



Electronic Communications Committee (ECC)
within the European Conference of Postal and Telecommunications Administrations (CEPT)

ACCOUNTING RATES AND SETTLEMENTS EVOLUTION

Maastricht, March 2003

EXECUTIVE SUMMARY**Purpose of the report**

This report presents the findings of a review of developments in international telecommunications, with a specific focus on accounting rates' evolution. As well as describing major developments and looking at specific issues of interest for CEPT countries, the report considers how past changes influenced the international telecommunications services industry, the risks for the future evolutions to lead to market failure and what possible regulatory measures might prevent such failure.

Conclusions

The international telecommunications service industry has undergone a fundamental transformation over the past decade – from one based on monopoly supply of voice services to an industry that is fiercely competitive on major international routes and which carries a mix of voice and data services over a variety of circuit switched and IP based networks.

This liberalisation of international services has generated significant economic benefit for the developed countries which have undertaken it. In particular the countries which led this move, notably the USA and UK, have benefited most through the development of a strong international wholesale services industry. But liberalisation of international services is much more problematic for developing countries as we discuss below.

The international telecommunications market is, on the whole, functioning well. Prices are falling quickly and supra-normal profits are disappearing. Regulators should therefore refrain from intervening in the functioning of this market in any significant way. This message was spelt out very clearly by all the operators and several of the international regulatory bodies approached in the course of this study.

However there is concern about a lack of transparency in the market. Statistics which provide a clear and comprehensive picture of market developments are difficult to obtain. To date it has been necessary to rely largely on statistics published by the FCC and, to a lesser extent, Ofcom to give an indication of developments in this market. For example there are substantial differences between actual and published international transit rates. At the same time both transit rate and IP interconnect arrangements are frequently the subject of non-disclosure agreements. A requirement for more openness on the commercial terms of such interconnect arrangements would undoubtedly help to increase competition in the international market place. It is believed that it should be possible for the regulators of Europe and the USA to agree on measures, which would require greater disclosure without substantially damaging the commercial position of the international carriers who are affected by such disclosures.

There is a growing gap between the global reach of the international carriers and the national and regional jurisdictions of the bodies which might in future be required to regulate them. This is not, in the view of this study, a cause of any great alarm. The competition authorities of the USA and the EU can, in combination, probably deal with most matters satisfactorily. But there is a potential future need for a truly global body with the powers to deal with market failure at the global carrier level. The WTO is an obvious body to consider. At first sight the ITU, which relies on consensus decision making and resolutions, is a less obvious candidate. But first an important choice should be made:

Should there be a model based on multilateral consensus or a one based on dispute settlement? In the context of the international telecommunications market, this choice can lead to market development based on ex-ante co-operation or on ex-post conflict resolution

INDEX TABLE

1	INTRODUCTION.....	4
1.1	COMING FROM A MONOPOLISTIC WORLD.....	4
1.2	KEY ISSUES DURING PAST YEARS.....	4
1.3	OVERVIEW OF THE REGIME AND ROOTS OF THE PROBLEM	5
2	NEW ACTORS, NEW BEHAVIOUR AND GROWING CAPACITY.....	5
2.1	RISE OF THE GLOBAL WHOLESALE CARRIER TO SATISFY CUSTOMERS NEEDS	5
2.2	NEW BALANCE OF BARGAINING POWER	7
2.3	NEED FOR TRANSPARENCY (PUBLICATION OF RATES) TO UNDERSTAND THE CHANGES AT STAKE	7
2.4	NEW CAPACITY TRADING MARKETS	8
2.5	DIFFERENCE BETWEEN TERMINATION RATES IN MOBILE NETWORKS AND IN FIXED NETWORKS	9
3	TOWARDS A RAPIDLY CHANGING INDUSTRY STRUCTURE.....	9
3.1	TECHNICAL CHANGES: ANALOGUE TO DIGITAL – COPPER TO FIBRE – CIRCUIT TO IP	9
3.2	RISE OF IMBALANCES OF TRAFFIC AND MONEY TRANSFERS - A SETTLEMENT SYSTEM UNDER PRESSURE.....	11
4	POSSIBLE EVOLUTION OF THE ACCOUNTING RATE SYSTEM.....	13
4.1	INSTITUTING REFORM WITHIN THE CURRENT ACCOUNTING RATE SYSTEM	14
4.2	REFORMS REPLACING THE CURRENT ACCOUNTING RATE SYSTEM	14
5	CONCLUSIONS.....	14

1 INTRODUCTION

This report presents the findings of a review of developments in international telecommunications, with a specific focus on accounting rates' evolution. As well as describing major developments and looking at any specific issues of interest for CEPT countries, the report considers how past changes influenced the international telecommunications services industry, the risks for the future evolutions to lead to market failure and what possible regulatory measures might prevent such failure.

1.1 Coming from a monopolistic world

The roots of the international accounting rate regime can be traced back to the origins of the International Telecommunications Union (ITU) in 1865 and the need to develop mechanisms for compensation for operators transmitting international calls. Since the 1930s, this regime has been working via bilateral contracts between operators (most of the time administrations). These contracts typically specified the accounting rate¹, the settlement rate² and the currency unit³ in which the rates are specified. At the end of each accounting period, the operator of the country which generated the most traffic would pay the difference between the minutes of outgoing and ingoing traffic flows multiplied by the settlement rate.

This system worked quite well in an era in which international services were jointly provided by monopoly PTTs and there were no significant traffic imbalances between countries. The system was easy to administer, with its basic principles being codified under the ITU. This cartelised arrangement implied that customer prices were disconnected from costs and that operators had limited incentives to negotiate lower accounting rates among themselves.

