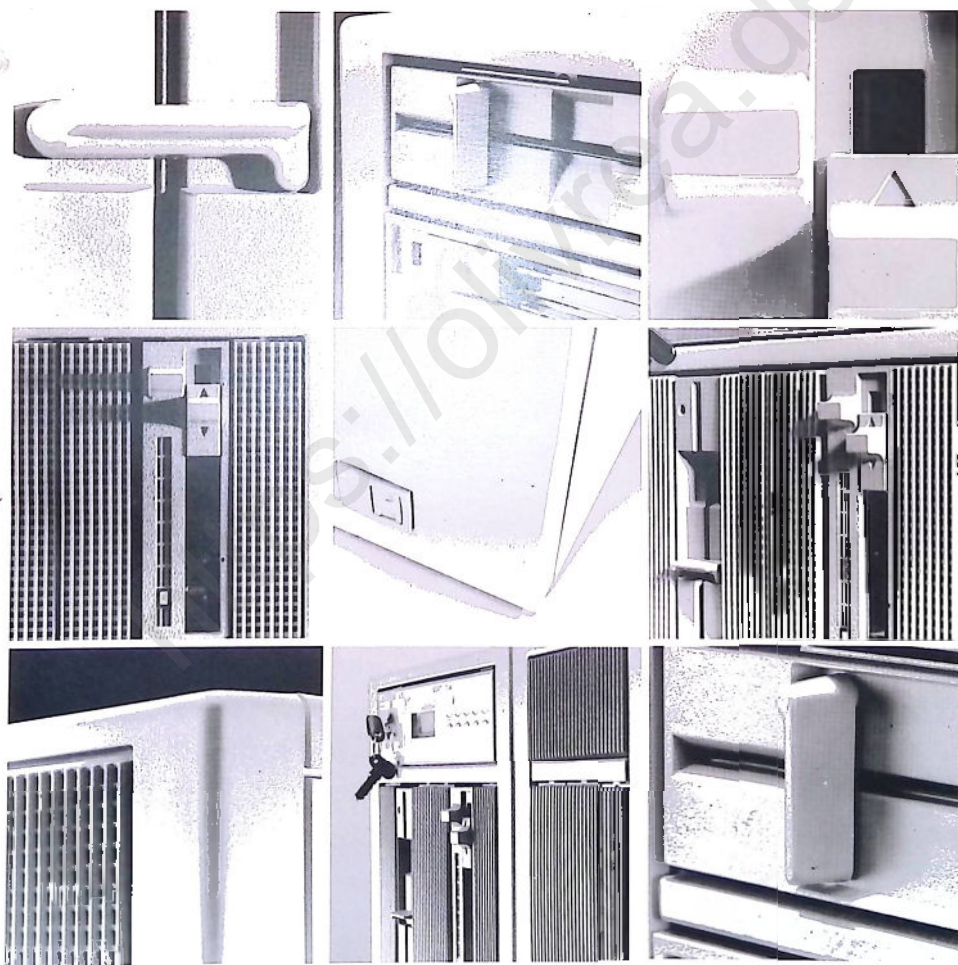


LSX 3000 Minicomputer Family System Summary



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Ing. C. Olivetti & C., S.p.A.
Direzione Documentazione
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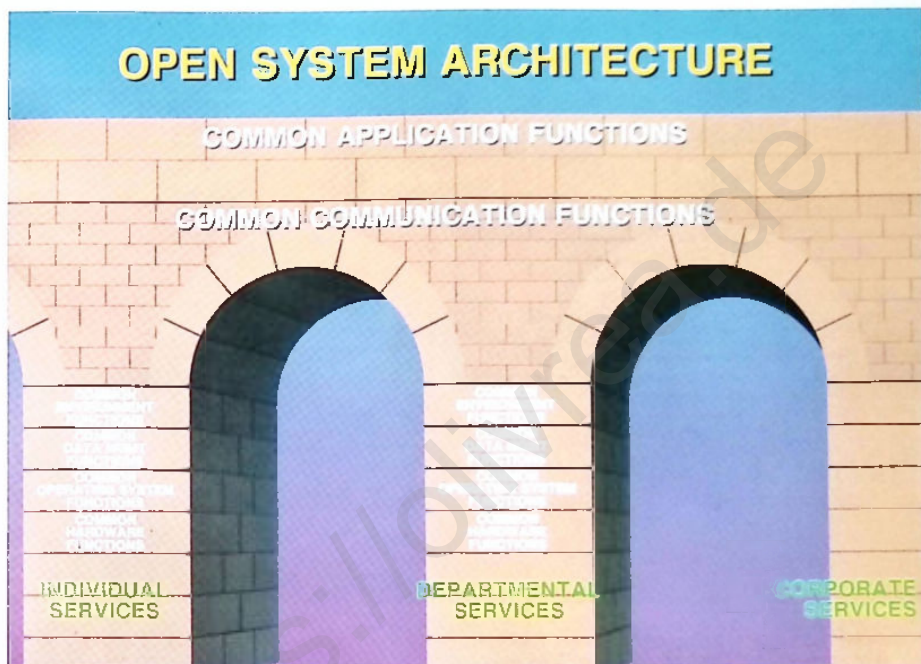
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1. Introduction



The realisation of optimal informatics solutions requires much more than the definition of a certain number of coherent products capable of supporting international standards. The solutions proposed must be integrated with the preexisting environment and be able to conform over time to technological evolutions and to growth of a company's informational needs. Olivetti responds to these requirements with its "Open System Architecture" (OSA).

Open System Architecture is something more than a simple classification of products and their interconnections: it incorporates a method that permits identification of individual "functional units" that can be used to meet specific needs. Open System Architecture speaks the language of the user, who can select rather than be selected.

Olivetti qualifies its architecture for "Open" systems as:

- "Open" to use of existing and emerging standards, chosen according to criteria of wide diffusion, quality, and functionality.
- "Open" to the different methods of expected connections, to guarantee integration with a company's present and future informatics realities.
- "Open" to develop over time with the growth of users' needs and technological evolution.

The LSX 3000 minicomputer family is included in Open System Architecture as a fundamental component for the realisation of the most advanced informatics solutions in the average company or in departments of large corporations.

The products of this architectural offer are made up of the LSX 3000 with its X/OS (UNIX System V-based) and MOS operating systems, PCs and their related

specialised adaptations, OLINET software for local and geographic networks.

The richness of the software offering available on the LSX 3000 minicomputers permits realisation of different types of application solutions, even in the presence of complex distributed information environments. The software catalogue comprises market standard Data Bases, an efficient transaction processing environment, Office Automation solutions, and a complete development environment that includes: commonly used high-level languages, fourth generation languages, Artificial Intelligence environment and porting tools.

The Data Management tools offered assure the highest possible performance: extremely rapid response times and high overall throughput. They guarantee strict data control and security.

Network configurations use standard means of transmission and the OLINET network software, common to all Olivetti products and adhering to ISO/OSI standards. OLINET-LAN is the software that permits integration of LSX 3000 minicomputers and intelligent work stations based on MS-DOS in local networks, and provides a set of services through which all the elements of the network can cooperate effectively.

OLINET-WAN is the software that permits the connection of geographically distributed systems, using both ISO/OSI protocols and the network architecture of other suppliers, for example, SNA. Other systems of interconnection between OLINET-LAN and OLINET-WAN are available (Bridge, Router, Gateway, Server).

2. Characteristics and Configuration



ADHERENCE TO STANDARDS

The Olivetti offer has been designed to provide minicomputer users with the security of an open architecture. An architecture which can manage technological changes and be integrated with the systems of other manufacturers.

A fundamental characteristic of open architecture is adherence to international standards.

From the informatics point of view standards signify: freedom of choice from a wide range of hardware and software products, protection of investments, and clear well defined rules for the connections between systems. UNIX and MS-DOS are perhaps the best known among the standards that Olivetti has adopted for its products.

The implementations of networks and communication protocols follow the most-commonly used industry standards (SNA, MS-NET, NETBIOS, etc.) and the recommendations of the international standardization committees (ISO/OSI).

Olivetti proposes "proprietary" solutions only when approved standards do not exist (for example the transaction processing environment), or when tools are required for sophisticated solutions (for instance, MOS operating system in a banking environment).

THE LSX 3000 MINICOMPUTER FAMILY

The LSX 3000 minicomputer family consists of various compatible models available in different ranges of products:

- **Low range:** the products in this range are minicomputers with either X/OS or MOS operating system. They are characterized by good price/performance ratio. The low range products are the models LSX 3010/3015.
- **Medium range:** the products within this range also use either X/OS or MOS operating system. They are widely configurable and are available in single/multi processor architectures. The models comprised in this range are LSX 3020/3025 and LSX 3035/3045.

- **High range:** the products belonging to this range are super-minicomputers controlling up to 192 workstations. They operate at a very high processing speed using the X/OS operating system. The models in the high range are LSX 3075/3085.

CHARACTERISTICS

The most diverse user needs can be met by the ample modularity and flexibility of the LSX 3000 minicomputer family. This stems from:

- the type and number of workstations and peripherals that can be connected
- the environmental software and programming tools: Data Base, Office Automation, transaction processing environment, languages, and porting tools
- the use of MS-DOS based intelligent workstations to meet specific application needs:
 - the PC (Personal Computer) station
 - the Personal PB (Personal Computer for Business)
 - the ORS (Olivetti Retail System) station
 - the ETV station, electronic video typing system.
- the types of connection for local (OLINET-LAN) and wide area (OLINET-WAN) transmission networks

STAND ALONE CONFIGURATION

The stand alone configurations can be individual systems with one or more workstations. The possibilities for use of stand alone systems can be increased through connection to a remote concentrator (Host computer).

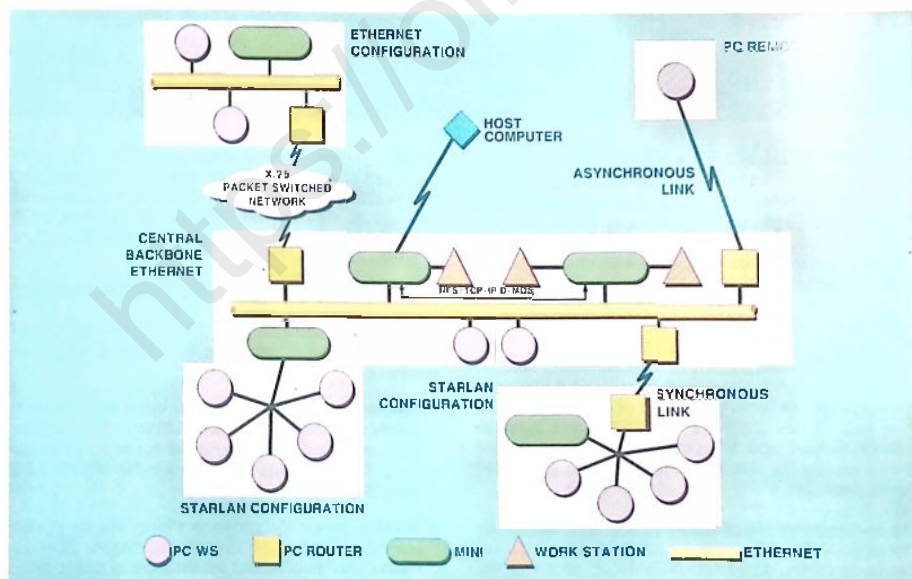
LOCAL AREA NETWORK

To satisfy the needs for information exchange in physically delimited environments (e.g., in the same building or in a group of buildings) LSX 3000 minicomputers can be connected in a local network.

A local network is structured to provide services to all the systems connected to the network or to some selected systems only. The architectural model of the network is of the "Server/Client" type. "Servers" are systems in the network that resolve application problems by use of specialized functions for information acquisition, processing, storage, distribution, and printing. "Clients" are systems that use the services available in the network environment, such as: file sharing, printers, communication lines, etc.

The possible types of networks are:

- **Homogeneous network**, consisting of minicomputers that use the same operating system. The LSX 3000 minicomputers running X/OS can exchange messages and share resources using Ethernet networks



Local Area Network

operating with the TCP/IP protocol and the NFS (Network File System) component. On the other hand, the LSX 3000 minicomputer running MOS use D-MOS based Ethernet/Starlan networks for the physical distribution of the logical resources to the various system within the network.

- **Heterogeneous network**, consisting of departmental minicomputers that act as Servers and of PCs that act as Clients. This guarantees a gradual growth from a small local network to a sophisticated departmental environment based on minicomputers, and rich with processing, data integration, and information control and security functions. The Olivetti heterogeneous local network is based on OLINET-LAN (OLivetti NETwork on Local Area Network) and connects LSX 3000 minicomputers to Personal Computers, PBs, ORS systems, and ETV systems.

