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Worldwide Report

TELECOMMUNICATIONS POLICY, RESEARCH AND DEVELOPMENT

(FOUO 5/82)

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CONTENTS

FOREIGN MISSIONS TO BE ALLOWED TO OPERATE RADIOS

OW221051 Tokyo SANKEI SHIMBUN in Japanese 19 Feb 82 Morning Edition p 1

[By reporter Kijio Sakakibara]

[Text] The Posts and Telecommunications Ministry has decided to revise the wireless telegraphy act to permit foreign embassies and legations in Japan to have their own radio communication facilities. The decision will be included in a bill of amendments to the act which is being prepared by the Ministry for Submission to the current diet session. The revision is also designed to enable Japanese diplomatic establishments abroad to have their own wireless communication facilities, under the "principle of reciprocity," so that in the future such communication disruptions as that which happened to the embassy in Poland can be avoided. All communications with the Japanese Embassy in Warsaw were disrupted for nearly a month due to the suspension of general circuits under the martial law rule.

According to the Posts and Telecommunications Ministry, there was a strong request from the Foreign Ministry to authorize foreign diplomatic establishments to operate their own radio stations.

Article 5 of the present wireless telegraphy act stipulates that "a foreign government or its representatives" are not licensed to operate a radio station; under the principle of diplomatic "reciprocity" Japanese embassies abroad also were not allowed to have their own radio facilities by the governments of the respective countries.

Japanese embassies abroad have thus been depending solely on general communciations circuits for their communications with the Foreign Ministry in Tokyo. Troubles occurred in December last year when the martial law rule in Poland susperded operations of the general circuits for nearly a month, cutting all contacts with the embassy and causing problems in the efforts to protect Japanese nationals as well as in other areas.

This prompted the Foreign Ministry to review the need for the nation's embassies and legations abroad to have their own radio communication facilities, and to strongly ask the Posts and Telecommunications Ministry to revise the wireless telegraphy act. As an initial step, the Posts and Telecommunications Ministry decided to delete the phrase "a foreign government or its representatives" from the text of article 5 of the act. Possible amendments to other related articles are also under study.

CSO: 4120/163

USSR

COMMUNICATIONS DURING 11TH FIVE-YEAR PLAN

Moscow RADIOTEKHNIKA in Russian Vol 36, No 11, Nov 81 pp 4-5

[Article by Yu. B. Zubarev, USSR deputy minister of communications]

[Text] The 64th Anniversary of the Great October Socialist Revolution has now passed. During this year, the entire country has lived under the influence of the 26th Congress of the Communist Party of the Soviet Union, which summarized the results of the 10th Five-Year Plan and adopted national development plans for the 11th Five-Year Plan. Major tasks have been placed before Soviet Science in terms of accelerating scientific-technical progress and improving the welfare of the Soviet people; specific tasks have been defined for individual branches.

Under the guidance of the directives of the 25th CPSU Congress, communications workers achieved major successes during the 10th Five-Year Plan: they fulfilled assignments with respect to the most important technical-economic indicators, they improved the efficiency and quality of operation of communications facilities, and fulfilled and overfulfilled assignments for the development of technical facilities. A significant step was made in creating nationwide Unified Automated Communications System (YeASS). The extent of long-distance telephone channels increased in 1980 by more than a factor of 1.9 over 1975, and a number of critical cable and radio relay links were put into operation, including a multichannel radio relay link along the Baykal-Amur Main Railroad Line.

Thanks to the expansion of the network of communications channels and construction of long-distance telephone exchanges, the level of automation of long distance telephone communications, to which more than 60% of city telephone subscribers now have access, has increased. Most rayon centers have automatic telephone communication with their oblast centers. The assignment for the development of telephone communications in cities and rural areas was overfulfilled: the number of network subscribers increased by about 6 million. The assignment to double the network used to receive newspaper columns phototelegraphically at decentralized printing locations was fulfilled ahead of schedule. This method in contrast to delivering newspaper plates by air, has accelerated the printing of newspapers at remote locations and made it independent of weather, thus speeding their delivery to readers. For example, the newspaper PRAVDA is now delivered to 90% of subscribers on the day it is published. Prototype message switching centers (TsKS-T) have been put into operaion. The indicators for bringing channel switching capacities of the Nationwide Data Transmission Network (OGSPD) and telegraph network have been overfulfilled, and the subscriber telegraph and Telex network have been expanded. The development of radio broadcast and television stations has made it possible to provide the first radio broadcast program to the entire country, and the second program to 80% of the country; territory containing 86% of the country's population is covered by television broadcast. The entire television transmitting network provides color transmission, and the network which feeds central television programs via the new "Raduga", "Ekran" and "Gorizont" communications satellites has been expanded significantly. The wire broadcast network continued its development, with over 80 million wired-radio outlets in place by the end of the Five-Year Plan, including 40 million three-program outlets. A significant amount of work has been done to develop postal enterprises and enterprises of Soyuzpechat': a large number of new post offices and communications departments have been put into operation, 108 junction enterprises have been mechanized, and 99% of city delivery sections have been switched over to mechanized delivery.

The need for accelerating the scientific and technical progress of all branches of the economy stands out in the resolutions of the 26th Congress. With respect to communications, this is especially emphasized on the part of forming the national unified automated communications system. During the 10th Five-Year Plan, the USSR Ministry of Communications together with the Ministry of Industrial Communications Facilities and the Ministry of the Electrotechnical Industry accomplished a great deal of work in creating new technical communications facilities which will provide the basis for further development of communications during the 11th Five-Year Plan.

