Zeitschrift: Technische Mitteilungen / Schweizerische Post-, Telefon- und Telegrafenbetriebe = Bulletin technique / Entreprise des postes, téléphones et télégraphes suisses = Bollettino tecnico / Azienda delle poste, dei telefoni e dei telegrafi svizzeri

Herausgeber: Schweizerische Post-, Telefon- und Telegrafenbetriebe

Band: 65 (1987)

Heft: 9

Artikel: The technical introduction of new telematic services : a challenge for the telecommunication industry : highlights of some Swiss PTT solutions

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DOI: https://doi.org/10.5169/seals-874824

The technical introduction of new Telematic services

A challenge for the telecommunication industry — highlights of some Swiss PTT solutions

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1 Some remarks concerning the introduction of new telematic services

11 The introduction of telematic services appears in a different technical and political light as compared to the telephone and the telex services

When the telephone and telex were introduced, the PTT had the entire technical means and components (transmission, switching, terminal equipment) under their own control. The development of these services could therefore be entirely coordinated by the PTT. The pattern of the introduction of new components and services could easily be dictated by the PTT since the time constants involved were different from those of today. The problem of quality assurance of the service was fully in the hands of the PTT.

A completely new situation exists for telematic services. Only the communication networks are in the hands of the PTT which has little or no information on the activities of the customers at the application layer of the service (e.g. Datel, PSPDN, leased circuits). The parameters determining service quality are only partially defined. Also, the pace at which developments are made is more or less beyond the control of the PTT. Today, the first move is more often made by the EDP industry. The Swiss packet switched public data network (Telepac) e.g. was introduced as an answer to the proliferation of private data networks based on leased circuits rather than as an innovative step made by the PTT, such as Telex. For the ISDN Swissnet network, however, the Swiss PTT is again trying to take the initiative.

Today's goals (Telepac, Swissnet) have to be reached within five to ten years as compared to 30 to 40 years earlier on (Telephone, Telex). In addition to this, the requirements of the customers are becoming increasingly complex and are initially poorly defined for the PTT as well as for the users.

12 Problems created by terminal equipment outside the PTT monopoly

The telematic services (including Telex and customer-tailored PABX) are facing a (quasi-)total liberalization; therefore, the PTT has to abandon the idea that service quality can be ensured by keeping the standard of all the components of the service entirely under its own end-to-end control. The definition of responsibility is no longer a trivial matter. On the operational side, the fault repair services are faced with a task becoming increasingly complex.

13 The key problem is how to ensure compatibility and service quality without owning the terminals

A bearer service (Telepac, Swissnet) or a teleservice (Teletex) can only be assured within a liberalized environment if the compatibility between PTT and non-PTT equipment as well as between different non-PTT equipment can be ensured.

This compatibility is much more difficult to obtain for telematic services than for analog telephony. It does not only concern the network control procedures (as in the case of Telepac) but also the entire procedures between the user equipment (as in the case of Teletex). Therefore, similar problems will apply to ISDN telephone equipment, expecially multifunction equipment (i.e. combining voice and data services).

14 Are type approval tests still justified where the software is gaining more and more importance? (Software: a world becoming increasingly 'soft')

A smooth integration of private equipment into a public service is usually achieved by merely approving the hardware involved. So far this way has been successfully followed by the PTT and to a certain extent has been generally accepted by the customers. However, it should not be disregarded that the approval philosophy has always been and still is defensive. In the past, the main goal of type approval was to protect PTT installations. No guarantee for quality and compatibility of the equipment is given by the approval when it is in use for a particular service. This fact is often disregarded by PTT customers.

