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Report on the expected development of the regulatory situation in European countries relevant for the SERENATE project¹

EXECUTIVE SUMMARY

The topic of this report is the implications of regulatory issues for the development of national research and education networks (NRENs). The topic is heavily influenced by a major revision in mid-2003 of the EU communications regulation, which is the latest since the liberalisation was first mapped out in a Green Paper in 1987. Regulatory issues may not be highest on the priority list of important questions in NREN communities since they are not often encountered in daily work. However, they constitute the environment in which NRENs develop and the present report documents that communications regulation matters a great deal to the conditions under which NRENs and GÉANT develop.

What is regulation?

The term regulation in this report means the politically instituted rules and provisions that market actors have to follow and the enforcement of regulations by regulatory agencies. The regulations dealt with are communications regulation governing communications infrastructures and the services associated with the conveyance of communications on networks, however excluding content regulation.

Whereas formerly telecommunications operators had national or regional monopolies and whereas political decision-making, operation and regulation were often closely tied together in telecommunications administrations, the reform process in the telecommunications area has not only entailed a liberalisation of markets and a process of privatisation, but has also meant a separation of the political, operational and regulatory fields, with regulation as an external activity to the operation of communications networks.

In this context, communications regulation most often encompasses three areas: competition regulation, including, for instance, interconnection regulation; regulation of scarce resources such as frequencies, rights of way, and names and numbers; and finally, universal service regulation and consumer protection. Among these areas of regulation, competition regulation and regulation of scarce resources are the most relevant for research and education networks to consider, as they have implications for their activities. However, the basic liberalisation of communication markets should not be forgotten, as this constitutes the basis for allowing research and education networks to deploy their self-owned physical network infrastructure where this is the best solution.

Own fibre infrastructure

Because of technical advances and the decreasing prices of fibre network technologies, the possibility of deploying a proprietary fibre network will appear more and more on the agenda of

1. by Dan Saugstrup, Claire Milne, Anders Henten and Knud Erik Skouby

NRENs. It is important to emphasise that in a liberal regime without special rights of any operators to build and operate communications infrastructures, there should be no overall impediments, of a communications regulatory character, for NRENs to establish self-owned infrastructures. NRENs can choose this option if they find it advantageous. Furthermore, no matter which kind of infrastructure NRENs choose to apply, there will be technology-neutrality under the coming EU regulation, meaning that different kinds of infrastructures will be regulated in the same, neutral manner.

Under the present EU regulations, obligations to obtain licenses and the conditions under which such licenses are awarded may effectively constitute limitations on the establishment and operation of networks in various countries. However, with the new 'light-handed' type of authorisation in the new 2003 EU regulatory package, NRENs and other entities operating communications networks are not required to obtain permission but only to notify national regulatory authorities. This makes it even easier for NRENs to choose the network solutions best fitted to their needs.

The question of rights of way (RoW), however, still has to be taken into consideration. A downside of installing own infrastructure may be the need to obtain RoW and accompanying permissions, for example, to dig up streets or put down cables on private properties. Rights in these areas are normally only available to public network operators. However, in a liberalised regime everyone can apply for RoW and should receive fair treatment based on objectively justifiable grounds.

The authorities responsible for granting RoW in the different countries vary. In some countries, local authorities are in charge, and in others, RoW are granted in a more co-ordinated fashion at the national level. Or a combination of local and central authorities is involved. RoW may, consequently, be a real hurdle and this is an important issue for NRENs to be aware of. For this reason, NRENs may consider to sidestep the issue of RoW by acquiring infrastructure already installed by operators with RoW instead of building the infrastructure from scratch. These are, however, issues that must be specifically addressed in the different national contexts.

In addition to the RoW question, there may be other hindrances for NRENs to take advantage of the option to choose the technology solutions best fitted to the specific circumstances. NRENs may be subject to certain political priorities and decisions, being publicly owned entities, or there may be provisions in the statutes of NRENs hindering them from owning proprietary infrastructure. But these kinds of limitations on the freedom of action of NRENs are not determined by communications regulation, and it is crucial to underline that liberalisation allows for NRENs to apply all possible networking solutions.

Direct and indirect implications of regulation

There are both direct and indirect implications of regulations, where the indirect implications are the most important; they may however not always be conceived as regulatory issues but tend to be looked upon as market conditions, e.g. prices of connectivity. However, as documented in this report, market conditions are strongly affected by regulation, and regulatory changes will certainly have an impact on the development possibilities for NRENs. This implies that besides the entry of more competitors on a given market, which every thing else being equal would support a greater competition level, also price regulation is an important regulatory tool for lowering the price levels and thereby creating better conditions for NRENs.

Currently, the EU-15 countries are moving from the 1998 liberalisation package to the new 2003 regulatory regime and the accession countries are adapting as fast as they can to the *acquis communautaire*. These different paths and liberalisation stages create a number of direct and indirect implications for the research and education networks throughout Europe.

The direct implications can be subdivided into three main categories:

- The basic right to establish self-owned networks: under an infrastructure monopoly regime, only the monopoly provider has the right to build infrastructure. When infrastructure provision is liberalised, NRENs have the possibility to choose between leasing capacity and building their own infrastructure. However, when considering a proprietary infrastructure NRENs must evaluate the problems involved in acquiring rights of way.
- The distinction between private and public networks can be important – based on the new EU telecom regulatory package the rights and obligations of private and public networks are different: public networks have the right to negotiate interconnection agreements and obtain interconnection prices. Public networks, however, also have to meet interconnection obligations and can be made subject to other regulations, e.g. regarding communications standards and quality of service. The classification of an NREN as a private or public network may, therefore, affect its development, and in relation to the implementation of the new EU regulatory package in the national legislations before July 2003 it may be important for NRENs to clarify their status.
- A third issue deals with competition between privately owned public network providers and NRENs. To the extent that NRENs provide services to groups of users and customers outside a closed user group of research and education institutions, privately owned public network providers may claim that they are subject to unfair competition as NRENs are supported by government funding.

With respect to the two last issues, NRENs have, at times, operated in grey zones. NRENs operate as private networks but could with good reason be designated as public networks if they provide services to a broader range of user groups. And this would also open the question of unfair competition between publicly financed NRENs and privately owned operators wanting to serve the user groups of NRENs.

It is possible that NRENs have not often had to confront these issues directly yet. However, this may not always be so. In the communications field there has, with the liberalisation of telecommunications markets, been a call for increasing clarity with respect to rights and obligations. There are thus issues that may need to be clarified in the near future concerning the private and public status of NRENs and the relation to privately owned operators.

Regulations also have indirect implications for NREN developments. The creation of competition in the telecommunications markets has clearly led to greater variety of services, higher quality and lower prices. All these factors are important for NRENs leasing capacity from infrastructure and network providers. It is documented that the costs of international connectivity are far cheaper in competitive markets than in markets with little or no competition. With respect to list prices for national leased lines, however, the differences between the different kinds of market situations are not that clear. But the negotiated prices clearly reflect the competitive situation and there seems to be ample room for further price decreases in the high-speed

connectivity markets. The whole communications market environment is very important for the development of NRENs.

Structure of report

The report focuses mainly on the EU candidate countries, as the regulatory and market conditions and the developments of NRENs are less documented there than in the existing EU member states. The analysis in the report shows however that the candidate countries cannot be considered as one homogeneous group of countries, and it also shows that there is no clear line of division between existing EU countries and the candidate countries. Some of the candidate countries are relatively far from the market and regulatory situation in the most advanced EU countries, and others are on the same level as most EU countries.

All candidate countries have been dealt with separately in annex I, and Greece and Portugal have also been analysed separately (see annex II), as the liberalisation process started somewhat later in these two countries compared with most other EU countries. Finally, there is an annex III on the new EU communications regulatory package. The standards of rules and regulations in this package are the ones to be achieved in the near future by all existing member states and new EU members.

The prospect is that the implementation of the EU regulatory package will help improve the conditions and possibilities for NRENs in both existing and new EU member states. But as shown in the analysis of direct regulatory implications, there are also challenges to be met with regard to clarity of the status of NRENs.

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1 Introduction

The focus of this report is on the implications of the regulatory situation in the field of communications in Europe for the development of national research and education networks and the extension and further upgrading of the European research and education network, GÉANT. As the regulatory situation in the present EU Member states is relatively well known² and as the supply conditions affecting NREN developments in these countries are mostly functioning well, the primary emphasis in the report is on the thirteen candidate countries to the EU (see Annex I). Furthermore, Greece and Portugal are dealt with separately, as the markets for high-speed connectivity in these two countries are less developed than generally in the existing EU member states (see Annex II)³.

The expected evolution in the existing EU countries and the countries following the direction of EU regulatory policies is dealt with in the report by presenting the new regulatory structure to be implemented already in July 2003 (see Annex III). Telecommunications markets in the EU are already liberalised and are, therefore, in terms of regulation open to the different ownership or leasing requirements that NRENs and GÉANT may have. This situation will be further strengthened with the initiatives in the new regulatory package to enhance competition. There will still be differences among countries, as EU directives have to be implemented and enforced nationally and as practices in the different countries may diverge. But the overall framework will ensure a fully liberalised regime in which NRENs and GÉANT can operate.

1.1. What is Regulation?

The term regulation in this report means the politically instituted rules and provisions that market actors have to follow and the enforcement of regulations by regulatory agencies. The regulations dealt with are communications regulation governing communications infrastructures and the services associated with the conveyance of communications on networks, however excluding content regulation.

Whereas formerly telecommunications operators had national or regional monopolies and whereas political decision-making, operation and regulation were often closely tied together in telecommunications administrations, the reform process in the telecommunications area has not only entailed a liberalisation of markets and a process of privatisation, but has also meant a separation of the political, operational and regulatory fields, with regulation as an external activity to the operation of communications networks.

In this context, communications regulation most often encompasses three areas: competition regulation, including, for instance, interconnection regulation; regulation of scarce resources such as frequencies, rights of way, and names and numbers; and finally, universal service regulation and consumer protection. Among these areas of regulation, competition regulation and regulation of

2. See, e.g., 'Eighth Report from the Commission on the Implementation of the Telecommunications Regulatory package – European telecoms regulation and markets 2002', SEC(2002) 1329.

3. EEA (European Economic Area) countries, Norway, Iceland and Liechtenstein, are obliged to follow EU directives, and Switzerland has also followed the regulatory direction of the EU.

scarce resources are the most relevant for research and education networks to consider, as they have implications for their activities. However, the basic liberalisation of communication markets should not be forgotten, as this constitutes the basis for allowing research and education networks to deploy their self-owned physical network infrastructure where this is the best solution.

The European Union has intervened in the rules and regulations for the telecommunications markets in its member states since the mid-1980s. The reform process reached an important goal with the total liberalisation in 1998 (with minor derogations for a small number of member states). This means that telecommunications markets in the EU member states and the countries following the policy directions from the EU have become fully liberal, meaning that all special rights of incumbent operators have been abolished and that all other players wanting to establish telecommunications facilities and offer telecommunications services are permitted to do so. However, it does not mean that there is equal competition in the communications markets, as incumbent operators often retain a significant power in the various market segments. This is a major reason for instituting a communications-specific regulatory structure and not only relying on general competition regulation.

Since the late 1980s, the EU has been issuing directives on the rules and regulation of telecommunications. Directives are not immediately in force when issued – they have to be transposed into national laws, and enforcement is a national matter catered for by national regulatory agencies. This means that there is no international regulation, *per se*, but a regulatory framework to be nationally instituted and enforced. This also means that there are differences in the interpretation and adaptation of EU directives in the different member states, and that international operations are governed by regulations relevant at each end of a given connection and rights of way for countries *en route*.

It has, consequently, been discussed at a number of instances whether an EU-wide European regulatory agency should be established in order to ensure equal regulatory measures across the whole EU area. This has, however, been rejected for various reasons, one of the more important ones being that communications markets in the EU are in fact still, to a large extent, national markets and that regulations should, therefore, primarily be national. But there is co-ordination between the national regulatory authorities in the Independent Regulators Group (IRG), and a greater degree of co-ordination will also be the result of the newly established European Regulators' Group (ERG). Furthermore, in the area of licensing, there has for a number of years been a one-stop-shopping procedure at a European level with the establishment of the European Telecommunications Office (ETO), now under the aegis of the Electronic Communications Committee (ECC).

1.2. Implications of Regulations

The development of NRENs depends on a multitude of different factors, including general economic conditions such as GDP per capita, telecommunications market developments including the regulatory situation, and national economic support for NREN development. The regulatory factors may not always be the most obvious ones, but there is a clear correlation between the level of competition in the different national markets and the price levels of access to connectivity⁴, for instance. The regulatory situation and development affecting the competitive environment thus play an important role.

⁴ Deliverable D6 in the SERENATE project, 'Report on present status of international connectivity in Europe and to other continents', demonstrates that the cost of international connectivity in monopoly markets is 18-39 times greater than in the most competitive markets.

The implications of the regulatory situation are basically of two kinds – direct and indirect. The direct implications deal with the possibilities of establishing self-owned networks and the conditions attached to operating a network (public or private). The indirect implications concern the state of competition in the communications markets affecting the development of new services and the quality and price of services and, therefore, the conditions under which NRENs can get access to connectivity.

1.2.1. Direct implications

Among the direct implications, the basic right to deploy a self-owned infrastructure outside the purview of the incumbent operator depends on the liberalisation of infrastructure provision. This stage of liberalisation has been reached in all EU member states and most accession states, but not all yet. However, the most common mode of operation of NRENs does not yet, to any large extent, include the actual deployment of physical networks but the leasing of communication connections, fully or less equipped. Equally important are, therefore, the regulatory conditions attached to operating a network, where stronger general conditions of authorisation will apply to public communications providers than to private networks. However, building own infrastructure may in the years to come be advantageous to NRENs and they, therefore, have to take RoW issues into consideration.

Assuming the research networks continue to cater only for education and research institutions, effectively self-providing services within a closed user group and not selling outside that group, the effect of the new EU regulatory communications package should be entirely positive. If NRENs will have no outside consumers, they should be subject to few constraints, whether they choose to rent or buy their networks.

The major direct regulatory issue for research networks arising from the new package will be determining their regulatory status and its implications for network access and interconnection. The new communications directives⁵ envisage broadly three types of status that could apply:

- Public communications provider
- Private communications provider
- End user.

A fourth type of status, public communications provider with SMP (significant market power), will not apply to research networks because, even where they offer public services, the markets in question are not in the Commission's recommended set for market analysis and SMP assessment (see Annex III and Commission guidelines on market analysis⁶).

It is likely that in most member states the research networks will be classified as private communications providers. A 'public communications network' is defined as an electronic communications network used *wholly or mainly* for the provision of *publicly available* electronic communications services. If, for example, the research network provides Internet access to schoolchildren at home, it is arguable that it is providing a form of *publicly available* service; however it is unlikely that the network is used *mainly* for this purpose.

The main significance of public or private status is for access and interconnection. Public network operators have both the right and the obligation to negotiate the interconnection of their

5. *The new European communications regulatory package was adopted by EU in April 2002, and must be implemented in EU Member States by July 2003.*

6. *Commission guidelines on market analysis and the assessment of significant market power under the Community regulatory framework for electronic communications networks and services', OJ 11.7.2002, C 165/03.*

networks with each other, while private network operators do not. All communications providers will, however, be entitled to make reasonable requests for access to network facilities (such as unbundled local loops, partial private circuits or wholesale ADSL) from SMP operators.

'Reasonable' requests must, for example, be technically feasible. The SMP operators will be under an obligation to provide this access on fair, non-discriminatory and reasonable terms.

Exactly what this will mean in practice remains to be seen. It is possible that public/private status of the party requesting access may be seen as a legitimate ground for discrimination in price or speed of delivery. Certainly, the volume of the request could be so seen. And where access is requested to limited resources (e.g. exchange space for co-located equipment) then regulators could possibly wish to see public providers given preference over private ones. Similarly, access to and prices for spectrum and rights of way could be less favourable for private communications providers than for public ones.

1.2.2. Indirect implications

The indirect implications deal with the effects of market liberalisation on the variety, quality and price of services that NRENs and other users can buy in the communications market places. Since the liberalisation of communications infrastructures in the EU there has been a mounting competition in the backbone markets in Europe with the incumbents investing in building out European networks and with new and alternative network providers offering high-capacity connectivity⁷. This has contributed to a much larger spread of high-capacity networks, larger varieties of different network services, improved transmission quality, and sharply falling prices. In the context of this introduction, the focus is on prices.

DANTE's⁸ international purchasing has shown dramatic price decreases in recent years, especially in Western Europe (and across the Atlantic), and similar benefits should in due course extend eastwards. DANTE has calculated their average costs per Mb/s per year to drop from approximately 200,000 euro in 1996 to 5,000 euro in 2000-2001. The lowest offer price per Mb/s per year was as low as 36 euro in 2000-2001⁹. In spite of these spectacular price decreases it is important not to overestimate the likely speed of change. Even though the European Commission has by the end of 2002 terminated its investigation of leased-line prices in Europe¹⁰, the background for this decision is a mere 30-40% price decrease from 1998 to 2001 - compared with the above mentioned factor of 40+ cost decrease obtained by DANTE for international connectivity.

Historically, leased-line prices, and especially international leased-line prices, have been kept high, based on inefficiencies including un-commercial purchasing practices as well as over-manning. Originally leased lines were paid by business customers who provided a convenient source of cross-subsidy to the residential market, which was both politically valuable and good for growing household telephone penetration. The cross-subsidy is largest where rentals are low and residential penetration high, e.g. in Bulgaria.

Later, leased lines were bought by new entrants and ISPs for resale purposes (usually in the form of calls). Incumbents have no desire to make it easier for these operators to undercut them by

7. SERENATE Deliverable D6 includes an overview of the different kinds of high-capacity network providers in the European markets.

8. DANTE is the not-for-profit organisation owned by European NRENs, whose mission is to organise, manage and provide advanced pan-European data network services, currently GÉANT, to the European research community.

9. SERENATE Deliverable D6.

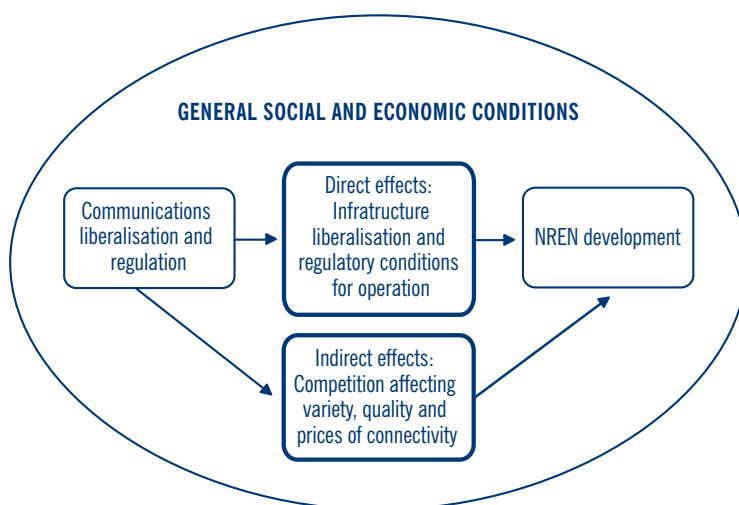
10. EC: 'Explanatory Memorandum – Leased lines: Commission closes the leased line inquiry and two ex-officio cases in Belgium and Italy', Brussels, 10 December 2002.

lowering leased-line prices. In the United Kingdom, high prices were even allowed in order to encourage new infrastructure build. Furthermore, high international accounting rates¹¹ are an indicator of the incumbents' need to keep international leased-circuit prices high.

1.3. Factors Affecting the Development of Research and Education Networks, and Structure of the Report

There are thus direct and indirect regulatory factors affecting the development of research and education networks and there are broader societal factors, as shown in figure 1.1. The figure illustrates the different elements in the analysis in the present report, i.e. general social and economic conditions, communications regulatory framework, communications market conditions, and development of research and education networks.

Figure 1.1: Factors affecting research and education networks



In the report itself, there is first an overview of NREN developments including developments in the thirteen candidates for EU membership, Greece, Portugal and the other existing EU member states. This is followed by a section on regulatory developments. Furthermore, there is an overview of telecommunications market conditions with special emphasis on the competitive conditions, and a section on the implications for NRENs. These sections constitute the summary of the subsequent annexes, which form the main bulk of the report, consisting of short reports on all individual candidates for EU membership plus a report on Greece and Portugal and one on the new EU communications package.

2 National Research and Education Networks

2.1. General Introduction

This section describes important basic features of, and differences between, NRENs. Emphasis is on NREN information with regulatory implications. There is information on the general function of NRENs, their customer base and financing sources, which may affect their regulatory status. Furthermore, issues regarding leased lines, deployment of own infrastructure and future capacity needs are described, as they also imply questions of a regulatory nature. The focus is on the accession states, as they are in a transition phase from previously operating their networks in less competitive or even monopolistic markets towards operating under more competitive and liberalised market conditions.

In most accession states NRENs were established in the late eighties and early nineties as data communication between different organisations began to be more commonly used and huge benefits in the electronic interchange of information could be seen as improving the performance of many research and education institutions. In addition to this, the boom of the Internet in more or less the same period further boosted electronic data communication and made it what it is today.

The main purpose of the NREN organisations is to operate and develop the national research and education networks in order to provide connectivity for education and research institutions and other public entities such as libraries and hospitals, where students, researchers, professors and others can access the network. In addition, another very important function of the networks is to provide international connectivity, which for most parts is provided primarily through the GÉANT network supplemented by other connections.

Besides operating and maintaining the national research and education network most research and education networking organisations also do some research and development regarding advanced network technologies and applications, normally in co-operation with universities and other research institutions. Moreover, most accession states' NRENs also maintain their countries' top-level domain and/or a public Internet exchange. Furthermore, it should be mentioned that accession states' NRENs play a very important role in delivering Internet access, as most of them provide a high proportion of the total Internet access and are among the leaders in installing high-capacity networks in each accession country.

2.2. User Base and Financing

In almost all countries, there is only one national research and education network; however some countries have more than one research network e.g. Latvia and Romania. The main customers of the NRENs are universities, research institutions and other higher-education institutions, but some NRENs also provide connectivity to primary and secondary schools and other public

institutions such as ministries, hospitals, libraries, museums and so on. Only very few NRENs, e.g. LATNET in Latvia, provide connectivity for commercial users or non-academic usage.

