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FOREWORD

The goal of this study is to give an overview of the necessary conditions and/or requirements for the application of ISDN in Germany. This information should help successfully launch ISDN applications in Germany, in this case the 64kbit inquiry station for the GEOTEL. project.

In preparing this information about Germany, the following Work Packages were taken into particular consideration: 122/123 and 210.

The topics "satellite communications", "Datex-P", "Datex-L", "2 Mbit work stations", "first user reports" and "pilot applications" will not be handled in this section, but will instead be dealt with in another context.

It should be mentioned that the structure of the DBP has been changed since 1. July 1989. The DBP is now represented by three firms: DBP POSTDIENST, DBP POSTBANK and BMPT (See Annex: "Die strukturpolitische Verpflichtung der Deutschen Bundespost bleibt gewahrt").

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1.1. HOW ISDN WAS LAUNCHED

1.1.1. Technical Aspects

ISDN stands for Integrated Services Digital Network. It is one of the integrated services digital networks which is now being tested and introduced in Germany as a possibility for a future worldwide network with worldwide standards.

Integration: The user can connect up to 8 different data terminals with ISDN-BRA (maximal 4 telephones for reasons concerning the power supply: more than 4 telephones can not be fed by the emergency power supply) these can all be reached with **one telephone number** (global call).

Service: That means higher quality. You can **transmit all sorts of communication:** language, texts, data and pictures at the same time, and in places where, up to now, it was only possible to transmit information using the basic telephone (analog). With the **BRA** you get two lines, and with the **PRA** 30.

Essential requirement: uniform digitization. That means that each analog signal is read off, measured and transmitted in .8 bit sequences of binary numbers 8000 times per second. This changeover from the analog to the digital system leads to a data flow of 64 kilobites per second (8000 times 8 bits = 64 000 bit/s = 64 kbit/s).

Network: The ISDN Network is simply our telephone network. This new technology allows for much better and more effective use of the telephone network. The transmission capacity today allows for the packaging of two 64-kbit/s-channels, as well as for a further 16-kbit/s signaling channel. This signaling channel is necessary for, among other things, the controlling of the various services and the connection setup and release.

1.1.2. Services

Telephone: The user can expect improvements in speech quality and luxury as soon as he has the ISUP (the ISDN User part), which is needed for outband signaling, installed.

Text services: The transmission time is reduced, and the reproduction quality of the facsimile should be improved.

Data transmission: This should be investigated as an alternative to the offers which have been made up to now, from a funktional point of view, as well as from a cost perspective. At the same time, new special applications should be tested: TELEBOX, a type of electronic mailbox, and TEMEX, a special type of process communication, which is planned especially for the area of remote control services.

Video transmission: Should first be looked at in terms of freeze-frame Image transmission, and then for new usage perspectives.

Interactive videotext: It has still not reached its ideal audience. However, it has a chance to merke a big splash as the typical form of application for the ISDN base terminal because of its mach shorter picture setup time.

Network interworking: The task here will be to Look at the lines which are aiready in existence using the analog technology, and to see if it is possible to connect them to the new network configurations for further use.

The service attributes which ISDN offers are incredibly diverse: Call waiting, call redirection and/or call forwarding, display for call number, service identification and exchange, terminal equipment selection and exchange, advice of charges, closed-•shop test system, multiservice operations, locking device, as well as changing of logen authorization, and bus changeover.

Besides these technical aspects, the DBP's interest can be summarized with the following questions, especially those which pertain to the acceptance and economic prospects of ISDN:

"- Dia the characteristics of ISDN call for an increase in demand from the customer's perspective?
- Are they attractive from an economic perspective?
Do the customers actually receive more for the same money than they already get with the current communication services?" (Joachim CLAUS, DBP, in: telecom report 9, 1986, Vol. 2, P. 107).

According to the DBP engineers: "Although studies about the marketing chances of ISDN take place through the questioning of ISDN pilot project customers, the technical testing of the whole ISDN System is in the foreground".

In the early stages of implementation, the DBP thought that the product advantages would be enough in and of themselves to launch ISDN. The DBP thought that its imminent advantages would bring the product onto the market almost by themselves: ...more than that, the DBP goes an from there that ISDN's attractiveness "speaks for itself" (loc. cit.).