The principal characteristics of OLINET-LAN are:

- Use of standard transmission products: Ethernet, Starlan
- High data transmission speed
- Transparent access to the resources of the system (files, printers, communication lines, etc.) independent from their location
- Compatibility with the MS-NET and PC-NET (NETBIOS) standards
- ISO/OSI standard network protocols up to and including the Transport level
- Configurations modularity.

WIDE AREA NETWORK

A wide area network consists of a number of nodes physically allocated far away from one another, e.g. in different cities or countries, inter-communicating via public/private telephone lines. Every node within stand-alone or distributed local network configurations can communicate with some or all the nodes in the network according to a specific model.

There are wide area networks having a "closed" architecture, which means that they can be used only by the systems of a single manufacturer. But there are also wide area networks having an "opened" architecture, which allow systems of different manufacturers to inter-communicate, this is called a multivendor environment. The communication model in wide area networks differs according to the type of architecture used, that is, in "closed" networks it is defined by the manufacturer (e.g. IBM, DEC), in "open" networks it is based on the ISO/OSI (International Standard Organization/Open System Interconnection) model.

Communication between the various nodes within a wide area network is handled for the LSX 3000 minicomputers by the LPU (Line Processor Unit) board, and the OLINET-WAN (OLivetti Network on Wide Area Network) software products. The OLINET-WAN architecture is called ONE: Olivetti Network Environment.

OLIVETTI NETWORK ARCHITECTURE - ONE

ONE is a network architecture that is consistent with the ISO/OSI reference Model. ONE makes a network completely independent from the physical communication model used.

Every physical model is implemented on a subnetwork; for example, the ISO/OSI model is on the X.25 subnetwork, and the IBM model is on the SNA (System Network Architecture) subnetwork. The main difference between the two is that communications with the ISO/OSI model are performed on the same level, while with the IBM model they rely on a Host Computer.

The services offered by ONE are: Program to program communication, File transfer (interactive and batch), Remote program execution, and Network monitoring. These services are also extended to all the types of subnetworks through which communications take place.

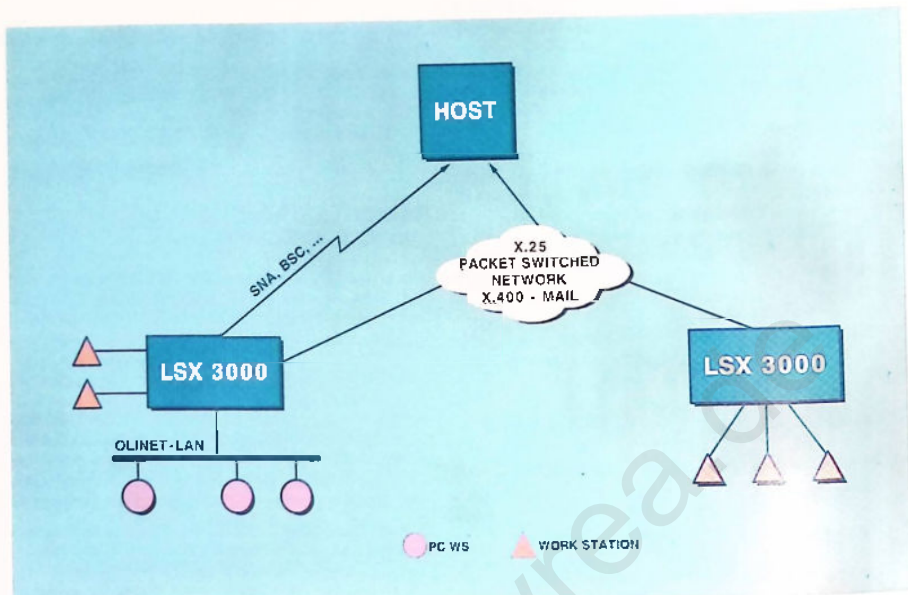
Particularly relevant in the ONE wide area network are the Network Monitoring functions. The entire network of systems is managed and controlled by one or more LSX 3000 minicomputers that host the Network Monitoring System. The latter consists of a set of services for controlling and maintaining the network's hardware and software resources, as well as distributing automatically any centrally developed software.

COMMUNICATION

The LSX 3000 minicomputers can communicate with Host computers (IBM mainframe) through public/private telephone lines, and access the files managed by the mainframe. Communication is performed by installing a hardware board and the appropriate communication software products.

The most important characteristics of these communications products are:

- IBM compatible: emulators emulating SNA architecture nodes (Node T2, T5, etc.) and Logical Units (LU type 0,1,2,3, 6.2) are available.
- Possibility of being connected to Host computers other than IBM, with character-oriented type (BSC3, VIP7700, B500/700, MSVI), or bit-oriented type (HDLC, SDLC, X.25, etc.) protocols.
- Ample availability of terminal emulators (IBM 2780/3780, 3270, SNA/BSC3, DKU, SIEMENS).



Wide Area Network

LAN/WAN INTERCONNECTION

Olivetti's offer in the network field guarantees a complete integration between local environment (OLINET-LAN) and geographically distributed environment (OLINET-WAN).

Complete interconnection between OLINET-LAN and OLINET-WAN is possible because both use the ISO/OSI standards. Interconnections are realized through specific products: Bridge, Router, Gateway, and Server.

An interesting aspect of the integration between OLINET-LAN and OLINET-WAN is the possibility for "Client" systems connected in a local area network to use the services offered in wide area networks (e.g.: Mail X.400, File Transfer, Software Distribution, etc.).

3. X/OS Software Environment

X/OS OPERATING SYSTEM

X/OS is a UNIX System V-based general purpose, multi-user, interactive operating system for the new LSX 3000 minicomputer family. X/OS offers a computing environment that is easy to use, efficient, flexible and productive. It is characterised by application portability and hardware independence.

It is structured to support a high level of integration between the single user (PC-based intelligent terminals or dumb terminals) and corporate environment (Host computer). This offers departmental solutions for the distribution of information and resources at high levels.

UNIX Standardisation

The X/OS operating system running in the LSX 3000 minicomputer models conforms with UNIX System V Interface Definition (SVID) standards, and is compatible with X/OPEN Portability Guide and POSIX (IEEE/ANSI Portable Operating System for Computer Environments).

SVID standards allow software applications to be written independently of the hardware on which they run. SVID software is portable and compatible with systems providing System V interface.

X/OPEN is a standards Committee with important computer manufacturing companies as members. It has worldwide influence. Applications operating in X/OPEN compatible environment are portable at source code level to a great variety of machines.

POSIX is an emerging standard, that supports applications portability at source code level across a wide range of hardware.

Structure

The X/OS operating system is composed of key elements such as the Kernel - the basic component on which the entire system relies - and sets of utilities:

- The basic utilities, advanced utilities, and system administration utilities all form part of the basic configuration (hardware plus operating system).
- The software development utilities are offered either as optional utilities (for the medium-range models), or as part of the basic configuration (for the high-range models).

The operating system is characterised by:

- functions that conform to SVID, X/OPEN, and POSIX standards
- Berkeley 4.2 functions, well known and used in technical and scientific environments
- basic Kernel facilities:
 - a flexible, robust and fast file system
 - virtual memory
 - demand paging feature (allowing applications to access more memory than the computer is equipped with)
 - inter-process communications and networking with socket interface (sockets allow user programs to access communication protocols to talk to other machines)
 - file and record locking feature to protect data integrity
 - reliable software interrupts to signal any asynchronous event to a user process.
- Olivetti proprietary extensions:
 - Shared libraries to reduce the space occupied by programs both in memory and on disk
 - Transaction processing environment support
 - Real-time feature with on-line application support
 - Multiprocessor architecture support
 - Graphics

X/OS includes the SAF (System Administration Facility) which allows users to perform general system administration and maintenance functions using the appropriate menus provided.

Another interesting feature included in X/OS is the NLS (National Language Support) package.



X/OS - UNIX System V-based Operating System Structure

NLS (National Language Support)

NLS is a package that contains a set of nationalisation tools for application programs written in C language. The nationalisation tools allow the handling of an 8-bit character set, date and time format, currency, and the nationalisation of standard libraries. They are also capable of isolating messages such as prompts and diagnostic messages from the program code, and translating them into the language required.

The X/OS operating system supports the following application environments: data management, programs development, transaction processing, office environment, networking and communication, and workstation monitoring.

DATA MANAGEMENT ENVIRONMENT

The Data Management environment is supported by high-quality software products for some of the more typical data base management functions.

RECORD-BASED ACCESS METHOD

Specific record-based access method packages are provided for all users that do not require the particularly sophisticated functions generally offered by a DBMS. The packages available are described below.

C-ISAM: a standard access method for sequential and indexed files.

C-ISAM PLUS: an Olivetti implementation for record-oriented access method conforming to X/OPEN ISAM definitions. Compared to other access methods, C-ISAM PLUS has a more robust implementation to access records by key.

RFAM PLUS: an Olivetti proprietary access method for relative files.

Another interesting package available is **CMX**, that allows access to remote files in distributed OLINET-LAN environment.

DATA INTEGRITY

For small and medium-range users that do not require sophisticated DBMS functions, the operating system offers the **COMMIT** package as an interesting solution to the problem of data consistency and integrity.

COMMIT is a package with recovery/restart functions. Through a login activity mechanism it is able to support different types of recovery depending on the fault encountered. **COMMIT** has a Client/Server architecture and because of this is able to interact in a network environment with other UNIX-based systems and PCs.

COMMIT can be linked to the transaction processing environment or used as a stand alone product.

DATA BASE MANAGEMENT SYSTEM (DBMS)

Among the different Data Base Management Systems available on the market as Industry Standard Products based on relational technology, INFORMIX-SQL and ORACLE are the principal DBMS packages used in the X/OS environment.

INFORMIX-SQL

INFORMIX-SQL is a relational DBMS supporting an SQL interface that conforms to X/OPEN definitions.

This product is used for applications development and the creation and maintenance of data bases. With INFORMIX-SQL it is possible to: create interactive menus, generate screen-page formats, perform data entries, and make inquiries.

INFORMIX-SQL is suitable for small and medium-user requirements within Business, Retail, and Office sectors.

The product includes the C-ISAM access method and supports the ASCII 8-bit character set.

The INFORMIX product line is completed by the INFORMIX-ESQL/C and INFORMIX-ESQL/COBOL packages. These allow access to data bases through SQL verbs embedded in C and COBOL languages.

ORACLE

ORACLE is a relational DBMS supporting an SQL interface that conforms to X/OPEN definitions.

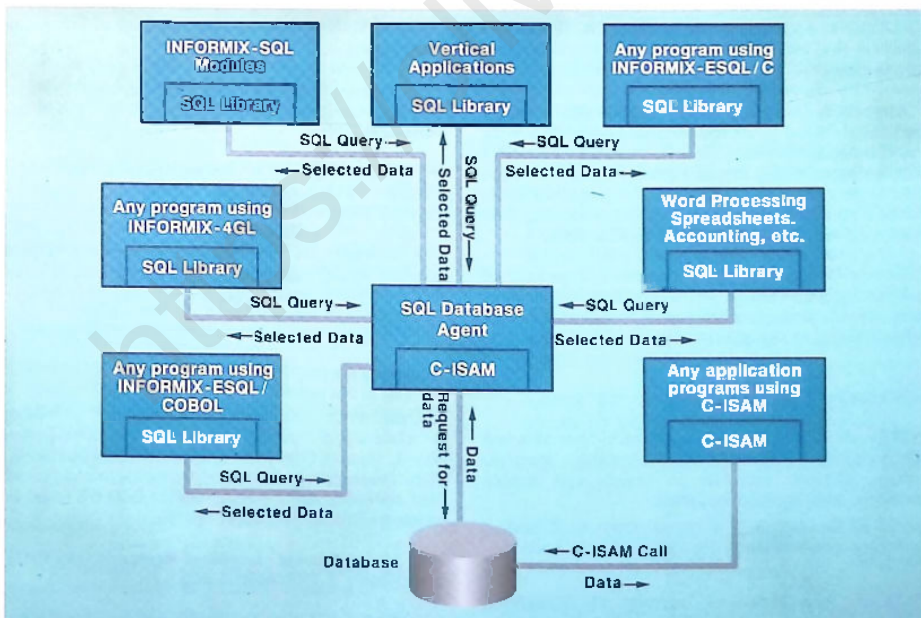
It is easily portable, and is available on IBM mainframes, minicomputers (DEC, AT&T, Olivetti, etc.), and PCs. Particularly suited to the requirements of medium to small-users within the Business, Banking, and Retail sectors, where a multivendor environment is likely to be encountered.