Table 2.1 contains information on the financing sources of NRENs in the accession states. The table documents that the Latvian example is uncommon though, and that the most common forms of funding are basic government funding and fees paid by connecting institutions. In addition, the financing structure reveals the organisational relation between the individual NREN and the government.

As can be seen in table 2.1, the accession states' NRENs have different financing models, which vary from 100% to only a few percent in direct government funding and where the remaining funding is based on user payments. Looking at the EU-15 countries their NREN funding models are as diverse as those of the accession states and the government funding percentages also vary a great deal.

Furthermore, it should be mentioned that even where both the NREN and all its customers (universities, etc.) are wholly government funded, they are generally separate legal entities, which means that there is a service provision relationship.

Table 2.1: Financing of NRENs

Country	Financing
Bulgaria	Due to administrative and legal statute changes there was no final financing model in place at the time of this study
Cyprus	90% by government and 10% by connected entities, which is a flat fee based on bandwidth
Czech Republic	66% by government and 34% by connected entities, which is a flat fee based on bandwidth
Estonia	100% financed by the government
Hungary	90% by government and 10% by connected entities, which is a flat fee based on bandwidth
Latvia	LANET: 10% by government and 90% by the university LATNET: 4% by government and 96% by connected entities, where the commercial connected entities pay three times more than the academic connected entities
Lithuania	100% financed by the government
Malta	campus network / financed through the university
Poland	50% by the government and 50% by the connected entities, which is a flat fee based on bandwidth
Romania	RNC: 50% by government, 40% by the connected entities, which is based on a flat fee and a usage-based fee, and 10% from other sources
Slovakia	90% by government and 10% by connected entities, which is a flat fee based on bandwidth
Slovenia	82% by government, 5% by the connected entities and 13% from other sources
Turkey	100% financed by the government

Source: Country descriptions (see Annex 1) and <http://www.terena.nl/compendium>

2.3. NRENs' Backbone Capacity and Future Plans

Today most NRENs are using fibre backbone networks and some also radio links, e.g., in the accession states. The general set-up is to use a fibre backbone between the main connection points in the network and then distribute the network capacity by using metropolitan area networks (MANs) or access networks in high-density areas.

Furthermore, most NRENs use leased lines for the backbone network - not many of them actually own their networks. However, there are some NRENs that plan to or already deploy their own infrastructure to become independent of operators and more cost effective. One of them is the Polish NREN, which currently uses leased channels (SDH and lambda). However, the plan is to migrate to a self-owned infrastructure during the next two years by interconnecting all MANs within Poland to an optical network.

Currently, the Polish research community has its own fibre infrastructure within the academic metropolitan area networks, and to become independent from external suppliers the research community has started a project called PIONIER. The PIONIER project is aiming at building fibre optic cables and using DWDM infrastructure connecting all MANs in Poland, and the research community has already put down 1200 km of fibres out of the 1400 km planned.

One of the biggest challenges for the NRENs is the relatively low number of suppliers that actually provide high-capacity leased lines and interconnection. Especially in the accession states this is a problem and it is the main reason for relatively high prices in these countries. Concerning the accession states in general, there are only very few providers of high-capacity connections, whereas for the lower capacities there are more operators and, therefore, also a more competitive market.

Regarding future capacity, almost every NREN is expecting a fairly high increase in demand for bandwidth, typically 4-10 times their current capacity in a two- to three-year timeframe. With respect to NREN backbone capacities, there are quite some differences looking at both EU-15 and accession states, where most accession states are at the lower-capacity levels and most EU-15 countries at the higher-capacity levels.

3 Regulation

3.1. Current Situation

Looking at the regulatory and market situation across the current EU and candidate states, we do not find a sharp division between the two categories. Rather, there is a graduation from lower-income and later liberalising countries (concentrated among the candidate countries) towards more prosperous and highly liberalised countries (concentrated among the EU membership). All countries are moving in the same direction, towards greater prosperity and greater liberalisation. Most experience a similar set of problems along the way. And within the timescales of this study, all the countries studied should be well advanced in resolving those problems.

Problems for competition that have been encountered in some countries under existing regulations include:

- apparently unreasonable refusal of licences, or licences granted for a short period, with high fees or on unnecessary conditions
- lack of co-operation or even outright opposition from an obstructive incumbent, delaying interconnection or provision of other facilities.

Underlying problems include:

- excessive government financial interest in the incumbent
- inadequate separation between branches of government responsible for the residual financial interest in the incumbent, for determining sector policy, and for day-to-day regulation
- continuing vulnerability of politicians and public officials to improper influence, for example in relation to the granting or refusal of licences
- long-standing bureaucratic traditions slowing everything down.

None of this can be sorted out overnight, but continuing reform and economic growth will lead to improvements.

3.2. The New Communications Regulatory Package

The bulk of the new European communications regulatory package was adopted by the EU in April 2002, and must be implemented in member states by July 2003. EEA countries and candidate countries are all planning to adopt compliant regulatory structures, though some to a more relaxed timetable.

The package consists of the following interlinked directives¹²:

- Framework directive
- Authorisation directive
- Access and interconnection directive

¹². *The major provisions of these directives are summarised in Annex III*

- Universal service and users' rights directive
- Data protection and privacy directive
- plus the Regulation on unbundled access to the local loop, which has already been in force for some time.

The whole thrust of the package is towards facilitating open competition in communications-network and service markets. Licensing will be abolished and replaced by a system of (mainly general, some individual) authorisations to provide electronic communications services, subject only to such minimum conditions as are necessary for a limited range of purposes. The most important of those purposes are:

- ensuring fair competition, primarily by means of extra conditions on companies with significant market power (SMP)
- making best use of limited resources such as spectrum, numbers and rights of way
- protecting consumers, through for example universal access to basic telephony and transparent price information
- safeguarding overriding national interests such as security and public safety.

In every country, there should be a strong and independent national regulatory authority (NRA), charged among other things with resolving any disputes and complaints.

3.3. Implications of Regulation for Research and Education Networks

As stated in the introductory section, there are direct and indirect implications of regulation on the development of national research and education networks (NRENs). The direct implications deal with the possibilities of establishing self-owned networks (infrastructure monopoly or liberalisation) and the conditions attached to operating a network (private or public). The indirect implications concern the state of competition in the communications markets, affecting the development of variety, quality and price of services. These implications are illustrated in figure 1.1 in the Introduction.

3.3.1. Direct regulatory implications

If there is monopoly in fixed-line telephony infrastructure provision, as has been the case in a number of accession states until 1 January 2003 and is still the case in, for instance, Turkey, NRENs cannot, in principle, deploy their own self-owned networks but have to lease capacity from the monopoly provider, or rely on data transmission services from the incumbent operator or the alternative operators in case data communication is liberalised. There are, however, examples of NRENs that have deployed own network pieces in a monopoly environment. As government institutions they have had the possibility to circumvent the exclusive rights of the monopoly provider.

In a liberalised market, NRENs have the possibility to choose between leasing capacity from operators and building their own physical infrastructure. In by far the most cases however, NRENs choose to lease capacity or buy data transmission services. But in Poland, for instance, the NREN deploys its own infrastructure.

In the case of NRENs deploying their own infrastructure, there is also the question of access to scarce resources, primarily rights of way (RoW) and radio frequencies. If NRENs do not lease the capacity or buy data transmission services from telecommunications operators, they have to have

RoW in order to lay down cables. They also need rights to mount their radio transmission equipment on masts in case of using radio links or radio access facilities and they have to have access to radio frequencies.

Because of technical advances and the decreasing prices of fibre network technologies, the possibility of deploying a proprietary fibre network will appear more and more on the agenda of NRENs. It is important to emphasise that in a liberal regime without special rights of any operators to build and operate communications infrastructures, there should be no overall impediments, of a communications regulatory character, for NRENs to establish self-owned infrastructures. NRENs can choose this option if they find it advantageous. Furthermore, no matter which kind of infrastructure NRENs choose to apply, there will be technology-neutrality under the coming EU regulation, meaning that different kinds of infrastructures will be regulated in the same, neutral manner.

Under the present EU regulation, obligations to obtain licenses and the conditions under which such licenses are awarded may constitute limitations on the establishment and operation of networks in various countries. However, with the new 'light-handed' type of authorisation in the new EU regulatory package, NRENs and other entities operating communications networks are not required to obtain permission but only to notify national regulatory authorities. This makes it even easier for NRENs to choose the network solutions best fitted to their needs.

The question of RoW, however, still has to be taken into consideration. A downside of installing own infrastructure may be the need to obtain RoW and accompanying permissions, e.g., to dig up streets or put down cables on private properties. Rights in these areas are normally only available to public network operators. However, in a liberalised regime everyone can apply for RoW and should receive fair treatment based on objectively justifiable grounds.

Authorities responsible for granting RoW in the different countries vary. In some countries, local authorities are in charge, and in others, RoW are granted in a more co-ordinated fashion at the national level. Or a combination of local and central authorities is involved. RoW may, consequently, be a real hurdle and this is an important issue for NRENs to be aware of. For this reason, NRENs may consider to sidestep the issue of RoW by acquiring infrastructure already installed by operators with RoW instead of building the infrastructure from scratch. These are, however, issues that must be specifically addressed in the different national contexts.

In addition to the RoW question, there may be other hindrances for NRENs when taking advantage of the option to choose the technology solutions best fitted to the specific circumstances. NRENs may be subject to certain political priorities and decisions, being publicly owned entities, or there may be provisions in the statutes of NRENs hindering them from owning proprietary infrastructure. But these kinds of limitations on the freedom of action of NRENs are not determined by communications regulation, and it is crucial to underline that liberalisation allows for NRENs to apply all possible networking solutions.

Apart from these basic issues, there is also the question relating to the status as public or private network and the conditions attached to these designations¹³. If a network is private, meaning for a closed user group and not open to the public in general, it cannot be made subject to the same obligations as public networks with respect to, for example, interconnection and quality of service and security. The downside for a private network is that it does not have the same rights to negotiate interconnection agreements with public networks and to obtain interconnection prices

13. The terminology of private or public networks has nothing to do with the question of owning or leasing. A self-owned network can be public and a leased network can be private. The notions private and public deal with the question whether networks are for closed user groups (private) or open to public use – see also the introductory section of this report.

(which should be lower than end-user prices) for the use of transmission capacity. However, big customers like NRENs will in most cases have the possibility to negotiate special discount rates with the providers of capacity.

In the current situation, the public or private status of NRENs is not always entirely clear. This applies both to NRENs in the existing EU member states and the candidate countries. The, at times, unclear status stems from the fact that some NRENs not only deliver services to public research and higher-education institutions, but also to schools, to private research organisations, and even to the broader public as is the case with, for instance, LATNET in Latvia. In cases where NRENs deliver services outside the relatively closed user group of public research and education institutions, they may be categorised as public networks, which entails different regulatory obligations and rights than in a private-network situation.

Furthermore, and possibly more important with respect to the development of NRENs and their different user groups, NRENs delivering services outside their traditional relatively closed user communities can be accused of competing with privately or semi-privately owned operators¹⁴. As NRENs mostly are publicly owned and built by public funds and as they often receive public economic support, they can be accused of competing unfairly with privately owned operators outside their traditional user community. Similar issues are known from other sectors where publicly and privately owned institutions deliver services to the same groups of users, for instance in the case of public and private hospitals. However, this similarity does not remove the issue of publicly owned and subsidised institutions competing with privately owned companies. In the telecommunications area, this has been a crucial issue since liberalisation and it has been an important background for the incorporation and ongoing privatisation of incumbent operators.

In the Authorisation Directive¹⁵ in the new EU communications package both public and private networks are covered. In the directive it is stated that it “covers authorisation of all electronic communications networks and services whether they are provided to the public or not”. “This is important to ensure that both categories of providers may benefit from objective, transparent, non-discriminatory and proportionate rights, conditions and procedures”, it is further stated¹⁶. The authorisation regime, put forward in the Authorisation Directive, is light and the provision of electronic communications networks and services may only be subject to a general authorisation, meaning that “the undertaking concerned may be required to submit a notification but may not be required to obtain an explicit decision or any other administrative act by the national regulatory authority before exercising the rights stemming from the authorisation”¹⁷.

The authorisation regime itself does, consequently, not present any difficulty for NRENs. A notification to the regulatory authorities is sufficient. However, a clarification of the NRENs’ status as public or private providers is necessary. It may be that NRENs, in some instances, have led a ‘cosy’ life in a grey zone between private and public networks and it may also be that regulators have not always paid close attention to the status of NRENs. But it is likely that there will be increasing focus on the status of different operators and a demand from privately owned operators for clarification.

14. *The notions private and public here refers to the ownership of networks and not to their status of public and private networks with respect to the users of networks.*

15. ‘Directive 2002/20/EC of the European Parliament and of the Council of 7 March 2002 on the authorisation of electronic communications networks and services’, *Official Journal of the European Communities*, 24.04.2002

16. *Ibid.*, p. 21.

17. *Ibid.*, article 3, p. 25.

3.3.2. Indirect regulatory implications

The indirect implications deal with the variety, quality and price of network services offered to NRENs (and other network users) as an effect of market liberalisation and of regulatory intervention in price and quality of services. It is well documented that competition in communications markets has contributed significantly to greater variety, higher quality and lower prices for services. However, lower prices induced not by means of competition but by means of regulatory decisions have also had an effect.

The most important implications deal with the quality and price of leased data lines, often necessary for the operation of NRENs. The general competitive environment in the communications area is, however, also important as it has an effect on network expansion and capacity, where, for example, mobile operators build backbone networks, which may be partly leased to NRENs. Of some importance may also be the provisions for local-loop unbundling (LLU), which contribute to the creation of competition in the access market. LLU measures in most EU member states deal only with unbundling the local copper loop but can also be applied to fibre access networks. The NRENs might take interest in this and make sure that the principle of technology-neutrality is also followed in this area.

The general competitive climate is thus genuinely important, but it has also turned out that direct regulatory intervention in prices for leased lines has been necessary in order to obtain prices closer to costs. This has been the case in, for instance, Denmark, where as a first step in the liberalisation process in the mid-1990s broadband prices of the incumbent operator were lowered by 65% as a result of a political decision. At the EU level, leased-line prices have been subject to a formal investigation, opened in 1999, but closed by the end of 2002 on the basis of market analyses conducted by the EC demonstrating that leased-line prices in average have decreased by 30-40% from 1998 to 2001¹⁸.

But this development has not come all by itself. In the EU Explanatory Memorandum referred to it is stated that “one of the principal outcomes of the sector inquiry is a considerable decrease in leased-line prices across the EU” and that “a second important outcome is a proactive stance of the NRAs regarding pricing and provision of leased lines”¹⁹. Price decrease is thus also a result of the threat of regulatory interventions and the actual measures taken by NRAs in different countries. The importance of regulatory intervention in lowering leased-line prices should not be underestimated.

18. EC: ‘Explanatory Memorandum – Leased lines: Commission closes the leased line sector inquiry and two ex-officio cases in Belgium and Italy’, Brussels, 10 December 2002.

19. *Ibid.* p. 1.

4 Telecommunications Markets

4.1. Market Developments and Current Situation

The main purpose of this section is to give an overview of the telecommunications market developments in especially the EU candidate countries, as the general telecommunications markets are the environments in which NRENs operate and on which their costs depend to a large extent. The market analysis is done by describing the general market developments, telecommunications penetration and by categorising the different markets. In addition, leased-line markets and the national differences among these markets are described and compared, as these issues are important for the GÉANT network and the NRENs.

Following the 1998 liberalisation of the EU-15 telecommunications markets, competition has increased significantly, but at different paces in the fifteen countries. Generally, the telecommunications markets are affected by the current slowdown of the global economy and the burst of the dot.com / telecom bubble during the last two years. Furthermore, over-investments in backbone capacity and unprecedented levels of debt among the telecommunications companies due to aggressive acquisition strategies and tremendous costs of 3G mobile licences and equipment have left the telecommunications sector somewhat fragile.

Moreover, it should be mentioned that both Greece and Portugal are still in the early stages of the liberalisation process, having had derogations from the EU 1998 deadline for full market liberalisation. Full market openings were initiated in January 2000 for Portugal and January 2001 for Greece, which can explain the low level of new market entrance and a relatively low level of erosion of the incumbent's market share, although new developments are taking place in both countries.

In the candidate countries, the liberalisation and privatisation processes started some years later than in most EU-15 countries. Two different privatisation strategies can be observed in most candidate countries: the reactive and the proactive strategy. The proactive strategy was chosen in countries like Estonia and Hungary, where the national telecom company was privatised relatively fast. The more reactive strategy is chosen in countries like Slovenia and the Czech Republic, where e.g. the privatisation of the Slovenian national telecom company, Telekom Slovenije, is proceeding very cautiously. Currently, the state still has 66% of the shares and less than 9% is divided among market traders²⁰. In the Czech Republic the early sale of shares in Cesky Telecom in 1995 to a consortium consisting of Swisscom, Dutch KPN and AT&T showed a promising start²¹. However, presently the state still controls 51% of the shares because the sale of these shares to a consortium consisting of Deutsche Bank and the Danish operator TDC during 2002 failed due to various reasons.

The fixed-line telephony market has seen different scenarios among the accession states, where countries like the Czech Republic and Slovakia have granted the national carrier monopolistic conditions until January 2003. At the other end of the different scenarios is Estonia, where the

20. IT & Telecoms Monitor No.1 - http://www.polishmarket.com/it_telecoms_monitor.php

21. IT & Telecoms Monitor No.1 - http://www.polishmarket.com/it_telecoms_monitor.php

telecommunications market was fully opened in January 2001. The accession states that had not fully opened their telecommunications markets already were in most cases taking the final liberalisation step by January 2003 with the liberalisation of telephony and infrastructure.

Regarding the data transmission markets, the developments are quite different compared to that of fixed-line telephony. In data services, the markets were opened in most accession states almost from the start of the privatisation and liberalisation process. This approach has resulted in the establishment of several backbone networks, but the data transmission prices are significantly higher than the general price levels for data transmission in EU-15 countries.

Mobile telephony in the accession states is a much more liberalised and competitive market, compared to that of fixed-line telephony. Except for Cyprus, all accession states have at least two, and most of them three or even four, mobile operators, and the mobile markets have become a 'test-market' for the liberalisation process.

4.2. Telecommunications Penetration

Table 4.1 below shows the fixed, mobile and Internet penetration in 2001 per 100 inhabitants in the candidate countries. Among the candidate countries only Cyprus is above the average EU-15 level regarding the fixed-telephony penetration and Malta is close to reaching the EU-15 level. At the other end of the scale, Romania and Turkey are the countries with the lowest level of fixed-phone penetration.

Table 4.1: Telecommunications penetration in EU candidate countries, 2001

Country	Fixed penetration	Mobile penetration	Internet penetration
Romania	19	17.2	4.4
Turkey	28	30.2	3.8
Poland	32	26.0	9.8
Latvia	32	27.9	7.2
Slovakia	32	39.7	16.7
Lithuania	34	25.3	6.8
Bulgaria	37	19.1	7.5
Hungary	37	49.8	14.8
Estonia	38	45.5	30.0
Czech Republic	38	65.9	13.6
Slovenia	47	76.0	30.1
Malta	53	61.9	25.4
EU-15	55	72.4	31.4
Cyprus	64	46.6	22.2

Note: Ranked by fixed-line penetration.

Source: Information Society Statistics - Pocketbook 2002 and 1st report on Monitoring of EU candidate countries (Telecommunication Service Sector)

The high levels of fixed-telephony penetration on Malta and Cyprus can mainly be explained by their high standards of living, which provide excellent opportunities for the incumbent telecommunications providers. On both Malta and Cyprus, the telecommunications networks are

all-digital and both countries have more than 100 fixed lines per 100 households, where a second line often is used for Internet connections. The situation in Romania and Turkey is rather different. Both countries are among the poorest with a per capita GDP of around 25% of the EU-15 average level.

Regarding mobile penetration, only Slovenia is above the EU-15 average level, however both the Czech Republic and Malta are not that far behind. And with respect to Internet penetration, none of the accession states reaches the EU-15 average level. However, Estonia, Malta and Slovenia are almost there. Malta and Slovenia are among the more wealthy countries, a fact that accounts for some of the phenomenon. Estonia, on the other hand, is 'special' in the average group regarding GDP per capita, but the fact that the Estonian telecommunications market was liberalised in January 2001 might explain the relatively high Internet penetration compared to the other accession states in the same economic situation. Besides these two reasons also the number of ISPs is believed to be of some importance to the Internet penetration level.

4.3. Leased Lines

The pan-European markets for international connectivity have become much more competitive within the last five years or so as the liberalisation process has swept across the EU-15 countries. Also, most of the accession states are experiencing this liberalisation process and more competitive markets as regards leased lines, due to the fact that data transmission in general is among the first areas to be liberalised.

Table 4.2 shows the cost development of international connectivity in euro/Mb/s/year, and is based on the response to pan-European tenders for the GÉANT-network from 1997 to 2001²².

Table 4.2: Price for international connectivity offered to DANTE, 1997-2001

	1997	1998	1999	2000	2001
Average offered price [euro/Mb/s/year]	200,000	150,000	30,000	12,500	5,000
Lowest offered price [euro/Mb/s/year]	200,000	100,000	20,000	2,000	36

Source: SERENATE deliverable D6

As can be seen in table 4.2, there has been a huge decrease in the price offers to DANTE. The average offered prices in the five-year period are reduced by a factor of 40 and the lowest offered price is reduced by a factor of 5,555. The decrease in the average offered price category in table 4.2 can be explained by the overall decline in telecommunication prices due to increased competition combined with technological developments, economies of scale and over-capacity in the backbone networks.

The explanation for the differences between average and lowest offered prices is based on the different price structures regarding most and less used routes, availability of capacity / number of suppliers, and geographical differences in the level of competition, where a leased line between for instance London and Frankfurt is much cheaper in euro/Mb/s/year than the same connection between Prague and Warsaw.

