

9. What comes next?

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Mobile Internet, as the communication system of the future has become a frequently used expression these days. During the past decade, mobility and the general spreading of mobile telephones were the biggest success in telecommunications, while datacommunication became part of our everyday lives through the spread of the Internet. However we can notice the convergence of telecommunications and datacommunications. It is hard to answer the question “How do we want to and how will we communicate in the future?”, since all that we know for sure about future is that it will be different from what we imagine at the moment. However we expect that the past decade’s two massive hits, mobility and Internet will play a part also in future’s telecommunication systems. The first steps have already been taken: during the past few years telecommunications and datacommunications have been converging. Now you can make a telephone call over the Internet, although there is still a lot of work to be done until it meets the high standards characteristic of telecommunications. When designing the next generation of mobile telecommunication systems the main objective is to enable data transmission in a mobile environment. This may hint at the fact that Mobile Internet will require a large bandwidth and a quality higher than that of today’s best effort services.

Today, mobile communication is primarily signified by GSM technology, but there are certain countries, such as the USA and Japan where different mobile systems, based on other standards, are general. This limits mobility, as GSM mobile telephones can only be used in countries that use GSM standards. Therefore it is very important for the future communication systems that the whole world uses the same standards and principles. Third Generation Mobile systems (3G) are designed to offer several features of the Mobile Internet. The

standardisation of 3G systems is performed by 3GPP, and is aimed at being accepted globally, after all this could be the key to the realization of the Mobile Internet.

We have already seen similar attempts aimed at the unification of the world's telecommunications. In the early 90s telecommunication researchers and developers were excited about the transfer to B-ISDN (Broadband Integrated Services Digital Networks) technology. According to the plans B-ISDN would have replaced the telephone network, at the same time promising the possibility of several new applications beside voice transmission. The concept included transmission of high-resolution still and motion pictures, videophone and data transmission. Based on the standards still valid, B-ISDN networks would have been based on the ATM (Asynchronous Transfer Mode) network protocol. Under the ATM layer the standard pictured a logical network built on optical cables with mainly SDH (Synchronous Digital Hierarchy) technology.

By now we can see that the world has passed by the original ideas of B-ISDN, without realizing them. The reason for this in all certainty is not the lack of demand, since during the one and a half decades elapsed since the design of B-ISDN, a global wide-band transmission network came to life, offering almost exactly the same services that had been planned to be the tasks of B-ISDN. By now apart from electronic messaging and data-base access, Internet can be used for making phone calls, what is more, various multimedia applications keep appearing all the time. While B-ISDN's planned Video On Demand service (a video library over the network) stayed on paper, the music-exchanging programs offered by the Internet gained ground in no time and gave the big music publishers plenty to think about.

The failure to realize the B-ISDN conceptions cannot be explained by the unsuitability of the selected technology either. Since today ATM is one of the important elements of Internet, replacing previous solutions in more and more networks. This phenomenon, however, properly indicates the basic difference between B-ISDN and Internet. When designing B-ISDN the objective was to

describe the entirety of a telecommunication network, from physical layer, through network protocol to applications. The first logical step of this design method was to determine future services that needed to be taken into consideration in every further step of the design process. The elements of the standard were fitted together so that they served the ultimate purpose – the application provided for the user – in the best way possible. Advantages of this vertical approach are evident, supposing that we really know future applications in advance and we can choose all elements of the system we are about to build. As a result of the linking of design steps, however efficient is the system in the conditions originally planned, it is just as inflexible when certain elements have to be modified because of the changing of the basic conditions (e.g. emergence of new services).

Internet is structured in accordance with horizontal design principles, radically differing from the above method. Each protocol level is designed to provide simple services for the layer above, thus ensuring independence of the application. This explains why Internet hardly achieves the service of quality of telecommunication networks, but at the same time surpasses by far the traditional telecommunication networks as regards flexibility.

Horizontal design principles result in the basic design attribute of the TCP/IP protocol family, its so-called end-to-end nature. The end-to-end principle means that a significant amount of network functions are delegated to the terminals. For example in end-to-end networks encryption, fault-free transmission or reliable delivery of messages constitute the responsibilities of the terminals, not those of the networks. In such networks the network itself performs dull and simple data transmission, while terminals are intelligent, and it is their task to perform difficult operations.

