Telecommunications Division
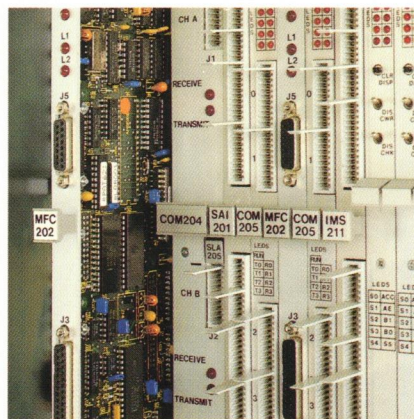## — a Presentation

RC Computer

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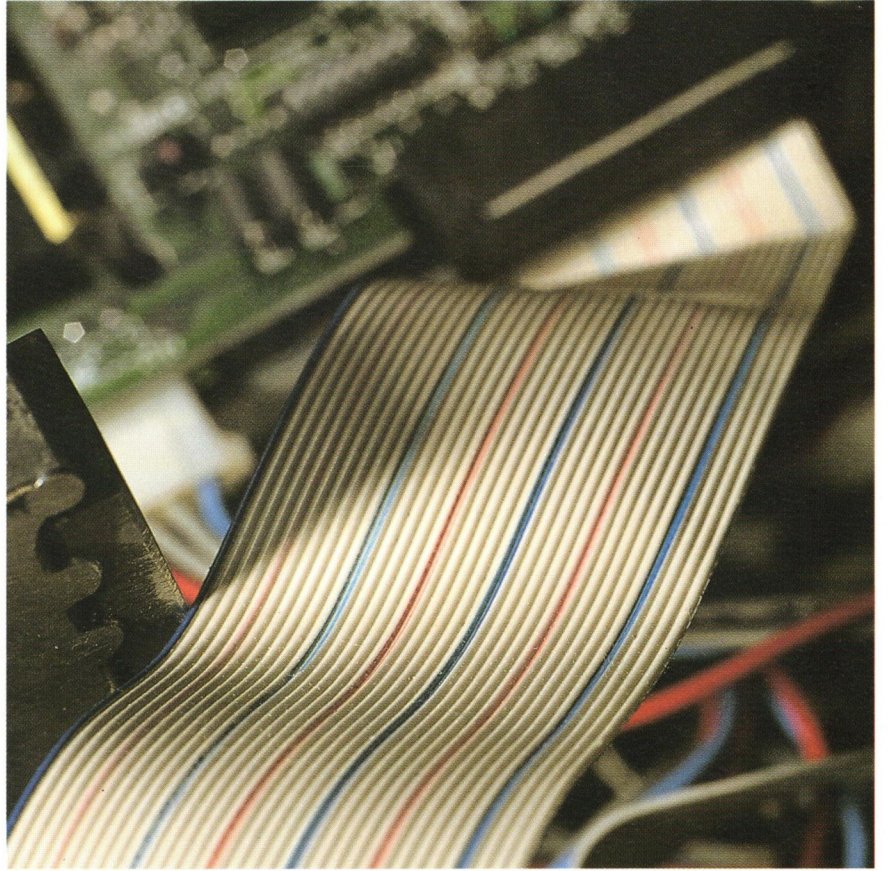
RC Computer

RC Computer A/S is a limited company owned by the following parties: The Danish Telephone Companies, The National Bank, Standard Electric Kirk, Post & Telegraph Administration, Danish Pension Fund Organisation and others, including members of the staff. The share capital amounts to 130 million kroner.

At RC Computer in Denmark there is a staff of approx. 800 employees (1987). About 180 of them are engaged in development. 125 in technical service, 200 in production, and 130 in administration and sales. On top of that there are dealers in Denmark, along with subsidiaries and distributors in other countries.