The prices offered to a large user like DANTE are considerably lower than the official list prices and the price decreases are also more significant. Table 4.3 shows an index of average list price variations within the EU-15 countries on international leased-lines prices over a five-year period. The table shows price decreases of around 40%.

Table 4.3: Index of price developments for leased-line connections in EU, 1998-2002

	1998	1999	2000	2001	2002
64 kb/s to near EU countries	100	82	74	64	59
64 kb/s to far EU countries	100	85	78	73	67
2 Mb/s to near EU countries	100	88	71	60	54
2 Mb/s to far EU countries	100	89	77	71	65

Source: Eighth report from the European Commission on the implementation of the Telecommunication Regulatory Package.

The price levels for national leased lines provided by the incumbent operators show a significant diversity among both the EU-15 and accession states. The national EU-15 leased-line prices for 64 kb/s (2, 50 and 200 km) have decreased in average 25% over the last three years. However, during the last year the price range has been more or less stable. For 2 Mb/s (2, 50 and 200 km) EU-15 national leased lines, the price decrease has been larger compared to the 64 kb/s circuits. Also here, the price structure in the last year has been more or less stable compared with the average trend of the last four years where the average reduction for 2 Mb/s circuits, all distances considered, was 37%²³.

In table 4.4, the price differences on 64 kb/s, 2 km national leased lines are shown for both the EU-15 and accession states, where the accession states are highlighted. The data are based on list prices charged by incumbent operators for one-year connections in 2002 PPS prices, excluding VAT.

Table 4.4: List prices for 64 kb/s leased lines, PPS²⁴, 2002

Country	Leased line 64 kb/s, 2 km national circuit [euro in PPS]
Luxemburg	900
Estonia	927
Romania	940
Denmark	980
Germany	1,062
Cyprus	1,120
Turkey	1,194
Ireland	1,266
Austria	1,353
Poland	1,661
Portugal	1,877
Belgium	2,240
Italy	2,407
Sweden	2,415
Netherlands	2,539
France	2,766
Malta	2,792
Slovenia	2,812
UK	3,004
Greece	3,106
Spain	3,161
Lithuania	3,810
Latvia	4,107
Bulgaria	4,181
Czech Republic	5,304
Hungary	6,300
Slovakia	6,125

Source: The 8th report from the commission on the implementation of the telecommunication regulatory package, annex 1, market overview and the 1st report on monitoring of EU candidate countries in the telecommunication service sector. Data are not available for Finland.

In table 4.5, the price differences on 2 Mb/s, 200 km national leased lines are shown for both the EU-15 and accession states, where the accession states are highlighted. The data are based on list prices charged by incumbent operators for one-year connections in 2002 PPS prices, excluding VAT.

Table 4.5: List prices for 2 Mb/s leased lines, PPS, 2002

Country	Leased line 2 Mb/s, 200 km national circuit [euro in PPS]
Luxemburg	10,350
Sweden	12,611
Denmark	13,483
Latvia	17,114
Romania	24,166
Austria	25,091
Germany	28,892
Ireland	28,971
Netherlands	29,121
Belgium	29,172
France	39,504
UK	43,954
Italy	52,986
Slovenia	59,808
Lithuania	60,954
Cyprus	65,574
Estonia	65,617
Portugal	68,673
Spain	70,111
Greece	78,846
Turkey	87,547
Hungary	97,443
Slovakia	108,970
Czech Republic	127,839
Poland	130,693
Bulgaria	177,729

Source: The 8th report from the commission on the implementation of the telecommunication regulatory package, annex 1, market overview and the 1st report on monitoring of EU candidate countries in the telecommunication service sector. Data are not available for Finland and Malta.

Although the picture shown by table 4.4 and 4.5 is mixed to some extent, it does illustrate that for most parts leased-line prices in the candidate countries often are higher than in the existing EU member states. The six most expensive countries are all candidate countries regarding both price examples. However, there are also some candidate countries among the cheapest countries in both price examples. In fact, five out of the ten cheapest countries with respect to 64 kb/s lines are candidate countries. The conclusion must be that competition does help prices decrease but that it is not the only factor leading to differences in prices. It should also be taken into

consideration that figures in tables 4.4 and 4.5 are list prices. While comparing costs of connectivity in competitive and non-competitive markets, DANTE has witnessed very significant differences in negotiated prices²⁵.

25. See SERENATE Deliverable D6, reporting costs of international connectivity in monopoly markets being 19-39 times greater than in most competitive markets.

5 Conclusions

The most important conclusion of this report is that communications regulation matters a great deal to the conditions under which national NRENs and GÉANT develop. There are both direct and indirect implications, where the indirect implications may not always be conceived as regulatory issues but tend to be thought of as market conditions, e.g. prices of connectivity. But as documented in this report, market conditions are strongly affected by regulation, and regulatory changes will certainly continue to have an impact on the development possibilities for NRENs.

Because of technical advances and the decreasing prices of fibre network technologies, the possibility of deploying a proprietary fibre network will appear more and more on the agenda of NRENs. It is important to emphasise that in a liberal regime without special rights of any operators to build and operate communications infrastructures, there should be no overall impediments, of a communications regulatory character, for NRENs to establish self-owned infrastructures. NRENs can choose this option if they find it advantageous. Furthermore, no matter which kind of infrastructure NRENs choose to apply, there will be technology-neutrality under the coming EU regulation, meaning that different kinds of infrastructures will be regulated in the same neutral manner.

The direct implications of regulation can be sub-divided into three main categories:

- The basic right to establish self-owned networks. Under an infrastructure monopoly regime, only the monopoly provider has the right to build infrastructure. When infrastructure provision is liberalised, NRENs have the possibility to choose between leasing capacity and building their own infrastructure. However, when considering a proprietary infrastructure NRENs must evaluate the problems involved in acquiring rights of way.
- The distinction between private and public networks can be important – the rights and obligations of private and public networks are different. Public networks have the right to negotiate interconnection agreements and obtain interconnection prices. Public networks, however, also have to meet interconnection obligations and can be made subject to other regulations, e.g. regarding communications standards and quality of service. The classification of an NREN as a private or public network may, therefore, affect its development.
- In relation to the difference between private and public networks there is another issue regarding competition between privately owned public network providers and NRENs. To the extent that NRENs provide services to groups of users and customers outside a closed user group of research and education institutions, privately owned public network providers may claim that they are subject to unfair competition as NRENs are supported by government funding.

With respect to the two last issues, NRENs have, at times, operated in grey zones. NRENs operate as private networks but could with good reason be designated as public networks if they

provide services to a broader range of user groups. And this would also open the question of unfair competition between publicly financed NRENs and privately owned operators wanting to serve the user groups of NRENs.

It is possible that NRENs have not often had to confront these issues directly yet. However, this may not always be so. In the communications field there has, with the liberalisation of telecommunications markets, been a call for increasing clarity in the markets with respect to rights and obligations, and it is conceivable that NRENs will also have to meet these criteria. There are thus issues that must be clarified in the near future concerning the private and public status of NRENs and the relation to privately owned operators.

Regulations also have indirect implications for NREN developments. The creation of competition in the telecommunications markets has clearly led to greater variety of services, higher quality and lower prices. All these factors are important for NRENs leasing capacity from infrastructure and network providers. It is documented that the costs of international connectivity is far cheaper in competitive markets than in markets with little or no competition. With respect to list prices for national leased lines, however, the differences between the different kinds of market situations are not that clear. But the negotiated prices clearly reflect the competitive situation. The whole communications market environment is very important for the development of NRENs.

In 1999 the European Commission started an investigation of leased-line prices in the European Union because of high prices and lack of transparency of leased-line markets. In December 2002, this investigation was terminated, as it can be documented that prices actually have fallen 30-40% in the period from 1998 to 2001. But when compared with the decreasing costs of international connectivity offered to DANTE in the same period (with a factor 40+), there seems to be ample room for further price decreases in the high-speed connectivity markets.

The report has focused mainly on the EU candidate countries, as the regulatory and market conditions and the developments of NRENs there are less documented than in the existing EU member states. The analysis in the report has, however, shown that the candidate countries cannot be considered as one homogeneous group of countries, and it also shows that there is no clear line of division between existing EU countries and the candidate countries. Some of the candidate countries are relatively far from the market and regulatory situation in the most advanced EU countries, and others are on the same level as most EU countries.

All candidate countries have been dealt with separately in Annex I, and Greece and Portugal have also been analysed separately (in Annex II) as the liberalisation process started somewhat later in these two countries compared with most other EU countries. Finally, there is an Annex III on the new EU communications regulatory package. The standards of rules and regulations in this package are the ones to be achieved in the near future by all existing member states and new EU members.

The prospect is that the implementation of the EU regulatory package will help improve the conditions and possibilities for NRENs in both existing and new EU countries. But as shown in the analysis of direct regulatory implications, there are also challenges to be met with regard to clarity of the status of NRENs.

Annex I

Country Descriptions ²⁶

Bulgaria

Key points

- High fixed-line telephony penetration coupled with slow rebalancing will prevent international prices from falling fast and limit fixed-network market entry.
- BTC is an entrenched and more than usually difficult monopolist to deal with, facing real problems itself with an obsolescent network, and supported by a government department with divided loyalties.
- Intentions for reform and liberalisation are excellent but their execution has been slow, for reasons such as those above.
- 1 January 2003 was an important landmark when BTC lost its monopoly, but things cannot be expected to change overnight; even at the planned EU accession date of 2007 some key EU provisions (e.g. fixed-number portability) will still not be in place.

General overview

Bulgaria's population of just under 8 million is only a little smaller than those of Hungary and the Czech Republic, but its low income level is similar to that of its larger neighbours Romania and Turkey. Like Romania, it is expected to join the EU in 2007. The size of the population has fallen by 5% since 1997.

Agriculture accounts for a shrinking but still significant share of national output - down to 14% in 2000 from 27% in 1997. Only 30% of the population is classified as rural. Services have expanded to fill most of this gap and now account for 60% of output, with the industrial and construction sector providing the remaining 26%. Trade stands at around 60% of total economic activity, and trade with EU partners is about half of total trade (Germany and Italy have the largest shares). The Black Sea beaches, varied landscape and other tourist attractions are leading to strong growth in tourism.

Political unrest following the collapse of communism culminated in an economic crisis in 1996-97. Recently annual inflation has been around the 10% mark, with real economic growth in the 2% to 6% range; however output has not yet regained its 1989 level. Unemployment has been high and growing, especially among young people.

Bulgaria has a long border with Greece and there are good transport connections between the capital, Sofia (population 1.2 million), and Thessaloniki in Greece (only about 250 km away). Other major cities include Plovdiv and Varna. Links with neighbouring Turkey are also strong, and there is a Turkish minority population of around 9%.

Telecommunications market

Fixed-telephone density in Bulgaria is high for a country of its income level, at 37 lines per 100 people. Household penetration is around 83%, similar to Slovenia, and is fairly high (though not uniformly so) even in rural areas. This must be associated with the continuing low level of residential rentals – still only 3 euro a month in mid-2002 – and low local-call charges (a factor of 20 remains between local and long-distance charges). The need for price rebalancing has been recognised and some progress has already been made in that direction; however the goal to complete rebalancing before 1 January 2004 is plainly not going to be achieved.

The incumbent Bulgaria Telecoms Company (BTC), still wholly state-owned, was due to lose its remaining monopoly (in basic voice services and leased lines) on 1 January 2003. Continuing efforts over the past few years to privatise the company seem to be bearing fruit at last, with an announcement in late October 2002 that the US investment fund Advent through its subsidiary Viva Ventures is the preferred bidder, with a Turkish consortium coming a close second. The outcome of further negotiations should be known early in 2003. The buyer will need to invest heavily in BTC's network, which although extensive, is at the local level by a long way the least modernised of all the accession states' fixed networks (only 15% of lines digital). The trunk Digital Overlay Network (the so-called DON project), under construction since 1994, links all major towns with optical fibres.

Although in principle non-voice services have been liberalised for some years, in practice the dependence of other companies on BTC for leased lines has seriously slowed down alternative network provision. Not only are rates for leased lines high (especially for international leased lines), they have been very hard to get at all, in spite of regulatory attempts to ease the situation. To some extent VSAT services have been used to fill the gap. Global One has provided Internet backbone capacity to ISPs in a joint venture with BTC, and the banks have provided their own private data network.

As in all accession states the mobile market is growing rapidly and in late 2002 mobile tele-density had reached around 28 per 100 inhabitants. There is one NMT 450 operator, Radio Telecommunication Company (RTC), with 8% market share (now operating at full capacity), and two GSM operators, the market leader MobilTel (78%) and OTE of Greece, trading as Cosmo Bulgaria Mobile (14%). Initially rather high tariffs have been falling, especially since OTE's market entry in 2001. Population coverage by the networks is good. Interconnection charges between fixed and mobile networks are very high in both directions (0.25 to 0.30 euro per minute).

All Internet usage indicators are still low in Bulgaria, though showing good growth. There are around 200 Internet Service Providers (ISPs), most of which operate in small regions. About fifteen national ISPs interconnect at the national Internet exchange. Cable television is well established in all towns, and these networks will offer obvious opportunities for voice as well as Internet service provision, once competition is fully opened. Prepaid cards for Internet access are proving popular and are helping to bring down prices.

Regulatory regime

Policy is set and various regulatory powers are retained by the Ministry of Transport and Communications, which also exercises the government's ownership functions over BTC. It is

recognised that this arrangement is unsatisfactory, and there is a commitment to transfer the ownership functions to another state body if BTC's privatisation is not complete by 1 January 2005. The MTC's Telecommunications Sector Policy paper of May 2002²⁷ lays out its good intentions for the next five years or so in great detail.

The old State Telecommunications Commission (STC) has recently been replaced by the Communications Regulatory Commission (CRC), a body with more extensive powers and clearer independence from the government. One aim of the new arrangements is to simplify and speed up dispute resolution, which has traditionally been cumbersome, often involving a full legal case. In future the CRC should be able to deal with most complaints. The EU has called for further enhancement of the CRC's capacity and its financial independence.

The Telecommunications Law of 1998, amended annually since then, sets the legal framework with the intention of conformity with existing EU law. Both general licences and individual licences are allowed for. Article 81 exempts private networks from any licensing requirement, as long as they do not require spectrum or other limited resources. Internet service provision is not subject to licensing.

Until 1 January 2003 the law maintained BTC's monopoly on leased-line supply, with a required delivery period of six months. If BTC refused to supply a leased line, then the person wanting it was entitled to apply for a self-supply licence.

Where scarce resources are not involved, licence fees are supposed to be limited to covering administrative costs. However the range of costs that has been included appears to be rather extensive, leading to fees that have been a significant barrier to market entry, at least for small operators. Reforms now in progress aim to bring down these fees and eliminate avoidable barriers to entry.

A few items of the existing EU regulatory package impinging on BTC will come into force later than 1 January 2003:

- Reference Interconnection Offer - by 1 July 2003
- Provision of call-by-call carrier selection - by 1 September 2003
- Accounting separation and cost-oriented tariffs - by 31 December 2003
- Carrier pre-selection and local-loop unbundling - by 1 January 2005
- Fixed number portability - by 1 January 2009
- Mobile number portability will be required from 1 January 2005.

It is planned to implement the new EU regulatory package by 1 January 2007, ready for EU accession.

National research and education network

The former NREN UNICOM B, with its major technical node based at the Bulgarian Academy of Sciences (Central Laboratory for Parallel Processing), still links around 50% of Bulgarian universities and all research institutes of the Academy. It interconnects with commercial ISPs at both Sofia and Varna Internet exchanges, but unlike some NRENS in the region is not involved in management of the national top-level domain.

At the time of this study, following some administrative changes, the legal statute for a new Bulgarian NREN was under review, creating difficulties for the acceptance of funding and

participation in international projects. However, the technical infrastructure remains operational, linking four cities (Sofia, Plovdiv, Varna and Rousse), with external connectivity provided via a 6 Mb/s link to the Greek NREN GRNET.

It is quite likely that the NREN will be legally re-established at the beginning of 2003 as a non-profit entity with the support of the Ministry of Transport and Communication (through the newly established ICT Development Agency), the United Nations Development Program (UNDP) regional office and the Ministry of Education and Science.

Cyprus

Key points

- A prosperous small country already well within the EU range on most economic indicators.
- Most telecoms services provided by a fairly efficient entrenched wholly state-owned monopolist.
- Liberalisation accepted late as part of the price of EU accession.

General overview

For the most part, Cyprus has already achieved EU economic conditions, including a good standard of living with high tele-density. Continuing partition of the island, with lower economic achievement in the north, represents a major obstacle to further development. Nonetheless EU accession is expected in 2004. The economy is strongly and increasingly service-oriented, with tourism a leading sector.

The southern population of 750,000 retains close links with Greece. The northern population is estimated at around 200,000. Cyprus' position in the eastern Mediterranean makes it a natural base for western allies, and also a landing point for submarine cables not only across the Mediterranean, but also to Asia and beyond.

Telecommunications market

The state-owned Cyprus Telecommunications Authority (CYTA) is the traditional monopoly operator of both fixed and mobile services. The entirely digital fixed network supplies a full range of advanced services. There are more than 60 fixed lines per 100 inhabitants, which implies practically 100% household penetration, with second lines in many homes (often used for Internet access). Mobile tele-density has rapidly reached 50 per 100 inhabitants.

The late opening of the market has given CYTA every opportunity to prepare itself for competition. Tariff rebalancing is well advanced and call tariffs are the same for local and trunk calls. The small size of the country, CYTA's reasonable efficiency and the good level of existing provision limit the scope for new infrastructure investments. However business services, mobile services and international communications for tourists do offer investment opportunities.

Although data transmission, Internet service provision and value-added services have already been liberalised for some years, CYTA remains very prominent in all areas. Leased-line list prices are still high, especially for international links. There are seventeen ISPs, of which five are of significant size, CYTA having 50% of the market. The Electricity Authority of Cyprus has an alternative fibre optic network for its own use and would be well placed to offer services to businesses following liberalisation.

Regulatory regime

The main motivation for telecoms sector reform is to avoid any obstacles to EU accession on 1 January 2004. CYTA will most probably be handed the responsibility of Universal Service Provision.

The 2002 Telecoms and Postal Services Act sets out an EU-compliant regulatory framework, and sets up the Commissioner of Telecoms and Postal Regulation as NRA, supported by a small staff. A second GSM licence is soon to be awarded following an auction in which CYTA will not be allowed to take part (CYTA being the holder of the first licence), followed later by UMTS licences which will be granted to CYTA and the new mobile operator if they undertake to provide third-generation service within ten years.

The new mobile licensee will need to negotiate interconnection terms with CYTA, but if agreement cannot be reached and the issue is brought before the Commissioner, then the Commissioner will issue a decree setting the tariff. For the time being CYTA will retain the monopoly on international calls.

National research and education network

There is only one university in Cyprus and it is responsible for running the NREN, CYNET. With a core capacity of 34 Mb/s, the network connects all university institutions and some other education establishments. Usage is doubling or tripling every two years and it is planned to expand capacity accordingly. CYNET runs the router for Cyprus' Internet exchange and also manages the national top-level domain (.cy). More generally, the university computer and networking department plays an important role in Cyprus by advising the government on ICT issues.

90% of CYNET's budget comes directly from the government and the rest from users, based on bandwidth. 60% of expenditure goes to transmission capacity and 20% to staffing.

Its 34 Mb/s connection to the GÉANT network is via Greece, and additional external capacity is supplied by CYTANET, CYTA's ISP operation, which also supplies the domestic links.

Czech Republic

Key points

- One of the most stable and prosperous of the accession states and is moving fast towards a modern market economy
- The leased-line market can be described as a very competitive market, with several operators offering services
- CESNET (NREN) has developed a modern network, with a backbone core capacity of 2.5 Gb/s reaching all major entities within the national research and education network.

General overview

The Czech Republic covers an area of around 79 thousand square km and is landlocked in Central Europe between Germany, Poland, Slovakia and Austria. The population is around 10.3 million people, where the distribution is 66% urban population and 34% rural population; 1.3 million people live in the national capital Prague. The Czech Republic consists of two main areas, Bohemia in the west, consisting of rolling plains, hills and plateaus surrounded by low mountains, and Moravia in the east, consisting of very hilly country.

Coal and lignite are in abundant supply. There are also deposits of mercury, tin, lead, zinc and iron ore, and a number of major European uranium deposits. Processing industries (machinery, steel, chemicals, glass, and agri-food) are the most highly developed. Cereals, sugar beet and hops are intensively cultivated, although agriculture plays a comparatively small role alongside the traditional engineering and other industries.

The Czech Republic is a parliamentary democracy; it is one of the most stable and prosperous of the accession states and is moving towards a modern market economy with increasing ties to the West. The Czech Republic has been recovering from recession since mid-1999 and is influenced by developments in Germany, which is its largest trading partner.

The 2001 GDP (PPS) was 63.3 billion euro and the GDP per capita (PPS) was 13,280 euro, which is around 43% below the general EU level of 23,160 euro per capita. The GDP growth rate is 3.3%, with an inflation rate of around 4.5%

Telecommunications market

In general the telecommunication market in the Czech Republic can be described as free and competitive but with Cesky Telecom as the incumbent operator, which provides a variety of telecommunication services.

Currently the process is underway of the sales of the shares of Cesky Telecom that are owned by the State. Today the State, through the National Property Fund, owns 51.1% of the company, while TelSource (51% KPN, 49% Swisscom) owns 27% of the shares and in addition to this KPN owns 6.5% of the shares. The remaining 15.4% is distributed among other shareholders. In August 2002, the government decided to speed up the privatisation of the State's majority stake in the incumbent dominant operator, which should help to improve the competitive environment within the telecommunications market.

The telecom market in the Czech Republic in relation to leased lines can be described as a competitive market, with several operators offering leased-line services. Besides telecommunications companies also railway companies, power companies, oil and gas companies and others are providing interconnection of relatively large capacities and at reasonable conditions and prices.

The following list prices regarding leased-lines refer to basic services provided by the incumbent operator and are standard prices excluding any discounts and VAT [1st report on Monitoring of EU candidate countries, Telecommunication service sector]:

- 2,500 euro regarding a 64 kb/s, 2 km national circuit
- 60,000 euro for a 2 Mb/s, 200 km national circuit.