Even though the DBP had its hands an this newest of communication networks, the most businessmen **were** unaware of its potential use in their offices and business dealings. Another Problem is that quite a few potential ISDN users were discouraged by controversial discussions about technical details, standards and security fears. Therefore, the DBP intended to **gear its Marketing** strongly toward the middle-•class companies, with a main emphasis an upgraded t:elephone services.

1.2. THE DIGITAL NETWORK SINCE 1979

On March 8, 1989 the ISDN lines were officially opened in Germany by Chancellor Kohl and the Minister of the DBP, Dr. Christian Schwarz-Schilling, in 8 local telephone exchange areas (See Annex: "Ansichten und Einsichten rund um ISDN"). But although the lines were just opened, the decision to do it was made ten years ago.

Since 1979 the DBP has given the development of this integrated services digital network top priority. Why? The advantages of a digitized transmission network convinced the DBP to go ahead with the plan, and therefore a decision was made to complete the switching node through stored program switching systems.

Just about half of this decade passed with planning and a competitive presentation, during which local and long distance switching centers were tested. The **first** of these were put into operation starting in 1985, either using equipment from Siemens (Siemens system EWSD) or Standard Elektrik Lorenz (SEL-System S12).

With this transposition the long distance switching center took priority over the local switching center. First of all, since this time only the digital systems were expanded, and secondiy, this was done using the new equipment. Both measures were pushed above all in the large metropolitan areas. And finally, since 1986 the introduction of a central signaling system was tested, using the CCITT-suggestions.

Parallel to that, since 1982 only pulse code modulation systems were provided for the regional networks, so that about one third of the long distance trunks are now digitally carried.
The following are offered:

PCM 30 with 2 Mbit/s for balanced cable
PCM 480 with 34 Mbit/s for balanced and coaxial cable
PCM 1920 with 140 Mbit/s
PCM 7860 with 565 Mbit/s, both for coaxial and optical wave guide.

The real virtues from the user's perspective are centered an what these new configurations can actually do: namely a four-wire switching of the *64* kbit/s channel in an existing network, which up to now was carried exclusively analog over balanced copper connected wires. A Palette of new service possibilities are opened up without having to lay down new cable.

It should be stated that some of the items which have been introduced via ISDN could have been made available with standard hybrid technology as well. But as the DBP's policy was to promote telephone services before everything else, this decision was more Marketing than technically oriented.

In the meantime, it turned out that the most important economical reason to seil ISDN PDXs was that the BMPT regulations could be officially bypassed. Direct inboard dialing was only possible when there was a minimum of 8 lines connected to the user's office. With the new ISDN boards, this feature can be utilized by just connecting 2 or more lines.

PC applications were not very widely used, but it turned out that the data transmissions were rated as stabile, safe and cost effective.

1.3. REGIONAL PILOT APPLICATIONS **1986 – 1989**

For a decade the DBP has been the technical forerunner of a new technology. **The long term goal is:** to operi up the lines of communication by integrating the networks and services which were historically separated from each other (the number of lines given represents the number at the end of 1988 unless otherwise noted):

- Telephone 3,1kHz (28.7 million lines - 30 million in 1990)
- Facsimile transmission service group 2/3 (197 thousand lines)
- Teletex (160 thousand lines)
- Interactive videotext (147 thousand lines)
- Datex L (CSDN) (22 thousand lines, including Teletex)
  Datex P (PSDN) (33 thousand lines 50,000 in 1990) (See Annex: "DATEX-P Anschlußentwicklung")
  HFD (Public leased circuit for data communication over a fixed circuit) (184 thousand lines).
- Radio Telephone (200,000 lines in 1990)
  Broad band cable (14 million lines to be connected) (See Annex: "Übersichtsinformation Kabelanschluß")

In the pilot projects which have been operating in **Stuttgart and** Mannheim since 1986, the first goal was to test the new soft and hardware, and to determi.ne whether or not the test models, which were delivered by the industry, are compatible with each other and with the specifications of the DBP.

The original objectives of the DBP are stated below:

"Test all of the technical components of ISDN from the home exchange, the home cabling and the digital telephones, ISDN-teletex-data terminals, ISDN-telefax-data terminals and multi-service data terminals. (...) Test all the locations for conformity with the specifications. (...) Check all specifications for their operative applicability, in order to minimize the risks for the DBP, the communication industry and the customers before a nationwide introduction in Germany" (Meinrad ADELMANMN, Peter KAHL, DBP: Das ISDN-Angebot der deutschen Bundespost. Mehr Spielraum für Telekommunikationsanlagen. In: net special 1988, Vol. 1, P. 82).

