future UMTS environment. Although the development of UMTS must be market led and driven by the private sector, the government's role in setting out the appropriate regulatory environment is important in providing confidence which will generate further innovation and investments, taking into account consumer interests.

UMTS is Europe's answer to global developments in the market for future mobile and wireless communications. Its characteristics of supporting Europe-wide (and global) services roaming, including a range of multimedia applications means that UMTS will play a key role in extending the reach of the information society.

For UMTS to succeed, industry has indicated a need for certain aspects of the current regulatory framework to be clarified, and for key resource decisions to be taken, so that business plans can be finalised. A strong home market will help European companies compete in other parts of the world and allow them to consolidate the leading position that they hold today on the world market with GSM.

The rapid and broad deployment of UMTS will benefit European businesses and all users and assist in the development of certain rural areas, by creating new pan-European services, stimulating the growth in cross-border provision of goods and services. It will help European businesses of all sizes and citizens to have access to a further route into the electronic economy.

Policy makers today have an exceptional chance to help shape a seamless mobile multi-media communications environment for Europe by setting out the broader policy lines that will create a common growth basis for the development and introduction of UMTS. This will benefit European citizens and industry as a whole.

This Communication of the Commission is intended to support political discussions with the European Parliament, the Council of the European Union, the Economic and Social Committee, and the Committee of the Regions.

ANNEX I: LIST OF CONTRIBUTORS TO THE CONSULTATION

as per 19/09/1997

Member States or their representative offices

ETO

Denmark, Research Ministry

Finland, Ministry of Transport and Communications

France, DPT

Germany, Bundesregierung

Italy, Ministry of Communications

Portugal, Instituto das Comunicacoes

Sweden, Ministry of Transport and Communications

UK

UK Home Office

Industry, industry associations and others

Airtel Movil

Airtouch

Alcatel

Autel

Bayerische Rundfunk/Mueller-Roemer

Belgacom

BT

Cable & Wireless

Cegetel

Cellnet

CNPF

Deutsche Telekom

Diehl GmbH

e plus

ECTEL

Enertel

Ericsson

ETNO

Finmeccanica SPA

Finnet Group

France Telecom

INMARSAT

Mannesmann Mobilfunk

MATAV

Nokia

Olivetti

One-2-One

ONP-CCP/Joint industry group

Orange

Philips

Picienne Italia

Post and Telekom Austria

Proximus

Siemens

T-Mobil

Telecel

Telefonica

Telenor

Tescher Team

TIM

UMTS Forum Manufacturers Group

UNICE

Vodaphone

WDR

ACTS	Advanced Communications Technologies and Services
CEPT	European Conference of Postal and Telecommunications Administrations
DAB	Digital Audio Broadcast
EP	European Parliament
ERC	European Radiocommunications Committee
ETNO	European Telecommunication Network Operators Association
ETSI	European Telecommunications Standardisation Institute
FPLMTS	Future Public Land Mobile Telecommunications System
GM-PCS	Global Mobile Personal Communications by Satellite
GSM	Global System for Mobile
HTS	High Temperature Superconductivity
IMT-2000	International Mobile Telecommunications 2000
ISDN	Integrated Services Digital Network
IT	Information Technology
ITA	Information Technology Agreement
ITU	International Telecommunications Union
MBS	Mobile Broadband Systems
MMI	Man Machine Interface
MoU	Memorandum of Understanding
MRA	Mutual Recognition Agreement
RACE	Research and technology development in Advanced Communications in Europe
R&D	Research and Development
QoS	Quality of Service
SDMA	Space Division Multiple Access
SMG	Special Mobile Group
TETRA	Trans-European Trunked RAdio
UMTS	Universal Mobile Telecommunications System
UNICE	Union of Industrial and Employers' Confederations in Europe
WARC/WRC	World (Administrative) Radio Conference
W-LAN	Wireless Local Area Network
WLL	Wireless Local Loop

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