DATA COMMUNICATIONS ACTIVITIES IN THE FEDERAL REPUBLIC OF GERMANY

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1 Introduction

Since the mid-sixties, when the first public data services were introduced, the Deutsche Bundespost has endeavoured to meet the demands of the market for communications and to enable the data customers to perform their different data processing functions in an efficient and economic manner. To achieve this objective, as required under the mandate conferred on it by law, the Deutsche Bundespost operates public telecommunication networks. Whereas in the beginning there existed only one possibility of data transmission, namely the public switched telephone network, new applications of data transmission have been made available in recent years. This process is still going on. Within the next few years, the data services offered and the number of facilities available to our customers will continue to grow.

The purpose of this paper is to give a survey of the current situation in the field of data communications in the Federal Republic of Germany and to provide an insight into the present stage of our projects.

2 Existing Facilities

At present, four networks are available, viz.

- the telephone network
- the telex network
- the circuit-switched Datex network
- the public data network for fixed connections.

The number of terminals connected is shown in the table below (as of April 1979):

Telephone network	26.000
Telex network	(120.000) (telex)
	+ (450) (data)
Circuit-switched	1.000 200/300 bit/s
Datex network	800 2.400, 4.800 and 9.600 bit/s
Data network for fixed connections	34.000
Total (data) approx	62.000

Table: Number of data terminals

In addition to parallel data transmission, bit rates of 300 bit/s dx, 1,200 bit/s hdx and 2,400 bit/s hdx are admitted in the telephone

network. Field trials performed with 1,200 bit/s dx and 4,800 bit/s hdx have been encouraging so that it is very likely that these extended possibilities of transmission will be offered in the near future.

In 1975, the circuit-switched Datex network, which is based on the electronic data switching system was introduced with the aim of taking over telex and data traffic. At present, the subscribers are almost completely connected to a total of 21 EDS exchanges. In 1976, a public switched service operating at 2,400 bit/s was opened, followed by 4,800 and 9,600 bit/s in January 1979. The subscribers are offered an increased set of new optional facilities, such as

- direct call
- multiaddress calling
- line identification
- closed user groups
- reception of charging information after release of a call
- advice facility (station barred to incoming traffic; sending of text to the calling party).

Figure 1 gives an impression of the distribution of nodes of the circuit-switched Datex network.

Because of the prevailing asynchronous traffic, the first development phase of the system aimed at handling this traffic optimally. However, the initial demand for synchronous data classes can be met quite satisfactorily even with the present structure of the EDS. In addition to about 10,000 telex and 200/300 bit/s asynchronous terminals, approximately 2,000 terminals of the synchronous data classes of up to 9,600 bit/s may be accommodated in one exchange. The data terminals are connected via interfaces X.20, X.20 bis and X.21 bis.

It was not always possible to immediately satisfy the subscribers' needs with the technical possibilities available.

- access to Tymnet and Telenet

To enable the subscriber to handle traffic to the Tymnet and Telenet, a Tysat concentrator was installed in Frankfurt am Main.

Since mid-1977, German subscribers have thus access to these networks via the public switched

telephone and Datex networks.

- BERNET

Although not generally accessible but considered as a public network for private use, BERNET represents an example of the great efforts of the Deutsche Bundespost to provide public services quickly upon the subscribers' requests.

BERNET is a computer communication network of Berlin Science, for example, the Scientific Computer Centre of Berlin and the Hahn-Meitner Research Institute. The telecommunication subnetwork has been established by the Deutsche Bundespost within the framework of pilot projects in packet switching. It is the first network in the Federal Republic of Germany for which the Deutsche Bundespost provides a packet switching service for the transport network, applying the interface in accordance with CCITT Recommendation X.25(LAP B).

Northern Telecom, the winner of the international tender, has put the system into operation early in 1979. The network configuration is shown in Figure 2.

- EURONET

From a number of publications, it has become well-known that the Deutsche Bundespost also takes an active part in the joint effort of the European PTTs to operate the EURONET.

3 New Developments

3.1 Circuit Switching

It has already been mentioned that the existing network was primarily designed for handling asynchronous traffic. However, because of the large amount of synchronous traffic expected, appropriate additions will have to be provided in the network to cope with this demand. Although the present state of the circuit-switched Datex network allows about 40,000 terminals of the synchronous user classes 2,400 - 9,600 bit/s to be connected, it was already started to develop these additions in the switching system EDS so as to be prepared for any future increase in traffic. Since, from the very beginning, this supplement was intended to be made, the exchanges can be subsequently equipped with this model at relatively low costs. In this way, the EDS will substantially increase its efficiency.

By increasing

- the throughput by a factor 5 (this can be achieved by envelope switching instead of switching polarity reversals)

and making use of

- a call rate of up to 360,000 calls/h
- X.71 signalling
- an interface according to CCITT Recommendation X.21

- X.51 multiplexors

the EDS system will satisfy all needs and meet any future requirements for circuit switching services.

The equipment will be available by 1980/81.

3.2 Text Communication

With the availability of the EDS supplement for synchronous classes, a new service for text communication, the TELETEX service, will be offered.