The resources of RC Computer comprise know-how, experience and expertise, and RC Computer has always managed to engage skilled employees. This has given RC Computer a reputation for quality and reliability that is underlined by the economic foundation which in recent years has manifested itself by a growth of both turnover and profits.
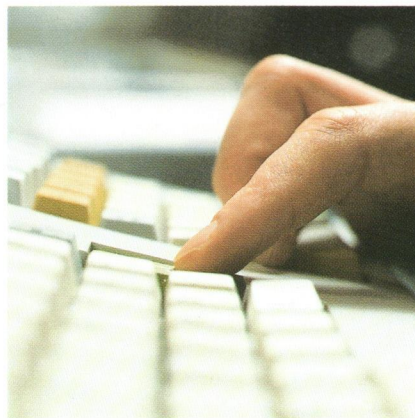
The History

Very few companies in the data processing field have more years of experience than RC Computer A/S (Regnecentralen) which was founded back in 1947 as an institute under the Danish Academy of Applied Sciences. In 1955 RC Computer was made an independent organization, and the name Regnecentralen was introduced.

In 1955-56 RC Computer developed the first Danish computer, DASK, short for Danish Arithmetic Sequence Calculator based on tubes.

In 1960 RC Computer took part in the committee defining the Algol language in the Algol-60 report. Ever since, RC Computer has always installed Algol compilers on its high-end computers, and today RC Computer has the most refined Algol system in existence. Today used in such systems as computerized telephone directory assistance systems, library systems and case handling systems in the public administration, all of them systems requiring a large number of transactions with very short response times.

Also in 1960, RC Computer introduced GIER, a fully transistorized computer developed in cooperation with the Danish Geodetic Institute. From 1963 and onwards RC Computer created a number of products, especially with relation to conversion and communication, and a product like the fastest ever paper-tape reader, RC2000, was sold in large numbers all over the world. In the late sixties and during the seventies RC Computer developed a series of computers, RC4000, RC3600, RC6000, RC7000, RC3500 and RC8000, which gave RC Computer a reputation as highly qualified supplier of computers for data base management and communications.

In 1964 RC Computer was converted into a limited company with a share capital of 10.5 million Danish kroner. Soon after, offices were opened all over Denmark and distribution channels established in West Germany, the United Kingdom, Sweden, Norway, Finland and Kuwait.

RC Computer Today

The minicomputer RC8000 is to a large extent used for processing of very large amounts of information, e.g. in connection with telephone directory assistance systems, integrated systems for libraries and complex administrative data processing systems.

For several years microcomputers have constituted a steadily growing part of RC Computer's product range, and today they account for a substantial part of the turnover. The professional 16-bit microcomputer RC750 Partner is among the most sold computers in Denmark. RC also markets RC39, which is known for its comprehensive communications program, combined with a wide range of Office Automation services.

In the terminal area RC45 offers flexibility, both with respect to communication protocols and interface. This also makes it possible to unite several types of terminals in one and the same physical terminal. The built-in ergonomic features and the compact design are characteristic of RC45.

One of RC Computer's objectives is to be among the leaders within development, production and sale of equipment for the office of the future. This objective has been met with the experience and expertise acquired by RC Computer within communications, information processing, ergonomics, design and ease of operation.

The RC Telecommunication Division located in Aarhus, has specialized in development and sales of systems for the telecommunications sector.

The Products
The Computerized Directory Assistance System (CDAS) is an information system for telephone companies. In Denmark it is known as the "telephone key", you call and receive the number of an indicated name, or vice versa.

The system was originally developed in cooperation with Jutland Telephone Company, and it is now used by all Danish telephone companies as well as by New York Telephone, Michigan Bell, Televerket in Norway, the Ministry of Communications in Kuwait and ETISALAT in the United Arab Emirates. A number of other telephone companies have decided to put the system into operation in 1988.

PAXNET is a packet switching network originally developed to link up the data banks of the telephone companies in Denmark in one big network. PAXNET is designed in accordance with the ISO-OSI model for Open Systems Interconnection and conforms to CCITT, ISO and ECMA standards.

ALARMNET is an alarm system. A value added service using PAXNET as backbone network. ALARMNET transfers alarms from subscriber premises to alarm centres via the existing telephone lines using outband signalling.