In order to develop the primary backbone communications network, high-capacity coaxial cable transmission systems have been created: the K-1920-P, which transmits, over a normal cable (2.6/9.4 mm) with four type KMB-4 tubes, 3840 voice-grade channels; and the K-3600 system which permits groups of up to 17,500 channels to be accomodated on a type KMB-8/6 cable. The 4 and 6 GHz KURS radio relay equipment allows up to 720-1300 or more telephone channels to be organized over 4 to 6 working trunks, as well as television transmission. The MDVU-40, "Gruppa", "Orbita-RV", "Ekran", "Moskva" and other geostationary satellites, which carry television, telephone, radio broadcast and newspaper column channels, have been developed for the backbone system. The "Molniya" system, which transmits via satellites in high elliptical orbit, which makes it possible to transmit programs and maintain telephone communications with high-latitude locations in the country, is still in operation.

Beside the previously developed K-300, K-120 and K-60 analog communications systems, intra-oblast primary networks are making extensive use of the newly created IKM-120 time-multiplexed systems for a standard balanced cable (to replace or augment the K-60) and the IKM-480, which uses a small coaxial cable

(1.2/4.6 mm), which can carry digital signals at 8.448 and 34.368 Mbps (120 and 480 telephone channels, respectively). This equipment has undergone testing on specially built experimental communications links. Since the testing indicated satisfactory results of operating the new communications sytems, they have been recommended for industrial production. Radio relay equipment operating in the 2 and 8 GHz range has been created for these systems which can carry 300 voice grade channels or television channels in the KURS trunk, and "Oblast'" equipment for telephone communication.

New digital IKM-12 (soon to be IKM-15), IKM-30, "Zona", and IKM-120 (which saves significant amounts of cable and copper) are in extensive use for local, city and urban telephone networks. Time-multiplexed radio relay link equipment will be introduced — the "Elektronika-11Ts" which operates in the 11 GHz range and has a 8.448 Mbps pcm multiplexing system. This system is now being tested on an experimental link.

Switching equipment is an important component of secondary communications networks. During the 11th Five-Year Plan, new quasielectronic stations which were developed late in the 10th Five-Year Plan and have been put into production, will be put into operation along with the already well-developed K 50/200 and 100/2000, ATSK-U and AMTS cross-bar switching equipment already in use in all branches of communications (rural, rayon, city and long distance). This includes the "Kvarts" exchanges for city and long distance communications, and the "Istok" for rural and rayon networks.

Channel switching equipment in direct-dialing, subscriber telegraph and data transmission systems will continue to be introduced into telephone communications. In addition, a message switching system — a new highly efficient telegraph communications system — will also be introduced more extensively. The first years of operation have already affirmed its high technical and operational indicators. The new "Kurok" electronic telegraph switching exchange, which is expected to be put into operation by the end of the Five-Year Plan, is also under development. Telegraph equipment is being improved significantly: the development and assimilation of 50 and 100 baud electromechanical alphanumeric teletype machines is reaching completion. The use of ink-type facsimile machines ("Shtrikh") will be developed further. The development of radio broadcast and improvement of its quality will occur primarily on the basis of existing technical facilities, as well as re-equiping existing stations. In order to develop television networks, a group of high performance remote-controlled unattended transmitters has been created: the "Il'men'-2", the ATRS-5/1, television relays, etc.

The development of all communications branches during the 11th Five-Year Plan will thus occur to a significant extent on the basis of new technology. In addition, besides introducing new facilities which have already been created, it remains to develop and create new, more sophisticated communications technology. The main tasks in this area are determined by a goal-oriented integrated program which provides for the creation of the next generation of coaxial cable systems — the K-10800 frequency multiplexed system, the IKM-1920 time-multiplexed system, as well as mastery of the production of IKM-480 equipment. An important direction for technical progress in the area of developing transmission systems is the creation of a fiber optic communications system. Experimental optical links carrying digital streams at 2.048 and 8.448 Mbps which were created during the 10th Five-Year Plan have indicated the applicability in principle of the components and optical cables which have been developed. During the 11th Five-Year Plan, fundamental problems of creating equipment and cables for operational fiber optic links must be resolved so that they can be introduced extensively by the end of this, and the beginning of the 12th Five-Year Plan.

The integrated program defines tasks of developing and producing equipment, as well as a number of indicators regarding the volume of introduction, which imposes definite obligations for the construction of new communications facilities on the part of introducing new technology.

Work is underway to create the new generation of "Elektronika-svyaz'" radio relay equipment for oblast communication links in all frequency ranges allocated for those purposes. The development is being done on the basis of the latest achievements of domestic radio electronics, microminiaturization and stripline technology. It is expected that these will be introduced extensively by the end of this Five-Year Plan.

The tasks imposed by the 26th CPSU Congress are grandiose. Soviet communicators, recognizing the responsibility they bear for the further development and perfection of communications facilities and systems and their role in managing the national economy, will apply all of their efforts and knowledge in order to fulfill honorably the plans of the party and of the people.

6900
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INTELSAT TO LAUNCH THREE MORE SATELLITES IN 1982

Paris AIR & COSMOS in French 18 Jan 82 p 33

[Article by Pierre Langereux: "Third Intelsat 5 Satellite to be Operational in March 1982"]

[Text] The third telecommunications satellite (F3) of the Intelsat 5 series, launched 15 December 1981, will be put into service in March 1982 over the Indian Ocean. Initially, the satellite will be positioned at 15 degrees East to be controlled by Telespazio's earth station at Fucinc (Italy). Subsequently, it will be repositioned over the Indian Ocean at 62 degrees East, over the Atlantic Ocean to replace the Intelsat 5 satellite currently in service which will then serve the Indian Ocean region. The telecommunications demand in this region is growing very rapidly--to the point where the 6,000 telephone circuits currently being provided by Intelsat 4A are close to saturation. The new Intelsat 5 satellite (1,870 kg) will have a capacity of 12,000 telephone circuits and two TV channels.