Since TELETEX, the new text communication service which is being defined in CCITT Study Groups I and VIII, is not yet generally known, some of its most important characteristics shall be listed below:

TELETEX shall become a worldwide compatible service like telex, be designed for the higher data signalling rate of 2,400 bit/s and have an extended character set (comparable to the character set of a regular typewriter);

TELETEX terminals shall be suitable for being used in the public TELETEX service as well as for replacing common electronic typewriters including editing and possibly processing facilities.

Basically, TELETEX represents a typical case of single-machine to single-machine communication like telex including access to and from PARXs, even if machine-to-computer communication is not excluded. The end-to-end protocol of the TELETEX terminals will be defined in detail like the existing telex protocol so that the terminals will be compatible with one another from the very beginning and no protocol conversion by the network will be required. For interworking with telex, a conversion unit will be provided for in the network.

It is intended to offer the new service in 1981 in the 2,400 bit/s class of the circuit-switched Datex network. No doubt, this new teletex machines could replace the existing telex machines considerably. Figure 3 shows the development of terminals in the telex and TELETEX services, as expected according to a study supplied by the Eurodata Foundation.

3.3 Packet Switching

The great variety of requirements to be met in the field of teleprocessing and the increasing number of applications call for an extension of the range of public data communication services offered by the Deutsche Bundespost. Any additional requirements imposed on these services as well as the Deutsche Bundespost's own demand can be met appropriately by a public data packet switching network. Furthermore, such a network may allow an easy future implementation of services for message switching and data storage.

In December 1978, the Administrative Council of the Deutsche Bundespost agreed to the proposal of the Federal Ministry of Posts and Telecommunications to include packet mode of operation in the services offered by the Deutsche Bundespost.

Undoubtedly, the users will benefit from this offer so that the provision of the packet switching service is justified. The following advantages should be mentioned:

- extended compatibility among the subscribers by the obligation to use standardized protocols for data transport
- extended possibilities of data communications
- extended range of facilities of the data network.

From the viewpoint of the Deutsche Bundespost, packet switching is an effective extension of the services offered which will strengthen the position of public switched data networks.

The packet-switched Datex network will primarily support the use of computer networks as well as dialog applications, especially in cases where compatibility between terminals has to be provided.

On the other hand, the circuit-switched Datex network may offer cost advantages to the customers in the case of batch applications and low traffic.

In the future, the customer has to weigh carefully the pros and cons of each network to take full advantage of the range of facilities available. This is rendered even more difficult if the characteristic features of each network play only a minor part in his application of data communications.

In close co-operation with potential customers and user organizations and the manufacturers the Deutsche Bundespost has taken all measures hitherto required for the introduction of the new packet switching facility. The problems resulting from the implementation of packet switching are being dealt with in a formal working group of subscribers. This ensures that the subscribers will have completed their preparatory work when the service will be introduced in 1980. In this way, they can immediately take advantage of the new facility. In the first year of operation, no charge will have to be paid by the subscribers. The salient feature of charging is that the traffic charges will not depend on the distance. The charges will consist of a

- monthly basic charge (where applicable, surcharge for multiaddress and other surcharges)
- traffic charge
  - . duration charge
  - . volume charge
- other charges
  - . access charge

- . PAD charge
- . surcharge for optional user facilities

The facilities include

- user rates: 110 - 300; 1,200; 2,400; 4,800; 9,600; 48,000 bit/s
- access from the public switched telephone network, the telex network, the circuit-switched Datex network (see Figure 4)
- multiple access
- virtual call and permanent virtual call
- reverse charging
- closed user group
- packet assembly/disassembly (PAD).

Interconnection with data packet switching networks in other countries is envisaged.

3.4 Interactive Videotex

Since the end of 1976, the Deutsche Bundespost has been working intensively on the interactive videotex system which, in the Federal Republic of Germany, is called "Bildschirmtext".

With the kind assistance of the British Post Office, the interactive videotex system was first introduced to the public in Germany in the autumn of 1977 using the viewdata system as a basis. The response was very positive.

Since the beginning of 1978, interested information providers have the opportunity of testing the interactive videotex system themselves within the framework of technical trials. At present, more than 160 information providers are participating in these trials.

In 1980, the Deutsche Bundespost will conduct a major field trial in the area of Dusseldorf and in the city of Berlin with a total of 6,000 videotex terminals. In this field trial mainly private customers are to participate. This trial is to show whether a widespread private interest in the interactive videotex system is to be expected. Private interest will determine in the first instance whether propagation of the new service in terms of subscribers will be as wide as in the case of the telephone service. This will have a great influence on the technical concept and the amount of the charges raised. If the result of the field trial is positive, the interactive videotex system is to be introduced generally as from 1982.

The technical concept of the interactive videotex system provides for the setting up of a larger number of interactive videotex centres. These centres, for which flexible extension for up to 70,000 subscribers is envisaged, will communicate with one another over the planned public data packet switching network. This computer inter-

working system will also include private data bases and private data processing systems. Subscribers will reach the centre assigned to them over the telephone network at the lowest tariffs applicable in this network. They may call up information from the assigned centre as well as from all other interactive videotex centres and from the connected private data bases. The connection of private data processing systems will provide the interactive videotex subscribers with direct access to data teleprocessing.