In the Czech Republic there are three GSM operators (Eurotel, Radio Mobile and Cesky Mobile), and the government has granted two out of the three available UMTS licenses, so that UMTS operations can begin when market conditions permit. The competition within mobile communication can be described as strong and the mobile penetration is above 70%.

The number of fixed-phones subscribers per 100 inhabitants is around 37 and is slowly declining. Regarding Internet penetration, the number of personal computers per 100 inhabitants is around 15, but just over 30% of the population has access to the Internet. In addition to this there are only 123 Internet subscribers per 1000 inhabitants. Mobile penetration is above 40%.

Regulatory regime

During year 2000 the Czech Parliament adopted the Act on Telecommunications and the act entered into force July 1, 2000. The Telecommunications Act sets out the following basic objectives:

- to set conditions for running a business in telecommunications
- to create equal conditions for entering the telecommunications market
- to set optimum extent of state regulation for individual types of telecommunications activities.

In order to attain these basic objectives the Telecommunication Act also provided the basis for the establishment of the Czech Telecommunication Office as an independent administrative office under the authority of the government of the Czech Republic (Ministry of Transport and Communications), beginning service on the 1st of July 2000. The main office is located in Prague, but several offices/departments are located around the country. The Telecommunication Act provides the basis for a free telecommunications market starting 1 January 2001, and the Telecommunication Office expects to be in compliance with EU telecom regulations by 2004.

The principal task of the Telecommunication Office in performing its regulatory functions consists of supporting the formation of a transparent competitive environment in the

telecommunications sector as well as protection of user rights, based on the means entrusted to the Telecommunication Office by the law. In addition to this the Telecommunication Office functions as an advocate for technical and economic progress, and ensures the technical co-operation among telecommunications network operators and telecommunications services providers for the purpose of preservation of the telecommunications infrastructures' integrity and increase of quality services.

To operate a network two kinds of licenses are needed: a general authorisation license and an operator license, which is fairly easy to obtain. If radio transmissions are required in connection with the license they must conform to the frequency regulation.

Concerning the liberalisation of the telecommunication market, the existing legal framework has not facilitated the entry of alternative operators to the market and the market has as a consequence largely been controlled by the incumbent operator in which the State holds a majority stake. However important facilities for opening the market have recently become available. Carrier selection facilities were introduced during July 2002 and furthermore the Czech Telecommunication Office has granted prefixes to operators in July 2002. The legal framework for the number portability facility is set in the Telecommunication Act and would be provided from January 2003. In addition to this the incumbent operator has been constrained by regulation to maintain a less than fully commercial approach to its business. Because of these reasons it has been difficult for alternative operators to compete, even though the market has legally been open.

In theory there are no barriers regarding leased lines and interconnection because according to the Telecommunication Act everybody is obliged to provide leased lines and interconnection. However according to the Telecommunication Office, in practice there have been some problems with the incumbent provider. The Telecommunication Office expects more competition within this area in the future, as they are in the beginning of the process of liberalising this market.

No SMP has been declared by the Telecommunication Office, but the incumbent has been defined as a "dominant" actor in the telecommunication market regarding fixed lines. Also no SMP within the mobile market has been declared, but two operators meet the criteria of having a market share of 25% or more regarding voice telephony.

Local-loop unbundling remains to be achieved, but is scheduled to be compulsory from January 2004. In addition to this, access to both public and private ways²⁸ has been legally granted (Right of Way).

National research and education network

From being a relatively low-capacity network in the early nineties, CESNET has today developed into a modern network, with a backbone core capacity of 2.5 Gb/s reaching all major entities within the national research and education network. Twenty-nine universities and 117 hospitals, schools and libraries are connected to the CESNET, where the universities account for approximately 95% of all the generated traffic. Through the 29 university connections almost 200,000 students, professors and other staff members have connection to the network.

At the moment CESNET has no strategy of trying to make primary and secondary schools connect to the network and the same goes for libraries and other public entities; however this is not the same as saying that they cannot be connected to CESNET. For making primary and

secondary schools connect to the Internet, there is another activity directly managed by the Ministry of Education, Youth and Sports.

The network topology can mainly be described as a star network with Prague in the centre combined with a national backbone ring structure. Today 95% of the network provided by CESNET is fibre connections and the rest is microwave links. Based on the competitive telecommunications market regarding leased lines and interconnection, CESNET is using up to eight different suppliers for leased lines and interconnections.

Overall the Czech national research and education network has not encountered any significant regulation problems/obstacles regarding the development and maintenance of the network.

CESNET has two international connections at the moment, one 1.2 Gb/s connection to GÉANT, which is only used for academic traffic, and one 622 Mb/s connection for commodity traffic. The 622 Mb/s commodity connection is provided by Telia. In addition to these two international connections, CESNET also has a national 1 Gb/s connection to NIX.cz (Neutral Internet exchange of the Czech Republic).

CESNET uses mainly the following companies for providing leased-line services and capacity for the national NREN: Czech Telecom, Aliatel, Sloane and Czech Teleservice, where Czech Telecom is the old former state owned telecommunication company. The highly competitive telecommunications market also means that it is no problem for CESNET to get capacity; the biggest problem is the 'last mile' connectivity.

If/when CESNET needs a new connection point or an increase of capacity in existing connections, they make a public tender, where interested providers can submit their offer, which gives CESNET the right to choose the best offer and thereby get the best combination of price and capacity.

As to the future, CESNET estimates that the capacity required will be 12 Gb/s for the next two years or so, and up to 40 Gb/s in a 5-year timeframe.

Since all public universities already are connected to the network, CESNET is not expecting an increase in the number of connected entities; however they are working on making it possible for technology parks, research institutions and other industrial research departments/entities to connect to the network on special conditions.

Today there are around fifteen small private universities in the Czech Republic, which are not connected to the CESNET. Instead they have themselves chosen to use commercial suppliers for their Internet connections.

The CESNET budget for 2002 is approximately 11 million euro and can roughly be divided as follows: salaries and office cost 23%, hardware and software 31%, transmission of data 39%, and other 7%.

Estonia

Key points

- Liberalisation of the telecommunication market in January 2001
- The Estonian National Communication Board (ENCB) has finished the initial wave of dispute resolutions that typically is associated with effective opening of a market
- Relatively competitive market for leased lines, with several operators.

General overview

The Republic of Estonia is located in the northern part of Eastern Europe, bordering the Baltic Sea and the Gulf of Finland, between Latvia and Russia. Estonia attained its independence in 1918, but forcibly incorporated into the USSR in 1940 and only regained its freedom again in 1991 with the collapse of the Soviet Union. Since the last Russian troops left in 1994, Estonia has been free to promote economic and political ties with Western Europe.

Estonia covers an area of just above 45 thousand square km, which mainly consists of marshy lowlands. Flat in the north, hilly in the south, it is sparsely populated with around 1.4 million inhabitants, where just above 400,000 live in the national capital, Tallinn. The split between ethnic groups is approximately as follows: Estonians 65%, Russians 28%, Ukrainians 2.5%, Belarussians 1.5%, Finns 1% and others 1.6%.

Estonia has a parliamentary democracy and is steadily moving toward a modern market economy with increasing ties to the West, including the pegging of its currency to the euro. The state of the economy is greatly influenced by developments in Finland and Sweden, two major trading partners.

The 2001 Estonian GDP (PPS) was 6.2 billion euro and the GDP per capita (PPS) was 9820 euro, which is around 58% below the general EU level of 23,160 euro per capita. The GDP growth rate for 2001 was 5.0%, with an inflation rate of 5.6%.

Telecommunications market

In general the telecommunication market in Estonia can be described as competitive, with Eesti Telefon as the incumbent operator, which provides a variety of fixed-telecommunication services.

Following the liberalisation, the Estonian telecommunication market has been fully open since January 2001. Temporary measures introduced at the start of 2001 to remedy very high interconnection fees have been scrapped and a cost-orientation model (LRAIC) was introduced from January 2002.

Eesti Telefon has been declared the undertaking with significant market power (SMP) on the telephone service, leased-line service and interconnection service markets. Eesti Telefon is owned 100% by Eesti Telekom, which is a holding company, where Telia and Sonera are the major shareholders next to the Republic of Estonia and the public.

Regarding leased lines for research networks the market is dominated by Eesti Telefon, however in this segment there are a few other operators present in Estonia today, which provide different leased-line services: Uninet, Eesti Energia and Microlink Online. In addition it should be mentioned that on many routes Eesti Telefon is the only provider.

The following list prices regarding leased lines refer to basic services provided by the incumbent operator and are standard prices excluding any discounts and VAT [1st report on Monitoring of EU candidate countries, Telecommunication service sector]:

- 429 euro regarding a 64 kb/s, 2 km national circuit
- 30,360 euro for a 2 Mb/s, 200 km national circuit.

In Estonia there are around 14 personal computers per 100 inhabitants and Internet penetration is around 39%. There are several ISPs in Estonia. Local authorities have established a number of local radio-based networks. These networks are used for provision of local access to the Internet.

In Estonia there are three mobile network operators: EMT, Radiolinja Eesti and Tele2 Eesti. The mobile penetration is around 61%, whereas the fixed-phone penetration is just about 35%.

Regulatory regime

The Estonian National Communication Board (ENCB) is a fully independent regulatory authority, with licensing power. ENCB operates under the administrative authority of the Ministry of Economic Affairs and Communications, and its main activities are:

- regulation of activities of telecommunication network operators and service providers
- management and use of limited telecommunications resources
- implementing government supervision over requirements to operations of telecommunications networks and provision of telecommunications services in terms of performance
- licensing and supervision of cable distribution networks.

For performing these activities and other tasks the ENCB had a budget of 38 million EEK (1 euro = 15.656 EEK) in 2002 and around 135 employees. The ENCB is funded by the government but is independent of the Ministry, and the Ministry is not able to interfere in decisions taken by the ENCB. Today the ENCB is 95% in compliance with EU legislation and they are currently working on implementation of the new EU telecom package.

The purpose of the new Telecommunication Act was to create favourable conditions for the development of telecommunications and to guarantee the protection of the users of telecommunications services by promoting free competition. Furthermore the Telecommunication Act establishes the requirements for telecommunications networks, the provision of telecommunication services and procedures for government supervision.

The Telecommunications Act was passed by the Estonian government in February 2000 and entered into force in March 2000, setting the basis for the liberalisation of the

telecommunications market in Estonia. Since 1 January 2001, the special rights of Eesti Telekom have ended and the Estonian telecommunications market is fully open. The ENCB has completed the initial wave of dispute resolutions that typically is associated with effective opening of a market. In addition to this, a cost-orientation approach regarding telecommunications services was put into practice fully from January 2002.

As a result of a telecommunications market analysis, the ENCB declared Eesti Telefon the undertaking with significant market power on the telephone service, leased-line service and interconnection service market, and declared EMT to be the enterprise with significant market power in the public mobile phones market.

Based on the telecommunications legislation, inspection of cost accounting is one of the tasks that the ENCB has to perform. This means that the ENCB in accordance with the Telecommunication Act can request operators of public telecommunications networks that have been declared the undertaking with SMP to provide an audited report on the cost accounting of their telecommunications services, and thereby inspect the cost accounting and fees, and if necessary regulate these. This change also requires the undertaking with SMP regarding interconnection to interconnect and provide interconnection service to other operators.

The interconnection market included only one undertaking with SMP (Eesti Telefon), which in 2001 provided interconnection services to ten operators. During 2001 the rates of the interconnection service of Eesti Telefon were lowered by approximately 50% on the basis of the changed Telecommunication Act. In addition Eesti Telekom has been forced to provide interconnection service at the local level based on a ruling from the ENCB as a result of an interconnection dispute.

According to the ENCB everybody can operate a telecommunications network and get interconnection if the company has an address and is registered in Estonia – all that is needed is a registration or license depending on the kind of network, which normally is available within 4-6 weeks.

Regarding rights of ways no access to public or private ways are legally granted in Estonia.

On 1 January 2001, the Estonian telecommunications market opened up for competition and therefore also for the use of operator codes. Several companies applied for this service to the ENCB and received the corresponding permits. LLU is not legally compulsory at the moment and there is no date on when LLU is expected to be legally compulsory. Nevertheless there are currently more than 900 unbundled lines of the SMP.

Today Eesti Telefon is the primary provider of local-loop services. The charge for raw copper calculated by use of the LRAIC model has resulted in a price that is higher than the rate for subscription. It is therefore difficult for new entrants to compete with Eesti Telefon on this market segment.

National research and education network

The Estonian Education and Research Network (EENet) is a governmental non-profit organisation established in August 1993 by the Ministry of Education and is today a public institution operating under the administration of the Ministry of Education. Currently there are

about six thousand hosts in the national network and it extends to every county in Estonia. EENet's main task is to offer Internet connection (permanent links or dial-ups) as well as additional services. In addition EENet manages the Estonian top-level domain (.ee).

The EENet is built with Tallinn, Tartu and Haapsalu as centres of a 'three-star' network connecting to all major cities in Estonia and with a 155 Mb/s connection from Tallinn to Stockholm to the GÉANT network. The current capacity of 155 Mb/s available through the GÉANT network is enough for the time being, but in 3-5 years time it is estimated that the capacity should be 600 Mb/s - 2.5 Gb/s. The split between international and national traffic is currently around 50/50, whereas four years ago the split was around 60% for international and 40% for national, but due to the fact that more webpages are becoming available in the national language, the national traffic has been and still is growing faster than the international traffic.

During 2002, EENet switched from using Eesti Telecom for leased-lines services for the backbone topology to mostly using Eesti Energia for leased lines, as they has entered into the leased-line market with very attractive prices.

As of March 2002, 208,000 persons were registered as users of EENet, which include different kinds of students as well as staff. 600-700 customers have a permanent connection to EENet, whereas the rest uses various kinds of dialup/radio connections.

Besides the already connected entities, EENet estimates that around 1500 entities that are not connected would qualify for connection, but for these entities the price of getting connected and obtaining the equipment necessary to make the connection possible is a major obstacle.

Overall the Estonian national research and education network has not encountered any significant regulation problems/obstacles regarding the development and maintenance of the network. ENCB intervenes in the setting of prices for leased lines, but EENet is sceptical about the ability of the regulator to ensure lower rates, e.g. through interconnection regulation. The only major regulatory obstacle that EENet has had, is related to the power limits in radio networks regarding transmission effects.

At present EENet uses the 2.4 GHz ISM band, where there is no licensing or regulation obligations and in addition, the equipment to be used in this frequency band is also fairly cheap, compared to equipment for other frequencies - according to EENet. EENet would also like to use more powerful transmitters using the 3.5 GHz band, if they could afford to buy the necessary equipment.

When a license is needed for a specific frequency band or for operating a network, the procedure can be described as relatively slow - but the price for obtaining the specific license is relatively low.

The EENet budget for 2002, of approximately 1.15 million euro, can be divided as follows: salaries and office costs 25%, hardware and software 15%, transmission (leasing lines) 60%.

Hungary

Key points

- The Hungarian telecommunications market can be described as relatively competitive, with one incumbent national operator and several local operators
- Mobile service provider rated as an SMP in terms of interconnection
- Fairly competitive market for leased lines.

General overview

The Republic of Hungary covers an area of around 93,000 square km and is landlocked in central Europe east of Austria. The population is approximately 10 million, where 1.9 million live in the national capital, Budapest. The distribution between urban and rural population is 64% urban and 36% rural.

The Hungarian terrain is predominantly flat and the river Danube divides Hungary into two main regions. A low, rolling plain known as the Great Hungarian Plain covers most of the region east of the Danube extending east to Romania and south to Serbia, with highlands along the northern border of the country. The area west of the Danube presents a variety of landforms and mountains and Lake Balaton, the biggest sweet-water lake in Europe. Regarding natural resources, bauxite, coal and natural gas are the most common. Furthermore the Hungarian soils are generally very fertile and 52% of the land is arable.

The Republic of Hungary is a parliamentary democracy. It continues to demonstrate strong economic growth and is moving towards a modern market economy with increasing ties to Western European countries. The largest trading partner by far is Germany, which accounts for more than 25% of both imports and exports; therefore the Hungarian economy is quite dependent on the German economic situation.

In 2001 the Hungarian GDP (PPS) was 58 billion euro and the GDP per capita (PPS) was 11,880 euro, which is around 49% below the general EU level of 23,160 euro per capita. The GDP growth rate is 3.8%, with an inflation rate of around 9.1%.

Telecommunications market

In general the Hungarian telecommunication market can be characterised as relatively competitive, with one incumbent national operator and several local operators, which all provide a variety of telecommunication services.

Matav, the incumbent national operator, is for 59.53% owned by Deutsche Telekom and the remaining 40.47% stake is publicly traded on the New York and Budapest stock exchanges, while 1 golden share is owned by the Hungarian State. However, Matav is not the only telephone service provider in Hungary, as certain municipalities are permitted to call a tender for local telephone concessions. When this procedure was implemented for the first time in 1994, eighteen concessions were won by nine partially foreign-owned consortia, which established thirteen local telephone operators. Matav had a monopoly on long-distance and international public switched services until the end of 2001 and the local telephone operators had monopoly rights for local services until November 2002.

December 23rd, 2001 was the official start date of the liberalisation of Hungary's telecommunications market, which was based on the Communications Act. The market is regulated by the Communication Authority of Hungary (HIF), which reports directly to the Ministry of Transport, Communications and Water Management.

Matav continues to be the dominant provider of local services, controlling 37 of the 54 local districts. The remaining 17 geographic regions are operated as regional monopolies by local telephone operators. These local telephone operators have signed franchise-like or 'concession' agreements with the government, which require the signatories to commit to a series of quantitative and qualitative targets for expanding and modernising the national telecommunications network.

As Matav started from a favourable position in the first year of the liberalisation, the companies of the Matav Group have acquired leading positions in the mobile, Internet and data communications markets. And in fixed-line telephony the Matav Group (Matav and Emitel) held over 80% of the market.

During November 2002 the Communications Authority of Hungary (HIF) has identified the country's telecoms service providers with significant market power (SMP). According to the liberalisation law of 2001, SMPs have more than 25% market share.

Over the past months the HIF has examined the position of all the service providers operating in the country and according to the HIF, in the wired phone market all of Hungary's five regional providers of telecommunication services including the dominant service provider Matav have SMP. In the GSM mobile phone market and the interconnection market, Westel and Pannon are said to have SMP status while Matav, the dominant telecoms company reached over 25% in the leased-line market. It is unprecedented in the EU for a mobile service provider to be rated as an SMP in terms of interconnection along with a subsidiary of the dominant fixed-line provider.

The following list prices regarding leased-lines refer to basic services provided by the incumbent operator and are standard prices excluding any discounts and VAT [1st report on Monitoring of EU candidate countries, Telecommunication service sector]:

- 3,020 euro regarding a 64 kb/s, 2 km national circuit
- 46,708 euro for a 2 Mb/s, 200 km national circuit
- 222,814 euro for a 155 Mb/s 200 km national circuit.

The number of fixed-phone subscribers per 100 inhabitants is around 37. Regarding PC penetration, the number of personal computers per 100 inhabitants is around 10 and 15% of the population has access to the Internet. There are only around 30 Internet subscribers per 1000 inhabitants, equalling 3% of the population. Several Internet Service Providers operate in Hungary.

In Hungary there are three mobile operators: Westel, Pannon and V.R.A.M., which each operate both 900/1800 networks. Westel is owned by Matav (51%) and Deutsche Telekom (49%) whereas Pannon is owned by Telenor and Vodafone is the major shareholder of V.R.A.M. Westel has just above 50% of the market share, Pannon almost 40% and V.R.A.M. just above 10%; the mobile penetration is 60% as of August 2002.

Hungary's government has no intentions to sell off UMTS licenses in the near future. This is based on the government assumption "that neither phone companies nor consumers are prepared for next-generation services". However the government had planned to sell off a number of UMTS licences in 2001 but postponed the auction until market conditions were more favourable.

Regulatory regime

The Hungarian telecommunication market is regulated by the Communication Authority of Hungary (HIF), which is a central public administration agency with nationwide jurisdiction, independent of market players and functioning under the guidance of the Government; it reports directly to the Ministry of Transport, Communications and Water Management (KHVM). The KHVM is responsible for policy formation and drafting legislation, whereas the HIF's role is to enforce sector policy. It is under this framework and the new Communication Act from 2001 that the Hungarian government has stated the liberalisation of the telecommunications market.

Concerning the liberalisation of the telecommunication market, the main fixed voice market was opened in December 2001; however a few primary areas of liberalisation will first be liberalised from November 2002 on the expiry of local telephone concessions with exclusive rights. Concerning the regulatory framework based on the new Communication Act the market is opened up for competition and the harmonisation towards EU regulation is underway.

However some important adjustments are still needed in the field of carrier selection and transparency of interconnection and in particular it is important for the communication authority to exercise its powers in order to reduce the number of barriers that new entrants face when entering the Hungarian telecommunication market. Regarding mobile communication there are three GSM operators, but UMTS licenses have yet to be issued.

Key pieces of secondary legislation to the Telecommunications Act, which came into force at the end of 2001, were scheduled to be passed by the end of 2002, according to the IT and Telecoms Ministry. The legislation would cover decrees on number portability, long-run incremental costs (LRIC) and accounting separation of telecoms firms' various businesses.

Regarding rights of way for public telecommunication operators, both accesses to public and private ways²⁹ have been legally granted (Rights of Way). Regarding competition in the local access market, local-loop unbundling is legally compulsory in Hungary, but as of March 2002 no operators had agreements for local-loop unbundling. Furthermore there is a need for a comprehensive policy in order for the government to follow its strategic goals of boosting Internet penetration levels and competition on the fixed-line market.

In the anti-trust field, the Office for Economic Competition together with its decision-making Competition Council has build on its enforcement record and took 120 anti-trust decisions in 2001. The Hungarian Competition Act, which the Office for Economic Competition and the

Competition Council are regulating by, contains the main anti-trust rules regarding restrictive agreements, abuse of dominant position and merger control.

National research and education network

The Hungarian research and networking community (NIIF) started in the late eighties as a national network (HUNGARNET) with a few users and even less capacity, however today HUNGARNET is serving well over 400 institutions, which have one or more connections and roughly 400,000 users. The backbone network has a 2.5 Gb/s and 155 Mb/s capacity and is formed as a star with Budapest in the centre. In addition some links outside the core star structure have a 34 Mb/s connection to different points in the star network.