ORACLE provides various mechanisms for preserving user data integrity, such as record locking, commit/rollback and recovery/restart, as well as a number of different application program development tools.

It also provides the user with instruments for creating formatted reports in which recorded data can be integrated with additional text data. This feature allows the creation of standardized letters and documents.

ORACLE is completed by the pre-compilers **ORACLE PRO*COBOL** and **ORACLE PRO*C**. These packages are well suited to the development of complex COBOL and C applications integrated with 3rd generation language tools.

The ORACLE offer is completed by other packages as described on next page.



Data Management

ORACLE SQL*FORMS is an interactive tool for applications development. It includes online help, user pop-up menus, screen painting to facilitate design, construction, and mask modify operations.

ORACLE SQL*PLUS is used for creating and modifying tables and logic views, inserting and modifying data values, constructing queries.

ORACLE SQL*MENU allows users to create customized menu interfaces for all ORACLE applications and any other activity desired.

ORACLE SQL*NET can be used by the various systems within a local network, multivendor or Olnet-Lan environment, to access the ORACLE DBMS functions.

DEVELOPMENT ENVIRONMENT

The program development environment provides a rich set of highly advanced technology tools, and conforms to market standards. This environment features all the UNIX System V and Berkeley facilities for program development, and portability features guaranteed by X-OPEN standards.

PROGRAMMING LANGUAGES

Several programming languages may be used. Some of these are described below.

C Language

C language is a high-level system programming language particularly noted for its efficiency and portability. With the C language it is easy to write portable programs - that is programs that can be executed without changes on a variety of other machines. C language is suitable for switching and communications, text processing, data base programs, and many other applications.

Common Development Environment: is a package of utilities for high-level program development, particularly suitable for C programmers as well as FORTRAN 77 and PASCAL languages.

FORTAN 77

FORTAN 77 is used mostly for scientific activities and can manipulate different types of variables: integers, strings, numeric variables in simple and double precision, and boolean variables.

PASCAL

PASCAL is a high-level language for structured programming. It is a landmark in program development and is widely accepted as an excellent teaching tool.

MF COBOL

The MF COBOL language has been specifically developed for business and commercial applications. It is composed of statements made up of words and phrases that are easily learned and read by non-technical users.

From within MF COBOL programs it is possible to access record-oriented files by using the C-ISAM PLUS method available.

The MF COBOL programming environment provides interesting software tools, specifically designed to simplify the developing and testing of applications:

- **ANIMATOR:** an interactive source-level program debugging tool that permits programmers to observe directly and have complete control over program execution at source statement level.
- **FORMS-2:** an interactive and user friendly package for the generation of screen formats.
- **SCREEN:** a package for creating and editing data-entry screens interactively. It generates data definitions and the SCREEN SECTION code.
- **SOURCEWRITER:** a data dictionary-based application program generator. This package provides specific menus with which users can define their applications and insert them in a data dictionary.

OLICOBOL

This package is a version of the standard COBOL language implemented by Olivetti for the X/OS environment.

It implements the ANSI 74 standard with some ANSI COBOL 85 extensions, and allows the porting of COBOL programs from the MOS environment.

The package can be integrated with the OLIDEB program for debugging OLIBOL programs, offering in this way a complete program development and execution environment.

4th GENERATION LANGUAGES

4th generation languages are capable of providing complete support to the various application development phases, from coding to the manipulation of documents. These languages operate entirely in interactive mode and their operating speed is much higher than the speed in which traditional languages operate.

The 4th generation language supported in X/OS environment is INFORMIX 4GL.

INFORMIX 4GL is a very flexible and functional database programming language. INFORMIX-4GL allows

the development of applications in less time than that normally required when using the traditional C or COBOL languages. Programming with INFORMIX-4GL is therefore faster and easier than with a traditional language, and the resulting programs are completely customised, easy to modify, and robust in scope.

ARTIFICIAL INTELLIGENCE ENVIRONMENT

The X/OS operating system supports specific tools for developing Artificial Intelligence applications. It offers the most widely used versions of the fifth generation languages used in the A.I. environment, and a powerful expert systems generator (Expert System Shell).

Fifth Generation Languages

PROLOG and KCL are the fifth generation languages provided in X/OS.

PROLOG is a logical programming language originating from Japan's Fifth Generation Computer Project. There are two versions available: C-Prolog and Quintus Prolog. Both versions conform to the de-facto standards defined by Clocksin and Mellish.

KCL is a LISP symbolic programming language developed in Kyoto University, and conforms to the Common Lisp standardization criteria defined by Steel.

- **C-Prolog:** an interpreter written in C language and interfacing C. It is endowed with graphic functions that facilitate user interaction with the logic programming environment.
- **Quintus Prolog:** the language considered throughout the world as the reference point for Artificial Intelligence systems. It offers a logic programming environment enriched by debugging and program development tools. It is structurally based on the EMACS editor and a large library of built-in predicates. It can interface different languages like C, PASCAL, and FORTRAN, and the Data Base Management Systems ORACLE and INFORMIX.
- **Kyoto Common Lisp (KCL):** is the most widely used Common Lisp implementation characterized by high portability and efficiency. KCL can operate as either interpreter or compiler. Written in C language, it can easily interface C.

Expert System Shell

To build expert systems, X/OS provides a specific development environment named **Cleopatra**.

Cleopatra is written in C language and uses Knowledge-representation techniques based on frames and

production rules. It implements reasoning methods such as "forward" and "backward", and provides special tools like "tracing" and "debugging". User interface is via the windowing feature, and the editor is guided by the syntax. This makes Cleopatra a powerful and easy-to-use development environment.

PORTING TOOLS

Porting tools allow migration of applications created on competitor systems into the LSX 3000 minicomputers operating with X/OS. The porting tools available are:

- **THOROUGHbred BASIC:** an implementation on different environments (UNIX, XENIX, MS-DOS, etc.) of the Business Basic language. It is considered a valid porting tool for applications available in Business Basic environment, and provides advanced facilities such as: record locking, indexed file access, dynamic memory allocation.
- **UNIBOL DIBOL:** an implementation of the DIBOL language used on DEC machine on LSX 3000 minicomputers. Greatly used within business environments, it is a highly valid porting tool within that environment. UNIBOL DIBOL uses the C-ISAM method to access files, and includes a symbolic debugger and a Run-time interpreter.
- **UNIBOL RPG II:** an implementation of the RPG II language operating on IBM S/34 and S/36 systems, and used for migrating applications from these systems onto LSX 3000/X/OS systems. It includes a symbolic debugger and a Run-time interpreter.
- **CGEN:** transforms BASIC applications into C language. There are three different CGEN porting tools available:
 - **CGEN PLUS STD:** to transform Microsoft BASIC, IBM BASICA, GW BASIC applications.
 - **CGEN BB STD:** to transform applications written in Business BASIC for Data General machines running in Advanced Operating System (AOS) environment.
 - **CGEN BP STD:** to transform applications written in BASIC PLUS for DEC machines.
- **BASIX:** transforms Microsoft BASIC applications into C language.
- **INDEX:** an implementation of the indexed-file access method used on DEC and Data General machines on LSX 3000 minicomputers.
- **XP-FORM1:** allows the running of MOS applications written in COBOL and VISA languages on the X/OS environment.

- **RM COBOL 74 and 85:** are compilers that conform to the ANSI 74 (RM COBOL 74) and ANSI 85 (RM COBOL 85) COBOL standards. These are used for porting COBOL programs developed for 16-bit and 32-bit computers of other manufacturers on LSX 3000 minicomputers.
- **UX-BASIC PLUS:** is a complete high-quality product supporting the development of sophisticated applications in multiuser and multitasking environments. UX-BASIC PLUS uses an embedded version of C-ISAM to access indexed files.

TRANSACTION PROCESSING ENVIRONMENT

The transaction processing environment of the LSX 3000 X/OS minicomputers is supported by an interesting software product: MTX (Modular Transaction Processing System under UNIX).

MTX

MTX is an On-Line Transaction Processing system extremely efficient and capable of satisfying the needs of medium to large users requiring sophisticated application performances.

The open architecture of MTX is based on the Client/Server model. MTX is characterised by functions addressed to the end user, and supports transaction processing applications on local and remote systems in a distributed environment.

With MTX it is possible to debug, configure applications, perform program Recovery/Restart, share information between programs, in both Server environment and in Client/Server environment.

MTX functions are visible in the PC MS-DOS environment through a library contained on PB (Personal Computer for Business).

MESSAGE

MESSAGE is a software package available in the MTX transaction processing environment which allows messages to be exchanged between two application programs, and messages to be sent from application program to workstation (with the message broadcasting facility).

OFFICE ENVIRONMENT

The main requirement of an OFFICE environment is to coordinate the various office activities and guarantee a working environment open to networking and customized to respond to the specific needs of the single

customer and multivendor environments. Olivetti responds to this requirement by offering IBIS, an Integrated Business Information System that provides functions for creating, manipulating, and delivering different types of information irrespective of its nature (structured or non-structured information).

IBIS provides sophisticated office automation facilities and is characterized by conformance to international standards, cooperative processing, and programming possibilities.

The IBIS software requires a hardware configuration consisting of LSX 3000 minicomputers connected to intelligent or dumb workstations either through Starlan or Ethernet local networks, or in RS232C asynchronous mode.

An interesting characteristic of IBIS is Cooperative Processing, that is, cooperation between a minicomputer and the Personal Computers (PC) connected to it. The applications residing on the minicomputer can be run by the PCs locally, and the applications residing on the PCs can access the data filed on the mini.



All the applications requiring high-level user interactions are written in MS-DOS on PC. All batch process-based services are written on the mini. There is thus complete integration between different machines, and because of the remote user interface feature, applications can be accessed homogeneously both from PCs and dumb terminals (TTY).

IBIS has been conceived to conform to the needs of the single user. It provides high level programming to create new utilities and to automate routine processes. It also offers a wide range of peripherals, like laser printers, scanners and optical disks, made by various manufacturers.

IBIS is composed of two types of component sets. The first set is made up of basic components which are part of the IBIS kit. The second one is made up of a series of optional applications, available singly, to respond to the individual user requirements.

The IBIS basic components are:

- X_MANAGER
- X_INDEX
- X_MAIL
- X_WRITER
- X_PRINT
- X_NOTE
- X_ADMIN

X_MANAGER

X_MANAGER is the integrated environment monitor. It is flexible and open and its main task is to coordinate the various IBIS activities and control all access to system applications.

X_MANAGER guarantees an homogeneous interface for the various applications regardless of the type of resource used.

The components provide an object-oriented user interface consisting of panels and a commands menu. IBIS supports both character workstations and graphic workstations. To operate in a graphic environment, IBIS requires the installation of the software package: MS-WINDOWS 2.0.

With MS-WINDOWS 2.0 installed, IBIS allows the running of industry-standard graphic packages, suitable for future migration towards OS/2 and PRESENTATION MANAGER, which are the emerging market standards for office graphics.

X_INDEX

X_INDEX is used for filing and retrieving files within IBIS. Filing is performed in response to a request made by X_INDEX indicating the object to be filed whose descriptor is recorded in a specific record. Profilers are stored in classifiers and every X_INDEX user owns one classifier or more.

In addition to an object created electronically, the descriptor can also refer to a paper document, like a newspaper article or a photograph, or any other external object. In this case the element remains in the file and the descriptor in the classifier makes it easily retrievable.

A classifier is either public or private. A public classifier can be read and accessed by all the components within a group; whereas a private classifier can be read and accessed only by a single user, that is the owner of the classifier. The table indicating the users who have access to a classifier is determined by the access rights of the following three user categories: owner, group, and others. The rights are: "no access", "read only", "read/write".

There are two more security levels in addition to the access rights. The first one is the Logging Service which ensures that users without a correct user name and password are not connected. The second one consists of a number of access rights defined at descriptor level.

X_INDEX architecture includes three access methods for the retrieval of filed elements:

- Hierarchical retrieval, performed by scanning the entire file system for the element desired
- Relational retrieval, based on the contents of the descriptor related to the element to be retrieved
- Contextual retrieval, performed on the words contained in the body of the element to be retrieved.

Contextual retrieval uses a function called "Keyword Indexing", with which it indexes all the predefined non-significant words of the document into the dictionary of the classifier.