The stability of the system began to erode with increasing service competition in some of the largest telecommunications markets in the 1980s (the US and the UK), alternative calling procedures driven by new technologies (call back) and the emergence of new modes of operation (International Simple Resale and later Voice over IP) outside the accounting rates regime. These developments increased opportunities for arbitrage, siphoning traffic out of the accounting rates regime and fostering traffic imbalances against countries with more competitive environments.

Operators that are net settlement payers, the US being the n°1 example, have been actively renegotiating accounting rates with their correspondents. For US carriers, for example, the average accounting rate fell by 43% between 1990 and 1995. Comparable trends can be assumed for other carriers.

1.2 Key issues during past years

In the last few years international accounting rates, the century-old revenue sharing mechanism for the joint provision of international switched telecommunications services, has come under tremendous pressure. Long considered as the cornerstone of international telecommunications and praised for providing a predictable, uniform and easy to manage system for revenue sharing, the international accounting rates regime is at odds with the new telecommunications environment brought about by the liberalisation of international trade in telecommunications services under the WTO.

International accounting rates were discussed during the Uruguay Round and more specifically during the negotiations of the agreement on basic telecommunications. The debate revealed a disagreement on the need and feasibility to include the issue of accounting rates in a new agreement. The contentiousness of the issue focused mainly around a North/South controversy. On the one hand developed countries suffering from deficit payments were eager to reform the accounting rates regime and align it with cost. On the other hand developing countries were reluctant to consider any change to the current regime.

The conflict in attitudes was resolved during the basic telecommunications negotiations by an agreement to defer the debate over accounting rates until the new round on negotiations on trade in services is due to start in 2000. The contracting parties concluded a gentleman's agreement waiving their rights to recourse to dispute settlement procedures under WTO.

¹ Notional price per minute to carry traffic from country A to country B or vice-versa.

² Price per minute that the operator originating the call is supposed to pay to the operator terminating the call (usually half the accounting rate)

³ Usually SDR (Special Drawing Right) 1 €0.75 SDR

1.3 Overview of the regime and roots of the problem

The revenue sharing mechanism for international telecommunications resulted from the way international telecommunications were conducted. From the beginning, international telecommunications have been treated as jointly provided services between monopolistic telecommunications operators in two countries. Under this regime of joint provision, the telecommunication operator in the country where the call originated conducts the call over its own facilities to a certain point, the international gateway. The telecommunications operator from country of destination takes the call over from the middle point and delivers it to its destination using its own facilities.

The accounting rate is the rate per unit of traffic agreed upon between two countries for the joint provision of service. In case of traffic imbalance, the carrier with more outbound traffic transfers funds to the carries terminating those calls. The payment is called settlement payment. It usually equals half the accounting rates. The settlement payment compensates the terminating carrier for the service of delivering the call to its final destination. The accounting rates regime has thus two important components: the applicable rate per unit of traffic and the splitting formula according to which accounting rates are divided between operators. Both elements are at the heart of the developed/developing countries controversy over accounting rates.

The evolution of the global system is the product of three forces, all converging simultaneously:

- technology, in the form of low-cost digital fibre optics and cheap, readily available switching capacity, which enables new market entrants to process millions of calls at an extremely low cost per port, per minute;
- competition in North America, Europe, Australia, etc., which forces carriers in these markets to offer wholesale domestic and international transport services at a price close to actual cost—stimulating, in return, the export of relatively inexpensive dial tone to less competitive markets; and
- the economic necessity for every nation to secure low-cost telecom service, in order to become or remain competitive in today's global economy.

All of these forces have tremendously altered the traditional bilateral mode of international telecommunications, which have prevailed for over a century. And the most immediate consequences on the accounting rates system are namely the increasing discrepancy between accounting rates and costs as well as the growing imbalance in traffic.

2 NEW ACTORS, NEW BEHAVIOUR AND GROWING CAPACITY

2.1 Rise of the global wholesale carrier to satisfy customers needs

Most of international voice traffic was, until recently, a service supplied exclusively by the historic operators, through bilateral investment agreements and the investigation of international means of communication. As for the international transmission capacity, its property belonged to a consortium of historic operators, the (former) incumbents, with specific interests in the infrastructure. The acquisition of international transmission capacity has been, traditionally, negotiated through “Indefeasible Rights of Use (IRUs)⁴” or “Minimum Investment Units⁵”.

The liberalisation of the international telecommunications market lead to the entry of many new national operators and allowed them to build facilities and carry traffic. In fact, with the liberalisation, private undertakings or other licensed operators started financing the construction of the international transmission capacity, transacting capacity with the interested undertakings.

⁴ An Indefeasible Right of Use (IRU) corresponds to the right to use the international transmission capacity throughout the infrastructure's useful life. Usually, the owners of IRUs do not have voting rights in the enterprise that constructed the infrastructure.

⁵ When acquiring a Minimum Investment Unit, the undertaking is buying the co-ownership of the international transmission capacity's infrastructure, voting rights in the enterprise that constructed the infrastructure and the right of access to the surplus capacity of the infrastructure.

Simultaneously, due to the massive growth of the Internet, there was an increase in the demand for international bandwidth by the retail operators, which wanted to develop their international backbone networks. This conjuncture enabled the global wholesale carriers to become important players in international telecommunications by the late 1990s⁶.

Those new carriers were wholesale operators who built high bandwidth fibre-optic transmission networks to link the metropolises of the world. Their strategy was characterised by the offer of high bandwidth transport services to service providers. The consequent economies of scale and reach generated by their network provided them with competitive advantage and, as a result, the termination rates tended to decrease.

However, the massive economies of scale resultant from building long distance transmission also encouraged the global wholesale carriers in such a way that over a short period of time the capacity of most major international routes increased several times. The new global carriers were aware of the potential problem of over-supply, but they expected that the growth of the telecommunications market would quickly absorb any surplus capacity.