For all three systems the RC3502 Communications Processor is used. RC3502 is an RC COMPUTER developed processor specially designed for high speed switching..

The RC Process II Industrial Control System is a data collection and presentation system combining flexible configuration with an advanced graphical presentation system. Together with its predecessor RC Process I the RC Process II system is now in operation at many power plants i Denmark.

The Milestones

1974 The first packet switching network JTNET based on the RC3500 communication system with 48 Kbps transmission is put into operation at Jutland Telephone Company.

1977 The first Directory Assistance System is put into operation at Jutland Telephone Company.

1978 A nationwide saving bank servicing system, SPINET, connecting 2500 terminals to a number of IBM hosts is put into operation at the SPARDAT, Vienna, Austria.

1979 The first RC Process Industrial Control System is put into operation at the Danish power plant of ASNAES.
A nationwide terminal network, RCNET, connecting 2500 terminals to several IBM hosts is put into operation at DATEV in Nürnberg, Germany.

1982 The PAXNET network is used for a nationwide Danish university network offering terminal access to the three university computing centers located at different sites in Denmark.

1984 The ALARMNET Alarm Transmission System based on PAXNET and the RC3502 Data Communication System is put into operation as a nationwide public service in Denmark.

1986 Copenhagen Telephone Company selects PAXNET as internal terminal network and interconnects more than 1000 terminals to a number of different host computers.

1987 PAXNET is put into operation as public Danish X.25 and X.28 network.
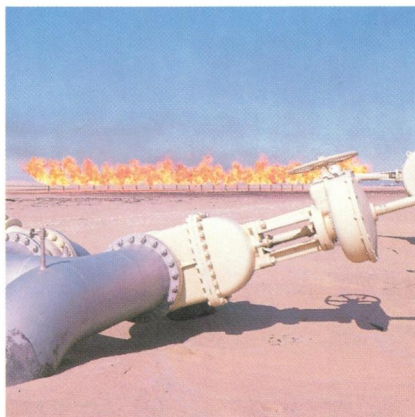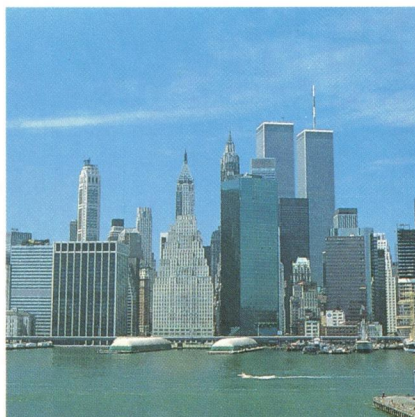
The Future

Through constant improvements of the existing products in parallel with development of new products the Telesector of RC Computer meets the fast changing world of telecommunication.

Today the 70 high skilled professionals in our research center are developing and testing the solutions of tomorrow. Solutions to communication problems such as 2 Megabit packet switching, ISDN Inter Working, ISO OSI Upper Layer Protocol implementation as well as to the problems caused by deregulation of PTT operation.

At the Telesector of RC Computer we welcome the challenge of building customized systems from standard RC modules to serve the special requirements of organizations with special needs.

At the lowest possible cost.

With the maximum flexibility.

And in the shortest time.

Computerized Directory Assistance System

The System

It is no coincidence that the Computerized Directory Assistance System (CDAS) from RC Computer has been used by PTT's all over the world for many years as the basis of information and paging services for their commercial customers.

Unlike conventional telephone directories the CDAS system, which is based on a multiparameter search strategy, offers many different ways of finding a required telephone number or subscriber name. In addition the system handles alternative spellings, alternative profession designations, acronyms, and vague location information. This allows the same number of operators to deal with double the number of enquiries — and give the right answers in 95% of the cases, even when the information supplied is limited.

The system was introduced in Denmark in 1977 for the first time and the coverage has been nationwide since 1978. It is now in use in New York, Michigan, Kuwait, the United Arab Emirates, Oman, and Norway.