Intelsat states that its satellites (Intelsat 4A and Intelsat 5) currently in service are carrying around two-thirds of the world's transoceanic telecommunications traffic and almost all overseas television transmissions.

The next Intelsat 5 satellites will be launched this year from Cape Canaveral (Florida), using NASA's Atlas-Centaur rockets. The fourth Intelsat 5 (F4) is to be launched in March 1982 and the fifth Intelsat 5 (F5) in May 1982. The sixth satellite, which will also be the first of the improved Intelsat 5A version, will be placed in orbit in December 1982.

Intelsat plans to launch a total of 15 Intelsat 5 and 5A satellites, six of which during the next 2 years. These will be followed in 1984 and 1985 by six more Intelsat 5A satellites. These launchings will be divided up between American Atlas-Centaur rockets (10 satellites: F1 to F5 and F9 to F13) and European Ariane rockets (5 satellites: F6 to F8 and F14 to F15).

In 1986, the first satellites of the new-generation Intelsat 6 series (40,000 telephone calls), the builder of which is to be selected in March 1982, between Hughes Aircraft and Ford Aerospace. These satellites will be launched by the Shuttle or by Ariane 4.

9238
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ITALY

COMMUNICATIONS SWITCHING: LEVELS, OBJECTIVES, ACTIVITIES

Turin ELETTRONICA E TELECOMUNICAZIONI in Italian Nov-Dec 81 pp 227-234

[Article by Paolo de Ferra, doctor of engineering, central director of STET [Telephone Finance Corporation], Rome: "Switching in Italy: Levels, Objectives, Activities"*; "Summary" as published in English]

[Text] Summary--Switching in Italy: Levels, Objectives, Activities. The situation of Italian telecommunications is firstly considered, and in particular the evolution of the last two years. The present guidelines, oriented to a future unique multiservice network, are then described. Indications are given on the conversion process (in the network and production plants) from analogue to digital techniques, mainly regarding switching (transit exchanges and local exchanges). The topic problems are considered, concerning network planning, common channel channel signaling, digital subscriber lines. Some recent trends in system evolution are shown, with particular mention to both UT 10/3 of ITALTEL and the concentration of activities on a system of Italian origin. With reference to telephony, a chapter illustrates the results of electronic exchanges in operation, the technological activities in software (mainly high level languages) and in hardware (mainly microelectronics) and to the most recent switching system developments. Another chapter describes the new telecommunications services: circuit and packet-switched data, teletex, videotel, slow-video, videoconference, etc. Special mention is given to the philosophy of a multiservice integrated network, that is a network open to the interconnection of systems, even of different nature. [End of Summary]

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* This article is the translation into Italian of the paper presented by the author at the "International Symposium on Switching" held in Montreal (Canada) 21-25 September 1981. This paper was Italy's contribution to the opening and orientation session of the Symposium. During this session, authoritative representatives of the seven most advanced countries in this sector (Canada, France, Germany, Japan, Great Britain, Italy and the United States) presented papers describing results achieved and the telecommunications developmental outlook in their respective countries.

Typewritten manuscript received 5 October 1981.

1. Introduction

The switching situation in Italy and the outlook for its development were discussed by Prof D. Gagliardi in the opening session of the ISS [International Switching Symposium] held in Paris in May 1979. The memorandum presented on that occasion contains much information that adequately describes the Italian situation.[1] The conclusions reached in that document can be very concisely summarized as follows:

Switching Outlook in Italy as of May 1979

Situation:

--A certain number of manufacturing firms;

--Switching centers almost exclusively of the electromechanical type (a few semielectronic automatic transit-traffic switchers);

--Scattered use of digital techniques in transmission systems.

Plans:

--Direct change from electromechanical to digital systems;

--Specifications oriented toward future developmental changes internal to the systems.

Objectives:

--Introduction of digital techniques to the extent of 50 percent in the urban area and 80 percent in the interurban area by the year 2000;

--Concomitantly progressive introduction of new services beginning in the early 1980's;

--Rapid evolution of international switching for every type of service.

Frequent references will be made in this paper to the foregoing memorandum, with the twofold aim of confirming the foregoing orientations and of pointing up, in some cases, new initiatives that have been undertaken since then from the standpoint of speeding up and better rationalizing the implementation of those plans.

2. Telecommunications Growth

As regards telephony, at the end of 1978, there were in Italy 11.4 million subscribers and 17.1 million telephone sets. At the end of 1980, there were 13.0 million subscribers and 19.3 million sets.

In terms of ratios to population, these figures represent a growth of from 20 subscribers and 30 sets per 100 inhabitants in 1978 to over 23 subscribers and 35 sets per 100 inhabitants as of mid 1981.

These figures can be related meaningfully to the GNP [Gross National Product] per inhabitant. Figure 1 shows, in this respect, how Italy stood at the end of 1979 by comparison with some other European countries. The area of each dot is proportional to the absolute telephonic component of the GNP for the country to which it relates.

This situation brought about the drawing up of the Italian telecommunications plan for the 1980's. Governmental bodies, social forces, manufacturing concerns and operating agencies are constantly trying to achieve a balance among factors of diverse natures: Economic, financial, service, employment, and so forth.

Pressures for accelerated growth stem from various factors. These include: The substantial current backlog of requests for subscriber services, involving in many cases long waiting periods; the conviction that telecommunications are an important infrastructure, essential to the improvement of the quality of life and to the production of higher levels of income, particularly in peripheral and less developed localities; energy savings; and the need to shore up the telecommunications industry, thus attenuating unemployment problems.