If the search is successful, the user can then perform a number of operations on the retrieved document. He can read, print, modify, or delete the document as he wishes, depending on this access rights. He can also transfer the element into the IBIS file system, or send it to another user using X_MAIL. All these operations can be performed inside the X_INDEX environment itself. All the user has to do is select and retrieve the desired element, then perform the operations he needs on that element.

X_INDEX and text processing are completely integrated within IBIS. This means that a modification requested on a document filed with X_INDEX, automatically activates the specific text processing program.

X_MAIL

X_MAIL is the electronic mail application running in IBIS. It allows single group users and users belonging to different groups to communicate with one another. The mail sent is either single message or a message with files attached to it.

X_MAIL conforms to the ISO/OSI CCITT X.400 communication standard. The X_MAIL user is provided with a wide range of utilities for sending, receiving, transmitting and replying to the messages received. He also has his own private mail box.

A message can be transmitted to a number of users at a time, and can be sent on behalf of another user. The text of a message is created using X_NOTE. A message may also include attachments in any of the following formats: ASCII, IBM Printable, X_WRITER, OTX or private.

Advanced retrieval and navigation functions are also available to X_MAIL users for localizing specific elements within the mail boxes. Thus, besides being a high-speed communication tool within offices, these functions also make X_MAIL a precise and efficient filing system.

X_WRITER

X_WRITER is the IBIS text processing program. A high-level MS-DOS application providing users with a great number of services.

X_WRITER can be used as a local text processor running on PC whenever the minicomputer is deactivated, or as an IBIS-integrated component. A text created with the integrated X_WRITER version is automatically filed in the X_INDEX filing system. As soon as the work session is completed, the document produced can either be sent or printed using the main IBIS functions, Send and Print.

X_PRINT

X_PRINT prints out the documents within IBIS. Printing is performed on either a centralized printer connected to the IBIS minicomputer, or a printer connected locally to a PC.

X_PRINT can be used by all IBIS applications.

X_PRINT has been designed specifically to support a large number of user-defined formats. IBIS considers X_WRITER, ASCII PC, ASCII UNIX as standard formats.

X_PRINT controls print queues.

X_NOTE

X_NOTE is an easy-to-use IBIS package for writing personal notes and messages, and is loaded on PC or TTY.

X_ADMIN

X_ADMIN consists of several utilities performing system control and maintenance functions. In addition to the basic components available in IBIS, Olivetti provides some optional applications, each one to be loaded separately. These are:

- X_DATA, composed of VIEW and MERGE
- X_PROGRAM, composed of TOOLKIT and PROCEDURE
- X_REMOTE
- X_GATE/UUCP
- X_GATE/TLX
- X_GATE/TTX

Furthermore, additional components can be integrated within IBIS, such as tools running on Personal Computers, for example the Office Productivity Tools (OPT) belonging to the OLISOFT family for Olivetti PCs, and some third-party software. The additional components are sometimes needed to satisfy specific user requirements.

X_DATA

X_DATA is a software package integrating data-processing functions within IBIS. There are two distinct programs in X_DATA, MERGE and VIEW.

VIEW

VIEW: the IBIS component integrating ORACLE and INFORMIX RDBMS with single-user tools (e.g.: spreadsheet, personal database, etc.). An outstanding feature of VIEW is its user interface, which allows any non-expert user of the SQL language to make enquiries easily on RDBMS.

MERGE

MERGE is an optional product which merges texts and data to create customized documents.

MERGE is an X/OS batch application designed specifically with an open architecture to allow various text formats to be manipulated and new data agents to be added. Provided with a programmable interface, MERGE is therefore very flexible and easy to activate by outside programs.

Being a batch application, MERGE allows the activation of more than one job at the same time.

X_REMOTE

X_REMOTE is an optional program that connects remote intelligent workstations to the IBIS environment through the RS232C interface, whenever a local LAN connection is not possible.

X_REMOTE supplies the software necessary to carry out the RS232C connection in complete conformity with IBIS standard functions.

The X_WRITER word processor is integrated in X_REMOTE.

X_GATE/UUCP

X_GATE/UUCP performs connections between IBIS mail service (X_MAIL) and UNIX MAIL (Q_MAIL a component of the Q-OFFICE product is one of these).

X_GATE/TLX

X_GATE/TLX connects the IBIS mail service (X_MAIL) to the telex network.

X_GATE/TTX

X_GATE/TTX enables connections between the IBIS mail service (X_MAIL) and the teletext services.

X_PROGRAM

X_PROGRAM is the real IBIS programming environment, and is composed of two individual modules: TOOLKIT and PROCEDURE.

TOOLKIT

TOOLKIT is a package made up of a group of routines for developing Cooperative Processing applications. After being developed, these applications are run like all the other applications belonging to the standard IBIS offer.

PROCEDURE

PROCEDURE is a package for automating user-defined operation sequences.

The operations automated with PROCEDURE are either defined by the user, or built-up with the programmable interface of X_INDEX, X_MAIL, X_MERGE, X_PRINT.

NETWORKING AND COMMUNICATION

There is a wide choice of networking packages available. Designed as building blocks they are easily compatible and expandable.

OLINET-LAN - LOCAL AREA NETWORK

The services dispensed by a minicomputer used as a Server in a Client/Server environment are obtained through specific software packages.

- **LAN BASE SERVER:** provides services such as sharing of files and printers, execution of programs in real-time and batch modes, and communication towards wide area networks (X.25, SNA, etc.).
- **LAN BOOT SERVER:** allows diskless Clients to load operating system and/or application programs directly from the Server.
- **LAN SUPERVISOR:** monitors all the resources connected in the network which receive the information from the LAN AGENTS (packages contained on PB Clients).
- **LAN END SYSTEM:** controls the session with the Network Center Control (NCC), from which it receives commands and software, and to which it sends the information collected by the LAN SUPERVISOR.
- **DME (Data Management Environment):** allows all the PBs on the network to access a data base contained on the LSX minicomputer using the Data Manipulation Language (DML) provided.

MULTIVENDOR LOCAL AREA NETWORK

The LSX 3000 X/OS minicomputers support packages for multivendor local area network connections. These are networks made up of UNIX-based systems from different manufacturers. The packages supported are:

- **TCP/IP:** protocol to communicate with the other systems within the network. The principal functions of TCP/IP are:
 - Remote login
 - Commands remote execution
 - FTP: file transfer utility program

A socket library interface allows C programs to access the TCP/IP protocol.

- **NFS (Network File System):** allows access and sharing of the principal resources available in the network regardless of their allocation within the network itself. The resources likely to be shared are: files, storage devices, printers, other peripherals, and central processing units.

OLINET-WAN - WIDE AREA NETWORK

The ONE network services in X/OS environment are provided on the X.25 subnetwork based on the ISO/OSI model. The latter is mainly composed of LSX minicomputers and is open to the multivendor environment (ONE ISO product).

Connections to SNA networks are made possible by the X/SNA protocol.

The LSX 3000 X/OS Server systems in OLINE-LAN networks can use and run the LAN END SYSTEM (ES) package. This package obtains information on the local network from the LAN SUPERVISOR, and transmits the information to the Network Center Control (NCC), which is in charge of controlling all the wide area network operations. The ES package operates jointly with the LAN AGENTS in the local network for the distribution of the software: ES receives the new software from NCC, and the LAN AGENTS activate it on the individual PC/PB Clients.

A wide area network can be configured with several LSX 3000 X/OS systems carrying out ES functions, but one NCC function only. The single NCC function and the various ES functions make up the Network Monitoring System (NMS).

The OPCC product provides the necessary interface to develop applications in distributed mode on a number of LSX X/OS systems connected to X.25 or SNA networks.

LAN/WAN CONNECTIONS

LAN and WAN environments can be connected together at the network protocol layer by using Routers.

COMMUNICATION

The products required for communication are protocols and terminal emulators.

Protocols

Different communication protocols are available to connect the LSX 3000 X/OS system to a Host Computer. They are:

- bit-oriented protocols:
 - SNA/SDLC on dedicated point-to-point or multipoint line in SNA networks, emulating the nodes PU 2.0, PU 2.1, LU 0,1,2,3 and 6.2
 - SNA/X.25 functionally equivalent to SNA/SDLC but for the X.25 public/private packet switching network connection
 - X.25 a protocol easily tailored to different types of public/private packet switching networks and application programs

- character-oriented protocols:

- BSC1/2 on dedicated point-to-point (BSC1) or switched (BSC2) lines
- BSC3/3270 on dedicated multipoint lines
- Burroughs B500/700 and SIEMENS MSV1 protocols
- VIP 7700/7800 protocols on dedicated multipoint lines for connections to Honeywell Host Computer.

TERMINAL EMULATORS

Different types of terminal emulator are available, which transform the LSX 3000 X/OS minicomputers connected to a Host Computer into normal Host Computer terminals. They are:

- 2780/3780 emulators, for connections that use the BSC1/2 protocols
- 3770 emulator, for connections that use the SNA protocols
- 3270 BSC emulator, for connections that use the BSC3 protocol. With this type of emulator it is possible to operate with the 3270 API programming interface
- DKU emulator, for connections that use the VIP 7700/7800 protocols
- Siemens emulator, for connections that use the MSV1 protocols

WORKSTATION CONTROL

The LSX 3000 X/OS minicomputers are supported by packages that provide specific facilities to the workstations comprised in the system configuration.

The VISA Package

VISA is a software product that runs on terminals such as WS 785 and WS 785/PC, or Personal Computers operating in the large accounts sector (PBs), and which function as VT220 emulators.

VISA consists of a set of tools, such as T-FORM, that provide several video masks to control operator interface during run-time. Usually each video screen displays a number of these masks so that the operator can select the one required for his own application needs.

The Window System Package

Window System is a software product used for displaying more than one application at a time on the video screen.

The product consists of two parts: one for the Client - the application program chained with the Window System library - and one for the Server - displaying the application.

In a Stand-alone environment, both the Client and Server parts are installed on the same system. But in a distributed environment, a program running on a system can be represented on another system connected to it via LAN through the TCP/IP protocol. This is done by installing the Client part on the system that runs the program, and the Server part on the system that displays it.

The system that hosts the Server part must be configured with a specific hardware board. Comprised in the package are the VT220 terminal emulator and the TEK 4010/4014 graphic terminal emulator.

The GKS/CGI Package

GKS/CGI is used only on systems that are configured with the graphic controller.

The package is used for developing graphic applications according to GKS (Graphic Kernel System) standards, and also to run applications written by other systems using the same standards. The GKS package provides the application with a set of commands translated by the CGI interface into primitives interpreted by the graphic controller.

The VT220 Emulator

This product connects MS-DOS-based systems to LSX 3000 X/OS minicomputers using them as WS 785 or WS 785/PC workstations.

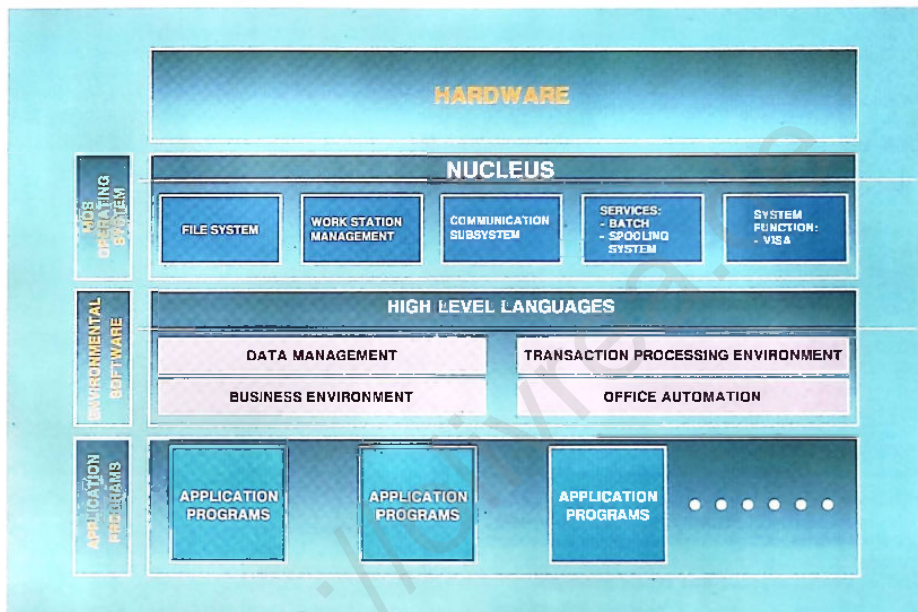
LSX 3000 X/OS - 3B FAMILY COMPATIBILITY

The LSX 3000 X/OS packages are completely compatible with applications running on other UNIX-based systems. A good example is the 3B computer family. The 3B source programs are compatible with the applications that use common tools in both environments, that is:

- Languages (C, MF COBOL, FORTRAN 77)
- Data Management packages (C-ISAM, INFORMIX-SQL, ORACLE-SQL)
- Porting Tools (UNIBOL RPG, UNIBOL DIBOL, THOROUGHbred BASIC)

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4. MOS Software Environment



LSX 3000 MOS Hardware and Software Architecture

MOS OPERATING SYSTEM

MOS is the Multifunction Operating System running on the LSX 3000 minicomputer family. It is designed to respond to specific requirements of various application sectors (banks, industry, etc.). MOS is a multitasking, and multiuser operating system, that is, a number of different workstations (**multiuser**) can activate several programs at the same time (**multitasking**). MOS has been designed to support more than one application environment (**multifunction**) on a single system and single workstation.