1.3.1. Studies

A long list of institutions carried out accompanying studies together with the DBP during the pilot attempts:

- das Institut Roland Berger und Partner
- die Universität Mannheim

Further studies have been done an location:

by the DBP itself
- the affected firms, such as Siemens, IBM, BASF
at the Ludwig-Maximilians-Universität, München
- von Mü Tel. Münchner Telekommunikationszentrum e.V.
- von der Industrie- und Handelskammer Hannover Hildesheim.

Most of these studies were requested by the DBP and were not made available to the public. Some of the results (especially those which were favorable) have been presented at public events. In general, it was easier to get public statements from private companies than from the DBP.

1.3.2. Pilot Results

It should be made clean from the outset that there was a great **lack of reliable information available.** But the general consensus from the available information was that the acceptance was 1('w among at least one third of the users. **Some of the reasons** which have been given for this result:

- There was **no real knowledge** of what the new service could do

- Problems in dealing **with the data transmitters**

Shortage of time and possibilities to study the instruction booklet for the data transmitters

- The **non-voice services** were confined to the pilot areas

- In these there was a **shortage of communication partners**

The **facsimile machines** which were made available to the pilot areas proved to be **incompatible** with Chose from group 3

- Also a lack of other explanations that go beyond these

- No Real Installation/Equipment Costs (although the time Investment could be considered a cost). Because this aspeot is so important, we will go into it in greater detail:

Concerning this economic part of the pilot applications which were carried out in Stuttgart and Mannheim, no actual cost calculations could be carried out (either by the DBP or its customers) for the following reasons:

All of the data transmitters put into use have been aquired and put: in exclusively by the DBP at customer production costs

- The laying and setting-up of the lines were cost--fr•ee as was the purchasing of the data transmitters (which were often delivered late and did not always function properly)

- Any line and especially any transmitter failures, as well as any service or equipment exchanges, were takten care of by the DBP, free of charge

- The ISDN users in the pilot project were given a complementary bonus of 200 units per month.

Many participants were excited about several of the following features in particular:

- display for call number

- call redirection

- automatic call back when the line is busy

  multiservice terminal

  greater transmission speed

  better transmission quality

  easier coordination

To sum it all up: They could be more easily and more quickly reached. Since they had ISDN, they also used the telephone more.

As already mentioned above, not all of these features are ISDN specific, but were regarded as such because they were first made available with the introduction of ISDN.

In contrast to those results, **we have the estimates which were made before the project began.** At that time, the decreased costs were the main point ahead of the advantages of improved work quality and capacity: 66% of those asked put the cost-saving in first place (Begleitsforschung zum ISDN-Pilotprojekt: Statusbericht, Erwartungen an den verstärkten Einsatz neuer Telekommunikationsdienste. In: ISDN Congress Report 1987, P. 367).

We know from the results at hand that the cost advantages played a small role (11% of those questioned) in the decision to take part in the project (Karl Heinz Rosenbrock, DDBP u.a.: Hoffnungsvoll bis optimistisch. Bilanz der ISDN-Pilotprojekte in Mannheim und Stuttgart. In: Telekommunikation heute. ISDN. Anschluß an die Zukunft. Special Edition from: *mittelständische wirstschaft* 1/1989, P. 26).

Looking at the **questionnaires** which were filled out by the participating groups before the project began, it is clear that their expectations were not in line with the specific qualities which this new technology had to offer: **Fewer than 10%** mentioned advantages such as networking possibilities, greater luxury **and** Integration of services. More than that, **they just did not want to miss out on beine connected** to this new technology. And at the same time, they did not want to be tied down to the information from the manufacturer, but wanted to use their own experience to form an opinion about it (loc. cit.).

These statements, müde solely by decision makers or so-called "informed decision makers" from the business sector, totally exclude the opinions of private households, and they give feedback from only a small percentage of the production trade. The participants came above all from industries and orqani-zations which are non-profit-oriented authorities). **Insu-rance and loan companies, as well as free-lanceworkers were the main** participants.

Before closing this section, it is interesting to observe the **attitudes** of different kinds of firms toward ISDN at the time of the survey, 1987: the **small firms** had a more open attitude than the **big firms**, which tended to be either indifferent or cri-tical. Why? One reason could be that there were so mang new applications in new technologies coming out on the market in Germariy at the time, and they were aimed at the larger companies - so by the time ISDN reached them, they had already been saturated with new developments.