On the other hand, the upward thrust on growth is being moderated by the need to ensure the economic balance of the system through adequate while not excessive rates for services as well as by the need to pace the rates of growth of plant initially to conform to the capacity of industry for converting to the production of modern systems in large quantities. In summary, the currently planned growths in subscriber services are shown graphically in Figure 2, which also shows in lighter lines, the previously projected growths announced in Paris. Under current projections, service densities in 1990 will be 38 subscribers and 57 sets per 100 inhabitants.

Figure 2 also shows traffic projections. Interurban traffic in particular is expected to grow; an increase of over 160 percent in international traffic during the 1980's is being projected.

The 1980's will also see an expansion of mobile radio services: conversational, vehicular paging and personal message. The first of these types of service is actively used in most of northern and central Italy's major cities and highways and its use is spreading to Southern Italy. The second type is in active use throughout Italy. Terminals for these two types of service now number 2,500 and and are expected to total some 28,000 by 1990. The third of these types is still in the experimental stage; our projection is that by 1990 around 5 percent of the population in urban areas will be served by terminals of this type.

Telex service is also expected to increase substantially during the 1980's, from the current 38,000 subscribers to 95,000 by 1985 and 150,000 by 1990. The projection, however, is meaningful only until 1985, in that, thereafter, new services will be available such as teletex, facsimile, word processing and others, that will adversely affect the further expansion of telex service.

As regards data services, the figures given in Paris are confirmed. The number of terminal installations increased from 50,000 in 1978 to the present total of 80,000 and is expected to grow to 250,000 by 1990. Based on a ratio of 2.4 : 1, subscriber terminals should total around 600,000. This figure includes datafax terminals (facsimile between data network subscribers); it does not include, however, videotex terminals.

For the latter type of service, called VIDEOTEL in Italy, the projection is around 350,000 terminals by 1987. The service is still in an experimental stage, as will be discussed later, and is expected to be made available to the public by 1983.

Experimentation is also under way, and will be discussed further below, on other services such as teletex, slow-scan video and teleconferencing. Substantial use of these services, however, is not foreseen until the second half of the 1980's and a projection of the number of terminals is not yet available.

3. Evolution of the Network

The need has long been recognized for an integrated services digital network [ISDN (in Italy, RNIS)], even though as a long-range objective, rather than having different networks for different services. For many years, however, it was possible to introduce digital equipment only into the transmission sector. Only recently have hardware and software technologies evolved to the point of rendering digital switching systems economically viable, particularly with respect to local switching.

This means that only beginning now will it be possible to start the large-scale deployment of those local exchanges throughout the country that are basic to the building of an effective ISDN. Then, by interconnecting these exchanges via a superimposed digital network, it will be possible to offer subscribers, on a gradual basis, those advanced services that an ISDN can provide. A certain length of time will necessarily be involved, however, in the evolution of these two processes, in the penetration of the market by these new digitalized systems, and in their gradual adaptation to providing not only telephony but other services as well.

Under these circumstances, the need to accommodate demands for new services (particularly switched data services) has led to the prior introduction of specialized facilities. On the other hand, it has also been considered necessary to avoid future incompatibilities between current facilities of this nature and the future network structure. The solution was actually to first draw up the basic specifications for the future ISDN. The most important characteristics and connotations were identified and are now sufficiently consolidated and tested. These characteristics and connotations subsequently became the basis for specifying the specialized facilities.[2]

In short, our evolution toward a network characterized by a high degree of integration of the various ISDN services is proceeding along the following guidelines:

--Large-scale digitalization of existing plant facilities;

--Specialialized facilities to accommodate demand for new services without delay;

--Compatibility of specialized facilities with the future requirements of the ISDN.

4. Digitalization of Plant Facilities

As regards transmission facilities, the degree of penetration of digitalized systems at district levels will be about 44 percent by the end of 1981. This figure is expected to be around 70 percent by 1985, through the use of digital systems on physical bearer facilities (copper or optical fibers) or on microwave links.

For longer distances, the process of digitalization is already under way. It will proceed initially on the basis of 70- and 140-Mbit/sec systems, going to higher-capacity systems subsequently. Significant development is also projected in the urban areas, where an intensive digitalization program has been started, using micro-coaxial cable techniques. 19-GHz microwave links and optical-fiber links are to follow very shortly.

With respect to optical-fiber systems, experimentation on various applications has been under way for some time now. Planning calls for putting numerous pilot plants in service on live traffic over the next 2 years. Optical fibers are expected to replace copper gradually not only in urban and district areas but also on long-haul systems. Their application may well be limited (even in a country the size of Italy), only for reasons of policy, by digitalized satellite systems, as will be mentioned later.

As regards switching, at the time of ISS '79 the introduction of time-division or frequency-division local exchanges with capacities of 1,000-2,000 lines, suited particularly for containerized use, had already begun. As regards interurban exchanges, about 15 percent of their terminations were of semielectronic technology. As of today, the number of small-capacity electronic exchanges of this type has grown.

Figure 3 shows the localities that will be served by various tens of thousands of lines by the end of this year. But what is more significant is that in 1980 the digitalization of trunk switching was initiated, with the putting into service of a Proteo TN16 exchange in Milan and an AXE exchange in Naples. As Figure 3 also shows, the digitalized trunk-switching exchanges are rapidly proliferating, and by the end of this year the various manufacturers operating in Italy will have already installed or be in the process of installing 10 exchanges of this type.

As regards trunk switching, it is expectcd that the process of conversion of production will be completed by 1985: This is to say that, beyond that year, no trunk equipment will be furnished that is not digital-technology.