Other important MOS functions are:

- Support of multiprocessor configurations
- Handling of print Spool functions
- Support of high-level programming languages
- Data security, encryption/PIN-check

- Production of national language messages

LSX 3000 MOS is able to operate as:

- a stand alone minicomputer in single or multiuser mode
- a node in a local or wide area network
- a system connected to a Host computer

MULTIFUNCTION FEATURE

The principal characteristic of MOS is multifunction, i.e. the ability to support various types of application on the same system. This allows a single system to:

- connect several workstations performing different types of activities
- change activity on a workstation.

The multifunction feature guarantees a high level of integration between the various application sectors supported by a system. These being:

- Data processing
- Distributed data processing
- Banking applications (using distributed techniques and specialized peripherals)
- Public and private networks
- Office automation for local and wide area networks
- University and Research Works.

The **virtual terminal** facility allows dynamic activation of up to four virtual terminals on the same workstation at different times. Each virtual terminal configures various application environments, so the user can choose the virtual terminal he requires and thus the environment in which he wants to operate from the ones offered by that virtual terminal. As it is possible to change from one virtual terminal to another without having to close the work session on the virtual terminal in use, a workstation may operate with up to four active environments at the same time.

MOS ARCHITECTURE

MOS is made up of a section called the operating system nucleus and a series of high-level modules: file system, shell environment, workstation management subsystem, communication subsystem, background Monitor, spooling system, utilities, and system packages.

FILE SYSTEM

The File System controls data storage and retrieval completely independent from the type of mass storage device used (diskette, hard disk, and tape).

Data is organized hierarchically in a tree-type structure, and is easily accessed by the user through the various languages available.

The File System allows access to the various types of data files: Byte Stream, Positional, and Keyed files. Different access methods are supported: Sequential, Direct, and Random access. Files are grouped into directories and are stored on physical devices divided into volumes.

The File System allows different users to access the same file simultaneously. File sharing is controlled by instructions that "reserve" the file in such a way as to constantly guarantee both the integrity and confidentiality of the information handled.

SHELL ENVIRONMENT

SHELL is the MOS interface that monitors and handles all user-workstation dialogues. SHELL interprets all user commands entered on the keyboard into specific instructions for the nucleus. The commands interpreted normally refer to operations to be performed on files, directories, and volumes, and are based on a specific language called MCL (MOS Control Language).

The Shell environment includes utility programs that are available in all environments for: program preparation, screen format preparation, re-sorting of files, and exchange of information with Olivetti and non-Olivetti systems.

EDITOR

Editor is the operating system module used for creating and modifying files. It handles data at character, string, line, and window levels, and carries out typical editing operations, such as insertion, substitution, deletion, and so on, of the data displayed.

MOS uses a full-screen editor and differs from other editors in the following additional functions: simultaneous handling of large files, different backup levels, tabulation and justification.

COMMUNICATION SUBSYSTEM

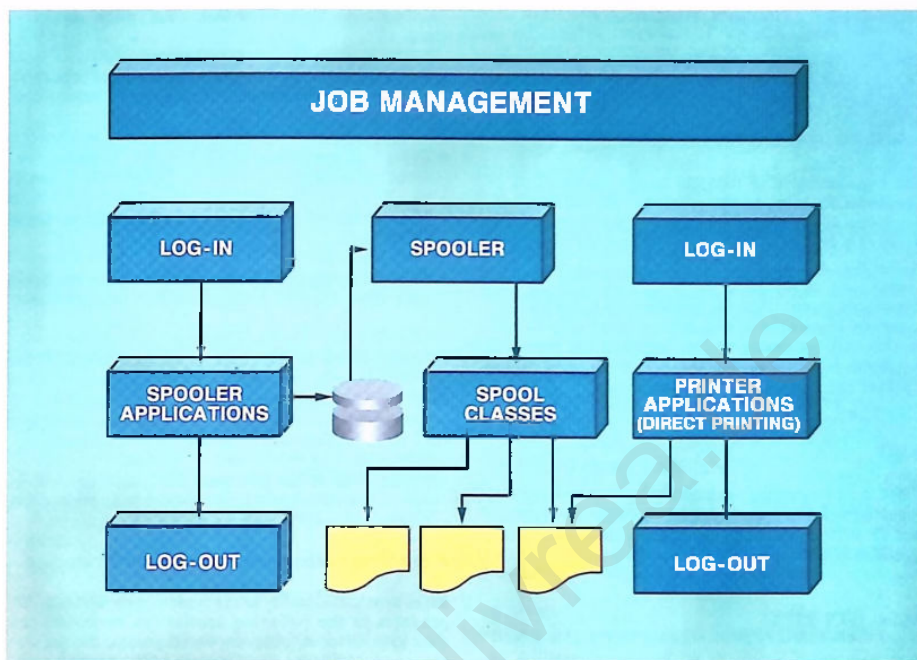
The MOS communication subsystem has been designed to provide a simple means of exchanging information with the Host computer. The exchange of data with the Host computer is performed by a high-level interface making the physical characteristics of the communication subsystem transparent to the application program, type of line and protocol used, type of network architecture, and type of transmission control/recovery procedure.

This means that the MOS user can change the type of communication used without having to modify the application programs.

BACKGROUND MONITOR

The Background Monitor is used to execute programs and procedures in batch mode. In Background Monitoring conditions, the program is not executed immediately but put in a low priority job queue and executed later. The workstation which has activated the Background Monitor is free and can execute other activities.

As a rule, the Background Monitor is used for the activities that take up a long time to execute and do not require operator intervention.



Spooling System

SPOOLING SYSTEM

The Spooling System allows sharing of system printers by all the active workstations. Every print request is enqueued to previous print requests and is performed when it becomes the first request of the queue.

The Spooling feature allows the specification of print parameters in every print request (e.g. number of copies to be printed), and control of all the print activities in spooling (e.g. cancel, suspend, and restore spooling).

MOS configuration includes some optional functions: **VISA**; signature control; **SORT**; security; nationalizing system messages.

WORKSTATION CONTROL USING VISA

MOS includes the additional package VISA (Video Interface System Analyzer), which provides specific workstation control functions (control of video screen, keyboard, printer and optional peripherals). (VISA).

VISA handles the data flow that an application program:

- transmits to a workstation for the display and writing of data

- receives from a workstation following a read or a keyboard entry function.

Besides the video screen and the keyboard, VISA controls all the peripherals connected to a workstation (printer, PIN-pad, badge reader, cash adapter, cheque reader).

VISA creates applications that are: independent from the workstation hardware used; transparent to the way in which output data is produced on the video screen, printer, etc.; transparent to the way in which input data is entered on the keyboard, read on the badge reader, and so on.

VISA programming is based on the Video Format concept, that is, a data structure dealing with input/output functions on the workstation and peripherals connected to it. The Video Formats are defined and modified interactively by using a specific utility program called T-FORM (Text-FORMat).

An interesting function of VISA is the opportunity to manage several Formats at the same time on the screen. But only one at a time is displayed with the possibility to swap it with another one when needed. Formats swapping is performed by using the keyboard.

SIGNATURE CONTROL PACKAGE

The PC/PB-based workstations operating with MS-DOS as ELB 3684 emulators (see chapter 5) provide the "Signature Control" facility. This facility is used in applications that require the automatic control of a centralised signatures file (e.g. banks).

The signature control package allows the checking of signatures. By using an optical reader, like the facsimile, connected to the system with the RS232C interface, the package is able to read the signature on the paper, and record it in a file.

The signature can then be displayed on a workstation screen by requesting it with the signature display call. In this way an operator can compare the signature displayed with the one in the document, and decide whether the signature is genuine or not.

SORT

SORT is an interesting package for sorting and merging one or more input files, to produce a single file in output that is sorted according to specific keys or criteria specified by the user.

DATA SECURITY

Data security is particularly essential in almost all working fields and especially in a banking environment. The data security facility prevents any non-authorized person from access to the system and its files.

The security mechanism used by the LSX 3000 MOS minicomputers addresses three fundamental access routes:

- System access: the security mechanism adopted here is at login level where it checks that the password is entered correctly and responds to the user login name
- Data access
- Program access

Encryption and PIN-Check

Supporting the security facilities, MOS is provided with the Data Encryption and PIN-check features with which application programs can:

- protect all data transmitted on line (end-to-end encryption)
- check the identity of users requiring the execution of operations that are particularly protected (PIN-check).

The functions provided by Data Encryption and PIN-check are:

- Encryption/decryption of data according to the Data Encryption algorithm (DES -Data Encryption Standard)
- PIN-check procedures of IBM, VISA, Eurocheques, IPACRI, COMIT
- Calculation of the Message Authentication Code (MAC)
- Support for the key management scheme, compatible with IBM 4700 for sophisticated key management

SUPPORTING NATIONAL ENVIRONMENTS

A very important user requirement is the possibility to communicate with the system in ones own language. LSX 3000 MOS is able to satisfy this requirement by:

- making use of the user's national language for all application interactions (MOS handles 8-bit representation)
- providing national versions of all system messages.

MOS provides support in the form of specific software products in the following application environments: data management, program development, transaction processing, business environment, office environment, networking and communication.

DATA MANAGEMENT ENVIRONMENT

The Data Management environment requires the use of the File System functions and some specific software packages (COMMIT, ORACLE, DMS).

COMMIT

The COMMIT package provides recovery/restart functions to protect data integrity and consistency in the event of system faults.

Data integrity is a very important requisite in application environments where a large number of users need to have access to the same database simultaneously. In these environments it is very important to keep data integrity under constant control to ensure consistency and availability.

COMMIT has a Server/Client architecture that allows communication with other MOS systems and PCs in network environments.

COMMIT can be integrated in the MTS transaction processing environment or used on its own.

ORACLE

ORACLE is a relational Database Management System created by the ORACLE Corporation. It is available on a wide range of product classes (PCs, minicomputers and mainframes). Because of this, ORACLE applications are widely portable.

ORACLE provides an SQL interface that conforms to the X-OPEN definition. SQL (Structured Query Language) was developed specifically for relational Databases.

ORACLE includes various functions that guarantee data integrity, i.e. record locking, commit, and recovery/restart.

Comprised in the ORACLE offer is the **ORACLE SQL*FORMS**, an interactive tool for applications development. It includes online help, pop-up menus, screen painting to facilitate design, construction and mask modification in updating and enquiring of databases.

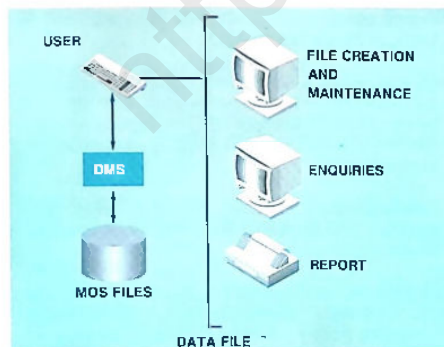
ORACLE is completed by the following pre-compilers: **ORACLE PRO*COBOL** and **ORACLE PRO*C**, used for developing sophisticated applications that need to have access to the Database through COBOL and C languages.

DMS (DATA MANAGEMENT SYSTEM)

DMS is a typical database management environment that is characterised by its Query Language.

DMS is interactive and procedural, providing an easy-to-use data management language (DML: Data Manipulation Language). It allows access to MOS files for:

- creation and updating
- inquiries
- report creation
- printing of data



Data Management System (DMS)

Data structures generated by DMS are such that files created in other languages (BASIC, COBOL) can be used in this environment and vice-versa.

DMS provides every user with a customised view of the file data. With the VISA/T-FORM functions a user can define data and create screen formats to display data.