The tendency towards an increased and more intensive use of software within subscriber equipment is unavoidable. The hardware is becoming more and more uniform (the heart of the hardware is a microprocessor). Specialized functions are entirely under software control. The remaining hardware consists of the power supply, the EMC protection and the physical design (appearance, ergonomical aspects) of the equipment. Today, this sort of equipment is more adaptable to user requirements than in the past. Hence, it is easier to meet the market demands. Another result, unfortunately, is an increased potential instability. In particular, e.g. how can identical equipment with slightly different software (a new software release) easily be distinguished from one another? Who can guarantee that what has been tested and approved on February 1st, 1987, is still valid for equipment delivered on March 31st of the same year?

Another aspect of the evolution is the tendency to move from the approval of individual equipment to the need for approval at customers' premises of complex systems containing hardware and software which could well originate from different suppliers. The term 'product' is becoming more difficult to define.

15 It is not sufficient for the PTT to focus on the protection of PTT installations against private equipment if a service is to be ensured by the PTT

Up till now approving private equipment was equivalent to protecting PTT installations. Approval tests were of an entirely defensive nature. The 'outsider' must not cause interference to the PTT network. No guarantee for quality and correct performance for a particular application is given by the approval. This situation is frequently ignored. The label 'PTT aproved' is often mistaken as a quality label for private equipment.

This procedure was and still is acceptable in an environment where the service is used only within the same private organization, allowing for private control of the service quality by the closed user group. It is also acceptable for private equipment which has merely a 'local' or auxiliary function within a telecommunication system.

Can a public telematic service with non-monopolized terminal equipment be based on the existing approval concept? The answer is probably 'no'. The likelihood of receiving a negative response increases with the degree of end-to-end interworking of the private equipment involved in the service. This emphasizes the importance of complete compatibility.

If the PTT, as an example, is taking on the responsibility for a Teletex service, then approval tests of terminal equipment must assess the quality and cannot be only of a defensive nature despite the unfortunate situation of software-controlled equipment previously mentioned in 14.

In this situation the classical approval philosophy is increasingly questioned:

- The term 'product approval' tends to be replaced by tests ensuring the performance during set-up and operation
- The testing of equipment supplied by the manufacturer in a laboratory environment will be replaced by tests at the user's premises during operation
- The testing will not only be carried out at the beginning of a product life, but also at regular intervals during its lifetime (e.g. whenever a new software release is installed in the product)
- The tests will not only be initiated by the PTT but will also be carried out on demand of the customers (a new requirement for a PTT service available to customers?)

16 Within a non-monopolized environment all partners are interested in communicating efficiently with one another: new approach for the approval of private equipment?

The manufacturers of equipment for an 'open' and complex telematic service such as Teletex agree that the assurance of compatiblity is an important element for developing a market for new services. This assurance is very difficult to attain individually by each manufacturer and for every product facing the rath obscure responsibility situation (manufactuer A, manufacturer B or PTT?).

If every manufacturer had to set up the necessary infrastructure to solve the problem individually, then considerable investment in staff and material would be required. As a consequence, the approval tests must undergo an evolutionary process: So far regarded (or merely tolerated) as an unavoidable procedure by the manufacturers for obtaining access to the PTT networks, they are now being more and more considered a central means of guaranteeing the compatibility between various heterogeneous equipment and to ensure the quality of the telematic service

This evolution is not limited to telematic services in conformity with CEPT/CCITT standards as offered or planned by the individual PTT's. It also extends to applications which are not regulated by the PTT, such as those being considered by ISO (International Standard Organiszation) within the framework of the efforts devoted to the interworking of heterogeneous teleprocessing systems (OSI = *O*pen *S*ystem *I*nterconnection). An effort is actually being made in Europe to establish joint test and approval centres for certifying EDP equipment (certification: quality assurance), and not only for obtaining permission to connect to the network.

17 How to technically set up a new service or a new network without owning to the terminal equipment?

The total liberalization of user eqipment creates particular problems with the introduction of a new PTT service. Laboratory tests and trials using measuring instruments are not usually sufficient to check the necessary maturity of the equipment required for operation. Especially pilot trials for which the PTT is entirely responsible are not possible without real terminals. The operations management departments are unable to work on problems of setting up, managing and maintaining the service before it has actually been established. This situation is comparable to the one encountered by private users of a new computer system. The problem is that users are generally more critical about a public service operated by the PTT than about a fully private service.