The connected entities are Hungarian universities, high schools, academic research institutions, libraries, museums and ministries, which for most parts have a direct connection; however some are connected through metropolitan area networks. Approximately 600 entities have a permanent connection, where the high-capacity connection is between 100 Mb/s and 1 Gb/s, medium access capacity is 2 Mb/s, and the low-end capacity access levels are 256 kb/s.

All Hungarian universities and their students are connected to the network; also most high schools and further education institutions are connected and provide access for their students. No commercial entities are connected to the network.

HUNGARNET has several options regarding possible suppliers for leased lines. Where HUNGARNET deploys leased-lines capacity from 64 kb/s to 2.5 Gb/s there are several providers able of providing these capacities, but there are mainly three players, MATAV, Vivendi and PanTel, that can provide high-speed capacities. Today HUNGARNET uses Matav, Vivendi, Pantel, Novacom and GTS for leased-line services.

In general HUNGARNET does not have any serious regulatory problems, but some regulation challenges makes life a little more complex for HUNGARNET. One example is that HUNGARNET almost failed in getting Internet access phone numbers on ISDN trunks, as the incumbent operator tried to stop the idea of HUNGARNET introducing free dial-in service for researchers. However the dispute was solved and HUNGARNET is now capable of providing this free service.

HUNGARNET has only one international connection, the 300 Mb/s GÉANT connection, which is using DWDM technology. For the future HUNGARNET expects the capacity needs to be around 10-20 Gb/s on a three-year perspective and 20-40 Gb/s in a five-year timeframe.

The HUNGARNET budget for 2002 is approximately 5 million euro and can roughly be divided as follows: salaries and office costs 10%, hardware and software 18%, transmission of data 60%, other 12%.

Latvia

Key points

- The Latvian telecommunication market can be characterised as predominantly monopolistic, with Lattelekom as the incumbent fixed operator
- Full liberalisation of the telecommunication market as of January 2003
- The Latvian NREN LATNET also operates as a commercial Internet Service Provider.

General overview

Latvia is located in Eastern Europe, and borders the Baltic Sea, Estonia, Lithuania, Russia and Belarus. The country is roughly covering an area of 64.5 thousand square km. After a brief period of independence between the two World Wars, Latvia was annexed by the USSR in 1940, but re-established its independence in 1991 following the break-up of the Soviet Union.

Today Latvia is a parliamentary democracy and is continuously consolidating and deepening the stability of its institutions. Latvia can today be characterised as a functioning market economy and is continuing to revamp its economy for integration into Western-European political and economic institutions.

The population of Latvia is approximately 2.4 million, which can be divided into the following ethnic groups: Latvians 57.6%, Russians 29.6%, Belarussians 4.1%, Ukrainians 2.7% and Polish 2.5%. Riga is the national capital with a population of around 850,000 inhabitants.

The Latvian GDP (PPS) for 2001 was 8.5 billion euro and the GDP per capita (PPS) was 7710 euro, which is around 67% below the general EU level of 23,160 euro per capita. The GDP growth rate was 7.7%, with an inflation rate of around 2.5%.

Telecommunications market

The telecommunication market in Latvia can be characterised as predominantly monopolistic, with Lattelekom as the incumbent fixed operator. The company provides a large variety of services, from fixed telecommunications to data transmission, leased lines and Internet.

According to the legislation of the Republic of Latvia, Lattelekom had been granted exclusive rights to provide telecommunication services in Latvia until 1 January 2003. Regarding data and Internet services the market is dominated by four ISP's: LATNET, Lattelekom (Apollo), Microlink Data (Delfi) and Telia Latvija, which together have a market share of approximately 75-80%. Overall there are around 30 ISP companies in Latvia, offering different kinds of services; currently the Internet penetration in Latvia is around 10%.

For leased lines and interconnection also railway and energy companies are providing service on a smaller scale, however these are limited by the existing monopoly operator Lattelekom, which by far is the largest provider of these services. The following list prices regarding leased lines refer to basic services provided by the incumbent operator and are standard prices excluding any discounts and VAT [1st report on Monitoring of EU candidate countries, Telecommunication service sector]:

2,000 euro regarding a 64 kb/s, 2 km national circuit

8,000 euro for a 2 Mb/s, 200 km national circuit

131,000 euro for a 2 Mb/s, 200 km international circuit.

In Latvia there are two mobile network operators (Tele2 and LMT), which each operate a 900 and 1800 GSM network, and both operators will acquire UMTS licences. A third licence for GSM and UMTS has not yet been issued. The mobile penetration in Latvia is approximately 30% and the fixed-network penetration around 32%.

Regulatory regime

Until July 2001 several institutions performed the regulation of public utilities in Latvia. The Energy Regulation Council was responsible for regulating the energy sector. The Telecommunication Tariffs Council carried out regulation in the telecommunications sector. The Communications Department of the Ministry of Transport regulated the postal sector and the Railway Administration regulated the railway sector.

Practical experience showed that the regulation was rather inefficient due to the fragmented institutions and limited resources available. Moreover, such regulation system did not ensure an independent decision-making process. In order to change the situation and improve the regulatory system, an institutional reform was implemented, changing the public-utilities regulatory model.

In January 1997 the government made the decision to set up a unified regulating institution in the energy, telecommunications, postal and railway sectors. After a four-year period of legislation development, the new public-utilities regulatory institution – Public Utilities Commission (PUC) started its operations in July 2001, taking over the responsibilities from Energy Regulation Council, Telecommunication Tariffs Council, Railway Administration and the Ministry of Transport, and providing the basis for full liberalisation of the telecommunication market as of January 2003.

Today PUC operates in compliance with the Law on Regulators of Public Utilities and the corresponding normative acts in the regulated sectors as a government institution supervised by the Ministry of Economy, but being independent in performing its tasks. PUC is represented in the Independent Regulators Group (IRG).

To ensure an efficient, sound and professional process of utility regulation the PUC follows certain basic principles: independence, openness and a balanced distance from the government, the regulated companies and users. The PUC is financed from payments made by the regulated enterprises; this approach is adopted in order to be independent of any government funding. The annual rate of such payments in Latvia shall not exceed 0.2% of the net turnover of the public utilities in regulated services in the preceding financial year. However from the institutional point of view, the regulator is not completely independent, as it is an institution supervised by the Ministry of Economy.

To ensure openness, the regulator co-operates with all entities involved in the regulation process by inviting them to participate in the preparation of draft decisions. Decisions made by the regulator are open and are published.

To operate and run a private network no authorisation or license is needed. To operate a public network two kinds of licenses are needed: a general authorisation license and an operator license, which are fairly easy to obtain.

As already mentioned, Lattelekom had been granted exclusive rights to provide telecommunication services in Latvia until January 1st, 2003, when the market would be liberalised or a liberalisation process within the telecommunication market started. After a one-year transition period it is the intention to have implemented the EU telecommunications directives more or less by the beginning of the year 2004.

The PUC is very aware of the high prices in telecommunication in Latvia, which is due to the old monopoly situation. According to the PUC, Latvia has the highest Internet connection prices in Europe, and the prices are approximately twice as expensive as the second most expensive country. Also for leased lines the prices are among the highest in Europe, due to the old monopoly situation regarding Lattelekom. In the future, interconnection will be regulated according to the principles of a cost-based model.

As to competition regulation, the PUC will be co-operating with the Competition Council regarding competition in general but also regarding specific regulations and competitions. Concerning anti trust regulation, the new competition law, which entered into force in January 2002, introduced an improvement of both substantive and procedural rules, including the definition of dominance, the criteria for merger control and sanctioning powers.

National research and education network

In Latvia there are two research networks, which both will be described in detail below.

LANET (Latvian Academic Network) is a computer network for education and science in Latvia and is used in higher education by students, professors, scientists and administration personnel. LANET is under the management and development of the Department of Information Technology of the University of Latvia, and was formed in 1992. The network is only available in Riga and only used as a university network. Today there are approximately 33,000 registered users at the University of Riga, who are connected through 21 departments or institutes.

The main concept for the network is that VLAN is used inside buildings, and cables are used outside and in some buildings. 40-50% of the network traffic is external whereas the rest (50-60%) is internal network traffic, which in general are 100 Mb/s connections between servers and switches. The amount of internal traffic is growing faster than the amount of external traffic.

LANET both owns and leases network capacity. LANET leases some dark fibres from Lattelekom and owns some. LANET has only put down own fibres in distances up to 1 km. It is generally considered to be too expensive for LANET to build its own network, as Lattelekom demands a higher price for renting duct capacity than for renting a fibre.

LANET has not experienced any regulatory problems in their own network operations, as there are no restrictions on building research networks and use of equipment in the 2.4 GHz ISM band. However, the lack of competition and the exclusive rights of Lattelekom have added to the costs of leasing of network facilities.

LANET does not have any international connection of its own, they simply rent IP capacity at Telia and use Telia's network as the international connection. At the moment LANET is renting a 24 Mb/s connection at Telia and a 2 Mb/s backup link. The current capacity is enough for the time being, but in 3-5 years' time it is estimated that the capacity should be in Gb/s regarding both the external and internal connections.

LANET has a budget of around 1 million euro, and does not charge its customers (different departments and institutes) for the network connection, but the different departments and institutes have to provide the workstations and other computer equipment needed - LANET only provide the network infrastructure. LANET's budget for 2002 is approximately divided as follows: 10-20% is spent on salaries and office costs, 40% is spent on hardware and software (+ development), 40-50% is spent on transmission/data communication, where one-third of this is spent on international connectivity.

The Data Networking Laboratory (LATNET) is a separate unit of, and located at, the Institute of Mathematics and Computer Science at the University of Latvia. LATNET was established in 1992 to provide data communication services to research and education institutions in Latvia. Besides providing Internet access to these institutions, LATNET also provides Internet services on a commercial basis to a wide range of business organisations and private persons, through a separate unit called LATNET Service Ltd., which was established in 1995.

The core network capacity is 1 Gb/s and over 2,200 entities are connected via a permanent connection, where a typical large-site access capacity is 2 Mb/s. About 70% of all university students in Latvia have Internet access through LATNET.

Today LATNET offers all kind of services: dial-up, leased lines, Ultra DSL, ISDN and different wireless solutions as well as hosting and homepage development. Furthermore LATNET is active in content providing and is very active in investigating the possibilities of implementing telecommunication technologies in business and everyday life.

The backbone network is built in a star-formation with Riga as the centre. The network is based on leased lines and radio links, where the radio links are used in the access network. LATNET mainly uses Lattelekom as a leased-line provider, but leases also capacity from radio and TV companies. In addition to this LATNET also owns some fibre-optic cables, which are used in the big cities and between major connections points. The radio links mainly consists of 2.4 GHz equipment, which is used in order to provide connections within a highly populated area.

The almost complete lack of competition on backbone networks / leased-line markets is a huge problem for LATNET, which according to them is the overall reason for the artificially high prices that Lattelekom is demanding for interconnection and leased lines. However Lattelekom offers a 30% discount on the academic part of the network.

LATNET has previously experienced some regulatory problems. When a license or permit is needed for a specific frequency band or for operating a network the procedure can be described as relatively slow.

At the moment LATNET has an international connection capacity of 60 Mb/s, which consists of two parts, one being a 34 Mb/s connection to GÉANT and the other a 26 Mb/s international connection to UUNet in Stockholm, which is the commercial part of the network. The split between international and national traffic is currently around 30/70 and the international share is decreasing while the national is increasing. This trend is believed to be based on the fact that more websites in the Latvian language are becoming available. Furthermore, 60-70% of the traffic can be related to academic use, while the rest is more or less based on commercial use.

The current capacity available through the GÉANT and UUNet network is enough for the time being, but in 3-5 years time it is estimated that the capacity should be 2.5 Gb/s.

The turnover in 2001 was approximately 1.4 million euro and the budget for 2002 is slightly higher. LATNET's budget for 2002 is approximately divided as follows: 30% is spent on salaries and office costs, 30% is spent on hardware and software, 40% is spent on transmission/data communication.

Lithuania

Key points

- Lithuanian Telecom (the incumbent) enjoyed exclusive rights to the fixed-line and domestic long-distance services until liberalisation of the telecommunication market in January 2003
- Higher mobile penetration than fixed-phone penetration
- Local-loop unbundling was scheduled to be compulsory from January 2003.

General overview

The republic of Lithuania covers an area of just over 65 thousand square kilometres and is located between Latvia, Belarus and the Kaliningrad exclave of Russia, bordering the Baltic Sea. In March 1990 Lithuania was the first of the former Soviet republics to declare its independence, but the proclamation was not generally recognised until September 1991.

Approximately 3.7 million people live in Lithuania, with about 56% of the inhabitants living in the three biggest cities – the national capital Vilnius, Kaunas and Klaipeda. The ethnic split in Lithuania is as follows: 80% Lithuanians, 11% Polish, 7% Russians and 2% others. The Lithuanian terrain can mainly be described as lowlands, with many scattered small lakes and forests on top of a mainly fertile soil. Lithuania is generally poor of natural resources and the major branches of the country's rapidly modernising economy are services, industry and agriculture, where Germany, Russia and Latvia are the main trading partners.

The republic of Lithuania is a parliamentary democracy and has been rebounding from the 1998 Russian financial crises, which affected Lithuania, as Russia was one of the biggest trading partners at that time. Today the economy is improving and privatisation of the large state-owned utilities is underway.

The 2001 Lithuanian GDP was 13.4 billion euro and the GDP per capita (PPS) was 8,730 euro, which is around 62% below the general EU level of 23,160 euro per capita. The GDP growth rate is 5.9%, with an inflation rate of around 1.3%.

Telecommunications market

In general the telecommunication market in Lithuania can be described as monopolistic regarding fixed lines, with Lithuanian Telecom as the incumbent operator, but fairly competitive within the mobile market where there are three major operators.

The former state telephone monopoly and one of the largest companies in Lithuania, Lithuanian Telecom was privatised in 1998; however the company enjoyed exclusive rights to the fixed-line

and domestic long-distance services until the liberalisation of the Lithuanian telecommunication market started in January 2003. Lithuanian Telecom has a noticeable indirect influence on the telecommunication market in Lithuania as all fixed-telecommunications service providers are forced to get interconnection at the incumbent at wholesale prices and at the same time compete with the incumbent for end-customers. An important event for the Lithuanian telecommunications market was the launch of DSL services during 2001; unfortunately the monopolistic rights of the incumbent operator have impeded the general development of the telecommunication market.

The following list prices regarding leased lines refer to basic services provided by the incumbent operator and are standard prices excluding any discounts and VAT [1st report on Monitoring of EU candidate countries, Telecommunication service sector]:

- 1,674 euro regarding a 64 kb/s, 2 km national circuit
- 26,780 euro for a 2 Mb/s, 200 km national circuit.

There are three GSM mobile operators in Lithuania: Bite GSM, Omnitel and Tele2. Bite GSM is a subsidiary of TeleDenmark, Omnitel is owned by TeliaSonera (55%), Motorola (35%) and others (10%), and Tele2 is owned by Tele2 AB in Sweden.

The number of fixed telephone lines per 100 inhabitants is around 34 and Internet penetration is around 14%, but there are only about 6 Internet subscribers per 100 inhabitants. There were approximately 7 personal computers per 100 inhabitants in 2001. Concerning mobile communications the penetration is just above 40%, which means that the mobile penetration is higher than the fixed-line penetration.

Regulatory regime

The principal institutions involved in regulating telecommunications in Lithuania are the government, the Ministry of Communications and the Communications Regulatory Agency (CRA), where the CRA is the telecommunication market regulator.

The law amending the Telecommunications law was adopted in July 2002; it specifies the functions of the CRA and simplifies access to the telecommunications market. The new Law on Telecommunications should implement the currently applicable EU telecommunications regulatory package (the changes of the new EU regulatory package of 2002 will probably not be covered) and accommodate the legal environment for the liberalisation of the telecommunications market from 2003.

The Communications Regulatory Authority was officially registered on May 1st, 2001 and started activities during June and July 2001. Lithuania has undertaken to ensure full compliance of its telecommunications legislation with EU regulation by January 2004. The CRA is set up as an independent governmental institution charged with the functions of regulating the telecommunications market and with reference to the Ministry of Communications. The main tasks of the CRA are set out in the Law on Telecommunications to ensure among other things:

- fair and non-discriminatory conditions for operators, especially with regard to interconnection of networks
- equal non-discriminatory consumer access to public telecommunications networks and services.

The CRA functions defined in the Law on Telecommunications provide the authority among other things with the responsibility to:

- issue authorisations for telecommunications activities that do not require licences, establish the authorisation procedure;
- adopt regulations for the construction, use and protection of public networks, general terms for interconnection, dispute settlement on interconnection and rules for joint use of facilities;
- determine price caps in cases prescribed by the Law;
- approve model agreements between telecommunications service providers and consumers, regulations on service provision;
- examine disputes with regard to network interconnection and joint use of facilities.

With the full liberalisation of the telecommunications market beginning January 2003, the function of the CRA will be to ensure a clearly defined fair competitive situation in the telecommunications service market both for new entrants and incumbents, as well as consumer interests and efficient use of telecommunications resources.

Currently all telecommunications activities and services are open to competition except for the operation of a public fixed telecommunications network and provision of fixed-telephony services over it. According to the Law on Telecommunications, until 31 December 2002 additional licences or authorisations, which would change the conditions of the incumbent's operations, could not be issued.

The Communications Regulatory Authority is authorised to approve the general terms and conditions of agreements on interconnection of telecommunications networks and the procedure for the settlement of disputes regarding interconnection. In addition, interconnection agreements are registered at the Communications Regulatory Authority and are public, except for commercially confidential information.

According to the Law on Telecommunications, public telecommunications networks must satisfy requests of other licensed telecommunications operators to interconnect public or private telecommunications networks. The request to interconnect may not be rejected if it is reasonable and technically feasible. The networks must be interconnected within three months from the date of a relevant request. Refusal to interconnect must be motivated and it must be submitted to the requesting operator and the Communications Regulatory Authority. In case of a dispute (due to refusal or inability of the parties to agree on interconnection of the networks in due time), either party may apply to the Communications Regulatory Authority. The Communications Regulatory Authority investigates the dispute and must adopt a decision within two months from the date of application.

As Lithuania Telecom had exclusive rights to fixed lines until January 2003, local-loop unbundling also remained to be achieved, but was scheduled to be compulsory from January 2003 in connection with the full liberalisation of the Lithuanian telecommunications market. In addition to this both public and private ways³⁰ have been legally granted (Rights of Way).

National research and education network

The Academic Research Network in Lithuania (LITNET) is an association of academic research institutes and other non-profit organisations, where the members use, manage and develop the LITNET network. The highest governing body of LITNET is the LITNET Board whose

30. 1st Report on Monitoring of EU Candidate Countries (Telecommunication Service Sector).

structure and regulations are confirmed by the Ministry of Science and Education in Lithuania. It is also the Ministry of Science and Education that financially supports LITNET.

LITNET is a national network, which interconnects all major Lithuanian cities and the local education and research institutions, schools etc. The main goal of LITNET is to provide advanced and high-quality Internetworking services to all kinds of education establishments in Lithuania. Due to these restrictions in the use of LITNET, LITNET service is only available for:

- higher education and colleges
- research institutions
- medical research
- national and local libraries
- primary and secondary schools
- national and local museums.

All fifteen universities in Lithuania are connected to LITNET and over 320 entities are connected through a permanent connection, either directly or through regional networks; almost 100,000 students are given Internet access through LITNET.

The LITNET core network can be described as a star-network, with Kaunas as the centre. Between the five major connection points in the core network the capacity is 155 Mb/s, whereas minor connection points have a 4 Mb/s or 1 Mb/s connection capacity.

LITNET has two international connections: one through GÉANT which operates at 155 Mb/s and one through Delfi Internet at 4 Mb/s. LITNET expects the access capacity to be upgraded to 622 Mb/s in the first half of 2003 and furthermore to upgrade this capacity several times within the next few years.

The LITNET budget 2002 is approximately 3.2 million euro, which can roughly be divided as follows: salaries and office costs 10%, hardware and software 23%, transmission of data 57%, other 10%.

Malta

Key points

- High standard of telecoms provision over a small territory
- Energetic implementation of European regulatory requirements
- Special potential for competition in international services.

General overview

With fewer than 400,000 inhabitants (similar to Luxembourg) in a tiny area, Malta is the smallest and also by far the most densely populated of the accession states. It has one of the higher standards of living and general levels of economic development, with steady economic growth and low unemployment. Financial services and tourism are both vital to the economy and their reliance on good telecommunications is recognised. Trade runs at around 90% of national income, about half of this being with the EU.

Telecommunications market

The incumbent Maltacom is 40% privatised, with a continuing 60% government shareholding. It has achieved excellent rollout of its digital network and the great majority of households have a fixed line. At only 5 euro per month (half the level of business rentals) residential rentals are widely affordable, and this is likely to remain an important objective for the future. Domestic calls (a single rate for all distances) are however now among the higher priced of the accession states, and similar to EU levels. Rates for international calls are also high in comparison to other accession states and member states. Cable television is supplied throughout the islands by Melita Cable, and is taken up by 70% of households.

In August 2002 Maltacom announced that for commercial reasons it would no longer be publishing quarterly financial statements (which provide information over and above the required annual returns).

The two GSM mobile operators have achieved between them more than 60 mobiles per 100 people, in spite of high interconnection charges with the fixed network. Since the second network started in December 2000, prices have fallen and take-up has doubled. Maltacom has a 20% shareholding in the Vodafone venture (which it is bound to divest, although this process has been delayed), and also runs the Go Mobile network, which has a 40% market share.

Internet use is competitively priced and widely taken up, often through public access points. Besides the university network (see below), eleven commercial ISPs interconnect at the public

exchange point. Given the very small dimensions of Malta and good coverage by the networks already mentioned, further domestic network entry is likely to be modest.

As regards international connectivity, currently there is one submarine fibre-optic cable connecting Malta to the outside world (to Sicily) and until 1 January 2003 all international traffic had to go through Maltacom, which had a monopoly in this sector. However, Vodafone have announced plans to lay their own fibre-optic cable between Malta and Sicily and will become another international gateway operator in 2003.