The Search

As complete flexibility in creating search entries to the system is provided, inquiries may consist of
— first name,
— last name,
— street,
— house number,
— building name,
— flat number,
— P.O. box number,
— area,
— profession,
— subscriber type, and/or any other element, extracted from a subscriber data base.

In order to cope with inaccuracies in the search entries the system offers
— Phonetization Tables handling misspellings or alternative spellings of search parameters,
— Synonymization Tables containing abbreviations for common search parameters,

Dual CDAS configuration with load-sharing and 24 hour operation
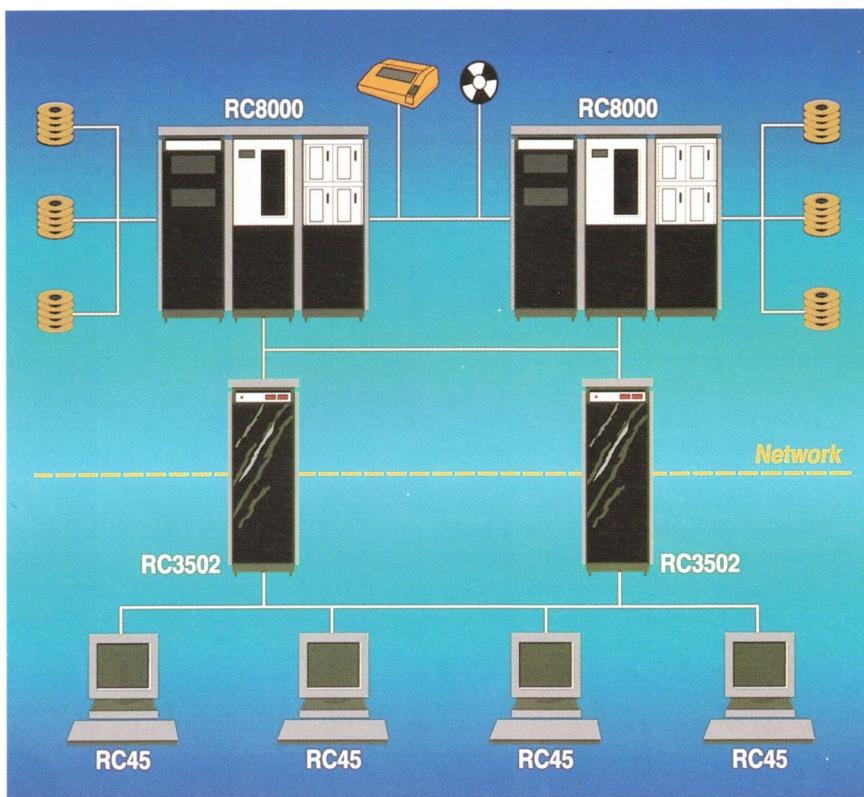
— Area/Location Tables handling borderline problems,
— Utility lists containing frequently requested numbers, emergency information or operator instruction,
— additional search entries,
— extra listings,
— related/sub listings, and
— supplementary text.
And, of course, updating the database may be carried out online from any CDAS terminal or from data extracted from existing subscriber databases.

The Operation

Based on the RC8000 database processor, the RC3502 Communication System and the RC45 Operator terminal, the CDAS system features:
— dual systems working in tandem for around the clock non-stop operation,
— directory production facilities,
— supervisor facilities,
— integration with the Automatic Call Distribution system, thereby providing Call Take Over to/ from a supervisor,
— Voice Response increasing operator efficiency by 33%, and
— System Distribution based on existing data communication networks.