18 The 'open' world of networks and services is a strongly herogeneous world

So far, the data processing world has been a more or less closed world. For practical reasons (compatibility) the user had to restrict himself to equipment from one single manufacturer. This situation is changing. The new public requirements such as Teletex and message handling X.400 as well as the introduction of the communication architecture for distributed data processing applications according to OSI are leading to an 'opening' of the telematic world. With standardization, new opportunities are provided for manufacturers and a larger variety of choice for customers. The availability of efficient text communication services will lead to an increasing

information exchange between companies. Consequently, there is a stronger trend towards more heterogeneous subscriber equipment connected to the PTT networks, which have to interwork smoothly in order to enable homogeneous 'open' applications.

2 Means to meet the challenge: the creation of interest groups to provide the link between the industry and the PTT and also to allow for setting up joint test and approval facilities

Closer cooperation between the PTT the telecommunication industry is one way to solve the earlier mentioned problems. A tradition of cooparation exists within the telecommunication industry. The new situation is that this cooperation has to be extended to cases where the PTT's are not directly interested in the acquisition of relevant material. In particular, the EDP industry has to be taken more into account. A few pilot trials in order to promote such a cooperation have been or will be established on the initiative of the Research and Development Department of the Swiss PTT.

21 The joint interest groups between the PTT and the industry

The interest of the terminal equipment industry and of the PTT have much in common during the set-up of new services: to sell the service for the PTT, to sell terminal equipments for the industry. The manufacturers competing in a free market are realizing that a new service has to reach a critical size in order to really get off the ground. Therefore, the different partners are generally interested in cooperating during the planning and the start-up phase. The PTT's can take advantage of this situation by obtaining support for their introduction work.

The way followed by the Research and Development Department of the Swiss PTT is to set up common interest groups between the PTT and the industry which are intended to jointly explore the problems connected with a new service. These roblems exist both for the infrastructures supplied by the PTT to support the service and for the correct interworking of private heterogeneous equipment involved in the service.

211 The historical need: Telepac

Originally, the need for a close cooperation with EDP manufacturers became obvious with the introduction of Telepac, the Swiss packet-switched public data network. Consequently, the PTT was faced with two problems: how to check the performance of the network used for the service without having access to the necessary computer tools for simulating conditions corresponding as closely as possible to the real traffic and how to check in an easy way whether the X.25 packet-switching software available on the market could be successfully used with Telepac.

The PTT was interested in ensuring that sufficient reliability and capacity of the network was attained before the service was introduced and in ascertaining the confirmation that the X.25 products were actually available on the market when the service was introduced. Therefore, the PTT Research and Development Department has decided to supplement the classical acceptance tests of network components (the Northern Telecom SL10 switches and associated transmission equipment) by joint tests with the EDP industry involving computer and terminal equipment.

The AMH group: objective and results

Cooperation between PTT and the EDP industry has taken place within the AMH (*A*bnahme *m*it *H*erstellern [Acceptance tests together with manufacturers]) group for Telepac. The following main objective was set for this joint action:

- to test the functions, performance and reliability of the network as expected by the future customer

The feedback received from the industry was very positive. Ten companies took part in the tests in 1981: Six system manufacturers (Borer Electronic, Data General, DEC, IBM, NCR, Nixdorf) and four potential users (European Laboratory CERN, Fides, Radio Suisse SA and a user of *Prime*). With this excellent cooperation already existing, the activities were further followed with part of the same group (IBM with the users CSI and Terco; DEC, Data General, Borer with CERN and the Swiss Federal Institute of Technology EPFL, and a user of Prime) in order to test version 2 (Release 2/4) of the Telepac software. These tests constituted the UOA (user-orientated acceptance) phase of the Telepac introduction. They allowed for the collection of extremely valuable data about network performance before it was taken into operation. This also enabled the PTT to rapidly gain the necessary know-how for the operation of the service and at the same time supplied the industry with valuable knowledge about installation and operation of their terminals. The tests also had an important psychological effect on the customers by demonstrating the real potential of the new service.