Besides building high bandwidth international networks, many of the new carriers also built large data centres⁷ at key nodes on their networks, with the prospect of multiplying revenue from commercial property. During 2000 there was a feeling of existence of under-supply of space. At the same time, data centres were considered the centre of the new web economy, accommodating new Internet applications and telecommunications and Internet switching equipment.

Conversely, in the beginning of 2000, there was a large decrease in the demand for data centre space. On one hand, several newly formed Internet companies went out of business and the others had to impose strict cost controls. Consequently, the managed service providers that served them, whose business looked very attractive in a market with an increasing number of agents, also suffered. On another hand, consolidation and business failures, reductions in or cancellations of network rollouts and the carrier's dominance of new Internet-based or IT-based offers⁸ are reducing the demand for data centre space by carriers Internet Service Providers (ISPs), which have been a major source of demand since this market emerged.

When the global wholesale carriers' capacity was ready to be used, the developments of the financial markets, namely the devaluation of many telecommunications stocks, made the national operators and ISPs re-examine their plans for broadband services. As a result, the demand for international bandwidth sharply fell and, consequently, great part of the international bandwidth capacity became idle. Facing these circumstances, the global wholesale carriers often felt compelled to, for example, sell capacity at prices below costs and/or enter the retail market⁹.

Currently market consolidation is ongoing, the financially stronger global wholesale carriers, namely operators with global businesses, are trying to acquire customers and/or assets of distressed or defaulted competitors. Additionally, carriers in distress with own infrastructures restructure their debts by stripping off not-core businesses, focusing on cash flow, so they will be able to continue competing effectively in global markets in the future. Furthermore, there is little investment in new international bandwidth. In fact, the investments made in sub-sea cable systems around the world over the last twelve years rose between 1999 and 2001 and dropped drastically in 2002. Also the majority of the investments to be made in 2002 were authorised in 1999 or 2000.

At the present time the international transmission capacity prices are still falling, but not so dramatically than in the years before. Additionally, new technologies, such as broadband Internet and UMTS, and new services, like electronic commerce (e-commerce), are quickly gaining ground. Concerning broadband Internet technologies, the share of broadband is growing in such a way that in 31.03.2002 there were around 24 million DSL lines world-wide, what represents a growth rate of about 26% since the end of 2001, accordingly to several specialised consultants. As for e-commerce, the number of secure servers, e-commerce's infrastructure, is still expanding at a fast pace, as are the number and percentage of individuals ordering products or services over the Internet.

⁶ In the early 1990s a consortia of historical operators owned all the capacity on the Trans-Atlantic route. Nowadays, accordingly to Ovum, more than 90% of the built capacity across the Atlantic is held by five companies, none of which existed in the beginning of the 1990s.

⁷ Data centres, also known as collocation centres, are facilities designed to host switches, routers and servers for the provision of interconnectivity to telecommunications networks and services.

⁸ Falling bandwidth prices have led carriers to develop value-added services such as web hosting and Application Service Providers (ASPs), both of which are big space consumers. This type of service development is now frequently being put on hold or scaled back.

⁹ Many of the global wholesale carriers which entered the retail market underestimated the resources required to build competitive customer relations and customer support capability and, therefore, failed.

2.2 New balance of bargaining power

Three major remarks should be considered when judging the balance of power for supply conditions negotiations that lies between the suppliers of international services and their customers. On one hand, the *national retailer*¹⁰ is in a very strong position in terms of purchasing international services, namely since many suppliers want to take almost all of offered business¹¹ and it can be expected that the national retail market further consolidates.

On another hand, it is not easy for the *global retailer*¹² to make considerable profits out of its multinational customers, given that the market has many participants and the multinationals are very skilful negotiators. However, this situation is somehow counterbalanced by the existence of high barriers to entry, in consequence, namely, of the investment needed to acquire a customer base and to provide customers with high quality support on a global basis.

Finally, the *global wholesaler* is in a weak position. Nevertheless, its position will strengthen as the industry consolidates and the excess of capacity starts disappearing. In fact, if the economies of scope in the supply of voice and IP services prevail, it can be expected that a handful of players will dominate the provision of wholesale voice, data and Internet connectivity services globally.

2.3 Need for transparency (publication of rates) to understand the changes at stake

The transparency existent in the international telecommunications service market does not come up to its full potential. It is very difficult to obtain organised statistical information that provides a satisfactory picture of the market developments. The FCC and, to a lesser extent, Oftel are the main publishers of statistics. Regulators should, however, be very careful when using those data, since there have been examples of divergence between published statistics and effective data.

Simultaneously, transit rates and IP interconnection agreements are frequently subject to non-disclosure agreements. A requirement for more openness on the commercial terms of such interconnection arrangements might help to increase competition in the international market place. Consequently, regulators should balance the pros and cons of greater disclosure, in order not to damage the commercial position of the affected international carriers. The market for transit services in developing countries has been becoming more transparent since 1998, with a few operators publishing their rates.

In fact, the International Bureau of FCC prepares a monthly statistical report that contains the U. S. accounting rates for various services for approximately 250 international points. Oftel also publishes information, quarterly, on the prices agreed between operators for the termination of international calls, as well as on the volume of calls carried between the United Kingdom and overseas. However, Oftel will not publish the accounting rates for operators without significant market power on a given route when that route has been liberalised, or is expected to be liberalised shortly, because such operators are unlikely to be able to affect adversely the market on these routes and, so, publication of their accounting rates would restrict their ability to actively compete.