Regulatory regime

The Malta Communications Authority (MCA) started work on 1 January 2001. Full market opening was planned for 1 January 2003 in line with the existing EU regulatory package. MCA expects to implement the new package on accession to the EU.

The MCA has identified Maltacom, Melita Cable and Vodafone as dominant operators in their respective markets. Accordingly it has decided to require separate accounting from these operators for their core networks, access networks, retail operations (for Maltacom, subdivided between business and residential for as long as their rentals differ) and other activities. Statements of accounting practices and unit costs (e.g. call costs per minute) will also be required.

Improvements that the MCA is looking for soon from Maltacom include:

- lower international call prices without compromising the affordability of access and local calls rates
- faster provision of service (including leased lines) and faster fault repair
- clear published information on both tariffs and quality of service
- leased lines provided at cost-based prices.

National research and education network

The NREN is run by the Computing Services Centre of the University of Malta. The research network currently mainly consists of the campus network connecting all faculties and institutes and links to outlying centres, including one on the island of Gozo.

A 20 Mb/s connection to the GÉANT network, via Milan, has recently been established. Other local research and education institutes will be able to connect to the research network operated by the university to also gain access to GÉANT, and it is hoped that the link can be upgraded to 34 Mb/s in the near future.

The University of Malta is participating in the EUMEDCONNECT project with the aim of developing an IP research network infrastructure in the Mediterranean region.

The university's Computing Services Centre also provides operations and technical support to the Malta Internet Foundation. The Foundation was set up by the university and is responsible for the top-level Internet domain for Malta (.mt) and was instrumental in setting up the Malta Internet Exchange.

Poland

Key points

- Local and long-distance telecommunication services became liberalised in January 2001 and full liberalisation of the Polish telecommunication market would start in January 2003
- The new law in force in the Polish telecom sector is almost fully in compliance with EU requirements and furthermore meets the WTO criteria for market liberalisation
- The Polish research community today has its own fibre infrastructure within the Academic Metropolitan Area networks, is planning to build its own fibre optic backbone network and has already put in 2,500 km of fibres out of the 5,000 km planned.

General overview

The Republic of Poland covers an area of around 313 thousand square km and is located in central Europe, east of Germany and with a coastline to the Baltic Sea. Poland is inhabited by 38.6 million people, and the urban population percentage is just below 62. The capital Warsaw with 1.6 million inhabitants is the country's economic and political centre. In general the Polish terrain can be described as mostly flat plains, with some mountains in the southern part. Approximately 60% of the country's land is used for agriculture, where the main products are grains, potatoes, sugar beets and livestock.

Poland has a variety of natural resources including coal, copper, zinc, iron, lignite and some oil and natural gas reserves. Agriculture is the biggest industry in Poland occupying one-fifth of the Polish work force, but it only contributes less than 5% to the GDP. Other dominant industries are metalwork, steel, chemicals and textile production.

Poland is a parliamentary democracy and has for some years pursued a liberalisation policy regarding state-owned companies and restructuring the economic foundation. As a result, Poland today stands out as one of the most successful and open transition economies, where the developing private sector is contributing more and more to the country's economic activities. The developments in the Polish economy are however fairly dependent on the German economy as Germany is by far the biggest trading partner both regarding exports and imports.

The 2001 Polish GDP was 197 billion euro and the GDP per capita (PPS) was 9,210 euro, which is around 60% below the general EU level of 23,160 euro per capita. The GDP growth rate is 1.1%, with an inflation rate of around 1.1% (over last twelve months).

Telecommunications market

Local telecommunication services became liberalised in January 2001. Furthermore long-distance telecommunications operators from January 2001 no longer need to apply for licenses but can operate after authorisation of the Office of Telecommunications and Post Regulation (URTIP). From 1 January 2003 the telecommunications market in Poland was to be entirely liberalised as the provision of international telephone services was scheduled to be liberalised from this date. The market is fairly competitive within the mobile sector where there are three major operators.

Until the end of 2002, the incumbent operator in Poland had a monopoly on international connections, even though the process of partial privatisation of the state-owned telephone monopoly began several years ago.

The following list prices regarding leased-lines refer to basic services provided by the incumbent operator and are standard prices excluding any discounts and VAT:

720 euro regarding a 64 kb/s, 2 km national circuit

49,800 euro for a 2 Mb/s, 200 km national circuit.

There are three GSM mobile operators in Poland: PTK Centertel, Polkomtel and Polska Telefonia Cyfrowa (PTC). PTK Centertel is owned by TPSA (66%) and France Telecom (34%) and operates both a NMT and GSM 900/1800 network. PTK Centertel has a market share of around 28% of the number of mobile subscribers. Polkomtel is co-owned by a number of Polish state-owned companies and two foreign companies, TDC and Vodafone. Polkomtel operates a 900/1800 GSM network and has a market share of around 34% of the number of subscribers on the Polish mobile market. The last operator, PTC, is co-owned by Elektrim Telekomunikacja (51%), Deutsche Telekom (45%) and Polpager (4%), where Elektrim Telekomunikacja is owned by Vivendi. PTC also operates a GSM 900/1800 network and has a market share of around 38% of the number of subscribers.

All three mobile network operators are about to be defined as SMPs (Significant Market Power) by the regulator, URTIP. This classification has only been held by the incumbent operator TPSA to date. The SMP classification of the three mobile network operators will most likely enable a greater amount of competition within mobile communications and allow Poland's six Mobile Virtual Network Operators (Tele2, Nasza Telekomunikacja, Genesis, Millennium Communications, Internet premium and SM Media) to lease network capacity and airtime at the three SMPs.

Poland was the first country in Central and Eastern Europe to issue UMTS licences, but the tender was eventually cancelled and all three Polish mobile network operators received licences just before the end of 2000 at a price of 650 million euro each. According to the government, the fourth UMTS license could not be issued in 2002 due to the country's poor economic situation and the resulting weaker interest expected from potential bidders.

The number of fixed telephone lines per 100 inhabitants is around 28 and Internet penetration is around 17%. There were approximately 8.5 personal computers per 100 inhabitants in 2001. In mobile communications the penetration was just above 26% at the end of 2001, which means that the mobile penetration is higher than the fixed-line penetration.

Regulatory regime

On April 1st, 2002, a new unit of the Polish central government administration was established, called the Office of Telecommunications and Post Regulation (URTIP), to replace the former regulation organisation the Office of Telecommunications Regulations. The new organisation is the regulatory body for telecommunications activities and frequency management, monitoring the compliance with electromagnetic compatibilities and postal regulations, whose provisions have been specified in the Telecommunications Law of 21 July 2000 and subsequent amendments.

The new law in force in the Polish telecom sector is almost fully in compliance with EU requirements and meets the WTO criteria for market liberalisation. The new telecommunications law has introduced what is theoretically a fully independent regulatory institution.

Important changes introduced by the new law have been the gradual liberalisation of the market in the form of the removal of legal barriers to entrance into the marketplace, where all barriers were to be removed by January 2003, the regulation of tariff rebalancing by TPSA, and the rule of network interconnectivity, by which each operator is obliged to make its network available to other players on fair terms and upon request. Furthermore the new telecommunication act will open the existing market structures and facilitate local-loop unbundling, which will enable other operators to access last-mile connectivity to the end-user, instead of having to rely on the incumbent operator. The new telecommunication act has also created the basis for a liberalisation of the international sector, which currently is the exclusive domain of the incumbent operator.

However in the areas of the definition of universal service, the conditions for provision of universal service, pre-selection and carrier selection, interconnection, number portability and local-loop unbundling, further efforts are needed to reach a fully liberalised and functioning telecom market.

National research and education network

In 1992 the Committee for Scientific Research in Poland started a program for building the information infrastructure for the Polish scientific community. It resulted in the creation of twenty-two Metropolitan Area Networks and five High Performance Centres. Metropolitan Area Networks with their own fibre infrastructure have connected all universities, institutes of Polish Academy of Sciences and libraries. In order to create an effective environment for collaboration and applications development for science, the Polish Scientific Network has been developed. Today the network is called POL-34/622, based on the fact that it is operating at 622 Mb/s in the core backbone. Currently the backbone infrastructure is mostly based on leased channels (SDH and lambda) from the Railway Telecommunications Company.

The Polish research community has its own fibre infrastructure within the academic Metropolitan Area Networks and to become independent from external suppliers it has started in 2001 its own project called PIONIER. The PIONIER project is aiming at building fibre optic cables and using DWDM infrastructure (10 Gb/s and 40 Gb/s lambdas) connecting all MANs in Poland. The research community today already has put in 2,500 km of fibres out of the 5,000 km planned.

Until the PIONIER network is fully deployed there is a migration to a 10 GE backbone connecting sixteen Metropolitan Area Networks, which will be the basis for further migration to a fully optical infrastructure with a multi-lambda network.

In January 1998 the Poznan Supercomputer and Networking Centre (PSNC), which operates and manages the POL-34/622 network and the Poznan MAN, received a license from the Secretary of Communications for operator activity in the field of data transmission and access to the Internet. This networking/telecommunication activity of PSNC on Polish territory is based on the registration in the Office of Telecommunications Regulation (OTR), and to operate the research network PSNC had to apply for a telecommunications license and become a formal operator, which also meant that they afterwards did not have any regulatory problems in relation to the telecommunications regime.

There are 715 locations of universities connected to the POL-34/622 network and more than 1.4 million students are connected. Besides universities also research institutions, R&D institutions, libraries, hospitals and other public and governmental institutions are connected to the network.

The international capacity for the POL-34/622 network is provided by DANTE via the GÉANT network, where the connection between POL-34/622 and the GÉANT PoP in Poland is 2.5 Gb/s. The GÉANT connection is based on Packet over SONET directly to the GÉANT PoP in Poznan. A second international link has been established to the SPRINT network via a local provider, where the capacity is 310 Mb/s based on ATM. The link to the GÉANT network is dedicated for research traffic and the link to the SPRINT network is for commercial traffic. This split of traffic is due to the funding, where the international capacity for the research community is funded by the State Committee for Scientific Research while the commercial link is funded by the users of this link.

Regarding future capacity, PSNC is planning to increase their international capacity to 10 Gb/s in 2003 and probably migrate to 40 Gb/s and multi-lambda connection within five years.

The PSNC budget for 2001 was 7.8 million euro, which roughly can be divided as follows: salaries and office costs 30%, hardware and software 10%, transmission of data 50%, other 10%.

Romania

Key points

- A low-income country with typically low tele-density, especially in rural areas
- Large, dynamic mobile market with the ability and incentive to serve rural areas, may detract further from fixed-network development
- Bold forward-looking regulatory development leapfrogging a whole stage of EU regulations, with full liberalisation on 1 January 2003 even though EU membership not due until 2007
- Two academic networks.

General overview

With a population of 21.7 million (slightly decreasing), Romania is larger than all other candidates for EU membership except for Turkey and Poland. It is still among the poorest, with a per capita GDP of 25% of the EU average (in purchasing power adjusted terms). Many challenges still have to be faced before EU accession, which is currently planned for 2007 (along with Bulgaria).

For the whole of the past decade, inflation has been a persistent problem. Triple-digit inflation rates in the early 1990s have been brought down to double-digit rates, but are still far too high. Only in the past couple of years has the decline in economic output following the fall of communism been turned around into sustained economic growth. Agriculture remains a mainstay of the Romanian economy, providing 44% of employment although only 15% of national income. Industry contributes 30% of national income, construction 5% and services 50%. External trade is at a level of about 40% of national income, around 60% of trade being with EU partners, with Italy and Germany having the biggest shares.

Correspondingly, the Romanian population is one of the least urbanised of the accession states, with 45% living in the countryside. The biggest city by far is the capital Bucharest with 2 million inhabitants, and four provincial cities each have between 300,000 and 400,000 inhabitants. Levels of education attainment are generally very high.

Romania's geographic situation, in the east of Europe on the shores of the Black Sea, means that it is not in general used as a through route. The small neighbouring republic of Moldova however receives various services through Romania, including telecommunications links, and there are some cables through Romania and Bulgaria to Turkey.

Telecommunications market

All telecoms and Internet indicators for Romania are low (though growing), consistent with the low level of incomes. Of special note is the very low level of IT expenditure per head, at under a quarter of the average for the accession states (which in turn is way below the EU level). Even as a percentage of GDP, IT expenditure comes in under 1%, lower than any other European country. Telecom expenditure per head is 5 times greater but still very low by accession country standards, reflecting a telephone penetration of only 19 fixed lines and 21 mobiles per 100 inhabitants in June 2002, and fixed-line rentals still below 5 euro per month. Most of these lines have been concentrated in urban areas. Projects have now been initiated in order to connect previously unconnected villages, e.g. the Alba Project for remote communities in mountain areas.

The mobile market is dynamic and technologically advanced. Three GSM operators (RomTelecom's associate Cosmorom, the market leader Connex - a joint venture of Vodafone and the Canadian company TIW - and Orange) between them have over 4.5 million subscribers. Early 3G (CDMA) services are being launched by a fourth company, Telemobil, under the Zapp brand. With a data rate of 150 kb/s, these aim to take a significant share of small-business Internet access.

Although it has doubled in size since the management split from the postal services in 1991, the fixed network is less advanced, with 31% of lines still using analogue technology. RomTelecom has 140 lines per employee, representing an improvement on earlier figures but still the lowest among the accession states. The Greek company OTE has had a 35% shareholding in RomTelecom since 1998, with management participation. Currently there are negotiations for OTE to buy a further 19% from the government, bringing OTE's holding up to 54%. Leased-line list prices are low by all European standards. Traffic and therefore revenues remain buoyant.

RomTelecom's only remaining statutory monopoly (which expired on 1 January 2003) was on basic telephony (local, national and international) and fixed-network leased lines. Internet provision has attracted several commercial providers and a range of alternative infrastructures has already come into play, including cable television (concentrated in Bucharest), satellite (with the soon-to-be-privatised National Radio-communications Company as major provider), and optical fibres between major cities for private use.

Regulatory regime

The new Romanian regulator, ANRC (National Authority for Communications Regulation) has sprung into life with tremendous energy. The plan was to move straight from the current fixed-network monopoly to a fully open regime (conforming with the new EU framework, published in April 2002) on 1 January 2003. The past year has seen several successive pieces of legislation and related consultations, including an Emergency Ordinance dated June 2002 setting up the EU framework with ANRC as regulator, an earlier Ordinance transposing the EU Access Directive, and the General Authorisation for the provision of both public and private networks.

The differences between operating as a public or private provider are as follows. Public network operators have the right and obligation to interconnect with each other, while private network operators are not allowed to interconnect directly with other private networks, or to carry any public network transit traffic. Private networks may connect with public networks but only as end-users, and may not offer publicly available services. Public network operators must pay a

monitoring fee and are liable to contribute to a universal service fund. They also have to provide annual reports and other information to ANRC.

RomTelecom's tariff rebalancing is proceeding, with prices rising overall at the maximum permitted rate of 90% of inflation. Call prices have reached the EU range (though still on the high side) but, as mentioned before, rentals are still very low.

ANRC has defined a market for providing access to the fixed public telephone networks for call origination, call termination and switched transit and identified RomTelecom as having significant market power in this market. RomTelecom therefore has to respect certain principles and pre-requisites when drafting its RIO (reference interconnection offer). Among these are ceilings for interconnection charges in the commercial relations of the company with other operators. The maximum interconnection charges established by ANRC are: 1.15 eurocent/minute for local level, 2.1 eurocents/minute for single transit level and 2.5 eurocent/minute for double transit level. Regarding co-location, ANRC proposes maximum charges of 5 euro per square meter and 10 euro per square meter, which will be differentiated over the territory of Romania according to the prices charged on the real-estate market.

This decision thus creates the necessary conditions for establishing competition in the Romanian market. The operators will not have to pay excessively high amounts for interconnection and therefore they will be able to offer competitive tariffs to their subscribers.

January 1st, 2003 seems to be a signal for new entry by operators who want to provide fixed telephony services. Many operators have announced their intention to enter the fixed-telephony market after this date (e.g. National Radiocommunications, National Electricity Company, National Railway Company, National Post Company, RDS - a company who provides CaTV and Internet services).

ANRC has defined a market for call termination in each individual mobile network and identified all mobile operators as having significant market power for call termination in their own network. ANRC may therefore impose on each mobile operator such obligations as are required to safeguard competition.

National research and education network

The transition to an Information Society is one of the strategic objectives of the Romanian government for the period 2001-2007 and one of the conditions for EU accession. The National Programme for R&D includes three sub-programmes directly linked with IS development: INFOSOC-Information Society launches and finances priority projects of national interest for the development of infrastructure and of IT applications in Romania, in keeping with e-Europe general interest topics; MATNANTECH launches and finances basic and applied research for nano- and micro-technology, new materials and micro-devices, and high precision instruments; AEROSPATIAL launches and finances other specific research, including GIS systems for navigation and global data communications.

For the year 2001, the funds allocated to these three programmes represented 10% of the budget of the National Research and Development Plan.

A major Information Society objective is support for academic networks, so as to ensure widespread access by students and researchers to international developments. Supporting actions

include: implementing optic fibre metropolitan networks in big cities, to connect all research institutes and universities to the national networks for research and development, education and academia; improving the performance of national research, development and education networks, so as to establish virtual teams (Grid) and connect them to the GÉANT European research network; creating a competitive framework for providing cheaper and faster Internet access; introducing digital television services, including Internet facilities; setting up university campus networks provided with multimedia communication capacity and integrate an efficient Romanian network in a European virtual campus; setting up an IPv6 pilot project; setting up a database for Romanian research.

Two separate organisations provide academic networks in Romania.

RNC (Romanian National Computer network) is run by the National R&D Institute for Informatics. Half its income comes directly from the government and half from users and other sources. In addition to providing connectivity to six universities and over 100 other education institutions, it offers a full range of Internet services on a commercial basis, manages the .ro top-level domain and acts as Local Internet Registry for IP addresses. It is also involved in the Internet exchanges for Bucharest and Romania. 70% of its operating budget is spent on transmission facilities and 10% on staff.

The network topology is mainly a star based on Bucharest, supplemented by direct links between other major cities and additional links among the many academic institutions in Bucharest. Core backbone capacity is 100 Mb/s, with a total capacity of 2000 km.Mb/s. Both internal and external capacity is expanding rapidly, by a factor of 10 or 20 in two years.

RoEduNet is the data communication infrastructure supported by the Ministry of Education and Research. RoEduNet's network structure consists of seven Network Operation Centres (NOCs) located in the major university centres of Romania – Bucharest, Galati, Iasi, Tg. Mures, Cluj, Timisoara, Craiova. The network topology is similar to that of RNC, supplemented by spurs from each of these major centres to surrounding counties. The connection speed is 34 Mb/s for Cluj, Iasi, Timisoara and 8 Mb/s for Galati, Tg. Mures and Craiova, with an 8 Mb/s backup ring. RoEduNet also has Points of Presence in every county's capital city (40 in total), each connected to the closest NOC by a 2 Mb/s link. RoEduNet also operates Gigabit, ATM and FastEthernet metropolitan area networks in Bucharest, Cluj and Iasi respectively. Core network capacity in Bucharest is 1 Gb/s.

RoEduNet has local exchange connections with all major ISPs in Romania and a 155 Mb/s link with GÉANT, to be upgraded to 622 Mb/s in 2003. It connects 80 universities and higher-level education institutions, 179 high schools, 55 elementary schools, 42 county school boards, 37 research centres and institutions, and 41 other not-for-profit and governmental institutions (e.g. ministries, city councils, hospitals, branches and institutes of the Romanian Academy). As the Ministry of Education and Research intends to put Internet-connected computer networks in every school in Romania, the figures for connected schools will increase rapidly in future.

Slovak Republic

Key points

- In general the telecommunication market can be described as liberalised with the exception of provision of public fixed telephone service where Slovak Telecom as the incumbent operator had exclusive rights until the end of 2002
- The Telecommunication Office of the Slovak Republic had by the end of October 2002 received thirteen applications from alternative telecommunication operators interested in offering fixed-line voice services and eleven licenses were issued in the beginning of December 2002
- In 2002 the National Council of the Slovak Republic failed to pass a new Act on Telecommunications that aimed to de-monopolise the incumbent Slovak Telecom, and subsequently, to liberalise the telecom market from January 2003.

General overview

The Slovak Republic covers an area of just over 49,000 square kilometres and is landlocked in Central Europe east of Austria and the Czech Republic and south of Poland. After the Soviet influence collapsed in 1989, the Slovak Republic and the Czech Republic agreed to separate peacefully on 1 January 1993.

Approximately 5.4 million people live in Slovakia and the population distribution is 57% urban and 43% rural. The national capital is Bratislava, which has a population of approximately 460,000. The ethnic split in Slovakia is as follows: Slovaks 85.8%, Hungarians 9.7%, Roma 1.7% and 2.8% others.

The Slovak terrain can mainly be described as rugged mountains in the central and northern part and lowlands in the south. The natural resources mainly consist of brown coal and lignite, small amounts of iron ore, copper and manganese ore, salt and arable land, which covers around 31% of the country.

Slovakia is a parliamentary democracy and has virtually completed the transition from a centrally planned economy to a more modern market economy. Major privatisations are nearly complete, the banking sector is almost completely in foreign hands, and foreign investment has picked up. The Slovak energy and power sectors are the next major areas to be privatised.

The 2001 Slovakian GDP was 22.3 billion euro and the GDP per capita (PPS) was 10,780 euro, which is around 54% below the general EU-15 level of 23,160 euro per capita. The GDP growth rate is 3.3%, with an inflation rate of around 10% in 2000.

Telecommunications market

In general the telecommunication market in Slovakia can be described as liberalised with the exception of the provision of public fixed-telephone service where Slovak Telecom as the incumbent operator had exclusive rights until the end of 2002. The mobile communications market can be described as fairly competitive with two major operators competing with each other. Regarding telecommunication networks the market is competitive as several players are represented in this segment.

The telecommunications infrastructure in Slovakia is relatively modern, with a highly developed optical fibre infrastructure and one of the highest fixed-telephone penetration rates among the accession states. The main owner of the infrastructure is the incumbent and dominant operator Slovak Telecom (a subsidiary of Deutsche Telekom), but also other operators such as Telenor, Slovak Energotel and the two mobile operators Orange and Eurotel and other smaller companies own an increasing share of the telecommunication networks in Slovakia.