DMS uses the standard File System structure to protect files from simultaneous access.

There are some application packages available in DMS environment that make certain operations such as data selection, transfer, and handling, more powerful and easier to use. The application packages are: DMS Multifile, DMS Multifile/Conversion, DMS Query by Form.

DEVELOPMENT ENVIRONMENT

PROGRAMMING LANGUAGES

Application programming in LSX 3000 MOS makes use of various languages conforming to the ANSI international standards that comprise all the necessary program preparation tools and libraries.

PROGRAM PREPARATION ENVIRONMENT

Programs are written with the system editor, stored on files, then compiled. MOS features some interesting tools for preparing and executing programs, that is:

- **Linker:** uses the output of language compilers to produce modules suitable for their loading into main memory.
- **Symbolic debugger:** allows full interactive control of compiled and chained program execution.

BASIC

BASIC (Beginners All-Purpose Symbolic Instruction Code) is a general purpose high-level language suited to business and technical-scientific applications. LSX 3000 MOS BASIC is a compiled language conforming to the ANSI X3J2/85-08 standard.

This language is a superset of the various BASIC language versions available on the market. It has been created for sophisticated and large-size applications requiring high processing speed.

The compiled BASIC includes the high-level structured programming feature which allows the structuring of sophisticated programs into modules to facilitate their development and maintenance.

COBOL

COBOL (Common Business Oriented Language) is a high-level language created especially for business applications.

LSX 3000 MOS COBOL conforms to the ANSI 74 standard and includes some features that are comprised in the ANSI 85 Recommendation. COBOL also provides the SCREEN SECTION feature which allows definition of screen formats for operator interface.

An application program written in COBOL can access the MTS (Modular Transaction Processing System) environment, and use all the services provided by the packages and the environmental software of the LSX 3000 MOS environment. This makes available all the functions provided by the MTS and BEAM environments, the VISA module, the ONE, the RS232C/CL interface, the CAT interface, etc.

COBOL's principal features are the:

- capacity to handle large volumes of data
- use of hierarchical structures for record description, and the definition of multilevel record structures
- use of specific tools to perform data entry and transaction processing operations on programs in execution (SCREEN SECTION).

C LANGUAGE

C is a programming language that implements UNIX application programs, utility programs, program preparation tools, text editing, electronic mail, and many others.

The C language supported in MOS allows the transport of standard C programs from one system to another, and the writing of C application programs.

C is a high-level structured programming language handling a variety of data and supporting numerous program creation facilities. It can be supplied with a number of library modules that provide users with helpful program preparation functions such as: system functions, standard input/output functions, etc.

PASCAL PLUS

Pascal Plus is an extension of the standard ISO-1980 Pascal and UCSD Pascal. The extension includes particular structures (Monitors) to synchronize simultaneous activities.

Pascal Plus is used in the LSX 3000 MOS environment to:

- write and modify line protocols
- write transaction processing programs for the MTS transaction processing environment.

TRANSACTION PROCESSING ENVIRONMENT

The LSX 3000 MOS minicomputers support a transaction processing environment where transactions are performed. Transactions are operations and functions executed interactively to control files, communication lines, and printers, used in common by all the users of a working environment.

The transaction processing environment must guarantee file integrity in all the transactions requested by users. This is an essential aspect in banking environments where the reliability of file contents is vital. Typical transaction computer applications are found in the following sectors:

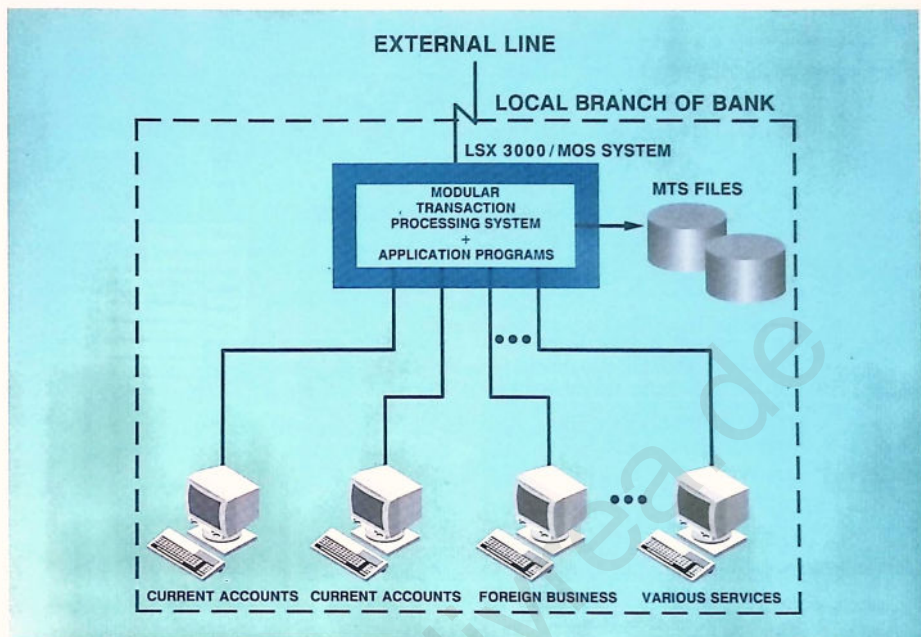
- Banking: handling current accounts, securities, etc.
- Industrial: handling orders, monitoring production, etc.
- Services: reservation of aircraft seats, etc.

MTS (Modular Transaction System)

MTS is a MOS environment that offers facilities for creating transaction processing applications. It guarantees:

- **Data security.** Access to the system is controlled by particular mechanisms that prevent any unauthorized person from having access to the system.
- **Efficiency.** The MTS structure is such that it allows the adaption of transaction response time to user requirements.
- **Easy use.** Application programs are involved with application requirements only. Everything that involves security control in the event of a system fault during file updating, simultaneous access to the system by different application programs, and so forth, is monitored by MTS.
- **Configuration.** MTS can be configured to guarantee optimal facilities for all installations. MTS can easily be reconfigured to meet the growing needs of the system (i.e. additional workstations, new application programs, etc.).
- **Recovery/restart facilities.** These facilities allow restoring of a system to the prior-failure operating conditions.

MTS supports the COMMIT and Message Switching tools. COMMIT protects files from undesired interruptions during transactions, and system users use the Message Switching facility to exchange messages between themselves.



Transaction Processing Environment

Filing in MTS

An efficient filing system is essential in any transaction processing environment. Among the various types of files handled by MTS, Chained DataBase is the most important. The C-DataBase is a centralised database embedded in MTS; it has a hierarchical structure that creates and re-organizes data, handling it with database management techniques and tools.

OLIFIN is composed of two packages:

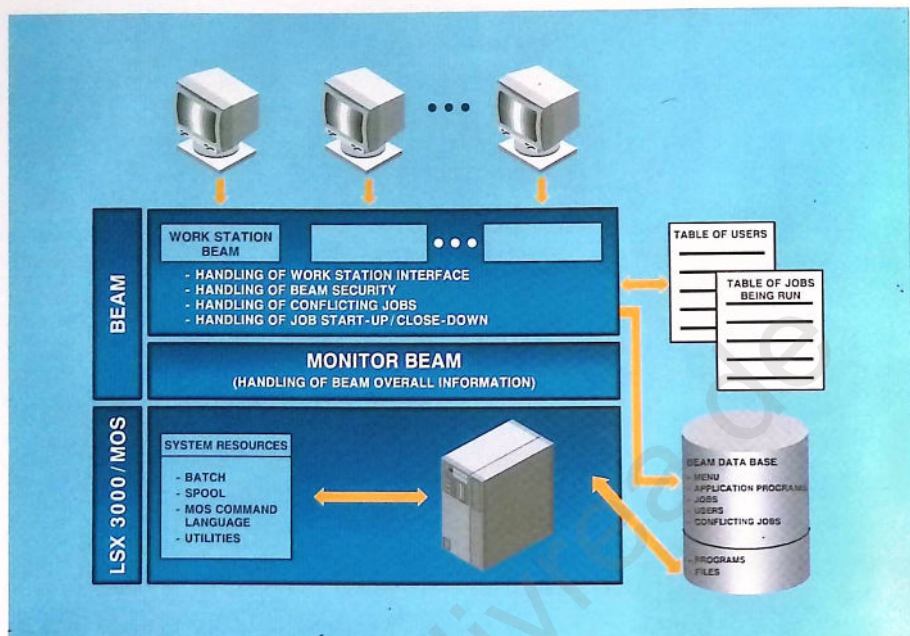
- **Olifin Profiler:** containing all the tools that are necessary for generating masks, menus, function keys, and transactions.
- **Olifin Library:** containing libraries supplied by Olivetti which assist the creation of application programs.

TRANSACTION GENERATOR

In large account sectors (Banks, Financial Institutions, etc.) OLIFIN is a useful software tool for developing financial applications.

OLIFIN allows optimal development of applications that address the following operating sequences:

- data entry
- transmission to Host computer
- reception of data from Host computer and automatic storing/updating of files and totals



BEAM Architecture

BUSINESS ENVIRONMENT

BEAM (Business Environment Application Monitor) is designed for business applications and interfaces all system functions.

BEAM controls all the users, and presents each one with menus containing programs to be run in the business environment. The main features it offers are:

- **User Identification:** each user is associated with specific information indicating which activities are to be performed. A significant example is the information on a user's company which is indispensable to the system when processing data for various companies.
- **Data Protection:** according to different data security levels.
- **Background processing:** where all the activities are executed in background without direct control by the user - except for manual interventions such as loading paper into a printer. BEAM controls the print queue and the printed output by checking the start-of-page alignment, page restart, restart after a system crash, etc.

- **Restart function:** allows recovery of program or application procedures after a system crash or a power failure.
- **Master workstation:** supervises all active operating environment functions such as background processing, spool queues, the "ready peripherals" requests (disk units, printers), restart, and BEAM configuration.

A user can customise BEAM environment to his personal requirements by defining: the identification of the company and its users, the priority levels for each user, the national language used for menu and messages, and the creation of application menus.

OFFICE AUTOMATION ENVIRONMENT

The MOS Office Automation environment requires LSX 3000 MOS minicomputers and MS-DOS Personal Computers.

The packages running on the PCs are the Office Productivity Tools (OPT) of the OLISOFT family:

- TEXT PLUS 2.0/NET
- CALC 2.0/NET
- DB 2.0/NET
- ODS

The packages running on the LSX 3000 minicomputers are: M_MAIL, M_MERGE, M_INDEX.

M_MAIL is an electronic mail service for exchanging messages and documents between systems according to the X.400 standard. M_MERGE is a package that merges texts created with TEXT PLUS 2.0 on Personal Computer with data extracted from a DataBase housed on a PC (DB/NET) or an LSX (ORACLE). M_INDEX deals with public/private archives, storing information on them or retrieving information from them.

NETWORKING AND COMMUNICATION

This paragraph presents the Olivetti networking and communication products for the LSX 3000 MOS minicomputer family.

LOCAL AREA NETWORK: OLINET-LAN

The LSX 3000 MOS Server operating in OLINET-LAN provides the necessary services by running some specific software packages, that is:

- **LAN BASE SERVER:** for sharing files and printers, execution of programs in real-time and batch modes, and extending communications to a wide area network (X.25, SNA, etc.).
- **LAN BOOT SERVER:** for loading the operating system and the application programs on diskless PC Clients.
- **LAN SUPERVISOR:** for monitoring the network resources with the information received from the LAN AGENTS (packages running on PB Client).
- **LAN END SYSTEM:** for controlling the work session with the Network Center Control (NCC), from which it receives commands and software, and to which it sends the information received from the LAN SUPERVISOR.

- **DME (Data Management Environment):** for allowing the PBs connected within a network to access information contained on a DataBase stored on the LSX minicomputer, using DML (Data Manipulation Language).

MOS HOMOGENEOUS NETWORK

MOS can be distributed on several systems (i.e., LI, LSX) connected to one another in a local Ethernet/Starlan network. This newly configured product is called D-MOS (Distributed MOS). The most important aspect of D-MOS is the fact that every system within the network, in addition to using its own resources, can use the resources belonging to the other systems of the network. Distributed processing is also used for remote systems operations (login, program execution, etc.).

WIDE AREA NETWORK: OLINET-WAN

The ONE network services are obtained in MOS on the ISO/OSI-based X.25 subnetwork, configured with LSX minicomputers, and which is open to the multivendor environment (ONE ISO product).

Connections to SNA and DSA ISO-based X.25 networks are also possible. DSA ISO is a Honeywell-Bull implementation for the ISO/OSI model.