Accordingly to Oftel, the publication of information has three purposes. First of all, it reduces the information asymmetry between the dominant operators and new entrants, accelerating the development of competition. Secondly, the publication of price information makes it more difficult for dominant operators to undertake in anti-competitive practices, since detection of those behaviours becomes much easier. Finally, publishing information will enable operators to identify themselves potentially anti-competitive behaviour, namely abuses which involve re-routing of traffic.

Besides that, Oftel recalls the need to balance the positive and the negative effects of collecting information. In this scope, Oftel argues that the response burden placed on operators, particularly new entrants, by collecting information, the main negative effect is more than compensated by the nature of the different international markets, coupled with the risk of an immediate impact on the development of competition, justifying the need to collect detailed information.

¹⁰ A national retailer is an undertaking which, in order to offer international services to its customers, purchases international services to international wholesale carriers.

¹¹ The continuous consolidation of the international industry leads to the expectation that the degree of competition for the international traffic of the national retailer will reduce. However, this does not invalidate the position of the national retailer in the international traffic market.

¹² A global retailer is an undertaking that sells international services. It can have its own international network or, alternatively, it can purchase international services to international wholesale carriers.

Ofel concludes that, as a rule, it should continue to publish all accounting rates. However, when an operator demonstrates that publication of an accounting rate will likely be detrimental to competition in the UK, Ofel will consider not publishing the rate in question.

In October 1997, the Directorate General for Competition of the European Commission launched an investigation concerning the accounting rates charged by European operators with a potentially dominant position. This investigation was considered relevant by the European Commission given the impact of settlement rates on end-user retail tariffs, which could allow the perception of excessive settlement rates as abuse of dominant position. The European Commission closed its investigation in respect to the operators on which there were no indications of an abuse of the dominant position concerning the settlement rates, that is, this proved to have had a favourable evolution of the settlement rates applied.

2.4 New capacity trading markets

With the liberalisation of the communication markets, the development of new ways of buying, selling and leasing capacity was encouraged where alternative infrastructures were installed. Besides that, the new suppliers also started using alternative ways of segmenting network pricing. This entire context enabled the creation of new markets for trading capacity where alternative infrastructure is available from different providers, amongst them there are many Internet sites¹³.

These new markets should, in principle, help in bringing down the cost of the communication infrastructure. In fact, the rates published by the telecommunication carriers are usually higher than the rates practised at those markets. Simultaneously, the markets' transparency in what concerns pricing also benefits the communication services, because wholesale rates become available to a greater number of network service suppliers. Notice that the absence from a trading market indicates that the underlying infrastructure was traded by the historical operator at retail prices.

Several of those new markets use indices for tracking the rates of the products traded. These indices show the benefits resultant from liberalisation on routes with alternative infrastructures available¹⁴ from different providers and their value will, in principle, increase, as the trading markets tend to expand their coverage and the volume of trade will likely keep on rising.

Band-X¹⁵ (in operation since 07.1997) is one of the online trading markets and, that way, a virtual place where capacity, namely leased circuits, IRUs and dark fibre, and PSTN minutes can be bought, sold and leased. The prices at Band-X represent the best available prices. Carriers or resellers can contract with Band-X a direct connection to the market and, through it, buy or sell minutes directly, anonymously and immediately. Volumes, rates and a quality measurement related to Band-X are available daily to interconnected carriers. Buyers and sellers every day receive statements of minutes traded.

Two of the Band-X's indexes track wholesale minute rates, the Band-X United Kingdom Index (created in 09.1997) and the Band-X United States (created in 12.1997). The rates of wholesale bandwidth are monitored by the Band-X Bit Index, launched in 10.1998. The Band-X Bit Index shows impressive falls in capacity rates, as can be concluded with an analyses of the Composite World Index and of some individual routes.

The Band-X prices shown are offers from infrastructure providers. Nevertheless, users can also make bids. A bid from a user can go unanswered for two main reasons: the demanded route is not linked with competitive infrastructure and incumbent operators do not wish to sell outside retail pricing levels; or the suppliers consider the price offered too low.

¹³ The sellers at the markets in which capacity is traded can be infrastructure creators (carriers' carriers), companies with their own facilities wanting to increase their network sales and resellers. The buyers at these markets can be facilities providers, resellers and users offering electronic commerce services. The products exchanged in these markets include minutes for communication traffic, leased capacity, dark fibre, IRUs on undersea cables and/or co-location of facilities.

The markets for trading capacity can operate in one of two manners: enabling the contact between buyers and sellers; or operating their own facilities, such as a telecommunication switch or an Internet traffic exchange point. Either way, these markets are characterised, among other aspects, by the anonymity they enable, which allows infrastructure providers to differentiate pricing without the knowledge of other market participants. Another attribute relates to the opening of new cables, namely by new entrants. As a way to generate immediate revenue from capacity that would, otherwise, be idle, an infrastructure provider could market this capacity at a different rate than on the retail market.

¹⁴ The rates for the products exchanged on the trading markets should fall as new capacity becomes available to the market. Therefore, those markets' indices are good indicators of the level of competition in different products.

¹⁵ www.band-x.com

2.5 Difference between termination rates in mobile networks and in fixed networks

The termination rates in mobile networks are, usually, substantially higher than the rates for terminating a call in fixed networks. In virtue of this disparity, a carrier either charges distinct termination rates and, consequently, different settlement rates accordingly to the destination of the call, or uses the same settlement rate for all the calls, based on the weighted average of the termination rates. The last solution can raise significantly the cost of terminating an international call in the mobile network.

One of the implications of the presented situation relates to calls originated in mobile networks and terminated in international free-phone numbers. These calls are, in practice, “reverse calls”. In the sight of the difference between the termination rate in fixed and mobile networks and of the difficulties that the terminating operator has to face regarding the identification of the originating operator (specifically if it is fixed or mobile), induces some of the international carriers to block the calls from their networks to international free-phone numbers. Technical methods to enable the operators to identify the type of the originating network are starting to be studied.