The key point, however, remains that of local digital switching, and it is in this highly relevant area that the process of "acceleration" mentioned above and a solidly based replacement plan will be maximally pressed. Figure 4 provides a comparison between today's projections as regards production of local exchanges and the modest ones exhibited in Paris. Correspondingly, it is projected that by the end of the 1980, 30 percent of all subscriber lines will be connected to digital exchanges.

It is easy to imagine what impacts this acceleration process will have on planning of the interconnecting networks in metropolitan areas as well as in the areas of medium- and low-density subscriber services.

On the one hand, the digitalization of certain parts of the network tends to set off a chain reaction toward a more rapid digitalization of other parts of the network; optimization can also affect the allocation of transmission-line stages, the scaling of exchanges in tandem, the allocation of facilities, the organization of maintenance operations, and the advancement of dates by which new services can be made available. On the other hand, the existence of nondigital plants very far yet from being amortized, and the financial effort required to replace them, tend to burden and slow the process and to maintain the "status quo" (at least to a break-even point). The results can vary widely according to specific areas and different situations. Hence, the choice of a suitable technical and economic digitalization strategy constitutes for the Administration one of its most pressing problems.[3] Obviously, the principal factor is the competitiveness of the digital local exchanges.

Another important aspect of our planning has to do with our ability to effectively offer something more than basic telephony or POTS [Plain Ordinary Telephone Service]; that is, new and sophisticated telephonic services, data services, and so forth. If digital switching modules are to be installed nationwide for these purposes as well, our planning must take into account the existence, by the end of the 1980's, of new-technology modules in every locality of a certain size. Their interconnection will then be a requirement of some importance, particularly as regards CCS [Common Channel Signaling].[4]

It is expected that a nationwide CCS network will be in place by the mid-1980's and able to interconnect a significant number of exchanges distributed throughout the country (Figure 5). In view of the current multiplicity of conventional signaling systems, our objective is to achieve a uniform telephonic signaling method based on the CCITT No. 7 system** and capable of satisfying the demand for services other than telephony.

Still another important aspect is that of the distribution network or, in other words, that of the digital subscriber lines. Two categories of multiple-service subscriber lines have been specified in the ISDN structure[5]: That of large private

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** A CCS system recommended by the CCITT for international links and designed to be used also domestically within the various countries.

digital networks with access via a 64-kbits/sec multiple-channel structure, and that of small private networks with access via a limited number of individual subscriber lines (including the single-line case). Both types are being studied and tested, especially as regards their architecture and requirements for certification.

5. Systems

Traditionally, the telephone switching systems installed in Italy are supplied by four manufacturing companies that have existed in Italy for a long time complete with research units as well as production units: ITALTEL (of the STET Group); FATME (L. M. Ericcson); FACE (ITT [International Telephone and Telegraph Company]); and GTE. The largest share of the market is that ITALTEL, with over 50 percent. To this list must also be added TELETTRA, a recent entry in the area of switching.

With respect to the situation as of ISS '79, each of these manufacturers has in the intervening 2 and 1/2 years, had undertaken to develop and perfect his own products, to create new devices, and so forth. The results achieved by them have given rise to various interesting contributions submitted to ISS '81.

First, however, due cognizance must be taken of some important accomplishments and new orientations that have taken place between ISS '79 and the present.

From the standpoint of technical evolution of products, the event that appears most interesting and promising for the 1980's is the introduction of a new ITALTEL product--the so-called UT 10/3 exchange, which is the first second-generation product of the PROTEO family. Two substantive contributions submitted to ISS '81 constitute its certificate of birth.[5,6]

By comparison with the preceding generation, the birth of which dates back to the ICC [International Conference on Communications] held in San Francisco in 1975, the UT 10/3 represents a noteworthy departure. This departure clearly has some of its origins in the technological evolution that has taken place, above all in its use of VLSI [Very-Large-Scale Integration] components and in the architecture of its controls. But important origins of this departure also spring from a reexamination, together with the SIP [Italian Telephone Company], of the system specifications. The result was a new systemic approach, oriented toward the ISDN, highly modular, flexible and suited for use in networks in general and not only the Italian one.

Figure 6 gives some idea of this exchange. An exchange of this type is currently being tested in SIP's "Volta" central office in Milan. An assembly line, to an appreciable degree automated, is expected to be in place shortly. On this basis, a certain number of exchanges of this type can reasonably be expected to be in service in the network by the forthcoming ISS '84.

While Italian industry went about proving itself capable of independently designing its own products, the extent of the efforts necessary to adapt existing systems to the demands of national managements as well as to independently develop original systems became increasingly evident. An important decision was taken in this regard by the appropriate governmental bodies. The decision was aimed at coagulating all such activities around a switching system of Italian origin, even though this might mean by way of agreements between national and foreign manufacturers. Generally speaking, there is now a trend toward a reduction in the number of systems.

In short, in compliance with the mentioned decision, an agreement was worked out and was signed between ITALTEL and TELETTRA, providing among other things for cooperation between the R & D laboratories of the two companies in the forthcoming development of the above-mentioned second-generation system.

6. Tests, New Devices and New Developments

The purpose of this chapter is to furnish basic information and a few comments regarding the technical activities that have taken place in Italy between ISS '79 and the present. Chapter 7 will furnish further information and comments on parallel activities devoted to new services.

Tests: As shown in Figure 3, the introduction of the first electronic exchanges was purposely distributive over the national territory, thus involving vast sectors of the operating organization. This made it possible to obtain data in actual practice and over a broad base with regard to the response of the equipment and of the organization in terms of service-restoration-time patterns, with regard to utilization of employed personnel, and so forth.