212 Analog requirements: teletex, Comtex (X.400), Swissnet

The positive results obtained with Telepac have encouraged the Swiss PTT to follow the same path for the introduction of other services such as Teletex (text communication service), Comtex (message handling service X.400) and Swissnet (Swiss ISDN network). For Teletex and Comtex the problem is more complex as compared to Telepac and Swissnet, because the compatibility and interworking have to be thoroughly tested not only between a network and private equipment, but also end-to-end between different private equipment.

213 The GITTX Group: aims and results

Teletex is the first service for which the PTT is faced with the operation of a complex, fully defined end-to-end telematic service (and not only with a service between subscribers and the network such as Telepac) with entirely private user equipment. An important factor is to determine the best way fo the approval tests and the requirements for ensuring compatibility in this totally 'open' service.

In accordance to the way followed for the introduction of Telepac it was proposed to set up a joint group between the PTT and the industry in order to help to solve these problems: The Teletex interest group (GITTX: *G*roup d'*I*ntérêt *Tele*tex).

This group had the following objectives:

- to set up a joint forum between the PTT and the industry for the exchange of information and experience for promoting the Teletex service
- to support the manufacturers participating in the interest group in the understanding of the specifications for the service
- to carry out joint trials in order to assess and to eliminate as early as possible the technical problems which could impair the introduction of the service
- in a realistic way to face the PTT and the manufacturers with the operational problems of the service.

Twenty companies were particpating in the work of this group set-up in 1985. Ten of them have been directly engaged in joint tests, namely Autophon, CSC, Hasler Company (HAG), Hewlett Packard International (HPI), NCR Nixdorf, Philips, Recom, Siemens-Albis Zurich (SAZ) and Zellweger (ZAG).

Among the results obtained were:

- the testing of the Telex/Teletex converter under real operational conditions by checking it against more than ten different implementations of Teletex equipment prior to the opening of the service
- the confirmation for the PTT that its acquisition of sophisticated test equipment (TPS, TTX-Test system, see 222) was justified in order to enable efficient assessment of compatibility
- the demonstration that equipment apparently in conformity with Teletex standards (i.e. already approved by other administrations) may have implementation differences leading already at the presentation level to incompatibility of exchanged documents.

The activities of the group proved to be very useful in gaining the know-how for the PTT as well as for the industry by providing the best possible environment for a successful introduction of the public service in 1986. It is intended to continue the activities of the group as it offers a meeting point for the efficient assessment of the technical and operational problems of Teletex.

214 The GIMHS Group: objective and first results

The future message handling services based on the CCITT X.400 standards are receiving a very positive feedback from the industry and from the customers. They form an important component of the Swiss Comtex project. These services should grow within a mixed environment composed of public systems (e.g. Comtex) interworking with private systems. The complexity of communication protocols in combination with the need for compatible end-to-end interworking of strongly inhomogeneous public and private equipment constitutes a considerable challenge for the PTT introducing the service.

Close cooperation of the parties involved is also required here. This was promoted by the PTT by creating a special interest group for message handling (GIMHS: *G*roupe d'*i*ntérêt *MHS*) at the end of 1985. The main objectives of this group are:

- to promote the acquisition of top level know-how about message handling techniques in Switzerland
- to ensure, as early as possible, close co-operation between public message handling services (Comtex) and message handling systems within private companies
- to establish a solid base for the test infrastructure required in order to ensure full compatibility between message handling systems.