The following list prices regarding leased-lines refer to basic services provided by the incumbent operator and are standard prices excluding any discounts and VAT [1st report on Monitoring of EU candidate countries, Telecommunication service sector]:

- 2,355 euro regarding a 64 kb/s, 2 km national circuit
- 41,879 euro for a 2 Mb/s, 200 km national circuit
- 77,587 euro for a 2 Mb/s, 200 km international circuit.

There are two major mobile operators in Slovakia: Orange and EuroTel, both operating GSM 900/1800 networks, where Orange is the major and EuroTel the minor operator. Orange is owned by France Telecom (64%) and private financial investors and the European Bank for Reconstruction and Development owns the remaining shares. EuroTel is owned by Slovak Telecom (51%) and Atlantic West B.V. (49%), a joint venture between Verizon and AT&T.

Both Orange and EuroTel have been granted UMTS licenses and are supposed to start operating 3G networks during 2004.

During July 2002 the Telecommunication Office of the Slovak Republic granted Profinet.sk (an ISP) a GSM and UMTS license after it was the only bidder for the combined GSM/UMTS license and thereby becoming the third mobile operator in the country. However in September 2002 both the GSM and UMTS licenses were revoked by the Telecommunication Office as Profinet.sk failed to come up with the first instalment of the licence fee in time. So far, there are no plans from the government for re-issuing the combined GSM/UMTS license.

The Telecommunication Office of the Slovak Republic had by the end of October 2002 received thirteen applications from alternative telecommunication operators interested in offering fixed-line voice services. Eleven licenses were issued in the beginning of December 2002 and the new licence holders are expected to start offering services in 2003. The eleven new licence holders are: eTel, GTS Slovakia, Energotel, ZSR, Via PVT, NEXTRA, Dial Telecom, ConnSpec Telekom, Aliatel Slovakia, PosTel and M.B.C.

The number of fixed telephone lines per 100 inhabitants is around 38 and Internet penetration is around 16.7%. There were approximately 14.5 personal computers per 100 inhabitants in 2001. Concerning mobile communication the penetration was just above 50% at the end of 2001, which means that the mobile penetration is higher than the fixed-line penetration.

Regulatory regime

The most recent Telecommunication Act is from 2000. This act however does not provide solutions for the important local-loop unbundling provision, considered as one of the key regulations for telecommunication market liberalisation. In 2002 the National Council of the Slovak Republic failed to pass a new Act on Telecommunications that aimed to de-monopolise the incumbent Slovak Telecom, and subsequently, to liberalise the telecom market from January 2003.

According to the 2000 Telecommunication Act the Telecommunications Office of the Slovak Republic (TU SR) is the primary regulatory institution and the body of state administration in telecommunications executing regulation activities within the telecom sector. The TU SR reports to the Ministry of Transport, Post and Telecommunication, which is responsible for the telecommunications policy of the Slovak Republic. One of the major objectives of the Ministry is to provide full liberalisation of the Slovak telecommunication market by January 2003. Liberalisation is understood as a full liberalisation of all services provided within this sector, including basic public telephone services through fixed networks and unbundling of local loops.

TU SR is funded by the state budget and its primary telecommunications regulator assignments are among other things:

- regulation of telecommunications activities
- regulation of installation and operation of telecommunications networks and equipment and provision of public telecommunications services
- regulation of numbers, frequencies and call signals
- price regulation
- licensing for the operation of radio communications equipment
- dispute resolution regarding telecom activities.

With the full liberalisation of the telecommunications market, the function of the Telecommunication Office will be to ensure a clearly defined and fair competitive telecom service market both for new entrants and incumbent operators, as well as consumer interests and efficient use of telecommunication resources.

Regarding interconnection, the Telecommunication Act states that operators of public telecommunications networks and providers of public telecommunications services, which control access to at least one terminal point in the network identified by one or several numbers in the numbering plans, and providers of a public telecommunications service of leased circuits, have the right and obligation to interconnect with one another if requested to do so.

For the Slovak Republic to achieve full compliance with EU telecom regulation, issues related in particular to local-loop unbundling and universal services need to be addressed – as was the aim of the rejected government draft described earlier.

National research and education network

The Slovak Academic Network (SANET) was initiated in 1990 to build and operate a computer network connecting academic and research organisations in Slovakia and with the possibility of connecting to similar networks around the world. Today SANET is an independent association, where the members have agreed to conditions that will provide each member with Internet

services. SANET is a non-profit organisation whose members contribute to the operations and build-out of the network.

In 1996 just above 100,000 students in tertiary education were connected to the network through 26 connected universities. Besides universities and research institutes also hospitals, libraries and entities of other levels of education are connected to SANET today, where more than 300 entities have permanent connections to the network.

The SANET network covers 21 towns. The southern and eastern path connecting the towns between Bratislava and Kosice and from Bratislava to Zilina is realised in the project SANET2 by leasing dark fibres and using Gigabit Ethernet, whereas the towns in the northern and central part of Slovakia are connected through leased digital circuits with up to speed 2 Mb/s. In 2003 SANET should finish building the SANET2 network, which at that time will connect all its nodes through dark optical fibres at Gigabit speeds. The backbone of the SANET network is built on Ethernet technology with a transmission speed of 1 Gb/s. Where it has not been possible to lease dark fibres the different entities are connected to the nearest access point through leased digital circuits.

When the development of the backbone network is finished, SANET will have an optical ring infrastructure, which will be connected in the middle-between Zvolen and Banska Bystrica. This means that if any segment is physically interrupted, the operation of the network will be redirected through the nearest node on the opposite end and high redundancy and reliability of the network will be ensured.

The national connectivity is realised through an Ethernet link to the Slovak Exchange point SIX placed in the Computer Center of the Slovak Technical University in Bratislava, with a 1Gb/s connection.

The international connectivity is realised through two lines. One of them goes to the Slovak node of the GTS network with a speed of 100 Mb/s. The second one goes to the Slovak node of the GÉANT network with 2.5 Gb/s connection. At present, SANET uses 100 Mb/s of this capacity

Regarding future capacity needs, SANET believes to be covered for the foreseeable future with their current 2.5 Gb/s connection to GÉANT, 1 Gb/s to the Slovak Exchange Point SIX and 100 Mb/s to the GTS network.

The SANET budget 2002 is approximately 815,000 euro, and can roughly be divided as follows: office and travel costs 4.4%, hardware and software 5.5%, transmission of data 90%, other 0%.

It should be noticed that SANET has no staff of its own: all personnel who are working within the network and also all Board members are related to some academic institutions, which pay their salaries and general expenses.

Slovenia

Key points

- A relatively prosperous small accession country, with high fixed and especially mobile tele-density
- Already fully liberalised since 1 January 2001, but little yet by way of notable price falls or more flexibility on the part of the incumbent
- A litigious incumbent making for a cautious regulator
- NREN provides free dial-up Internet access from home to students and schoolchildren.

General overview

With a per capita income (adjusted for purchasing power) at around 70% of the EU average, which is higher than that for Greece, Slovenia is the most prosperous accession state apart from Cyprus. It was also the most prosperous part of the former Yugoslavia. It is small both in population (2 million) and area. Apart from its short Adriatic coastline, the land is mainly high, and is mountainous in the north. The population has been steady in recent years, with a slight natural decrease offset by net inward migration. Ljubljana, the capital and largest city, has a population of around 0.3 million.

Services account for over 60% of the national product, and agriculture for less than 5%. In recent years inflation has been under control and economic growth has been steady. The country is regarded as well on track for EU membership in 2004. Already its trade is mainly with EU partners, especially Germany.

Slovenia's geographic situation makes it a natural through-route between Western and Central Europe and the Balkans. Optical fibre cables, as well as roads and railways, reflect this status.

Telecommunications market

Fixed telephone line penetration is high at 93 lines per 100 households, but in recent years mobile phones have become much more numerous than fixed phones. Total (fixed plus mobile) tele-density, at 116 per 100 people in 2001, was high by world standards, exceeding for example the USA and well within the EU range.

Slovenia has one of the most advanced fixed networks (100% digital) and fastest growing markets in the region. Telekom Slovenije (TS) and its associated companies remain very profitable and heavily dominant in all markets, including Internet (where its associate SiOL has 80% market share) and mobile (where Mobitel had 80% market share last year). At 300 lines per employee the company is well within the EU efficiency range.

Early fixed-network competitors include the Austrian company Kiwvi and the Canadian company Incotel. CATV networks in towns may make fibre available. The electricity distribution company ELES and Slovenian Railways are offering high-speed leased lines but so far have only small market shares (5% between them in late 2002). List prices for low- and medium-speed leased lines in Slovenia are near, though generally below, EU average levels. However on the level of “lambdas” (in DWDM), prices are up to an order of magnitude more expensive than in countries with more competition.

During the 1990s, there was a perception among foreign investors that the government favoured domestic operators, and especially TS. This fear is reducing with the drive towards EU accession, and the publication of clear laws. The plan to sell another slice of TS in 2002, thereby reducing government’s shareholding to 25% plus one share, has been put on hold (maybe for a year) until market conditions are thought favourable.

Internet access and usage are high compared to other accession states. The organisation *Research on Internet in Slovenia*³¹ provides useful surveys and comparative data. The end-user cost of being online is dominated by telephone charges. Despite price cuts, non-TS ISPs still complain of excessive interconnection prices and lack of local-loop access for the provision of ADSL. TS supplies ADSL at less than 25 euro per month.

The Competition Protection Office decided in September 2002 to file proceedings against three mobile phone service operators that jointly increased their prices. They increased their service rates by an average ten percent as of 1 August, after ATRP called on them to adapt the rates to the actual costs “to the benefit of the users and to encourage competition on the telecommunications market”.

Regulatory regime

Slovenia is well forward in preparations for EU accession. TS’s voice fixed-line monopoly was formally ended in 2001, and all other markets have been liberalised since 1997.

The independent regulator (ATRP – Agency for Telecoms, Radiocommunications and Post) was set up in 2001. Its formal powers are adequate but it is still short of trained staff (only 45 of 60 posts are filled) and young as an institution. To date TS has been regularly appealing to the Administrative Court on regulatory decisions, which slows down the regulatory process. This also makes ATRP cautious in its decision-making, for fear of losing a court case. It is said that people hesitate to make formal complaints against TS for fear of reprisals.

The Telecommunications Law of January 2001³² brings Slovenia into conformity with the existing EU regulatory package. The Law is very comprehensive, as the Constitution requires all obligations to be contained in it and not in secondary legislation. Licensing is not required for telecoms networks that are not accessible to the public. Where a licence is required, it may only be refused (to someone showing the necessary competences) on grounds of public order or national security. Fixed network licence fees are around 20,000 euro, based on the regulator’s costs. One UMTS licence has been awarded.

Carrier selection has been available since July 2002 and fourteen alternative operators have been allocated access codes for long-distance and international telephony. However, none of them have yet started to offer national service. This is probably because TS has a single tariff for local and

31. <http://www.ris.org/indexuk.html>

32. Available in English online at <http://www.atrp.si/3tel/1tel-2.html> (Zakon o telekomunikacijah)

national calls, leaving little margin for new entrants to the national calls market. Some argue that this is anticompetitive.

Telephony price rebalancing is proceeding at a reasonable pace, with residential rentals now exceeding 10 euro per month (their estimated eventual level being 15 euro per month).

Fixed-network call interconnection charges are around double the European average. As a result of twinning with the German regulator RegTP, ATRP has been looking at German software for calculating interconnection costs. This may prove too complex and a simpler approach is now being considered.

Attention is now focused on implementing local-loop unbundling. Although (along with infrastructure sharing generally) TS is required in principle to supply all facilities to operators, so far there has been little demand for it at current prices. Also, in practice, it is hard to get TS to cooperate in achieving interconnection, especially on its premises; and complaining to ATRP is not perceived as likely to help change this.

Obtaining planning permissions for civil works, including the installation of radio masts, is seen as a significant obstacle for network construction. Different authorities are involved and the procedures are time-consuming and complex. A new Building Act that will simplify the procedures is now pending approval by Parliament. The previous situation favoured the electricity and railway companies, which own appropriate land and rights of way. The roads agency would be similarly well placed to enter the market.

National research and education network

The Academic and Research Network of Slovenia (ARNES) is publicly funded and also allowed to obtain funds by other means. A high share of its expenses is for international connectivity.

ARNES connects all tertiary education institutions in Slovenia (mainly at 100 Mb/s), and many secondary and primary schools and libraries (typically at 2 Mb/s or less). Apart from research departments in private companies, which are charged, Internet services are provided for free.

As well as providing the national research and education network, ARNES manages the .si domain name and also the national Internet exchange. It also provides individual dial-up accounts (which can be used from home) for 50,000 students and schoolchildren.

ARNES is already established as the operator of a closed (private) network. The network topology is mainly a star radiating from Ljubljana. ARNES is keen to own and run its own fibre, and believes that it could make substantial savings by doing so; however to date it has found this impossible.

Of ARNES' budget of 4.5 million euro in 2001, 66% was spent on transmission facilities and only 13% on salaries. National core capacity is 40,000 km.Mb/s, expected to grow by a factor of 100 in the next two years. External capacity is also growing - from 310 Mb/s in early 2002 it is expected to reach 10 Gb/s in January 2004.

Turkey

Key points

- Liberalisation of fixed-line telephony and infrastructure can take place before the end of 2003 if privatisation of Türk Telekom results in a state share of less than 50%; however, a privatisation has not yet taken place and is not foreseen to take place before the end of 2003 either
- Fixed-line telephony and infrastructure are monopoly areas for Türk Telekom until the end of 2003
- Turkey has had a regulatory Telecommunication Authority (TK) only since August 2000, which was established as an independent body with financial and administrative autonomy.

General overview

Turkey is a large country with a land surface of 770,760 square kilometres and an estimated population of more than 68 million. The country has 17.5 million households and consequently a comparatively large average household size of approximately four. The literacy rate is 85% in average (94% for men and 77% for women) for inhabitants of age 15 and over.

The largest cities are Istanbul with more than 9 million inhabitants, the capital Ankara with more than 3 million, and Izmir with over 3 million inhabitants. 40% of the labour force is employed in agriculture, 22% in industry, and 38% in services. With respect to GDP, the corresponding figures are approximately 15% from agriculture, 28% from industry, and 57% from services, indicating a relatively low productivity in the agricultural sector and a high GDP contribution from services.

GDP was 166 billion euro in 2001, corresponding to a per capita GDP of 2,424 euro, which is the second lowest among EU candidate countries after Romania and less than one-tenth of the EU average³³. Primary trading partners are Germany, the United States, Italy, the United Kingdom, France and Russia.

Turkey has lately experienced a serious economic crisis with a negative real growth rate of 6.5% in 2001. The unemployment rate was 10.6% (plus underemployment of 6.1%) in 2001. The consumer price inflation was 69% in 2001, and the currency exchange rate has fallen approximately ten times during the past five years in relation to the US dollar.

Turkey was created in 1923 from the Turkish remnants of the Ottoman Empire. The state is secular and Turkey has a republican parliamentary system. The latest election to Parliament in November 2002 saw the victory of the moderate Islamic AK Party (Justice and Development Party). Turkey is a member of NATO since 1952 and a candidate country to the EU, but has not yet obtained an accession date.

³³. In purchasing power parities (PPP), these figures are considerably higher (app. 2.5 times higher) because of relatively low prices in Turkey.

Telecommunications market

Until the mid 1990s, all telecommunications services were provided by a state monopoly operator under direct control of the Ministry of Transport and Communications. In 1994, a telecom reform process started gradually with the adoption of Law No. 4000 establishing Türk Telekom as a joint-stock company (wholly owned by the state) and the liberalisation of value-added services. With respect to fixed-line telephony and infrastructure, Türk Telekom holds a monopoly until the end of 2003.

Liberalisation of fixed-line telephony and infrastructure can take place before the end of 2003 if privatisation of Türk Telekom results in a state share of less than 50%. However, a privatisation has not yet taken place and is not foreseen either to take place before the end of 2003. A privatisation tender was issued first in June 2000 and later in December 2000, but with no success because of apparently unattractive conditions and the financial crisis in February 2001.

The rate of digitalisation of the fixed-telephony network is 93% (December 2001). The total number of PSTN subscribers is approximately 19 million. In the mid 1990s, the number of subscribers grew by a little more than 1 million per year, but in 2000 and 2001 the market only grew around 0.5 million per year. The penetration rate is 28 lines per 100 inhabitants. In terms of fixed lines per households this corresponds to approximately 82 lines per 100 households, taking the relatively large households in Turkey into consideration. It should be added, however, that this figure is systematically larger than the number of households actually having a fixed line connection because of some households having more than one line.

In the mobile market, there are presently four GSM operators. Two of them (Turkcell and Telsim) started in 1994 and the other two (Aria and Aycell) in 2001. Turkcell, Telsim and Aria are all privately owned, while Aycell is owned by the incumbent Türk Telekom. By September 2001 there were 23.2 million GSM subscribers, of which around two-thirds are prepaid customers. The penetration rate of mobile telephony is thus slightly higher than fixed-line telephony. Turkcell has approximately two-thirds of the market, Telsim one-third, Aria around 3% and Aycell less than 1%. Since 1986, Türk Telekom has operated an NMT network, which today has approximately 60,000 subscribers.

The number of Internet Service Providers (ISPs) is at present around 80-90, of which four (among them Türk Telekom) cumulate over 75% of the market. Turkey was first connected to the Internet in 1993 through a 64 kb/s leased line to NSFNET in the United States. Internet was at first limited mostly to academic circles, but has since then spread primarily to business customers (60% of the market) but also residential customers. By the end of 2002, there were 4.3 million Internet users, corresponding to approximately 6 users per 100 inhabitants. The host count number was 1.8 per 1000 inhabitants in April 2002, which is the lowest among the candidates for EU membership.

Total value of the Turkish telecoms market was estimated to approximately 11 billion euro in 2000. It experienced however an approximate shrinkage of 30% to 7.6 billion euro in 2001 following the financial crisis, beginning in February 2001. The contribution of fixed voice telephony was 55%, mobile telephony was 40%, and the rest comes from Internet and data transmission and leased lines.

Of special direct interest with respect to research and education networks are prices of leased lines. By March 2002, standard prices charged by the Türk Telekom, excluding discounts and VAT, were 550 euro per year for a national 2 km 64 kb/s line, which is a relatively low price compared

with most other accession states. The price of a national 200 km 2 Mb/s line was 40,331 euro, which is close to the price average in accession states.

Regulatory regime

Turkey has had a regulatory Telecommunication Authority (TK) only since August 2000. TK works under the auspices of the Ministry of Transportation, but is established as an independent body with financial and administrative autonomy. No share of its budget is obtained from the general state budget but from GSM frequency use and license incomes.

TK was established on basis of Law No. 4502 of January 2000, which gave TK a general role of promotion of competition, regulation and supervision of the telecommunications sector. The adoption of a new telecommunication law (No. 4673) in May 2001 increased the competencies of the regulator to encompass powers with regard to licensing, which had been kept by the Ministry. The 'division of labour' today is, therefore, that the Ministry of Transportation has the responsibility for policy making and the definition of minimum (universal) services, while the regulator is responsible for regulation, monitoring, reconciliation and authorisation, and Türk Telekom for operations.

Fixed-line telephony and infrastructure are monopoly areas for Türk Telekom until the end 2003, while four operators are licensed in the mobile area, several companies are licensed in the satellite services area, and a large number of companies act in the ISP area. One of the major cases of the regulatory agency since its creation has been to implement national roaming in the mobile area. The two incumbent operators in this field, Turkcell and Telsim, have been unwilling to concede national roaming to the two newcomers, Aria and Aycell.

With a monopoly on infrastructure, Türk Telekom is the only operator providing leased lines, which, e.g., are of central interest for building a national research and education network. However, if Türk Telekom cannot meet the requests of users, licenses can be granted to other providers to establish and operate the infrastructure needed.

In the summary of chapter 19 on telecommunications and information technology in the Turkey section of the European Commission report 'Making a success of enlargement', it is stated Turkey should focus on "preparing for the liberalisation of fixed voice telephony in 2004; providing for national roaming in mobile telephony; completing the regulatory framework in the field; protection of personal data, numbering and universal service... Turkey should also transpose the updated telecommunications *acquis*"³⁴. Exact dates for the implementation/transposition of the EU telecom package have not been set in Turkey.

National research and education network

In 1986, the Turkish Universities and Research Institutions Network (TÜVAKA) was set up. Only few universities were connected. It had a limited networking capacity and it was not based on the Internet Protocol, but had connections with BITNET and EARN. TR-NET was set up to connect Turkey to the Internet and in 1993 connection to NSFNET was established.

34. 'Making a success of enlargement: Strategy paper and report of the European Commission on the progress towards accession by each of the candidate countries', Turkey report page 107.

In 1996, the National Academic Network & Information Center (ULAKBIM) was established, taking over the responsibilities of TÜVAKA, TR-NET and the Higher Education Council Documentation Center. The objectives of ULAKBIM are:

- to establish and operate a computer network enabling interaction within the institutional elements of the national innovation system, and to provide information technologies support to help information production
- to provide information services, which will reflect the information accumulation in the national innovation system via this network and/or using traditional ways, and to offer information services that will help information production³⁵.

The first objective was met by the creation of Turkish National Academic Network (ULAKNET) in 1997, which today provides access for all universities and research organisations in Turkey (more than 120 connections) to the global Internet. Access is provided to these organisations over an ATM backbone installed between three main Points of Presence (PoP) in Ankara, Istanbul and Izmir. The bandwidth of ULAKNET to the global Internet is currently 310 Mb/s, to be increased to 465 Mb/s shortly. As of 4 December 2002, a 34 Mb/s GÉANT link has been established via satellite and this link will be increased to 155 Mb/s in January 2003. The nodes connected to ULAKNET are universities, research and development organisations, some governmental organisations, and military and police academies³⁶. Access speeds range from 2 Mb/s to 155 Mb/s. Dicle University in Diyarbakir, e.g., is connected at 8 Mb/s and the 40+ universities and research institutions in Istanbul are connected with speeds from 2 Mb/s to 155 Mb/s.