1.3.3. Our Own Results

In addition to the pilot results which are mentioned above, we can add a few things from our own experience at IRIS. We believe that the following supplementary results can shed some light an other aspects of the ISDN pilot projects in Germany. We add that although they are generally typical, they may not be representative.

- From the beginning, it was very difficult to find participants who were really interested in the project.

- Some participants let themselves be equipped with data transmitters for reasons of prestige which had nothing to do with their actual possibilities for use.

Exclusive use of the network was not possible, as there were too mang rough edges that had to be ironed out before it would function properly.

No Integration in the data processing cooperative (EDV Verbund) was offered.

- No ISDN hunt group was available.

It is also questionable to what extent the participating groups can be called "typical clients" in regard to their structure and application of data transmitters. Certainly most of them were laymen in terms of ISDN.

One year later, the first 400 participants in the Stuttgart Network were introduced to ISDN **(in Mannheim** lt was first in 1989/90).

Since March 1989, the first participants were able to communicate with each other using this network from Hamburg, Berlin, Hannover, Düsseldorf, Frankfurt, Stuttgart, Nürnberg and München. At this time, 3000 were BRA and 650 PRA (See Annex: "ISDN-Serieneinführung an acht Standorten").

At the CeBIT 1990 DBPT press conference (20.03.90), lt was stated that an ISDN line for the Fax G4 would be opened from Hannover to Frankfurt.

At that moment, 3,000 BRAs and 400 PRAs had been requested, which means 18,000 ISDN B-channels. According to Helmut Schön, an the Board of Directors of DBPT, this is a satisfying result after the first year. However, at least 300,000 connections have to be installed before the application is profitable ("kritische Masse").

In order to promote the use of PCs in the network, lt was decided to give each new user of any kind of PC-ISDN card a kickoff payment of DM 888,-. Secondly, a promotion program for Pilot project applications has been successfully launched.

In the meantime, ISDN capable OV Stations have been opened in 39 cities, and by the beginning of next year the number of cities should increase to 135. In this way, the ISDN access is becoming wore widespread: By the end of 1993, a blanket coverage of Germany should be attained (See Annex: "Das ISDN-Angebot der Deutschen Bundespost").

2.1. COSTS

Costs for universal access

With ISDN two typen of services are possible:

* the **BRA**, which gives you two lines (2 B--channels with 64 kbits each, plus 1 D-channei with 16 kbit)

* the **PRA**, with 30 lines (64 Kbits each, plus 1 D-channel with 64 kbit).

	One-time char9e	Monthly char9e
BRA	130,-DM	74,-DM
PRA	200,-DM	518,-DM

Various service attributes are included in these fees:

- Terminal equipment selection an bus
- Bus changeover
- Change in service
- Call walting and call number indication

The following services are available upon request, some free of charge:

Locking devices:

Full locking device (Locking device A): One-time charge of 15,-DM

Switched locking devices (Dienstabhängige Sperre bestimmter Selbstwähl-Verkehrsbeziehungen: Locking Device B) / Sperre bestimmter Selbstwähl-Verkehrsbeziehungen: Locking Device C): Monthly charge of 15,-DM

Closed user group with or without external traffic: Monthly charge of 30,-DM

Transfer of charge information: Na charge

Detent of incoming switched connections:

On the Ist day: Daily charge of 20,-DM

From 2nd - 4th day: Daily charge of 10,-DM

- From 5th - 8th day: Daily charge of 5,-DM

- From 10th day on: Daily charge of 1,-DM

Call redirection: Monthly charge of 3, -DM

Call .. fprwarding: Monthly charge of 5, -DM

Continuous activation: Monthly charge of 3,-DM

Connection transition to Datex-P

The additional set-up to the network nodes of the DBPT is called "Interworking Port", and takes care of the transition from ISDN to Datex-P. The monthly charge depends an the transmission speed of Datex-P. Connection transition to Datex-P with a transition speed of:

2400 bit/s: Monthly charge of 140,-DM, One-time charge of 65,-DM

- 4800 bit/s: Monthly charge of 240,-DM, One-time charge of 65,-DM

- 9600 bit/s: Monthly charge of 340 -DM, One-time charge of 65,-DM

The monthly charges include the connection charges to ISDN and the lease and rental prices for the interworking gort. In addition, the connection charges for Datex-P-10-services will be collected. The installation charges for the data terminal X_25 are determined by the necessary expenses.