The point that warrants underscoring, particularly as regards the exchanges developed within the STET Group*** is that the introduction into the network constituted only the final, though highly important, step in a long process. During the preceding steps, from the drawing up of the specifications to the production stage and on to the testing phase, throughout the operating structures, there were created numerous interactive nuclei of persons, who are now prepared to draw on the findings of these field tests and to put them rapidly to fruitful use. A typical example is the speed with which the results of the initial live operating tests were converted into significant improvements in restoration times and in the efficiency of the personnel.[8]

New Devices: In this domain as well, the close cooperation among the various functional units, in the form of rapid interactive reactions between one unit and another, produced fruitful results. For example, there was the joint development of new devices based on SDL [Specification and Description Language] for operational uses such as the verification of completeness of a specification, the maintenance of software, and so forth. Now, the same devices are being used in manufacturing applications, in view of their utility as aids in the development of software.[9]

*** The STET Group has the advantage of a structure similar to, though differing in size and environment from, that of the Bell System, comprising within itself functional R & D, productional and operational capabilities.

Reciprocally, a system based on an SDL editor, a CHILL concurrent compiler, and a command language designated L-CHILL was developed by ITALTEL as a supporting device in the design and development of software. Now, this same system will enable the user to operate independently on data structures as well as on operational programs.[10]

In general, the two important factors are: The close interaction among R & D structures, productional as well as operational, and the experience gained in the development of innovative projects. With respect to the latter, it was proved once again that to gain a true understanding of the greater or lesser importance of implications relating to a given sector, an essential condition is that one actually construct something within that sector.

Still within the domain of software-development devices, TELETTRA has enhanced its own capabilities in the domain of engineering methods relating to software products for large systems. A high-level language for this purpose was developed and has been used since 1980.[11]

Lastly, as regards the production of hardware, the prime importance of acquiring the capability for developing LSI [Large-Scale-Integration] components has been confirmed. It is correspondingly and equally important to be capable of designing new architectures that will maximize the advantages that can be derived from the use of these components. Particularly active in this regard are the SGS and the CSELT [Telecommunications Research and Study Center].[12]

New Developments: During the past 2 and 1/2 years, substantial further efforts have been devoted to the study and development of new products and to the improvement of existing ones.

With regard to the PROTEO system, mention has already been made of the second-generation UT 10/3. Concurrently, however, first-generation products, including the CT 2 terminal exchange and the TN 16 transit exchange, have undergone considerable technological improvements. The TI 2 exchange for transit and operator-assisted services is also now being upgraded by the introduction of a higher-capacity digital-connection network to meet the special requirements of ITALCABLE.[13]

Aside from the PROTEO system, two further activities in this domain merit special mention:

--The upgrading of the operating and maintenance performance characteristics of the digital transit exchange developed by TELETTRA;[14]

--The related development, within the STET group, of a system designated the ESCT for the real-time supervision and control of the existing long-distance telephone network.[15]

7. More Advanced Telecommunications

As mentioned above, it is planned to offer new services commensurately with the gradual introduction of digital urban exchanges. For certain services, however, specialized facilities will be introduced on an advance basis.

As regards data, as was indicated at ISS '79, the introduction of circuit-switched as well as packet-switched data services, with adequate availability of optional features, will begin in the early 1980's.[1]

As of today, it is planned to put into service during the initial months of 1982 a first circuit-switching network that will be known as the RFD [Telephone and Data Network]. The related plants, including interconnections with the telephone network, are now in the test phase. The transit exchanges are located in a few large cities; the remote-controlled concentrators are installed in 87 important localities throughout the country. A new type of concentrator, using digital technology and particularly suited to networks of this type, is currently under development by TELETTRA.[16]

Paralleling this, orders have been placed with industry for three hubs and several dozen ACP's [packet adapter-concentrators] for delivery by 1982 .

The distribution of data services subscribers is expected to be as follows in 1983:

Subscriber terminations:	(Thousands)
--on circuit-switching network	8
--on packet-switching network	12
--on direct links	60
--on the switched telephone network and RFD	40
Total	120

As has been indicated above, all new service developments are being undertaken from the viewpoint of their integration into the ISDN. For example, the above-mentioned ACP's were developed by CSELT and ITALTEL in such a way that they will be easily absorbed into the ISDN.[17]

Fundamentally, in the design of the ISDN, the telecommunications network may be viewed as transparent lake into which the information can be transferred (digital connectivity) but not limited to this. With technological evolution, new "islands" will surface within the network (Figure 7) and will justify the allocation of facilities in it for such as packet-treatment of message-oriented communications services, and thus even the memorization and treatment of the informational content.

On the one hand, this involves a series of efforts to rationalize the allocation of necessary facilities to the individual services and to enforce a strict standardization of interfaces and equipment specifications. On the other hand, this is the only way the public network can be made effectively an open network offering maximized facilities for communication between individual terminals, and between terminals and the facilities of the network. This is the concept embodied in the term OSI [Open System Interconnection], in the sense of a network open to interconnections between systems even though these may be systems of different natures. In this concept, all new services are viewed as part of a single service, namely, the public telecommunications service.

Italy devotes substantial resources to the pursuit of an international standardization, convinced as it is that every unilateral initiative constitutes not an advance but rather a delay of progress.

Particular attention is being devoted to subscriber and network interfaces. Two contributions submitted to ISS '81 refer to work currently being done toward a rationalized standardization of subscriber accesses to the ISDN.[15,18] One contribution is devoted to multiple-service CCS.[4] Another refers to current developmental work on adapting a digital telephone-switching system (ITT 1240) to standardized interfaces for other services.[19]

Other work currently under way is being devoted to experimentation.

As regards teletex, a service test is in the course of preparation in the form of an electronic mail experiment. After an initial phase limited to post offices and to a few large-scale subscribers, the service will be extended gradually to other subscribers.