The divergence between the termination rates in mobile and in fixed networks could be considered disturbing, given the impact of mobile traffic on cross-border telephone traffic. International calls originated in mobile networks represented more than 15% of the world’s telephone traffic in 2000, and this number is expected to increase, as this traffic has been growing faster than the one initiated in the fixed networks¹⁶. Therefore, and in particular, mobile operators have emerged as increasingly important clients for wholesale international services.

3 TOWARDS A RAPIDLY CHANGING INDUSTRY STRUCTURE

3.1 Technical Changes: Analogue to Digital – Copper to Fibre – Circuit to IP

Technical advances in telecommunication have led to significant changes in telecommunication markets globally. While some major leaps in technology are just about to show their effects, others have already proven to put pressure through improving competition on the traditional system of accounting rates settlement.

The transition from analogue to digital networks, which has not yet been fully performed by all countries, reduced dramatically the switching cost per unit for national calls and, timely delayed, for international calls as well. Additionally with analogue switches there are limits on the number of switches through which a call can be routed before its quality degrades to an unacceptable level. This constraint does not apply with digital switching. Therefore refiling and by-passing through third countries has become possible and is being practised now for quite some time, thus reducing significantly the traffic amount being settled through the traditional accounting rate system.

Fibre optic transmission on international routes has massively increased the capacity of long distance cables, reducing immensely the cost per unit for international bandwidth. The impact of this technology evolution has led to a price decrease for a Gigabit/s from about \$600 in 1988 to even less than \$8 today. Refiling, by-passing and transiting has become even more interesting from a business perspective, thus reducing again the overall amount of traffic settled traditionally through the accounting rate system.

The conversion from circuit switched to IP transport, which is just about to happen, is expected to let prices for bandwidth and switching costs tumble even further, thus putting even more pressure on the international accounting rate system. With the success of the Internet and dominance of data traffic it makes good commercial sense to redesign global networks. IP transport rather than circuit switches will be the leading technology and treat most of the traffic in the near future, whether voice or data, as an IP bit stream. The cost structure for IP routers are more efficient than circuit switches and the economies of scope in running a single (IP) network rather than separate IP and circuit switched networks are significant.

Many carriers are expecting to come to a point when all their voice traffic will be carried on IP networks. At the present time, the majority of Voice over IP (VoIP) traffic is carried by just a handful providers, which act as carriers’ carriers, taking advantage of the difference between the Public Switched Telephone Network (PSTN) settlement rates and the termination rates. In fact, there are few cases where VoIP is used solely because of its efficiency as a transmission technology. Additionally, it should be noticed that the use of IP technology to transport voice traffic is not legally foreseen or allowed in all countries.

¹⁶ Mobile telephones contribute to international traffic by simply providing more calling opportunities and, more significantly, by roaming across borders with their subscribers.

The development of data networks has had a set of services in mind. Due to the possibility of transmitting voice using IP-based networks, data networks based on packet-switched technology, the use of these networks for end-user communication services has been increasing. Given that, and since the PSTN is also used for the transport of data, it may be adequate to migrate voice telephony services onto a unique data network used for both voice and data.

The expectation of a migration of the traditional PSTN voice networks onto the IP-based networks raises fundamental questions. One of the main concerns in this scope is the nature of the services that the new network is able to provide and the way in which they are provided¹⁷. IP Telephony, VoIP and Internet Telephony correspond to the different technical solutions for voice carried over IP networks, although there is no consensual definition of them.

In fact, there are several technology scenarios under which voice is carried on IP networks, each of them usually requiring a specific policy or regulatory treatment¹⁸. The regulatory structure is an important element in establishing favourable market conditions for investment on IP-based networks. A good understanding of the relationship between Internet and telecommunications policy will facilitate decision making concerning regulatory appropriate actions.

The shift towards IP Telephony appears to be highly dependant on the development and degree of market competition of the respective economy. In the context of IP Telephony, the cost of building and maintaining IP networks may not be significantly lower than the cost of building and maintaining PSTN networks. Especially for calls originating in non-liberalised markets, the retail price associated to IP Telephony can be lower than the retail price of a PSTN call, something that consumers much appreciate on the short term.

IP Telephony services can be functionally equivalent to traditional telephony services, making the means of transmission irrelevant to the user. In spite of the fact that operators are creating new services that integrate voice with the Internet, data services and other media, from the consumers' perspective, current IP Telephony offerings do not always correspond to expectations and generally there is a trade-off between price and quality.

Besides that, the growing digital convergence will have significant implications, namely the disintegration and specialisation along the communications value chain. The vertical end-to-end integration structure of the traditional telecommunications industries tends to be replaced by specialised, horizontal segments of the market. The process of the digital convergence and the migration between PSTN and data networks will take place in various specific standards designed to bring them together, namely to ensure that products can be connected and that services are interoperable. Standardisation can also extend industry's access to world markets and market intelligence, reduce development costs and lead to economies of scale.

¹⁷ In fact, it is not clear if the evolved network will resemble a data network that additionally provides new voice services, if it will approach a telecommunications network whose transport technology evolved or if it will come close to a new type of network that takes elements from its predecessors. A comparison between the communication models that underlie both networks should help addressing this issue, especially if it focus on the way applications are offered and used over the networks.

¹⁸ There are four main technology scenarios under which voice is carried on IP networks. In a first scenario, IP-packetized voice is carried across the public Internet between computers (corresponds to a pure transport service, which can not be considered as IP Telephony). In a second scenario, IP is used as an underlying transport technology for networks that provide a voice service equivalent to the PSTN services, and the signalling system used is the one applied on the PSTN (the end-user receives the traditional telephony service, which can not be considered as IP Telephony).