The LSX MOS Server systems in OLINET-LAN networks can support the LAN END SYSTEM (ES) package. The latter receives information on the network from the LAN SUPERVISOR, and transmits that information to the Network Center Control (NCC), which controls all the wide area network operations. ES operates jointly with the various LAN AGENTS installed on the local network to distribute the necessary software: ES receives the new software from NCC, and the various LAN AGENTS activate it on the single PC/PB Clients.

Every WAN network can easily contain more than one ES function, but only one NCC function. The NCC and the various ES together make up the Network Monitoring System (NMS).

LAN/WAN CONNECTIONS

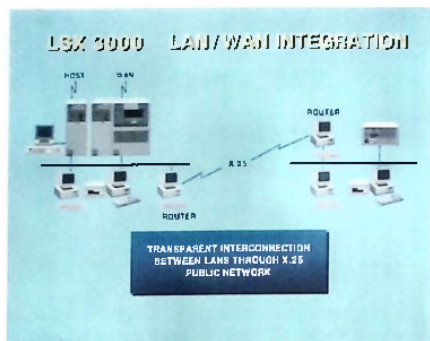
LAN networks and WAN networks can be connected together at network protocol layer using Routers.

LINE COMMUNICATION

The MOS line communication subsystem supports:

- connection to Host computer
- line protocols
- terminal emulators

The software products used for line communication are protocols and terminal emulators.



LAN/WAN Integration

Line Protocols

Various line protocols are available:

- Bit-oriented protocols:
 - SNA/SDLC for dedicated point-to-point and multipoint lines in SNA networks, emulating the nodes PU 2.0, PU 2.1, LU 0,1,2,3, and 6.2.
 - SNA/X.25, functionally similar to SNA/SDLC, but used for packet switching X.25 public/private networks
 - X.25, protocol easily adapted to various types of packet switching public/private networks and application programs
- Character-oriented protocols:
 - BSC1/2, for dedicated point-to-point line (BSC1), or switched lines (BSC2)
 - BSC3, for dedicated multipoint lines
- Burroughs B500/700 and Siemens MSV1 protocols
- VIP 7700/7800 protocols for dedicated multipoint line connection to a Honeywell Host Computer

Terminal Emulators

Different types of terminal emulators can be used to connect LSX 3000 minicomputers to a Host Computer as if they were normal Host Computer terminals. The terminal emulators available are:

- 2780/3780, for BSC1/2 protocol connections
- 3770, for SNA protocol connections

- 3270 BSC, for BSC3 protocol connections; with this emulator it is possible to use the 3270 API programming interface
- 3270 SNA, for SNA protocol connections; with this emulator it is possible to use the 3270 API programming interface
- DKU, for VIP 7700/7800 protocol connections
- Siemens emulator, for MSV1 protocol connections

LSX 3000 MOS - L1 MOS COMPATIBILITY

The LSX 3000 minicomputers run with the Olivetti proprietary operating system MOS, which is the operating system in use on the L1 family, but with the addition of new LSX 3000 specific functions.

The LSX 3000 MOS minicomputers support all the L1 MOS files and application programs. The latest L1 models are supplied with a transformation kit that enables users to change from L1 into LSX environment. New systems can be added to the network in use through the Olivetti distributed environment tools and facilities.

5. Hardware



Olivetti LSX 3000 minicomputer family

Olivetti LSX 3000 is a family of 32-bit single/multi-user and single/ multi-processor minicomputers. The extensive range of models offers a wide choice of processing and configurational capabilities, ensuring comprehensive coverage of varied applicational requirements.

The Olivetti LSX 3000 range is:

- **Low-range models:** LSX 3010/3015 single-processor. Desk-top (LSX 3010) and stand-up (LSX 3015) models, connecting up to 16 work-stations and processing at 2 MIPS.
- **Medium-range models,** stand-up models connecting up to 64 work-stations and processing at 6 MIPS:
 - LSX 3020 single-processor which can be upgraded to dual- and tri-processor,
 - LSX 3025 single-processor which can be upgraded to LSX 3035 and 3045,
 - LSX 3035/3045 single/dual-processor.
- **High-range models:** LSX 3075/3085 single/dual-processor. Stand-up models connecting up to 192 work-stations and processing at 9 MIPS.

MAJOR COMPONENTS

In the LSX 3000 family these are:

- **Basic module:** made up of the central processing unit, the RAM memory, the controllers for peripherals and work-stations, power supply and console
- **Mass storage devices** incorporated either within the basic module or an expansion cabinet
- **Work-station** video, keyboard and, in certain cases, electronics box
- **Printers and optional modules** can be connected either to the work-station or directly to the basic module

The small-medium LSX 3000 configurations are the basic module only, whereas the extended configurations include connected extension cabinets for the various mass storage devices.

COMMUNICATION

The LSX 3000 systems can support serial connections to local networks, to wide area networks and to a Host

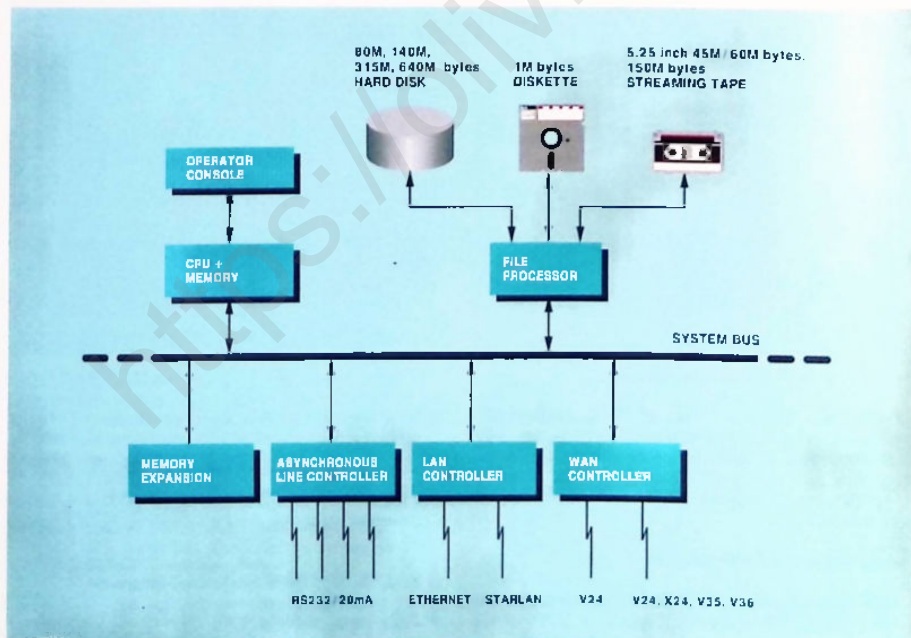
computer, as specific boards are installed to handle these connections.

Serial connections use the RS232C/Current loop interface to connect the basic module to work-stations and peripherals, either in local or remote mode. Remote work-stations and peripherals, using the RS232C interface, are connected to the system by a modem and telephone line. Special devices can be used to correct transmission errors.

The OLINET-LAN local network connections use intelligent boards for parity bit error checking. These boards can handle two lines each, one Ethernet maximum and one Starlan maximum.

However, for connection in a multi-vendor local network using TCP/IP protocol (an X/OS environment) or in a D-MOS network, Ethernet hardware and dumb boards are used, which can handle only one line each.

Wide area network or Host computer connections require dual channel intelligent boards which allow the user to choose type of connection. One channel is always V24, but the other can be any one of V24, X24, V35 or V36.



LSX 3010/3015 Architecture



LSX 3010



LSX 3015

LSX 3010/3015 ARCHITECTURE

LSX 3010/3015 are the MOS or X/OS entry-point models of the LSX 3000 family, and are based on a 32-bit parallelism system bus.

LSX 3010 uses a desk-top-type basic module, to which an expansion cabinet for mass storage devices can be connected. The LSX 3015 has a stand-up cabinet as the basic module.

The basic module houses the central processing unit (CPU), the RAM memory (up to 14M bytes for the LSX 3010 and 12M bytes for the LSX 3015), the power supply, the console, the board-rack (9 slots for the LSX 3010 and 11 slots for the LSX 3015) and the mass storage devices.

LSX 3010/3015 can connect up to 8 work-stations with the MOS operating system and 16 with the X/OS operating system.

Both models can function either as stand-alone systems or connected in local or wide area networks.

CENTRAL PROCESSING UNIT

The CPU is based on the 32-bit MOTOROLA MC68020 microprocessor, operating at 20 MHz with 2 MIPS.

The microprocessor is supported by the MOTOROLA MC68881 coprocessor for simple and double precision floating point calculations.

There is an MMU device (Memory Management Unit) in the CPU which optimizes memory management to allow execution of several programmes and processes.

RAM MEMORY

The CPU has a 4M byte main memory expandable to 14M bytes (LSX 3010) or 12M bytes (LSX 3015) by the addition of expansion boards of 4M bytes or 8M bytes. The system can detect parity errors in the memory, and suspends all system operations.

MASS STORAGE DEVICES

Fixed and removable storage devices can be incorporated into the basic module of LSX 3010/3015 systems. The fixed devices are mainly for data storage, while the removable ones are for copying whatever is contained in the fixed devices i.e. as back-up.

Up to five devices can be incorporated into the LSX 3010 (3 in the basic module and 2 in an expansion cabinet), while the LSX 3015 can take 4 - two of which can be removable.

The mass storage devices are:

- Fixed storage devices:
 - 5.25", SCSI, 80M byte (LSX 3010 only), 140M, 315M and 640M byte hard disks
- Removable storage devices:
 - 5.25", 1M byte diskette
 - 5.25", 45/60M byte streaming tape
 - 5.25", SCSI, 150M byte streaming tape

LSX 3010/3015 has a "File processor" controller that drives all the system's mass storage devices. An expansion box can be connected to the LSX 3010 that houses two SCSI interface hard disks.

LSX 3020 ARCHITECTURE

The LSX 3020 minicomputer with MOS or X/OS operating system is the medium-high range model in the LSX 3000 family. It is based on a 32-bit data parallelism system bus.

LSX 3020 operates at high processing speeds and can be configured in a variety of ways: up to 16 work-stations with MOS and 32 with X/OS can be connected.

If greater processing capacity or extended configurability are needed, the LSX 3020 can be upgraded to either a dual- or tri-processor version: up to 48 work-stations with MOS or 64 with X/OS can be connected.

The basic LSX 3020 module is a compact stand-up cabinet, easily installed next to a desk or, indeed, anywhere in the office.

The basic cabinet houses the CPU, main memory (up to 14M bytes), power supply, console, 11-slot board-rack and mass storage devices.

Expansion cabinets can be connected to the basic module to increase the number of board-slots from 11 to 16 and to allow connection of additional fixed storage devices and a tape unit.

The LSX 3020 can operate as a stand-alone system or within a local or wide area network.

CENTRAL PROCESSING UNIT

The core of the CPU is the 32-bit MOTOROLA 68020 microprocessor operating at 16 MHz with a processing speed of 2 MIPS.

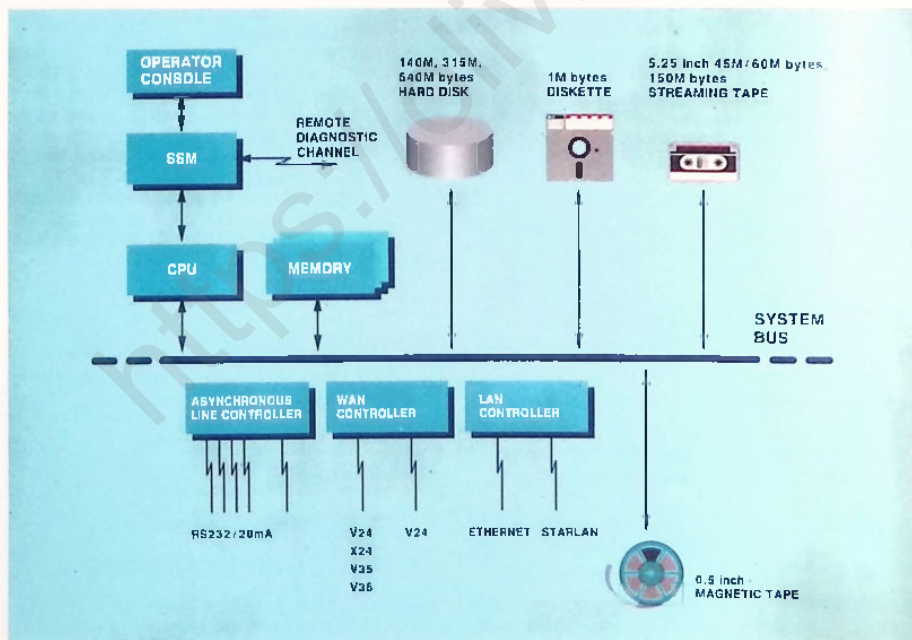
The CPU has an 8K byte "cache memory", reserved for the CPU. This memory interacts with the RAM so that the CPU avoids direct access to the main memory, using the system bus for data exchange.