With regard to facsimile, once the standardization phase has been completed there are no plans as yet to include specific facilities for this service in the network.

Worthy of special mention is the experimental work to be done on VIDEOTEL and on its potential market in the Milan area beginning in the first half of 1982. The future standard has not yet been decided; for the moment, experimentation is being based on Prestel technology, with a view to rendering it more "open" to accommodate also interconnections between data banks and VIDEOTEL centers via the network. The experimental phase will involve some 1,000 subscribers and some 100 information providers. The service is expected to be made available to the public by 1983.

Still regarding video services, developmental work is proceeding on a slow-scan video system using a 256 x 256 standard and 64-kbit/sec transmission with reduced redundancy. It is expected to find applications in the field of remote surveillance (for example, vehicular traffic intersections) or in association with teleconference services, and so forth.

In the field of images in motion, plans call for the start of an experimental videoconference within a few months. Two subscriber videoconference rooms are being prepared--one in Rome and one in Milan. Speed of transmission will be 2 Mbits/sec. Opening thus is the "digital wideband" era, the era of speeds greatly exceeding 64 kbits/sec. Such speeds will be found useful in the future for not only images in motion but also for other video services (for example, the projection of slides during teleconferences) and for updating of files, etc.

The subject of digital wideband is being pursued diligently also because of the current unavailability of distributional digital facilities at high bit rates. This, among other things, imparts a stimulus to the study of a satellite capable of providing wideband digital connectivity over the entire national territory.

The design of a satellite of this type is currently under way, to provide wideband services and to serve as an alternate facility for the carrying of any other type of signal, and particularly telephony (for example, in case of natural disasters). To enhance its competitiveness, the satellite system should be equipped with a switching capability that can be shared, as necessary, between ground stations and the satellite itself.[20]

8. Conclusions

The current status of switching in Italy have been set forth, as well as the developmental work that has been done or is being done in this sector. The information submitted on this topic to ISS '79 has been used as a benchmark. The correspondence between the evolution under way and the previously indicated lines of advance has been confirmed.

The fact is that these lines of advance are still being closely monitored and brought into convergence by government bodies, social forces, manufacturing firms, and operating agencies in an ongoing effort to find a balance among various factors of diverse natures: Economic, financial, service, employment and so forth. New actions undertaken recently in this domain, toward acceleration and greater rationalization, have been discussed.

Studies, projects, and results with regard to the technical aspects of the situation have also been discussed, reference having been made to the numerous contributions of Italian origin submitted to ISS '81.

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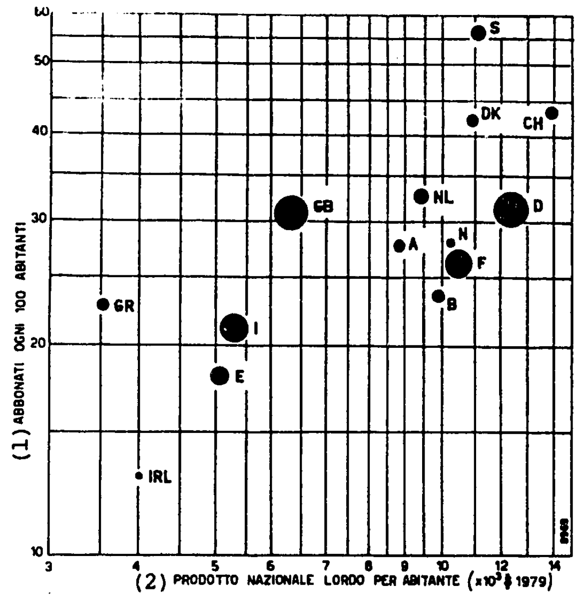
[Graphs and illustrations follow]



Key:

1. Subscribers per 100 inhabitants.
2. GNP per inhabitant - in $ thousands (1979).

-. Areas of dots are proportional to the total number of subscribers in their respective countries.

Fig 1 - Telephone subscribers versus Gross National Product (GNP).

Key:

1. Millions of inhabitants.
2. Total calls.
3. Subscribers.
4. Local calls.
5. Billions of calls.
6. ISS 1979 forecasts.

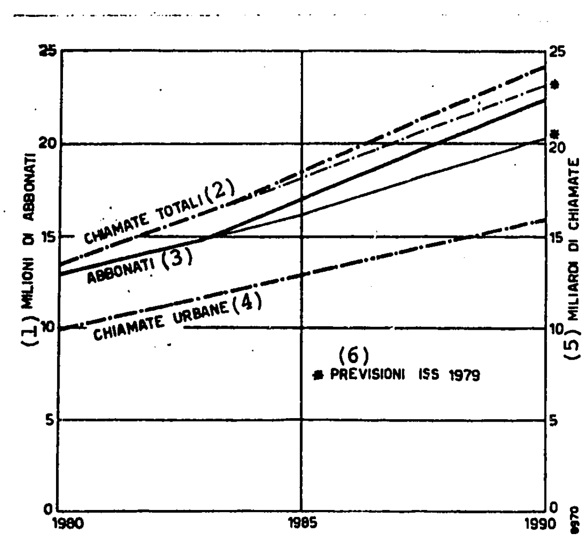
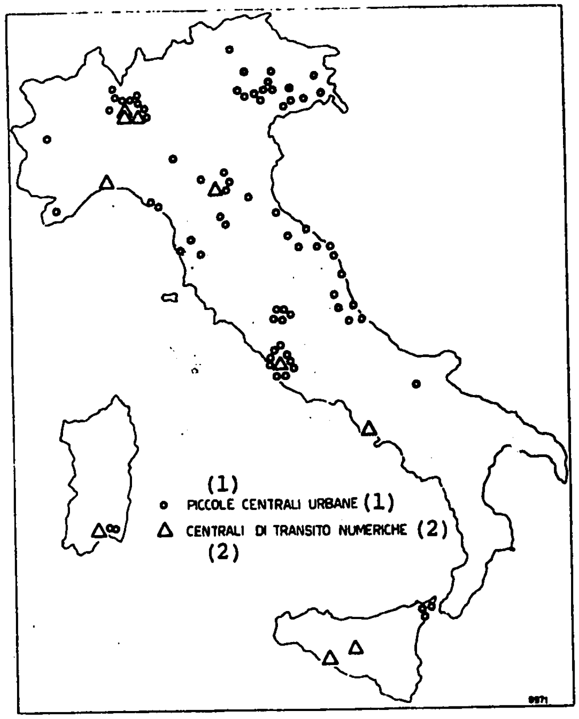