Open Data Communication with PAXNET
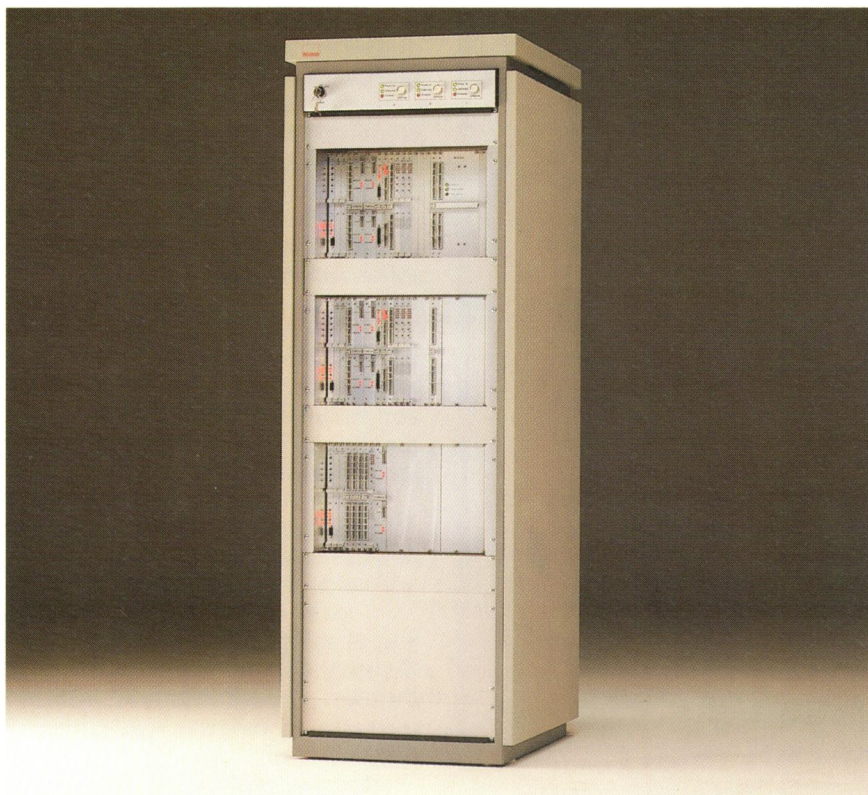
and flexible data communcation system with
- access interfaces conforming to international standards and recommendations,
- access interfaces and gateway functions supporting major industry standards
- a highly efficient and reliable transmission service utilizing dynamic adaptive routing and internal end-to-end control mechanisms.
- a network management system integrated in all network components and modules, supervised by one or more Network Management Centres.

The Application
Based on the fundamental architecture adhering to the Open System Interconnection model PAXNET is equally suitable for new network installation as for extension of the facilities and performance of existing public and private data networks.

The Product
PAXNET is a versatile data communications system intended to provide efficient data communication services. The PAXNET product is primarily intended for public telecommunication providers, and private high capacity corporate networks.

The main service provided is a packet switching data transport system with access protocols as defined by the CCITT X.25 and X.28 recommendations.

PAXNET also supports a number of industry standards and internationally standardized protocols, and is therefore the ideal foundation for important value-added corporate network services. Furthermore PAXNET is committed to adhere to the ISO protocol standards for Open Systems Interconnection (OSI).
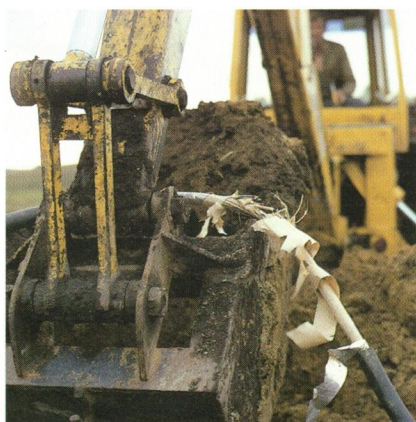
PAXNET incorporates the latest data communications technology to provide the optimal utilization of transmission media and techniques. The specially designed switching node RC3502 executes resilient and maintainable software components developed in high-level language only (real time Pascal).