The group was established at the beginning of 1986. Sixteen so-called 'active testers' are participating in the efforts of the Swiss PTT. These are manufacturers (Bull, Data General, DEC, Hasler, Hewlett Packard, IBM, ICL, Nixdorf, Siemens, Unisys, Wang, Xmit), consulting companies (Radio Suisse SA, SPAG Services), as well as the Swiss Bank Corporation and a joint group of the Swiss Institute of Technology, CERN and the University of Zurich. The projects during 1986 and 1987 mainly deal with methods and techniques to be adopted for testing the X.400 systems, in particular with the detailed definition of the MHTS test system developed by the Danet Company on the joint order of the Deutsche Bundespost and the Swiss PTT (see 223) and with the tests to be carried out with this system. They also aim at clarifying the necessary definitions for the interworking of private and public systems.

An important contribution has also been submitted to CCITT in the matter of MHS conformance testing. With the input of this interest group it was possible to draft a CCITT Recommendation on MHS conformity testing for the 'Heading protocoll'. This draft has the provisory name X.CNF2. The Swiss PTT, with the support of Softlab in Munich, ensures the editing of this Recommendation until its official publication.

Another concrete result of this group was the acquisition by the PTT of a prototype of ADMD (*ad*ministration *m*anagement *domain*) from the Swiss STR Co., using the CIT/ALCATEL Atlas 400 technology. This prototype enables the interest group to participate in joint demonstrations with other X.400 service providers and/or suppliers. With this prototype the Swiss PTT, together with 20 other companies, is participating in the Joint X.400 Demonstration at Telecom 1987. This prototype is connected to the ADMD's of Transpac, Dialcom and Telenet, and with X.400 private systems by DEC, HP, IBM, Nixdorf and Unisys.

215 An analog requirement: Swissnet

The same problems as encountered with the other services mentioned earlier are found with the introduction of the Swissnet (the Swiss ISDN service). The setting up of an interest group Swissnet (GISN: *G*roup d'*i*ntérêt *S*wissnet) was decided in the first half of 1986.

Some of the objectives of such a group are:

- to set up a forum for the technical problems touching upon the telematic involvement of Swissnet
- to provide PTT support for the EDP manufacturers participating in the interest group for a better understanding of the specifications

- to establish mutual technical support for software manufacturers testing their products and for the PTT engaged in performance tests of the network
- to determine the potential applications, in particular for multivendor applications (OSI applications in a heterogeneous environment)
- to define test means and procedures for the operation or type approval of private equipment at low and high protocol levels
- to set up tests co-ordinated jointly by PTT and the industry
- to jointly determine the problems encountered during the operation of the network, particularly at the interface between the network and the user equipment.

The main objective of the group will be to prepare common PTT/industry tests for the network test phase during 1988/89.

216 Co-operation should be passed on to the operations management

The need for such interest groups does not end with the introduction of the public service. They are equally important as a meeting place for the operations management of the PTT and the EDP industry in order to gather operating experience and to centrally treat the pending problems in an efficient way. As an example, several members of the GITTX group have indicated their desire for something along these lines. After the introduction of the service the sponsorship of the interest group has been transferred from the Research and Development Department to the relevant operations management department of the PTT.

22 The equipment for tests and for type approval

Telematic services are accompanied by the need for new instrumentation for tests and type approval. New solutions are required for the problems connected with the uncertain validity of the results of classical type approval tests during the lifetime of the equipment as mentioned in 14 to 16.

The solution may consist of making the necessary means available for the operations management, the equipment manufacturers and finally for the customers to continuously verify whether private equipment is still in conformity with the approval requirements. In cases where the equipment communicates directly with PTT equipment (i.e. where a non-conforming user can only cause interference to himself and not to other customers), such tests might even allow the omission of formal type approval of private terminal equipment. This, for example, is the case for Videotex terminals.