The second objective has been met by the establishment of Cahit Arf Information Center, which offers information and documentation services to the national innovation system, conducts research and development studies in the field of information and knowledge management, conducts studies to form national data bases, and provides co-ordination among the organisations which produce and store information³⁷.

35. Objectives are cited from the homepage of ULAKBIM, <http://www.ulakbim.gov.tr/english/>

36. Information from <http://www.ulakbim.gov.tr/english/>

37. *Ibid.*

Annex II

Country Description Regarding Greece and Portugal

Greece and Portugal are already EU members and bound by the *acquis communautaire*. However, they liberalised later than other members and high prices are still being paid for their international connectivity, so a special look at their regulatory situation was felt to be worthwhile. As the two countries have many features in common, the approach adopted has been to look at similarities and significant differences between them.

General

Both Greece and Portugal are relatively small southern European countries, with populations of around 10 million. Both have much mountainous terrain and significant island populations. Both are situated at the edge of the current EU, though with enlargement Greece will become increasingly important as a through route to Eastern Europe.

Both have just one major urban centre, with Greater Athens at 3 million population much larger than Greater Lisbon at under 2 million. Other cities are much smaller (Thessaloniki 0.4 million, Oporto 0.3 million). In both cases there are considerable disparities between urban and rural standards of living.

Their GDPs per capita are similar (at around 12,000 euro, the lowest in the EU and about 70% of the EU average in purchasing power adjusted terms; these are below Cyprus and Slovenia). Both still have significant primary sectors (agriculture etc), although agriculture in Greece is more than double the size of that in Portugal, with Portugal correspondingly having more manufacturing activity (especially textiles and footwear) and a bigger service sector. Both have major tourist industries of similar sizes.

Both countries became democracies in the mid-70s following periods of right-wing authoritarian government. Greece joined the EU in 1981 and Portugal in 1986, since when both have benefited from significant amounts of EU funding, especially for infrastructure development. Both economies have grown fast in the last two decades. Greece, however, has much higher unemployment rates than Portugal.

As the home of a widely spoken language (160 million speakers worldwide), Portugal has an impetus for Internet content production; but only Greeks speak Greek.

Telecommunications markets

Both countries are still in the early stages of liberalisation, having had derogations from the EU 1998 deadline. Full market opening dates from 1 January 2000 for Portugal and 1 January 2001 for Greece. Although only a year apart, in 2002 the difference is still significant, particularly in

view of the recent severe market downturn. To date there has been little new market entry or erosion of the incumbent's market share, although new developments are taking place in both countries (see below). In both countries, number portability and carrier selection facilities are following a year after the initial market opening.

In Greece, already the power company DEH together with WIND have installed 1700 km of 48-pair fibre from Athens to Thessaloniki and Corfu (connecting to the submarine cable to Italy). Mediterranean Nautilus has completed its main routes terminated in Athens, where GRNET rents co-location space. Furthermore ATTIKI ODOS, a road construction company, will complete its greater Attica region fibre network (including several rings in the city of Athens) by April 2003. On this network, the University of Athens has already procured a 4-pair ring for connecting its four main buildings in Athens.

In Portugal, most of the population is concentrated in the narrow coastal strip linking Lisbon and Oporto, and this is where new competitors are beginning to install fibre and prices are starting to fall. Portugal Telecom is focusing on 2 Mb/s as its main leased-line offering, and leaving prices for higher capacity links at very high levels.

Overall, telephony prices in both countries are among the highest in Europe. They have been adjusted in recent years in preparation for competition. Residential rentals in Greece are only 13 euro per month (19 euro in Portugal, both in PPP terms) but OTE claims that these represent fully rebalanced levels. Possibly reflecting affordability of rentals, fixed-line tele-density is 61 per 100 in Greece and only 44 per 100 in Portugal. However, with competitive mobile markets, mobile tele-density is high in both countries, at 68 per 100 in Greece and 75 per 100 in Portugal.

Both countries lag behind the rest of the EU in all Internet indicators. However Portugal seems to be ahead of Greece with 31% household access in mid-2002 according to EU figures, though a September 2002 Greek survey put Internet penetration at almost 20%. Per capita annual telecom spend is similar in both countries, at 580 euro only 76% of the EU average, and well below the rest of the EU.

Leased-line prices are high in both countries, especially Greece (around 150% of Portuguese levels). The total size of the Greek leased-line market is only two-thirds of the Portuguese one, suggesting that in volume terms it may be only around half the size. A recent pronouncement by the Portuguese regulator ANACOM requires PTC to reduce its leased-line prices by varying percentages (up to 30%+ for 34 Mb/s lines) to bring them more into line with cost.

Greek leased-lines prices were reduced by 26% in early 2002. A recent external audit concluded that overall, leased-line prices were cost-oriented, but that structural adjustments were needed to make individual leased-line types (analogue or digital and capacity) cost-oriented. List prices for 155 Mb/s lines in Greece in 2001 were four times the EU average. There have also been problems about competitors obtaining wholesale rates. Following an EETT Decision in June 2002, public telecom operators should be charged wholesale tariffs for leased lines. OTE is also obliged to issue a Leased-Line Offer (LLO) including details of available Service Level Agreements. This LLO is now being approved by EETT.

A recent EU (Competition Directorate) announcement³⁸ about its international leased-lines enquiries concluded that competition does not really exist yet in this sector in either Greece or Portugal. The markets are to be re-examined in 2003.

38. http://europa.eu.int/comm/competition/antitrust/others/sector_inquiries/leased_lines/

Cable TV passes 87% of Portuguese homes and is non-existent in Greece. A few Portuguese (0.5%) have broadband through cable modems, but this is hardly a competitive alternative, as the cable networks are mainly owned by PT.

At September 2002, OTE had 17,000 staff compared with PTC's 10,000, roughly in keeping with its larger base of fixed lines. Both companies have greatly increased their subscriber bases over the past decade, and more recently reduced their workforces, and their lines per employee are now similar to those of other EU countries. Over recent years the government shareholding in OTE has been reduced, and in June 2002 it was announced that a further 8% would be sold, to bring the government share down to 34%. PT is largely privatised, but there is a government 'golden share' and small residual government shareholding, which give rise to some complaints about political interference. Before the original share sale, PT's market position was strengthened in the mobile, cable and international markets - to the benefit of the share price and to the detriment of competition.

OTE is entering into a variety of foreign ventures in countries of Eastern Europe and Central Asia. In particular, it has important interests in the Romanian and Bulgarian mobile markets. PT also has significant non-domestic interests but these are nearly all outside Europe (mainly in Brazil and other Portuguese-speaking countries).

Regulation

The national regulatory authorities have both recently been restructured and renamed, to EETT in Greece and ANACOM in Portugal. Doubling its staff in a short time to around 80 (with a further doubling planned), EETT is plainly suffering from growth pains and a continuing acute shortage of staff, especially non-engineers (lawyers, economists and accountants are still needed). ANACOM has over 400 staff and four times EETT's budget to cover broadly similar responsibilities. However it is still criticised for slow and ineffective response to complaints.

Both governments are pursuing 'Information Society' initiatives designed to get more people online and bring in e-government and e-commerce. The Portuguese initiative appears to be the better funded, more ambitious and more successful of the two. It is certainly higher-profile. The Greek Broadband Task Force has issued a comprehensive broadband strategy white paper, and the Ministry of Transport and Communications plans to fund the private sector to create broadband infrastructure covering all Greek regions (except Attica and the city of Thessaloniki) using EU structural funds.

Regulatory proceedings are in progress in both countries to bring the incumbent's leased-lines prices more into line with costs. Both seem rather slow; matters are further ahead in Portugal than in Greece (see above). Costing in Portugal is on a historic cost basis. In Greece the aim is to produce LRIC costs soon, but meanwhile international benchmarks are being used in place of cost data.

Local-loop unbundling (LLU) is underdeveloped in both countries and as yet barely taken up in either, although Reference Unbundling Offers exist (at apparently reasonable prices). ANACOM has published the results of its 2000 consultation on this issue, showing that in principle LLU is welcomed by customers and alternative providers.

It seems that there have been some deficiencies in the licensing regimes in both countries. For example, Portuguese licences have not made sufficient provision for new technological

developments. However, both countries expect to be fully in line with the new EU regulatory package by July 2003.

National research and education networks

Government spending on R&D in Portugal is roughly double the level in Greece (0.63% of GDP and 0.32% respectively, compared with the EU average of 0.73%). This may be reflected in the 50% larger budget enjoyed by the Portuguese NREN FCCN than the Greek NREN GRNET. Both organisations spend around two-thirds of their budgets on network infrastructure, solely (Greece) or mainly (Portugal) with the incumbent operator.

Both NRENs link all universities, are responsible for running their country's main Internet exchange, and are now also reaching out to schools. FCCN is currently extending its network to schools in keeping with the government's Information Society initiative. With its 150,000 users in higher education, GRNET caters for a significant proportion of the country's active Internet user community. GRNET also provides distribution and backbone network services to the EDUnet access network that covers almost all Greek schools, thus raising the population that currently has access to Internet through GRNET to one million.

FCCN is linked to the GÉANT network via a single 622 Mb/s link to Madrid. GRNET has two 622 Mb/s links to GÉANT, one to London and one to Frankfurt. In turn it provides lower-capacity links to Sofia, Nicosia and Belgrade. GRNET also co-ordinates the IST project SEEREN, which will link the NRENs of Albania, Bosnia-Herzegovina, Bulgaria, the Former Yugoslav Republic of Macedonia (FYROM), and the Federal Republic of Yugoslavia – Serbia and Montenegro (FRY) to GÉANT. The NRENs will be linked via 2-34 Mb/s international connectivity.

Conclusions

High prices for connectivity in these countries are not surprising. Liberalisation is still young in both countries and the markets are relatively small. Traditional monopolists are still very strong and not always co-operative in matters of interconnection and access. However, there is every reason to expect more competition and falling prices over the next three to five years.

Factors favouring Greece include a larger conurbation in Greater Athens, and physical and business links with more European countries. Factors favouring Portugal include a year's head start in telecoms market opening, a more interventionist government targeting funding at 'Information Society' activities, a larger Internet user base and larger content industry, and a stronger national regulatory body.

Annex III

The New EU Communications Regulatory Framework

Summary of main provisions of potential relevance to European research networking

What follows aims to be a simple, plain-language guide to key features of a large volume of legal documents. It does not aim to be comprehensive. Any reader wishing to follow up points in this summary is strongly advised to consult the original documents³⁹ (some of which may have changed).

Key points

- The new package applies to “electronic communications networks and services”. The new term, invented because of convergence, is meant to do away with artificial distinctions between telecommunications and broadcasting. Content regulation is however excluded.
- The package represents an evolution, not a revolution, from the status quo. One important aim has been to ‘tidy up’ and simplify the existing large collection of relevant Directives and other regulations. All Directives allow for transitional arrangements intended to avoid unjustified or unpredictable changes.
- The package retains the existing twin themes of:
 - fostering open competition on equivalent terms throughout the Union
 - harmonisation of national regulations when there is no objective justification for them to differ.
- All regulation must follow the general regulatory principles of being: objective, non-discriminatory, proportionate and transparent.
- *Ex post* regulation (as used in normal competition law) is to be preferred to sector-specific *ex ante* regulation (which typically controls the behaviour of former monopolists). It is recognised that because of the special history of the sector, for the time being some *ex ante* regulation remains justified. However the thrust is towards reducing *ex ante* regulation and eventually eliminating the need for it.
- The new framework provides a logical structure within which national regulatory authorities are meant to decide what *ex ante* regulations continue to be appropriate in each country. Regular market reviews are required to assess the state of competition in each subsector and to identify actors with significant market power. All continuing *ex ante* regulation will require justification.
- The new package was adopted in April 2002 and comes into force on 25 July 2003. All Member States are required to transpose the new package into their national legislation by that

39. Currently available at

http://europa.eu.int/information_society/topics/telecoms/regulatory/maindocs/index_en.htm#directives_and_related_web_pages

date. Thereafter, its implementation and results will be subject to regular review and ‘fine-tuning’.

Directive of 16.09.02 on competition in the market for electronic communications networks and services

This ‘Competition Directive’ essentially restates requirements that have been in place since 1990, taking in amendments made since then and using the new language.

Member States must abolish all special or exclusive rights to provide electronic communications networks and services, and must not unnecessarily restrict their provision by anyone. Any decision to prevent such provision must be on objective grounds and subject to appeal. The same applies to directory services.

Licensing is to be replaced by general authorisations, where at most a registration with the authorities is required. Conditions may be attached to general authorisations, but all conditions must conform to the general regulatory principles (and be within the maximum set permitted by the Authorisation Directive, see below). Any required contributions (in cash or in kind) to achieving universal service objectives must be in accordance with the principles and designed to minimise distortion of competition.

Spectrum and satellite space segments are to be allocated in accordance with the general regulatory principles and in conformity with competition law.

Dominant vertically integrated concerns (i.e. normally, incumbents) must be prevented from discriminating in favour of their own operations. Cable television networks run by incumbents must be in legally separate entities, at any rate until there is adequate competition in the provision of local networks.

Directive of 7.03.02 on a common regulatory framework for electronic communications networks and services

The ‘Framework Directive’ starts with a set of important definitions that apply throughout the legislation. The following points are of particular note:

- an ‘electronic communications service’ means a service *normally provided for remuneration* that consists wholly or mainly in the conveyance of signals on electronic communications networks....
- a ‘public communications network’ means an electronic communications network used wholly or mainly for the provision of *publicly available* electronic communications services
- a ‘user’ means someone using or requesting a publicly available electronic communications service.

The terms in italics are not further defined.

Each Member State must establish a National Regulatory Authority (NRA) that is independent both of the industry and of any branch of government involved in ownership of any industry player. The NRA must be adequately funded to fulfil its role, and there must be an avenue for appeal against its decisions. It must:

- regulate impartially in accordance with the EU principles and in a technology-neutral way
- consult openly on all regulatory decisions
- co-operate with its own national competition authority and with its counterparts in other Member States
- obtain such information from the industry as is necessary, but without imposing undue burdens, and respect commercial confidentiality where requested.

The overall objective for NRAs is to promote competition and the smooth functioning of the internal market. Supporting objectives include:

- promoting the interests of users, and especially of disabled users; this includes providing for universal service and consumer protection
- encouraging investment and innovation
- encouraging efficient use of spectrum and numbering resources
- encouraging the establishment and interoperability of trans-European networks
- maintaining the security and integrity of public communications networks.

The necessary but limited resources of radio frequencies, numbering, rights of way and co-location and facility sharing are to be made available, within their natural limits, to all applicants on fair and equal terms. The procedures for granting rights of way may however favour public communications networks; co-location and facility sharing are the preferred course where environmental etc considerations preclude new construction.

Radio spectrum must be managed in a harmonised way, under the oversight of the Radio Spectrum Committee (set up by a separate decision of the same date), and as far as possible in co-ordination with the broader European grouping of CEPT.

Historic incumbents must adopt separate accounting and reporting procedures for their electronic communications network and service activities.

NRAs shall identify undertakings with significant market power (SMP) in specific markets. SMP (similar to dominance) means occupying “a position of economic strength affording it the power to behave to an appreciable extent independently of competitors, customers and ultimately consumers”. Market definition and market analysis are to be carried out “with utmost regard” for Commission Guidelines. The markets for analysis will be limited to those identified in a Recommendation which will be reviewed regularly. The current draft list of markets is:

Retail level

- PSTN access and public telephony service at a fixed location
- The minimum set of leased lines (up to 2 Mb/s)

Wholesale level

- PSTN call origination and termination (separate markets)
- Wholesale local access, including unbundled access to local loops and sub-loops
- Local or terminating segments of leased lines
- Mobile call termination
- International mobile roaming
- Broadcasting transmission and distribution

- PSTN transit
- Mobile access and call origination.

Segmentation of some of these markets is permitted, including segmentation by bandwidth of leased-line local or terminating segments.

NRAs must encourage or require the adoption of a range of (mainly ETSI) standards, which are separately listed. The current draft list covers:

Compulsory standards: minimum set of leased lines (64 kb/s and 2 Mb/s), PSTN quality of service parameters.

Voluntary standards: higher speed leased lines (up to 155 Mb/s), access and interconnection, number portability, carrier selection and pre-selection, unbundled local loop access, various user services, data protection requirements, digital broadcasting distribution.

NRAs must put in place procedures for resolving inter-industry disputes in less than four months, and co-operate with each other to resolve cross-border disputes equally promptly.

NRAs will work closely with and supply information to the Commission, which will be supported and advised by a Communications Committee. A Decision of 29.07.02 sets up the European Regulators Group, composed of the heads of all NRAs affected by these Directives, which is to work closely with this Committee.

Directive of 7.03.02 on authorisation of electronic communications networks and services

The “Authorisation Directive” aims to simplify and harmonise the currently varied licensing and authorisation regimes among Member States. Simple, cheap authorisation to provide electronic communications networks and services is the norm, from which any departure must be justified.

Authorisation may require notification to the authority, and the provision of minimal necessary information, but must not entail any delay in activities. It automatically confers the right to provide services to the public and to negotiate interconnection with other authorised providers of public communications services, as well as to set up networks and apply for rights of way. Authorisation also entitles the provider to apply for and where possible be granted numbers (within two weeks) and radio frequencies (within six weeks). These resources may be granted for a limited duration only.

All these rights may be subject to general conditions relating to the following topics.

- payment of fees and charges to cover administrative costs or to incentivise optimal use of limited resources

Entitlement to provide service:

- universal service funding contributions and consumer protection rules, including data protection
- interoperability and interconnection, including accessibility of numbers to end-users and the protection of network integrity

- transmission of public broadcasting content and protection of minors from illegal or harmful content
- protection of the environment, public safety and national security.

Rights of use of limited resources:

- use for specific identified service and in compliance with undertakings made by the applicant
- efficient use of the resource
- avoidance of radio interference and compliance with international obligations
- number portability and provision of public directory information.

In addition to the general conditions, specific conditions may be imposed on particular (generally, SMP) undertakings under the Access or Universal Service Directives.

NRAs may request information from authorised undertakings to verify compliance with all the conditions. If breaches are found, reasonable and proportionate enforcement measures should be employed, with a right of appeal.

Directive of 07.03.02 on access to, and interconnection of, electronic communications networks and associated facilities

The 'Access Directive' defines:

- 'interconnection' as the physical and logical linking of networks to enable users of both networks to communicate with each other, or with services on the other network
- 'access' as the making available to another undertaking of facilities and services such as network elements, buildings, ducts, masts, or software systems. (End-user access is a different concept).

Interconnection is therefore a specific sort of access between network operators.

The norm is for all authorised public communication network providers to negotiate and agree on terms for access and interconnection. In case of difficulty, the NRA may intervene at the request of either party or on its own initiative.

In defined markets (see wholesale list under 2 above), following a process of market review and analysis, NRAs may impose access and interconnection obligations on SMP operators. These include:

- transparency (e.g. publication of a sufficiently unbundled Reference Interconnection Offer)
- non-discrimination
- access to particular network facilities, in a fair, reasonable and timely manner
- accounting separation and cost accounting requirements, including publication of internal transfer prices, and
- price controls (which may include a requirement for cost-orientation).

SMP operators must provide unbundled access to the local loop and a Reference Unbundling Offer. A detailed list of required elements and conditions for local loop unbundling and co-location appears as Annex II to the Directive. It includes both full loop and sub-loop access, as well as shared access.

Conditional access systems for digital television must be managed in a way that is fair to all broadcasters.

Directive of 07.03.02 on universal service and users' rights relating to electronic communications networks and services

The 'Universal Service Directive' aims to preserve or improve standards of consumer protection in the sector, and to deal with circumstances where needs are not met by the market.

Member States must ensure throughout their territory the provision of affordable PSTN service, on lines of sufficient quality to permit Internet access and meeting other quality of service targets. Other universal service obligations include a universal directory, directory enquiry service, enough public payphones to meet reasonable needs, special measures for disabled users and 'affordability' tariff options and facilities (such as itemised billing, selective call barring and prepayment). At least one operator shall be designated to meet each obligation.

Where the net cost of fulfilling such obligations is shown (by transparent calculations carried out as prescribed in an Annex) to be an unfair burden on the designated operator, it may be reimbursed by government or shared on an equitable basis across the industry.

Retail price regulation on SMP telephony operators shall be maintained (with a view to achieving cost-oriented tariffs) for as long as this is necessary to foster competition and protect consumers. The minimum set of leased lines (up to 2 Mb/s) must continue to be made available at cost-oriented prices for as long as market conditions make this necessary.

All public telephony users have a right to a clear contract, knowledge of applicable tariffs, published quality of service information, operator assistance and directory enquiry services, ability to use the emergency number 112 free of charge from any phone, and number portability (for both fixed and mobile service). In addition NRAs may require tone dialling and calling-line identification to be provided.

All providers of public telephony service must adopt the standard international dialling prefix 00 and must handle calls to the European Telephony Numbering Space (+3883).

SMP operators must provide carrier selection facilities, both call-by-call and pre-selection. Pricing for number portability and carrier selection must be cost-oriented.

Directive of 12.07.02 concerning the processing of personal data and the protection of privacy in the electronic communications sector

The 'Data Protection' Directive aims to restrict the processing and retention of personal data by providers of public communications networks and services, so as to protect personal privacy in a way that is consistent with other EU legislation. The general principle is that the user should be aware of and should consent to any use of his or her personal data. Exceptions are permitted for emergencies, criminal investigations and in the interests of national security.

Special provisions apply to traffic data, location data, itemised billing, calling line identification, automatic call forwarding and directories.

Unsolicited commercial communications, including unsolicited email, are prohibited on either an opt-in or an opt-out basis (the choice being left to each country). Unsolicited email with the sender's identify disguised is in any case forbidden.

Annex IV

References

The main sources for the country descriptions of the different NREs and national regulatory situations have been the national research and education network and the national regulatory authority. A draft version of each country description has been forwarded to both the national regulatory authority and national research and education network for review and comments.

Of other main references the following main sources should be mentioned:

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The TERENA Compendium
<http://www.terena.nl/compendium>