The Facilities
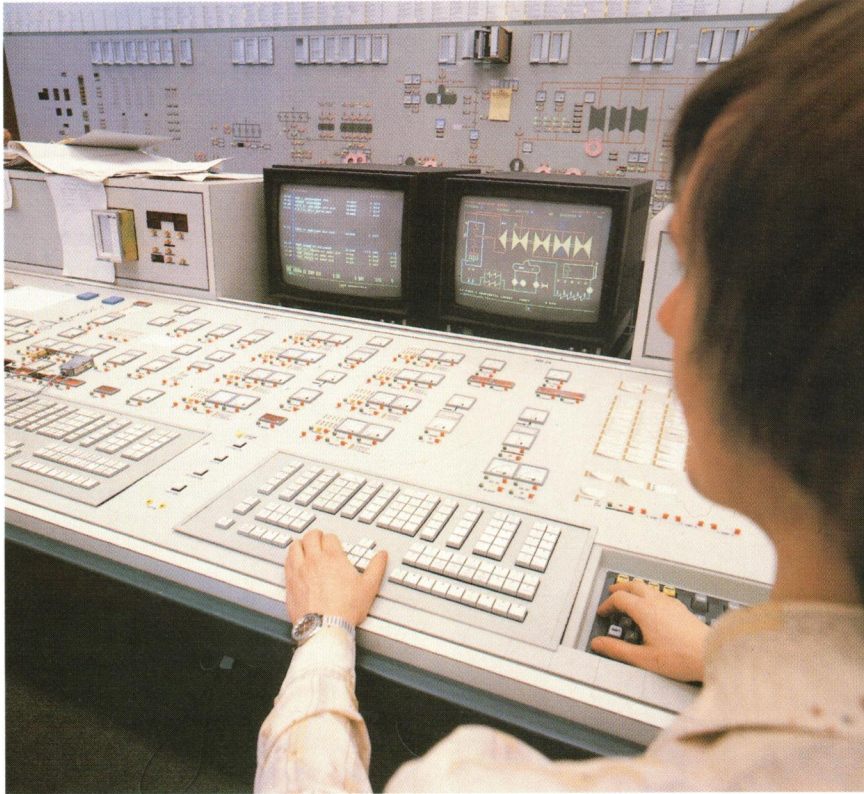Based on a unique architecture PAXNET provides an advanced

The specially designed RC3502 Switching Node

The Dynamic Adaptive Routing Mechanism ensures high transmission reliability

PAXNET combines X.25 Packet Switching and ISO Open System Interconnection

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Industrial Process Surveillance with RC Process II

The Danish Power Plant at Asnaes

The Product
The RC Process II Industrial Control System is a highly reliable and flexible data collection system.

RC Process II combines flexible configuration with advanced graphical presentation.

The History
The system was originally developed in cooperation with a Danish Energy Supplier for surveillance of a power plant.

The first RC Process I was put into operation in 1980.

The purpose was to give the plant operators a complete, consistent and quickly perceptive status of the power plant system combined with automatic detection and indication of anormal data in the constantly reported measurements.

RC Process I was based on the RC8000 computer carrying the database and presentation system, and the RC3600 minicomputer as data logging unit.

The Facilities
Today the RC Process II system is a modular system based on a number of cooperating RC750 micro-computers interconnected by Local or Wide Area Network.

The system interfaces to sensors and detectors via IEEE488 buses and industrial standard signal processors, e.g. Hewlett-Packard.

In addition to high resolution graphic display pictures of states and values with alarm indications, the system offers extensive report facilities easing logistic tasks.

All parameters and graphic representations are user definable and stored in a database.

The Applications
Together with its predecessor RC Process I, the RC Process II system is now in operation at many power plants in Denmark.
The general and modular architecture of RC Process II makes it applicable to any automated process with operator surveillance giving increased security and efficiency combined with easy adaption to changes in the configuration of the process.

Implementing the future in the ESPRIT CARLOS Project

The Project
Since 1985 RC Computer has been prime contractor in the I.E.S. ESPRIT sponsored CARLOS (Communications Architecture for Layered Open Systems) project, which will provide different degrees of network-based support for the higher-level protocols being defined in ISO's Open System Inter-connection (OSI) work.

Together with RC Computer the CARLOS consortium consists of CASE, SYSWARE and Fisher & Lorenz.

By developing tools to provide access to the OSI systems of tomorrow by today's (and yesterday's) terminals, CARLOS will enable the expansion of the I.E.S. structure and enhance the potential interworking among the ESPRIT community.