ISDN-Bus installation

Just like the ISDN data terminal.s, the network (So Bus) is offered by the DBP. The placement, alteration or maintainance of the So

Bus will be charged for according to expense. The minimum charge is 65,-DM and from then an, the bus is the customer's property.

Char9es for a switched connection ISDN

The charges for switched connections depend an time, distance and type of service. The charges are identical to the current charges for telephone connections, independent from which type of service is used. For all connections, a one time-unit costs 0,23 DM.

Charges for fixed circuit in group 3

ISDN fixed circuits in group 3 are digital connections which are scheduled according to the rase upon request an BRA connections. The connection charges for fixed circuits in group 3 dopend an time, distance (tariff zone) and type of service.

The following tariff zones have the following charges: (Charges given are per time unit)

- Local zone (Ortszone) 1: Fiat rate of 69,-DM

- Local zone (Ortszone) 2: Fiat rate of 69,-DM

Area zone (Nahzone) 1: Normal tariff (8 - 1.8 O'clock): 240 Seconds, Savings tariff (18 - 8 O'clock): 360 Seconds

Area zone (Nahzone) 2: Normal tariff(8- 18 O'clock): 120 Seconds, Savings tariff (18 - 8 O'clock): 180 Seconds

Lang distance zone (Fernzone) 1: Normal tariff (8 - 18 O'clock): 26,67 Seconds, Savings tariff (18 - 8 O'clock): 51,428 Seconds

- Lang distance zone (Fernzone) 2: Normal tariff (8 18 O'clock): 16 Seconds, Savings tariff (18 - 8 O'clock): 51,428 Seconds

Charges for fixed connections and fixed .. ,cjrcuilA__j„ ... ?

ISDN fixed circuits in group 2 are scheduled digital connections over basic channels (64 kbit/s).

The DBP offers two types of fixed connections:

Basic rate fixed connection: Twa basic channels (64 kbit/s) and one channel for character option.

- **Primary rate access fixed connection:** 30 basic channels (64 kbit/s) and one channel for character option.

For the fixed connections in group 2 and 3 with standard service possibilities, the same charges apply as for the universal connections.

Until application of terminals for the connection time of fixed connections in group 2, the charges will be calculated as follows:

For each 100 m of chargeable cable connection length (gebührenpfichtige Verbindungslänge) and for each hour of connection time, the following charges will be collected:

- up to 50 m: 0,05 DM

- more than 50 m for the part up to 50 m: 0,05 DM

- for the part that is between 50 - 100 m: 0,015 DM

- for the part that is more than 100 m: 0,005 DM

As connection time, a flat time of 80 hours per accounting period (Abrechnungszeitraum) will be calculated.

2.2. ISDN and DATA TERMINALS

In order to receive the benefits of ISDN, the system is used along with specific data terminals. In spite of the fact that the telephone has been the most important medium in the launching period, it is easy to understand why the role of PCs and work stations will increase in importance.

And when one looks at the increasing number of PCs and work stations in the form of PC-networks and LAN to LAN coupling, ISDN comes into the picture as a fast, economical and flexible transmission medium which will be ideal for the upgrading of the communication possibilities in the public network which have existed up to now. Or one could say that ISDN will be the answer for expanding the communication possibilities, as soon as the ISDN applications which are offered are adapted to the current infrastructure.

Eesides the direct 64 kbit connections, other connections can be made: to the analog lines in the telephone network and to the CSDN for Teletex and Telex and to the lines of the PSDN. With these new connections, ISDN can be used as the feeder port to the next Datex-P nodes through the signaling protocol, the so-called D-channel.

The German coommunications industry is currently pushing the production of ISDN-capable data terminals. The trend is to develop multifunctional communications stations which facilitate the use of several services at the same time. The base for such terminals can be the personal computer. The PC has already been upgraded and can be connected to the ISDN Network using the appropriate expansion cards (Erweiterungskarten). Complete components which are necessary for digital communication are located an these PC boards. All you then need in Order to have a functionable ISDN data terminal is the appropriate software. You have to be aware that a standard PC AT gives a maximum access to five boards, and that three of them are already used to give access to the main frame, to a LAN, and to run graphic applications.