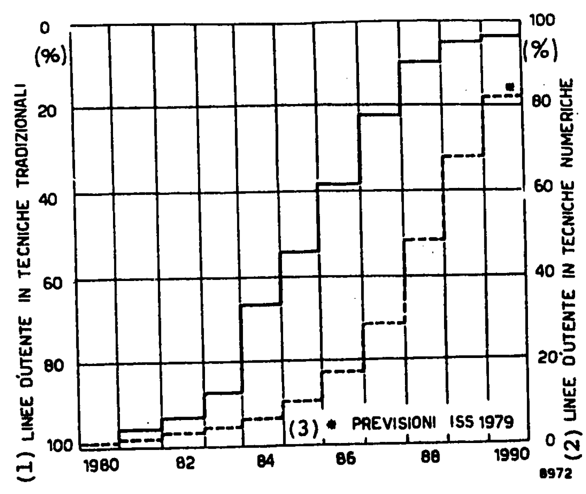
Fig 2 - Subscriber and traffic forecasts.



Key:

1. Small local exchanges.
2. Digital transit exchanges.

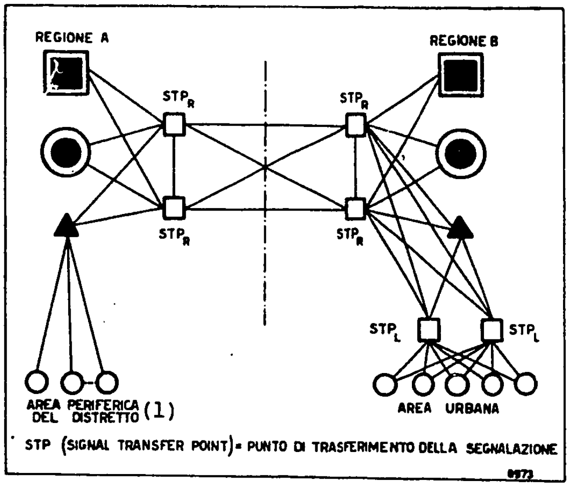
Fig 3 - Electronic switching centers (December 1981).



Key:

1. Conventional-technology subscriber lines.
2. Digital-technology subscriber lines.
3. ISS 1979 forecasts.

Fig 4 - Forecasts of local exchanges to be provided.



Key:

1. District peripheral area.

Fig 5 - Fundamental structure of CCS network.

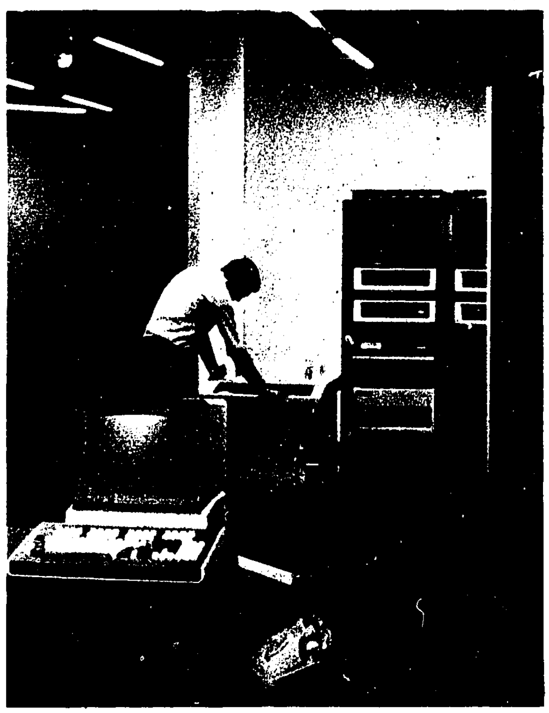


Fig 6 - Components of UT 10/3 switcher.

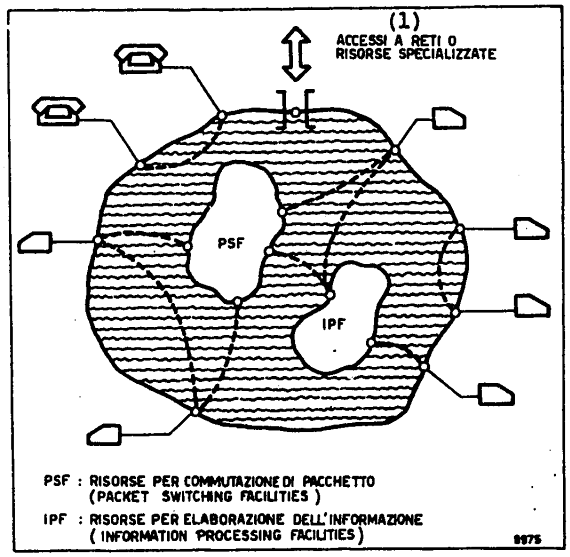


Fig 7 - Model of ISDN.

Key:

1. Access to the network or specialized facilities.

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