221 Videotex test connection

With the introduction of the Videotex service it soon became apparent that the terminal manufacturers should have some means of checking the conformity of their equipment with the CEPT standard beyond the real Videotex service. A test connection was developed in order to solve this problem. It allows to access about thirty test pages containing various aspects of the standard. Free access from the switched telephone network is provided. This solution has proved successful (the test system is even accessed from abroad). It has allowed the omission of formal type approval of private Videotex terminals. The Deutsche Bundespost has used the concept of the Swiss PTT test system as a reference and has developed a similar test system with more sophisticated features.

222 Teletex test system

The Teletex protocols are complex and can hardly be tested manually with classical protocol analyzers. One single straightforward manuel test may require hours of tedious decoding. This fact has led to setting up the automatic test equipment TPS (*T*eletex *P*rüf-*S*ystem = Teletex test system) which is capable of carrying out tests as well as analysing the results almost automatically. This system has been developed by the Danet Company for the Deutsche Bundespost and has been modified for the X.25 interface in order to meet Swiss PTT requirements.

The aim of the system is to test the protocol layers four to seven of Teletex as well as the main requirements for service conformity. Any serious type approval of Teletex equipment would be virtually impossible without this equipment. Actually, close to 1000 test cases have been identified by the CEPT working group in order to test whether a piece of equipment is conforming to the specifications.

It is foreseen to use the TPS in three different modes:

- the 'laboratory mode' for carrying out type approval tests (the TPS should allow for several thousand test cases to be handled within a few hours)
- the 'set up and fault repair mode' in which the TPS will be used by the Swiss regional telecommunication administrations for setting up the equipment at users premises or for tracing and repairing faults. A simplified mode will be available especially for service staff in order to carry out straight forward go/no-go tests. This procedure will also considerably facilitate the fault repair service's work
- the 'support mode for manufacturers' in which the system can be made available at a charge to manufacturers for the final adjustment of equipment and for pre-acceptance tests.

In all three modes the system can be remote controlled through the Telepac network without the need for moving the Teletex equipment to be tested to the laboratory.

223 Message handling test system

The TPS concept has been reused for the message handling test system X.400. This MHTS is based on the TPS system. The X.400 version has been developed with close co-operation between the Swiss PTT and the Deutsche Bundespost together with the Danet Co. The system will be used similarly to the TPS. The MHTS is an essential tool for the tasks to be carried out within the GIMHS group and is the basic framework for the so-called Comtex-Lab project of the group. It will also be required for setting up the public Comtex system. The development of the system has attracted considerable

interest from the EDP industry as well as from foreign administrations. There is a certain chance for creating a de facto standard for this type of system.

224 Integration of the requirements for test equipment

The real new feature of the test equipment described earlier is that it can be used equally well for solving the problems of conformance tests, for operations management of a telematic service and the installation and fault repair services as well as for supporting the manufacturers. Additionally, a first check level is made available for the users of the service.

The adoption of such a concept results in centralization of the means, allowing the entire coherence to be ensured. This centralization takes place at the logical level. Nothing, apart from the high investment costs at present, stands in the way of physical decentralization of the equipment, should such a requirement appear.

3 Conclusions

The liberalization of terminal equipment has become a fact for telematic systems. In this domain, the PTT can no longer rely on its monopoly position. Therefore, co-operation with the industry and the users has to be intensified. A few elements of this enhanced co-operation have been presented. To summarize, it can be said that the PTT is considering in the future

- to promote pilot trials for new services
- to encourage technical multivendor experiments by extending cooperation with the PTT beyond the traditional manufacturers and having also the EDP industry take part
- to find means, together with the industry, of ensuring national and international compatibility of terminal equipment
- to solve installation and maintenance problems in an efficient way
- to meet the challenge of software-controlled equipment conformity and approval tests
- to encourage the dialogue between the PTT, the equipment manufacturers and the customers by setting up meeting places for interest groups or forums
- to adopt a technical approach guided by market requirements by taking in particular the applications of EDP users into consideration.

The entity of these proposals can be summarized in one single sentence:

Taking care of the user needs by quick and efficient adaptation to the facts and requirements of continuous evolution.

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