But still: PC-owners can stretch their "desktop gadgets" into full-service communication devices. It is now possible to individually retrofit and upgrade the computer by buying more software rnodules. The result is a multitalented computer that can deliver all the Telecom services, as well as serve as a bare for future telecommunications services. Yet another advantage: Stationary PCs can be networked with each other and with other' computers, and therefore open the door to much larger amounts of data.

The more than two million personal computers which are currently installed in Germany could help the digital communications network merke a quick breakthrough. Experts in the field of telecommunications estimate the number of computers with communications needs now at 350,000, and in 1992 at 450,000. ISDN cards from various producers are now available, at prices ranging from 1000 to 4000 DM (See Annex: "ISDN-Adapterkarten für Personal Computer").

The buyers of non-PC supported data terminals also have the guarantee that their equipment remains mountable. In order to ease the ISDN development from the current communications infrastructure, terminal adapters are available for terminal adapta-•-tion, as well as the network and service transition. The terminal adapters take care of the connection of the available data terminals to the uniform ISDN-interface. Network transitions act as links between the various networks to insure the end-to-end communication within the same service.

Service transitions create connections between the various services, as not all of the performance characteristics of the desired service are available. An example is the interactive videotext with its transitions to Telefax and Telex. The three components which were mentioned guarantee the continuous tr•an--sition of the current data terminals and services in the ISDN environment.

Whoever ponders the use of ISDN certainly wants to know about equipment costs. Single service data terminals are still rare and therefore expensive: up to 15,000 DM can be spent. Terminal adapters cost around 1,200 DM (For more information see Annex: "Die Endgeräteadapter auf einen Blick").

2.3. PILOT APPLICATIONS

The number of BRA and PRA is not increasing as quickly es the DBP would like to see; therefore, the DBP has decided to use new Marketing strategies to lure more PC users into the ISDN Network.

The idea was to win PC users over with economicel ISDN adapter cards, but it has been pushed to the side, es the DBP(T) had negative experiences with this strategy in other areas. Since 1990, the adapter card producers will only push it in the sense that they will allow the buyers of the adapter cards to weit a year before paying the monthly charge for their ISDN line. Since the reduction in charges is not a good enough reason in and of itself to get oneself an ISDN adapter card, the DBPT has also become involved in pushing ISDN applications.

The DBPT i.s pushing the purchase of cards in the early stege with a service gift of 888 DM. This offer is good until March 31, 1991 under the following conditions: the card purchased has to have been authorized by the DBPT; the buyer has to aPPlY for BRA at the same time.

The main suppliers of ISDN applications for the PC are the adapter card producers, who have figured out that the users can only be convinced to buy an adapter card with usage arguments.

Because most of the adapter cards were created for the XT/AT-bus, the MS-DOS oriented applications outweigh the other solutions. If the ISDN adapter card would also offer a connection possibility to a telephone set (Telefonset) besides the So Interface, then the software which would be delivered with lt should support the parallel use of both D-channels for language and data connections. This would be an important first step toward making the ISDN-PC a multifunctional data terminal. In the meantime, software solutions for ISDN adapter cards which take care of the FAX-Group 4/ Cl. 1, ISDN-Teletex and ISDN-Btx. already exist (See above Annex).

Other methods of working in the area of data processing which allow the user to experience ISDN as an interesting transmission medium are basic applications, such as data transfer and remote log-in functions. Several of these possibilities will first become interesting through ISDN and its high transmission speed of 64 kbit/s. It is not just just the Promotion of full text database development that is a current issue. It is also interesting to think about the transmission of fixed video (Videobilder) with the use of central video data banks and a video solution.

With this video solution, two PC users who are in connection with each other over an ISDN line can communicate with each other by telephone about the program which is running almost simuitaneously over both screens. This application is particularly interesting in regard to remote maintainance.

The producers of PC expansion cards offer a variety of cards, as well as development kits, which also offer the possibility of a back-to-back configuration which makes it possible to develop such system and software houses without having to have a So connection in the hause. This is especially important in the current Phase of the indroduction of ISDN, as it is not yet possible in some areas to receive their own ISDN access. With these test configurations, two PCs are connected over a crossed cable (gekreuzte Kabel), so that one of the PCs can play the roll of the ISDN terminal, while the other one simulates the home exchanae.