The Concept
The CARLOS components enable devices of different levels of complexity and different degrees of OSI conformance to interwork with each other and with network-based or host-based OSI applications. CARLOS results in modular system components providing users of public data communications networks with value-added OSI and network management services, which represents significant progress towards the goal of interworking among the ESPRIT community.

The Products
The OSI-PC is a modular all-layer implementation of OSI services on an RC750 Microcomputer including File Transfer Access and Management (FTAM) service and a Basic Class Virtual Terminal service.
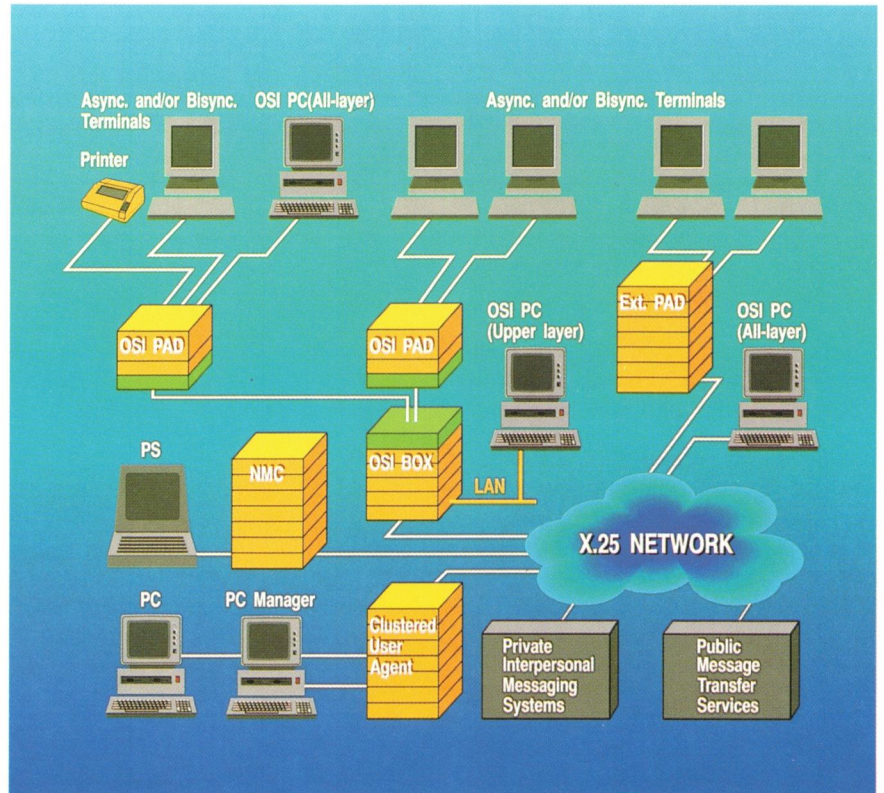
The Open System

The OSI-BOX provides an interface between low-level (X.25) networks and end-user equipment. Based on the RC3502 Communication System the OSI-BOX provides a user interface on OSI level 5 (Session service), and provides the environment for the control of distributed applications as well as for the implementation of network management applications. The end-user equipment might be directly coupled Upper Layer OSI-PC's X.25 terminals or non-OSI terminals.

The OSI-PAD, which is based on CASE 8500 series hardware, provides the ability for users of common, currently used terminal equipment to enter the world of OSI communication and provides access to applications and facilities on different host computers.

The CARLOS Network Manage-ment System is a network integrated and distributed application providing the Network Admini-stration with operational tools for network administration, operation and planning. Network Management Centers based on the RC39 UNIX computer may be connected to the network anywhere.

The CARLOS Network Management System may be extended with the CARLOS Presentation System, which offers a flexible graphic presentation of network management information, based on the DILA language.

It is not a coincidence that the CDAS from RC Computer is used world wide from the USA to the Middle East as well as all over Europe.

RC Computer

Integrated Service Systems for PTTs all over the World

Contents are subject to alterations.