

**QUESTION 18/2**

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*Strategy for migration of  
mobile networks to IMT-2000  
and beyond*

**ITU-D** STUDY GROUP 2

RAPPORTEUR FOR QUESTION 18/2

***“Mid-Term Guidelines (MTG)  
on the smooth transition of  
existing mobile networks  
to IMT-2000 for  
developing countries”***

***v1.01***

**DISCLAIMER**

**This report has been prepared by many volunteers from different Administrations and companies. The mention of specific companies or products does not imply any endorsement or recommendation by ITU.**

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## Foreword

The World Telecommunication Development Conference held in 2002 (WTDC-02) in Istanbul, Turkey, adopted Question 18/2 dealing with “Strategy for migration of mobile networks to IMT-2000 and beyond”. The main task entrusted to the Rapporteur’s Group entitled to study the Question was to draft mid-term guidelines (MTG) for a smooth migration to IMT-2000, including interoperability among third-generation systems. However, given the complexity and the economic implications of the subject, the Rapporteur’s Group dealing with Question 18/2 found it appropriate to focus on the stages involved in materializing IMT-2000 systems. For this reason, the process of IMT-2000 materialization is considered as a transition from pre-IMT-2000 systems that can be undertaken via a variety of scenarios. This first edition of the MTG is by itself a challenge. The purpose of the MTG is to provide telecommunication operators, policy-makers and regulators from developing countries with an understanding of viable transition paths – including economic aspects – to change smoothly their pre-IMT-2000 networks towards IMT-2000. The reflection induced by this MTG should help to perceive the pros and cons of the possible solutions towards IMT-2000 and to take adequate decisions.

With the upsurge of global wireless personal communications, these guidelines represent a complement to the ITU Handbook on the Deployment of IMT-2000 Systems where more detailed technical information can be found. The MTG is the result of the dedication of experienced and qualified experts from different Administrations, companies, industry groups and associations from developed and developing countries. The fruitful and outstanding cooperation with the ITU-R Sector, as well as with the ITU-T Sector, deserves special mention.

I would like to commend the Rapporteur, Ms Natasa Gospic, and the Editor, Mr Davide Grillo, for the important and useful results achieved, as well as special thanks are due to all those who have been volunteers in the preparation of the MTG.

ITU-D Study Group 2 has decided to streamline the MTG to a shorter and more typical Guidelines format within the coming year in readiness for the next WTDC to be held in Doha, Qatar in 2006.

In the meantime, it is my hope that the MTG will be a useful source of information for developing countries.



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## SUMMARY

### Introduction

In the last decade, large pre-IMT-2000 mobile telecommunications networks have been deployed all over the world. In some countries, the penetration of mobile users exceeds 75% and the mobile generated traffic is comparable to – if not greater than – the fixed traffic.

The following aspects, among others, characterize the current situation of mobile telecommunications:

- High penetration of mobile services in developed countries, with large investments in pre-IMT-2000 systems and materialized/planned deployment in the vast majority of them;
- Recognition that penetration of mobile services and increase of the customer base follows similar development trends in different developed countries, although with different factors of scale—setting the assumption that this may also be true for developing countries;
- Definition of a family of IMT-2000 systems in ITU (IMT-2000 family), with continued standardization work on the members of the family progressed via dedicated Standard Development Organizations;
- Identification and harmonization of spectrum usage on a global basis, with spectrum allocation policies following different rules in different countries;
- High potential for advanced and innovative IMT-2000 services if offered at attractive prices.

Operators have been very cautious in planning large-scale deployment of IMT-2000 networks and these will be implemented, more than ever, based on both short- and long-term strategic decisions, in-depth market analysis, and sensitivity analysis of key factors influencing service penetration and economic returns. More importantly, deployment of IMT-2000 networks will capitalize on investments already in place in pre-IMT-2000 infrastructure. This implies that the transition path from legacy, pre-IMT-2000 systems to IMT-2000 systems will be shaped by enhancements to existing equipment and/or replacement of equipment no longer capable of performing the desired functions. Movement of users and/or services delivery from an existing system to a new system may also belong to the materialization of a transition.

The possible mixture of enhancement and replacement actions depends on a variety of factors, including the target services to be offered, the capability of the legacy systems to adapt to changing requirements, the early or deferred decision about the target system that will eventually replace the legacy system. Whereas the above picture applies, in principle, to both developed and developing countries, the latter have specific requirements that impact to a substantial extent the transition path from pre-IMT-2000 to IMT-2000 systems. These requirements relate to operators, regulators and users.

### Operator requirements

Minimization of infrastructure costs is a concern for operators in developed as well as developing countries. However, due to lower penetration rates and Average Revenue per User (ARPU) in developing countries this constraint is heavier in these countries. Thus, from the standpoint of the operators there is a need for a regulatory environment that minimizes implementation and roll-out costs (sustainable coverage obligations, low license fees, choice between alternative technologies allowing a cost efficient network deployment, possibility to use lower frequency bands, infrastructure sharing, etc.). Furthermore, since in most developing countries mobile networks provide a more extensive coverage than fixed networks, administrations in these countries may wish to support the usage of such networks for fixed/data applications.

### Regulator requirements

Regulators in developing countries may wish in particular to set up a regulatory/legal framework that minimizes network deployment costs while facilitating the provision of an extensive network coverage and of specific “socially efficient” services and applications (e-health, e-education, etc.). There is also need for an education policy allowing the improvement of literacy rates and populations’ ability to utilize IT services. Finally, since the usage of these services depends on the availability of computers and not only of telecommunications infrastructures, it may be desirable that a certain number of measures be taken in order to increase computer penetration rates.