In order to use the computer often and to communicate using store and compute-bound applications, an adapter card with a processor and write and read-only memory is needed. More than that, the transmission software should cover only a reasonable part of the main memory with mounting. It is also important that both E3-channels can be operated at the same time.

There is a differente in the expense for such adaptibility. Hard and software from some producers come "from one hand". That means further applications are easier than when products are bought from different companies.

Various producers have agreed an a tandard software interface, called Common-ISDN-APT. It is between the adapter cards and the application software, and its producers assure that all of their products can be used with each other, problem-free. Applications that already use this Interface are not affected by expansions or changes. The current version of the Common-ISDN-API is version 1.0 Profil A.

2.4. OUTLOOK: EAST GERMANY

Dr. Christian Schwarz-Schilling (BMPT) and Dieter Gallist (DBPT): "With the upcoming reunification of the two Germanies, telecommunications will play a key rote. The DBPT is undertaking all of the necessary efforts to build the telephone network as quickly as possible. Success in this work will lead to breaking down of the economic barriers between the two Germanies, and an attaining of similar living conditions" (Press Release: Der Bundesminister für Post und Telekommunikation, Bonn, 17.07.90).

Karl Thomas, with BMPT, describes the level of development (or, in this rase, underdevelopment) in East Germany as similar to the end of World War II. The lines are for the most part shut off, and the home exchanges which were set up for national and international telephone traffic with modern computers are up to sixty years old. There are not even any spare Parts, explains Heinz Ulig, Director of the DPT.

An even bigger problem is that too few people are equipped with a simple telephone: for every one hundred apartments in East Germany there are no more than sixteen telephones; whereas, in West Germany there is statistically - one telephone per house hold.

Another problem is that the planniong of the infrastructure system has to be correctly built, which takes a large amount of time in itself but without precision, nothing will work.

Dr. Christian Schwarz-Schilling and his colleauge in East Germany, Minister Emil Schnell, have agreed an a unified direction: "We are convinced that the unification of both Germanies will lead to a uniform post and telecommunications system".

In East Berlin the goal is to install a digital overlay-network by the end of this year. It is an almost totally new infrastructure that should connect the most important metropolitan centers with one another. When the cables are installed underground and the home exchanges are finally in operation, the worst traffic jam in East Germany will gradually be cleared up. This infrastructure should provide a blanket coverage by the end of the century.

In Order to connect this network to that in West Germany, Bonn wants to extend the glass-clad glass fiber line to West Berlin and lengthen it into East Berlin. In addition, two cable connections should connect West Germany with East Germany by the end of 1992: A northern raute over Magdeburg and a southern raute over Leipzig to Berlin.

By the middle of the 90's another million households can also hope for a telephone connection. Now there are 1,8 million lines. Compared to the West German niveau, the people who actually have a telephone belang to an elite class. Therefore there are 1,2 million applications for telephones lying in East Berlin - some have been there for years.

In order to get the communication going in business, the mobil radio telephone service should be made available. The special infrastructure for the mobile telephone can be built quickly, but is expensive. The equipment itself is also expensive - a few thousand Mark- and is therefore only to be had by the larger companies.

With the successful launah of the Kopernikus 2 Satellite, the telecommunication links to the East will be more than doubled. Following the technical development in the area of satellite communication, even the network monopoly of the DBFT will be shaken.

Overall, the estimate is that 7 million lines, 90,000 telephone booths, 360,000 Telefax connections and 60,000 data lines are needed, which are especially important for industry and business. Just equipping the people with telephone lines will cost 30 Billion Mark.

How high are the estimated costs for the building of a modern telecommunications infrastructure? The total investment need in East Germany for the construction, according to Schwarz-Schilling, is 55 billion DM from 1991 to 1997. The requirement for such an investment is the currency reform, which is now taking place in East Germany. About 30 billion DM are supposed to be put directly or indirectly as a loan into the capital market by the BMPT.

"The investiment of 20 billion DM for construction gives the building of a middle class which is performance capable a good boost in the direction of a social free enterprise. Especially small and middle-sized workshops - electronic and civil engineering which are regionally limited in carrying out their work stand to benefit from this Investment program" (Press Release: BMPT, Bonn, 20.06.90).

Already in 1990 the BMPT is planning Investments in East Germany of up to 110 million DM. In particular, funds are planned for the improvement of the 0-Network. And the DBP plans to spend up to 540 million DM for the building of an updated communications network. The BMPT supports the financing of this Investment with loans of 240 million DM.