The modem required at the subscriber's end is equipped with an automatic calling facility for dialling the assigned interactive videotex centre and with an automatic answerback unit permitting identification of the subscriber's station by the centre. The cost of the modem, which is not integrated into the receiving equipment, is very low.

The Deutsche Bundespost will make possible the connection of private data processing systems already in the 1980 field trial. For this purpose, definition of an interim standard for the higher protocol levels of X.25 is necessary; an interim standard for the character set is likewise required. In the opinion of the Deutsche Bundespost, it is most desirable that the CCITT should adopt definitive Recommendations before the end of this study period, if possible. Otherwise, there is a great danger that, on account of the progressing introduction of interactive videotex systems in the individual countries, a common standard will no longer be achievable.

In the "Bildschirmtext" service, the Deutsche Bundespost will only provide the telecommunication facilities but not the information itself.

- Facsimile

In 1975, a special national committee, which was appointed by the Government and charged with the studying of the issue of telecommunication in the Federal Republic of Germany, came to the conclusion that an appropriate public facsimile communication service should be offered. So far, facsimile equipment conforming to the relevant CCITT Standards has been offered by a great number of manufacturers. However, interworking of this equipment was not possible in many cases. Moreover, the absence of a directory resulted in a restriction of the general use of this equipment.

At the beginning of 1979, a facsimile service called TELEFAX was introduced which at present is based on equipment of group 2 and carried over the public switched telephone network. In general, the telecopying machines are installed by Deutsche Bundespost staff. It is only allowed to install equipment which has been approved by the Administration. This approval is given if the technical and operational installation requirements are met. Prior to installation, it is also checked whether a maintenance contract has been concluded and the contractor is authorized to render maintenance services.

The following services are offered by the Administration:

- special directory for TELEFAX subscribers
- an additional mark in the telephone directory
- information service
- operating instructions for subscribers.

The Deutsche Bundespost is also a supplier of telecopying machines (which it maintains itself) and thus stands in competition with the private firms engaged in this field. The Administration's decision to lease such equipment was not undisputed. No doubt, however, this solution will increase competition on this market, a fact which will certainly be of benefit to the consumer.

Certain circles had reproached the Deutsche Bundespost for its behaviour which allegedly extended its monopoly and hampered competition. From the Deutsche Bundespost point of view, this reproach was unfounded. The TELEFAX service is a good example of how cautiously the Deutsche Bundespost uses its monopoly rights.

What had happened? After a thorough weighing of all pros and cons, the Administration had resolved not to offer telecopying machines only by itself, as is done by some other European Administrations. It wanted to lease its equipment in competition with other private firms. This attitude was not shared unanimously. The Deutsche Bundespost which has provided this service at the subscribers' special requests, had no interest in ousting other firms from this service. On the contrary, there was a tendency to keep the Deutsche Bundespost out of its own service.

With its terminal policy, the Deutsche Bundespost pursues the following objectives:

- a qualified further development of the technical systems
- impartial provision of the population with communication services
- stimulation of competition by offering its own equipment
- protection of its own substance from the viewpoint of economy and employment policy.

3.5 Electronic Mail

It goes without saying that, because of the highly developed state of facsimile technology, the possibilities offered by this service are also taken into consideration to improve the mail transfer in the postal services.

Early in 1980, the TELEFAX service is intended to be combined appropriately with the facilities of the national postal service. For this purpose, the post offices will provide this service to those customers who have no telecopying machines

of their own. The Electronic Mail will be delivered to the addressees by the express service.

Since mid-1979, a field trial has been carried out by different European Administrations with the United States (United States Postal Service), in which the Federal Republic of Germany is participating. Figure 5 shows the configuration of this field trial.

During the field trial, some hitherto unexperienced problems have been encountered on the postal side. New directives will be necessary for the letters to be mailed, which regulate, for example, the size, folding, writing, colour, envelope in consideration of these new conditions. Special difficulties will have to be overcome in the international traffic because of the different standards used for the envelopes, the position of the windows and the letter format.

4

Conclusion

In this rough survey, it was only possible to deal with the new facilities and services offered by the Deutsche Bundespost. However, a description of their technical implementation would have gone beyond the scope of this paper.

The Deutsche Bundespost is fully aware of the heavy responsibilities it bears towards the public as a result of its task to install and maintain communication systems.

It has been shown that the Deutsche Bundespost has been making every effort to adapt its data transmission networks so that they meet the steadily growing and changing requirements. Novel means of data transmission are used to offer telecommunication and postal customers new or improved services. Since new services will be accepted by the users only if the charges levied for them are attractive, all technical and economic possibilities will have to be taken into account to achieve this objective. The terminal policy of the Deutsche Bundespost is aimed at enabling the user to take full advantage of the services offered.

References

The references will be supplied later on.