In a third scenario, there is a full end-to-end IP technology, that is, IP Telephony. This scenario is based on an original manage network call control technology, an intelligent network management and the incorporation of telephony specific functionalities. Call and media control functionalities interact with user's terminals to provide the end-to-end IP Telephony service. A fourth scenario consists on the use of gateways or interconnection between the IP networks and the PSTN. In the scope of this scenario, there are various situations and principles related to interworking between PSTN and IP-based networks.

In the last two scenarios, parties other than the IP network operators can provide at least some of the voice-specific IP functionalities. Therefore, IP Telephony can be offered as an overlay service over pure IP transport networks.

The questions of numbering and naming systems have an essential role, since universal access implies the existence of a consistent and universally acceptable addressing scheme, as well as mutual operator obligation for proper completion of calls within their network, guaranteed by the interconnection agreements that link operators. Reversely, the universality of reach of a data network is provided on an application per application basis in an ad-hoc manner, since interconnection agreements between data operators are independent from applications and, therefore, are not sufficient to ensure access universality (each user and network operator has to determine for each application the name of the translation server that has to be addressed for a proper completion of a communication)¹⁹.

But a complete move from circuit switched to IP transport is not as easily performed as thought two years ago. This evolution in global network design is yet still to be finalised, with much slower spread out than expected. IP transport is still not as reliable in quality and timing as circuit switched transport and has yet to position itself as a reliable voice protocol. In fact, there are still concerns about the quality of voice over IP calls. Carriers with new networks offer only IP transport but are carrying relatively little voice while carriers with lots of existing circuit-switches in their international networks are replacing them with IP routers much more slowly than they originally planned. Nevertheless it is obvious that IP transport will replace nearly completely the circuit switched transport in the near future, thus allowing even further innovative products and services which will not rely on the traditional accounting rate system.

Another increasing effect will have the global use of wireless technology and permanent evolution of wireless technology. GSM and Wi-Fi infrastructure have become much cheaper due to economies of scale and intensified competition. With wireless technologies, access substitution of copper and fibre has become a real alternative. Universal service requirements may now be satisfied even through wireless technologies. The tremendous growth of mobile telephony users especially in developing countries shows clearly, that mobile voice telephony services are vastly sought after, thus leading to further investments in wireless infrastructures. Price cap regulations for universal services provided through wireless technologies could help to increase wireless tele-density in developing countries faster and make those services payable. But wireless technology may at the moment not help to bridge the digital divide due to its current lack of cheap broadband accessibility and capacity and its still relative high price per minute respectively per Megabyte.

3.2 Rise of Imbalances of Traffic and Money Transfers - A Settlement System Under Pressure

The current system for delivering voice traffic treats only about 15% of all international voice traffic with the traditional settlement rate system. This has been once 100% before opening up telecommunication markets. Much of this traffic being settled traditionally originates or terminates in developing countries. Some is between carriers on competitive routes where there is a balance of traffic flows and there is little, if any, exchange of money. In these circumstances the carriers do not see it as worth the effort to move to a new system of settlement, so there will presumably always be traffic being settled traditionally, where no significant amount of net payments occur. Nevertheless it is expected that this percentage will further decrease, even flaws in the trend will occur continuously like currently the abuse of the international accounting rate system for arbitrage reason to by-pass relatively high national mobile termination rates. This leads currently to a slight boost of the traditional accounting rate system currently, which will not last.

Already about 20% of international traffic is being re-filled via a third country which has a low settlement rate with the terminating country, this amount depends heavily on sanction possibilities of the originating and terminating countries to prohibit such mechanisms, but arbitrage mechanisms help to level rates in order to prevent different rates for different countries, so with further liberalisation, removing rate differences between low and high rate countries, a downward trend might be expected again.

Hard to measure, but a significant percentage of international voice traffic is being settled through Sender Keeps All (SKA) arrangements. Operators A and B agree to deliver traffic for each other without charge. This is the same "peering" arrangements which is common between backbone ISPs. The increasing substitution of circuit switched with IP Transport technology will definitely increase this percentage.

Another way to settle traffic, and representing nowadays 60% of the overall amount of international traffic settlement is through delivering traffic via a point of presence in the terminating country, so only national interconnection has to be settled with local carries for inbound international traffic. Many developed countries now allow point of presence delivery.

¹⁹ The ENUM protocol, adopted in 2000 by the Internet Engineering Task Force, defines the mapping of telephone numbers into Internet domain names. ENUM enables the interoperability of the telecommunications and Internet networks and, consequently, it will facilitate the development of IP telephony. Nevertheless, many issues related to this protocol are still in discussion.

But most restrict it to routes where point of presence delivery is also allowed at the other end. Here a clear upward trend can be identified due to the foreseeable relaxation of such restrictions.

Significant changes occur not only in settlement patterns of international traffic through technology evolutions, as explained above. Also the asymmetric traffic distribution between developed and developing countries is even further being intensified due to differences in collection charges and the development of alternative calling procedures, enabled due to technology advances.

The difference in collection charges is an important element in the determination of the level of demand. Different economic studies demonstrate that demand for international telecommunications services is elastic with respect to prices. The introduction of competition has had a tremendous impact on collection charges for international telecommunications services. Countries, which have not introduced competition, do have higher collection rates and trigger less outgoing traffic. This will put further strain on the traditional accounting rate settlement system.