F'or more details see the Annex: "Investitionsvolumen Fernmeldetechnik der DBP TELEKOM in der DDR 1991 - 1997".

2.5. PERSPECTIVES

The DBP has decided to launch more pilot projects, with the goal of showing the users that ISDN is much more than just a big variety of individual services. In bringing these new aPplication perspectives to light, the hope is to bring other multiple effects to the surface - and to encourage the growth of the private sector in the market, which will naturally grow out of the liberalization and appearance of services.

Dr. Christian Schwarz-Schilling, Bundesminister for Post and Telecommunication: "...The digitization of the network will make new services such as ISDN possible. That also means the demand for high-quality telephones with various technical performance characteristics will st:eadily increase. One single supplier will be quickly overwhelmed. "Competition" is the recipe for more friendliness to customers and additional growth - and innovative impulses. Since 1. July 1990 all data terminals can be purchased through the DBPT, in department stores or whereever else they are offered - that means that besides the DBPT, private suppliers can offer their products an the market. All suppliers will certainly make a profit from the expected growth."

This means that in the international field the traditional partnership of national PTTs will be measured according to ä new set of rules defined by deregulation. Therefore it was even more important to know what the attitude of the new German President of the Board of Directors was. In a personal interview at the CeBIT 1990, he stated that the technical implementations will no langer in and of themselves be regarded as sufficient to promote the new network. It still has to become a real service; therefore, a wide range of applications has to be promoted. In this context, he referred to the success of France Telecom's effort:s in this field. He stated: "There is certainly no shame in repeating good things, even if they have already been done by someone else".

The opening of the network between France and Germany is foreseen for the end of September 1990. It will be a good occasion to test the implementation of a GEOTEL inquiry station in Germany.

UPDATE: PAGE 9: 1.3. REGIONAL PILOT APPLICATIONS 1986 - 1989

For a decade the DBP has been the technical forerunner of a new technology. The long term goal is: to open up the lines of communication by integrating the networks and services which were historically separated from each other - the number of lines/connections given represents the number at the mid of 1990:

- Telephone 3,1kHz: 30 million
- Facsimile transmission service group 2/3: 546,266 lines
- Telex: 126,557 connections (as of 30.04.1990)
- Teletex: circa 17,560 lines
- BTX (Interactive videotext): 231,459
  Datex L (CSDN): 23,980
  Datex P (PSDN): 45,189 (See Annex: "DATEX P Anschlu(3-entwicklung")
- HDF (Public leased circuit for data communication over a fixed circuit):205,100 lines
- Radio Telephone: 8-net: 20,557; C-net: 208,235
  Broad band cable (14 million lines to be connected) (See Annex: "Übersichtsinformation Kabelanschluß")
- ISDN: 13,520 lines (3,300 BRA already connected [2000 more to be connected], 230 PRA already connected [500 more to be connected])

In the pilot projects which have been operating in Stuttgart and Mannheim since 1986, the first goal was to test the new soft and hardware, and to determine whether or not the test models, which were delivered by the industry, are compatible with each other and with the specifications of the DBP.

The original objectives of the **DBP** are stated below:
"Test all of the technical components of ISDN from the home exchange, the home cabling and the digital telephones, ISDN-teletex-data terminals, ISDN-telefax-data terminals and multi-service data terminals. (...) Test all the locations for conformity with the specifications. (...) Check all specifications for their operative applicability, in order to minimize the risks for the DBP, the communication industry and the customers before a nationwide introduction in Germany" (Meinrad ADELMANMN, Peter KAHL, DBP: Das ISDN-Angebot der deutschen Bundespost. Mehr Spielraum fUr Telekommunikationsanlagen. In: net special 1988, Vol. 1, P. 82).

GLOSSARY OF ABBREVIATIONS

ISDN	Integrated Services Digital Network
BRA	Basic Rate Access
PRA	Primary Rate Access
CeBIT	The annual Telecommunications Fair in Hannover•
CCITT	International Consultative Committee for Telegraph and Telephone
CSDN	Circuit Switched Data Network
PSDN	Packed Switched Data Network
DBP	Deutsche Bundespost
DBPT	Deutsche Bundespost Telekom
BMPT	Bundesministerium für Post und Telekommunikation
DP	Deutsche Post der DDR
DPT	Deutsche Post Telekom der DDR

LIST OF' ANNEXES

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