## **User requirements**

Due to lower income levels, users' ability to pay for telecommunications services is lower in developing countries than in developed ones. Thus, the availability of an affordable service offering and of reasonably priced handsets is a particularly important issue in these countries. The implementation by operators of technologies based on open international standards seems to be the best way for ensuring low network and terminal equipment costs thanks to competition between numerous manufacturers and economies of scale.

## **Objectives**

These Guidelines are intended for use of telecom operators, policy-makers and regulators to facilitate development of their respective strategies for the transition from pre-IMT-2000 networks to IMT-2000. While it is desirable for pre-IMT-2000 systems to be able to evolve to IMT-2000, the decision whether or not to evolve is not within the scope of the ITU. In each case the decision, as a policy matter, must be made by those responsible for each particular system/service. These Guidelines intend to present an objective and neutral view of the issues to be addressed in the transition from existing mobile networks to IMT-2000.

The Guidelines are a natural complement to the ITU "Handbook on Deployment of IMT-2000 Systems", in which more detailed technical information can be found.

All IMT-2000 radio interfaces meet the ITU requirements for IMT-2000. The individual IMT-2000 radio interfaces have each been specified against these requirements to offer commercially attractive solutions for deployment of IMT-2000. The ITU does not therefore indicate preference for any one IMT-2000 radio interface over any other, and the mention of specific companies, products or migration scenarios in this document does not imply any endorsement or recommendation by the ITU. These Guidelines do not make any comparison between performance of different technologies nor do they promote any specific technologies.

## **Organization of the Guidelines**

The Guidelines are organized as follows. Initially, in the introduction section the rationale for IMT-2000 systems is introduced and basic concepts on IMT-2000 are recalled. Aspects having great bearing on policies intended to guide the transition to IMT-2000 networks are then addressed (such as accommodating special needs of developing countries, spectrum requirements, interoperability with existing networks and among IMT-2000 technologies, spectrum licensing).

The section on policies for transition to IMT-2000 networks, considers a variety of situations in developing countries relating to the technology and the development of existing mobile networks to determine appropriate policies for the transition toward networks based on enhanced systems. The identification of a transition policy is based on the analysis of key aspects, that impact demand, investments and revenues. As already stated, although these aspects are common to all countries, their implications for developing countries deserve special treatment.

The section on transition starts with the recognition that today there are a number of pre-IMT-2000 systems (both analogue and digital) in operation, providing wireless voice and data services to end-users worldwide. These systems include, but are not limited to, AMPS, NMT, cdmaOne, TDMA, and GSM. Recommendations ITU-R M.622, M.1033 and M.1073 and Report ITU-R M.742 describe characteristics of pre-IMT-2000 systems.

Due to differences between the various pre-IMT-2000 systems, as well as differences between the IMT-2000 family systems, the possible transition paths for each pre-IMT-2000 system differ. However, in most cases, the transition requires the addition of IMT-2000 base station equipment and/or software, necessary modifications or additions of the Radio Access Networks (RAN), suitable upgrade/modification of the underlying "core network" along with the introduction of new terminals, which are typically dual-mode devices capable of operating both pre-IMT-2000 and IMT-2000 radio technologies.

Several factors should be considered in the selection of a transition path towards IMT-2000. One important factor is the availability and use of spectrum for both pre-IMT-2000 and IMT-2000 systems. Other issues that will have a major impact on how to materialize the transition include availability of equipment and service applications for the various technologies and their performance in the desired operating environment.

A key step in the process of finalizing a transition path toward IMT-2000 network deployment is the economic evaluation of the revenues expected from the investments over the economic life of the system, including the spectrum license acquisition costs – where appropriate. The section on economics of transition to IMT-2000 considers the cost of the possible options and also the assumptions about the evolution of demand and service penetration as well as tariff trends and policies. The methodology and practical aspects of transition to IMT-2000 are addressed.

In planning investments, a balance has to be struck between actions decided in the early stages of the network deployment – those that normally have long-lasting effects in terms of both shaping the network infrastructure and capital recovery – and actions which may be deferred – those that are normally taken in response to changing market trends and/or conditions, and whose economic profitability has to be measured within relatively short time frames. Whatever deployment policy is adopted, a significant margin of flexibility for adjusting the deployment plan has to be factored in from the outset.

A series of annexes complement the Guidelines, covering aspects such as evolution methodology and scenarios, operator migration paths, functional and service enhancements for pre-IMT-2000 operators. One of these annexes is a compilation of operator experience in transitioning to IMT-2000 systems. The transition is described in terms of existing systems, services envisaged to be offered, spectrum usage policy, investment plans, marketing strategies and socio-economic achievements. The consideration of the conditioning factors and the rationale underlying the choices shaping the transition path in the different cases is instructive for developing a sensitivity to key aspects to be addressed in other cases of transition.

### **Disclaim**

Some sections of these Guidelines incorporate material from published ITU-R and ITU-T Recommendations in the form of “extracts”. To ensure correct reference to this material, relevant text is explicitly indicated by including it between “{” and “}” brackets and no editorial interventions has been operated on it to preserve integrity. As a result, minor misalignment in the use of names, acronyms and/or terms between this text and the rest of the Guidelines text may have occurred due to the different epochs in which the source material has been generated. In the few cases in which this may have occurred, either more recent names and/or acronyms should be retained or a “note to extract” indicates the suggested way to resume alignment.

### **Acknowledgements**

These Guidelines have been prepared using information provided by a variety of administrations, companies, industry groups and associations, including examples of their products, systems, models and case studies.

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