The appearance and evolution of alternative calling practices like call back, calling cards, country direct services, refiling, etc. do also have a vast effect and put pressure on the traditional accounting rate system through by-passing international traffic. These practises, especially call back, do not rely solely on the traditional accounting rate settlement system and therefore provoke competition in countries that do not permit infrastructure competition by offering cheaper rates than originally would have been paid for if settled traditionally.

Traffic originating from developing countries contributes only relatively little to total international traffic, in 1998 26%. Almost three quarters of outgoing traffic is being originated in high income countries. But developing countries' incoming traffic represents around 43% of total traffic being settled traditionally.

These reasons culminated to create a situation where developing countries stand to be net importers of international traffic and beneficiaries of substantial sums of settlement payments. Developed countries, led by the United States, have become net exporters of international traffic suffering from deficits in settlement payments. This situation created an ongoing conflict in positions of each group toward the accounting rate regime and a difference in approaching a satisfactory solution.

The relationship between traffic and wealth has been established in various studies. According to the ITU Secretary General, for the majority of countries, the general rule holds that an increase of GDP per capita of US 1'000 will generate around six minutes of extra traffic per inhabitant per year.

The growing imbalance in traffic and rates between developed and developing countries can be most significantly demonstrated by the example of the US. US outgoing traffic exceeds incoming traffic with almost all countries, resulting a huge settlement deficit, since the US has a major share of around 25% of global outgoing traffic market. In 1999 the US sent 28.132 billion minutes, up from 22.64 in 1997 and received 10.67 billion minutes, resulting an imbalance of almost 18 billion minutes (13.4 in 97). This leads to a huge settlement deficit every year for the US, e.g. in 1997 5.6 billion US\$. By imposing its Benchmark Order in 1997, the FCC was able to reduce the US deficit to 4.5 billion US\$ in 1999 without decreasing traffic volume.

The applicable rate per unit of traffic has never been directly connected to cost. The discrepancy between accounting rates and the costs of conducting international telecommunication has grown extremely wide in recent years. Studies show that accounting rates are sometimes 10 times higher than the actual cost of delivering international service.

Through technological evolution and increased international bandwidth capacities, the cost for international traffic, data and voice, has been steadily dropped by 30% a year for the last couple of years. Unfortunately, this decline of cost per unit has not automatically led to lower accounting rates in all parts of the world. Monopoly operators in developing countries kept their bi-laterally agreed settlement rates high throughout most of the 1990s, while settlement rates in the European Union and North America were at 10 to 15 cents per minute in the late 1990s, those in Africa, Central Asia and the Middle East were in the 50 to 85 cents per minute range.

It is obvious, that this system of settlement that worked well in the era of national telecommunication monopolies, if not being sufficiently reformed, will bring no further benefit to the international telecommunication markets. The networks of the future will rely heavily on IP platforms with traffic flows hard to control, therefore becoming an even bigger threat to developing countries. Declaring VoIP as an illegal practise, as it has happened in certain developing countries, will only increase the digital divide and not prevent its use. An intensified approach towards more cost-oriented rates will not be avoidable, may only be delayed, but with harmful consequences.

4 POSSIBLE EVOLUTION OF THE ACCOUNTING RATE SYSTEM

Due to the fact, that more international traffic is being sent from developed countries to developing countries and settled traditionally than vice versa, an imbalance of net payments between developed and developing countries exists. The US and other developed countries were never fully satisfied with this traditional international accounting settlement system, which does not impose special measures to take this imbalance into account. But the traditional system had been accepted since benefits have flown to operators of developed countries as well due to its non-cost relating characteristics, keeping rates way above actual costs, allowing supernatural profits for monopolists. With liberalisation tendencies and aims to eliminate any supernatural profits, developed countries together with their former incumbents lost incentives to stick to the traditional accounting rate system. In addition, the promises of developing countries to use the net payments to develop their infrastructures were not sufficiently kept in the eyes of the developed countries, leading to even further questioning of the system.

This dissociation between rates and the cost per unit caused the dissatisfaction of developed countries. As a consequence, the FCC of the USA, notably representing the country with the biggest net payer unilaterally set already in its benchmark order of 1997 targets for settlement rates with US carriers. Under this order US carriers are required to reach certain target settlement rates with countries in different categories by specific dates. From the FCC point of view, this order was supposed to impose the needed pressure to rebalance traffic and reduce the traffic asymmetry or at least, if these objectives are not achieved, would reduce the rates and thus reducing net payments. Some developing countries with very low Tele-density did and still do not meet the requisitions made by the FCC and therefore face further rate, thus aggravating the financial situation of those countries.

The ITU as well brought pressure to bear on all countries, including the developing countries, to reduce their settlement rates to more cost oriented levels by 2001 and for some least developed countries by 2004. These target settlement rates are being set out in recommendation D140 and vary according to the Tele-density of the country concerned. But these rates are still far away from the Benchmark set by the FCC. Thus the discrepancy between the ITU and the FCC rates could not yet been resolved, leading to a not very satisfying condition of stalemate, which is unbearable and harmful to the telecommunication markets.

Thus the evolution of the international accounting rate system has become a process extensively discussed over the last five years, at least. In general, the international trend shows a transition from a monopolistic telecommunications policy to a trade policy based on the principles of competition.

The question, if the accounting rate system may be replaced progressively by other systems or if it will remain as one option of many is not decided yet. The process of establishing new commercial arrangements in the telecommunications industry is requiring some time, but the following types of relationships between countries can be identified to be present in the future:

Monopoly to monopoly relations, where accounting rates or sender keeps all (rather seldom) will continue to be prevalent. Competitive to competitive relations, where a variety of different revenue-division mechanisms will come into play including interconnection charges, accounting rates or sender keeps all. Competitive to monopoly relations, where the competitive operator will be obliged to pay half-circuit based termination charge and will try to apply a similar charge to incoming calls. Where monopoly countries continue to maintain highly differentiated rates between countries, they will be vulnerable to traffic refile. This will logically lead to uniform termination charges in the medium-term.