This principle is diametrically opposed to the design principles generally used in telephony or conceived in the case of B-ISDN. There, terminals are simple and it is the network that provides the difficult services. Call transfer, short numbers or automatic redial when a busy line is disengaged are such services.

This sort of design is extremely advantageous for the network operator from a business point of view, since the network operator decides about the introduction and the charging of the services. In an end-to-end network the above functions are available from the terminal, therefore they cannot bring extra profit.

In a certain sense every network that provides data transmission services is automatically of the end-to-end character. In this way the spreading of fax machines means the end-to-end utilisation of the telephone network, where the added value of communication is provided by the fax machines, not by the network. Similar applications are the answering machines or automatic call-center services operating with DTMF signals. In these cases, just like above, the telephone is used for data transmission, while the value-added part of the service is realized by the terminals. The principles according to which the converged global network will be structured will seriously determine the connected business model as well – which is, as yet, significantly different in the case of telephone and Internet networks.

The horizontal design and the end-to-end nature also enables the very fast spreading of Internet applications. The most striking example is WWW that became almost completely dominant on the Internet within 4-5 years. You can never know when a new and explosive application, a so-called 'killer' application emerges and starts to spread with enormous speed. In the case of napster a totally new application gained ground very rapidly, within just a few months, resulting in very high traffic on the network. Under such circumstances it is rather difficult to design for the future. This fact is one of the important lessons of the Internet: future applications and traffic are very hard to foresee.

However it is not only the applications that come up with new variations, ownership structure of networks and related business conditions are continuously changing as well. The academic network – financed by state funds at the beginning – has been entirely commercialized within a few years. What is more, several 'species' of Internet service providers were formed, beginning from the ones operating international backbone networks to the enterprises adjacent to

subscribers. Their connections, the exchanging and charging of traffic are continuously changing as technology advances. This change may be accelerated by the emergence of the wireless Internet. What kind of economic frames are ideal for operating such networks? Will the services be provided by several small enterprises connected to busy locations, like airports, hotels or shopping malls via their owners? Or will these be operated by a few large companies? These questions raise not only business, but also regulatory issues concerning interoperation and alliances of networks.

Nowadays Internet is more than a communication network and a source of information, it is also an important stage of the society and the economy. This may result in new phenomena, sometimes problems that we could not imagine before. Information stored and transmitted on the Internet raise copyright issues in an increasing number. The possibility to store electronically, copy and transmit pieces of music urge big music publishers to elaborate new solutions for legal/technological protection, or on the contrary, to agree with Internet-based distributors. The growth of Internet economy and the transmission of important economic data via the Internet make it necessary to develop encrypting and security solutions. At the same time, however, it is required that, if needed, authorities may check the information streaming on the Internet. This inevitably affects legal questions and launches a debate, in which the right to free and confidential communication is opposed to the authorities' right to control.

Internet's international character makes it more difficult to determine legal and economic affiliation of activities on the Internet. Arising from the very nature of the technology, an Internet service provided in one country is accessible in all other countries as well, regardless whether the activity in question is legal in the given country, and if so on what conditions. Furthermore it is not evident which country should account for the results of the Internet economy.

Finally, while Internet use is spreading almost everywhere in the world, we must not forget that this will not reduce the differences between certain countries and regions, what is more, in several cases it will further increase them. Internet

creates an opportunity to get closer to faraway people and lands. The use of the network may make economic and cultural life more efficient, and through this, may give a chance to less developed countries to reduce these differences, but only if the given country can make the best of the opportunity. They have to learn how to use its capacities.

The number of mobile phone and Internet users is rapidly growing in the world. The number of users in itself offers the Mobile Internet, several novel application and technologies the opportunity of spreading. As the saying goes "More is different¹". An aggregate of cells is more than just a set of cells, it has a new quality, it is an independent living being. Similarly, the joint application of existing and already available technologies in the not so distant future will result something of a different quality, something completely new. If we are able to take the opportunities offered by this enormous change, we will be able to take a huge step ahead.

¹ P. W. Andersson, Science 177; 1972, pp 393-396