A trend already visible in the world of international telecommunications is the increasing fragmentation of the international telephony market into three distinct operations. Between countries, international alliances will offer end-to-end-connectivity where access is permitted, or traditional half-circuit access where it is not. Growing competition will come from Internet telephony, international facility owners (Satellite operators, private cable operators) selling direct to customers and from an emerging spot market in resale rates. For call origination, competition will continue to be intense as call back, Internet telephony and resale will be increasingly successful. For call termination, competition may be slower to increase as former and actual monopolies continue to keep the rates for call termination high. Their dominant position will decline slowly, as it takes time and investment for new networks to be deployed.

Proposals for a reform of the accounting and settlement rates regime can be defined to fall in two broad categories. One is instituting reform within the current accounting rate system, while the others are reforms replacing the current accounting rate system.

4.1 Instituting reform within the current accounting rate system

Firstly, a reform within the current accounting rate regime comprises of a simple reduction of the accounting rates. Secondly, it involves a change of the split of the settlement rate from 50:50 to one that reflects the difference in cost of delivering a call between the two ends of the relationship. This is an action item principally welcomed by many industrialised countries, but most insist that their willingness to depart from the 50:50 split of the AR is dependent upon the use of cost-oriented accounting rates. A third item on the agenda is to abandon the requirement by some NRAs that all international operators in the country have the same accounting rates with corresponding operators in another country.

4.2 Reforms replacing the current accounting rate system

Several concepts are currently discussed, which are potential solutions to not only complement the current accounting rate system but to replace this by many countries as obsolete described settlement system.

Call Termination Charges: Concept of transparent (i.e. published rates), cost-based (mutually agreed costing methodology), non-discriminatory (the same for all international operators) call termination charges. In this scenario, the operator fixes the charge for terminating an incoming international call received at its international gateway at the subscribers premises. A problem could be the internationally different regulatory policies, different accounting practises and cost definitions.

Interconnection arrangement: This describes a system, where a foreign international operator is free to interconnect with a national operator's domestic network at virtually any point in that network. The foreign operator pays the costs of the facilities from the POI to terminate the call. A problem with this system is, that the charge of interconnection may be very high, where the destination operator is a monopoly.

End-to-end Service Provision: A variant of the interconnection arrangement is end-to-end service provision. Providers being present at both ends of a relationship do no longer need special accounting and settlement arrangements between operators. Global alliances of operators already provide end-to-end services outside the conventional system, currently mainly to corporate customers.

Sender Keeps All: The sender keeps all (SKA) is a system, in which the originating operator keeps all the revenue it collects and exchanges no traffic information or accounts with the destination operator, as both parties simply deem the outcome of the call accounting process to be absolutely equal. A problem of this system is, that it produces no financial flows to compensate for the cost of building and maintaining the network at the terminating end.

Unbundling of the settlement rate: The settlement rate comprises three separate cost components: The international transmission link, the international gateway and the call termination (national extension). A reform of the settlement rate system will involve unbundling those three elements and allowing carriers to make economically rational build or buy decisions for each separate component.

As mentioned above, the evolution of the international accounting and settlement rate regime is not finally decided, but the elements necessary in any reform of the system are clear. Cost-orientation, transparency, non-discrimination, competition, passing on of benefits to customers as well as the ease of transition for developing countries will be crucial for the success of development in the accounting rate system.

5 CONCLUSIONS

The international telecommunications service industry has undergone a fundamental transformation over the past decade – from one based on monopoly supply of voice services to an industry that is fiercely competitive on major international routes and which carries a mix of voice and data services over a variety of circuit switched and IP based networks.

This liberalisation of international services has generated significant economic benefit for the developed countries which have undertaken it. In particular the countries which led this move, notably the USA and UK, have benefited most through the development of a strong international wholesale services industry. But liberalisation of international services is much more problematic for developing countries as we discuss below.

The international telecommunications market is, on the whole, functioning well. Prices are falling quickly and supra normal profits are disappearing. Regulators should therefore forebear from intervening in the functioning of this market in any significant way. This message was spelt out very clearly by all the operators and several of the international regulatory bodies approached in the course of this study.

However there is concern about a lack of transparency in the market. Statistics which provide a clear and comprehensive picture of market developments are difficult to obtain. To date it has been necessary to rely largely on statistics published by the FCC and, to a lesser extent, Oftel to shed light into the darker corners of this market place. For example there are substantial differences between actual and published international transit rates. At the same time both transit rate and IP interconnect arrangements are frequently the subject of non-disclosure agreements. A requirement for more openness on the commercial terms of such interconnect arrangements would undoubtedly help to increase competition in the international market place. It is believed that it should be possible for the regulators of Europe and the USA to agree on measures which would require greater disclosure²⁰ without substantially damaging the commercial position of the international carriers who are affected by such disclosures.

There is a growing gap between the global reach of the international carriers and the national and regional jurisdictions of the bodies which might in future be required to regulate them. This is not, in the view of this study, a cause of any great alarm. The competition authorities of the USA and the EU can, in combination, probably deal with most matters satisfactorily. But there is a potential future need for a truly global body with the powers to deal with market failure at the global carrier level. The WTO is an obvious body to consider. At first sight the ITU, which relies on consensus decision making and resolutions, is a less obvious candidate. But first an important choice should be made:

Should there be a model based on multilateral consensus or a one based on dispute settlement? In the context of the international telecommunications market, this choice can lead to market development based on ex-ante co-operation or on ex-post conflict resolution

²⁰ If only at an aggregate level