Every CPU is equipped with the MMU (Memory Management Unit) for optimised memory management, and with the MOTOROLA MC 68881 mathematical coprocessor for floating point calculations in simple and double precision.

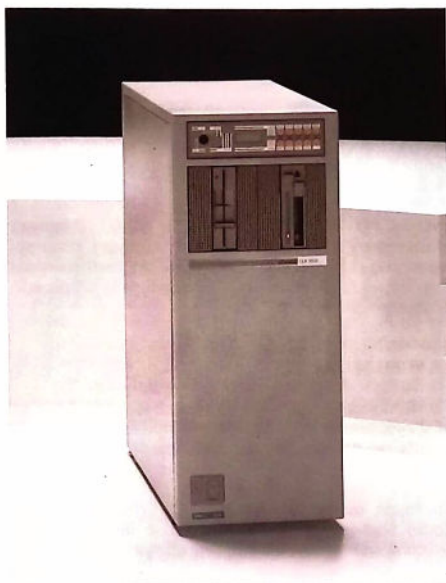
RAM MEMORY

The RAM varies from 2M expandable to 14M bytes using 2M, 4M, 8M and 16M byte expansion boards (at present, logical addressing is 14 M bytes maximum).

The main memory is equipped with the ECC (Error Correction Code) feature, which corrects single bit errors and detects double errors, suspending system operations.



LSX 3020 Architecture



LSX 3020



LSX 3020 with expansion cabinet

MASS STORAGE DEVICES

Both fixed and removable storage devices can be housed in the basic module of LSX 3020 minicomputer. The fixed devices are used mainly for storing data, while the removable ones are for copying the contents of the fixed devices i.e. data back-up.

Up to four devices can be incorporated in the basic module; two fixed and two removable. An expansion cabinet can also be connected to house two hard disks which may be shared by two computers.

The mass storage devices are:

- Fixed:
 - 5.25" 140M, 315M and 640M byte ESDI hard disks. These are driven by a controller that can handle up to a maximum of four of them, and only one controller can be installed in one system.

• Removable:

- 5.25", 1M byte diskette
- 5.25", 45M/60M byte streaming tape
- 5.25", 150 M byte, SCSI streaming tape
- 0.5", 1600 bpi magnetic tape
- 0.5", 1600/6250 bpi, SCSI magnetic tape

The removable devices are driven either by their own controller or by a "peripheral back-up controller" that drives all the devices installed. The magnetic tapes, however, are driven as follows: the 1600 bpi by its own controller, and the 1600/6250 bpi by the back-up controller. The diskette and streaming tape are housed in the basic module, while the magnetic tape is housed in an expansion cabinet.

LSX 3025 ARCHITECTURE

The LSX 3025 minicomputer with MOS or X/OS is the medium-high range model in the LSX 3000 family. It is based on the 32-bit data parallelism system bus.

LSX 3025 operates at high processing speeds and can be configured in a variety of ways: up to 16 workstations with MOS and 32 with X/OS can be connected.

The basic module is a compact stand-up cabinet easily installed next to a desk or, indeed, anywhere suitable in the office.

It contains the CPU, main memory (up to 14M bytes), power supply, console, 11-slot board-rack and mass storage devices.

Expansion cabinets can be connected to the basic module to increase the number of board slots from 11 to 16, and to allow several fixed storage devices and a magnetic tape to be added.

LSX 3025 can be upgraded in terms of capacity and configurational adaptability to the higher-range models LSX 3035/3045.

It can operate either as a stand-alone system or connected in a local or wide area network.

CENTRAL PROCESSING UNIT

The CPU is built around the 32-bit MOTOROLA 68020 microprocessor operating at 16 MHz and 2 MIPS.

There is an 8K byte "cache memory" reserved for the CPU, which interacts with the RAM memory, so that the CPU does not have to communicate directly with the main memory but uses the system bus for data exchange.

Every CPU is provided with the MMU (Memory Management Unit) for optimized memory management, and the MOTOROLA MC 68881 mathematical coprocessor for floating point calculations in simple and double precision.

RAM MEMORY

The RAM can be configured from 2M expandable to 14M bytes using 2M, 4M, 8M and 16M byte expansion boards (at present, logical addressing is 14 M bytes maximum).

The main memory has the ECC (Error Correction Code) feature, which corrects single bit errors and detects double errors, interrupting all system operations.



LSX 3025



LSX 3025 with expansion cabinet

MASS STORAGE DEVICES

The basic module of the LSX 3025 minicomputer can house fixed and removable storage devices. The fixed devices are mainly for data storage, while the removable ones are for copying what is in the fixed devices i.e. data back-up.

Up to four devices can be incorporated, two fixed and two removable. An expansion cabinet can be connected to house two hard disks that can be shared by two minicomputers.

The storage devices are:

- Fixed:
 - 5.25", 140M, 315M and 640M byte SCSI hard disks. These are driven by an "FP4" controller which can handle all the storage devices, fixed and removable. System mass memory can be increased by installing 2 "FP4/D" hard disk controllers, each capable of driving up to 6 hard disks. This means the system can handle a maximum of 12 SCSI hard disks.
- Removable:
 - 5.25", 1M byte diskette
 - 5.25", 45M/60M byte streaming tape

- 5.25", 150M byte SCSI streaming tape
- 0.5", 1600/6250 bpi SCSI magnetic tape

Removable devices are driven by a "FP4" controller incorporated in the basic module, which also drives the hard disks. The diskette and streaming tape cartridge are placed in the basic module, while the magnetic tape is placed in an expansion cabinet.

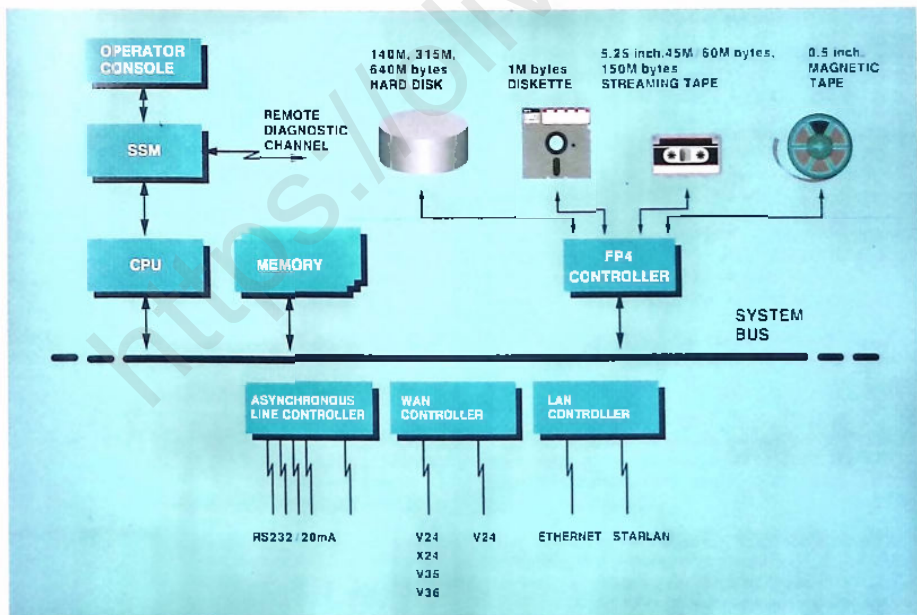
LSX 3035/3045 ARCHITECTURE

The LSX 3035/3045 single or multiprocessor minicomputers with MOS or X/OS are the medium-high range models of the LSX 3000 family, and are based on a 32-bit data parallelism system bus.

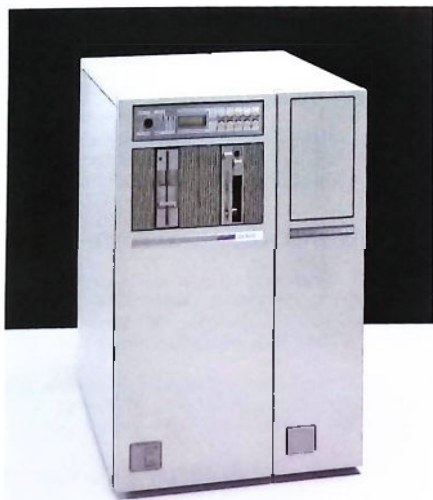
LSX 3035/3045 operates at high processing speeds and can be configured in a variety of ways: up to 48 workstations with MOS and 64 with X/OS can be connected.

These are stand-up models, made up of two connected cabinets, and can easily be installed next to a desk or anywhere suitable in the office.

The basic module houses the CPU, RAM (up to 64M bytes), power supply, console, 16-slot board-rack and mass storage devices.



LSX 3025/3035/3045 architecture



LSX 3035

An expansion cabinet can be connected, housing fixed and removable storage devices: magnetic tape and SCSI hard disks.

LSX 3035/3045 systems can operate as stand-alone systems, or connected in local or wide area networks.

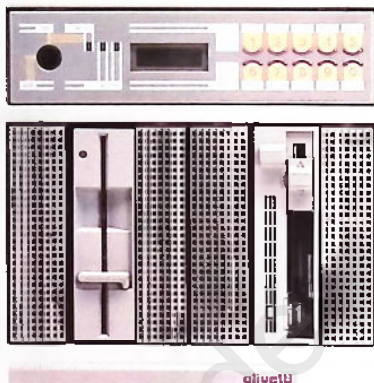
CENTRAL PROCESSING UNIT

The CPU is based on the MOTOROLA MC 68020 microprocessor operating at 30 MHz. There is a 16K byte "cache memory" for the LSX 3035, and one of 32K bytes for the LSX 3045 reserved for the CPU, which interacts with the RAM so that the CPU does not have to communicate directly with the main memory, but uses the system bus for data exchange.

LSX 3035 is a single-processor system operating at 3.5 MIPS; LSX 3045 is a dual-processor system operating at 6 MIPS.

Every CPU has the MMU (Memory Management Unit) feature for optimized memory management, and a MOTOROLA MC 68882 mathematical coprocessor for floating point calculations in simple and double precision.

The multiprocessor model is symmetrically architected, not having a central unit dedicated to specific activities. This means any activity in queue can be executed on the first central unit available.



LSX 3035 with mass storage devices

RAM MEMORY

The RAM can be extended from 4M to 64M bytes using 4M, 8M and 16M byte expansion boards.

The RAM has the ECC (Error Correction Code) facility, which corrects single bit errors and detects double errors, interrupting all system activities.

MASS STORAGE DEVICES

The basic module of the LSX 3035/3045 systems can house 4 hard disks and two removable media. The hard disks are SCSI and can be 140M/315M/640M bytes; the removable media can be 1M byte 5.25" diskettes and/or 5.25" 150M or 45M/60M byte streaming tape.

Also available is an expansion cabinet for fixed and removable mass storage devices, which can house either 4 SCSI 140M/315M/640M bytes hard disks (to a maximum of 12 hard disks per system) and 0.5" SCSI magnetic tape operating at 1600 or 6250 bpi, or 8 hard disks.

All the storage devices are driven by a "FP4" controller in the basic module and, where necessary, by "FP4/D" hard disk controllers.

LSX 3075/3085 ARCHITECTURE

LSX 3075/3085 with X/OS, single or dual-processor, are the high-range models in the LSX 3000 family - super-minis connecting up to 192 work-stations.

They are based on the ESB (Engine System Bus) dedicated to the Engine sector (CPU, memory and other connected devices), and on one or more buses dedicated to the I/O sector (storage devices, peripherals, communication lines).

The basic module is composed of the Engine cabinet and one or more I/O cabinets.

Both the Engine and I/O cabinets are constructed in the same way. The console is on one of the I/O cabinets. The I/O cabinets can be connected to additional expansion cabinets to increase storage capacity.

The LSX 3075/3085 superminis can operate as stand-alone systems or connected in local or wide area networks.

CENTRAL PROCESSING UNIT

The CPU on the LSX 3075/3085 models is based on the 17 high density CMOS VLSI gate array technology; it uses a full implementation of the 32-bit MOTOROLA

MC 68010 instruction set with proprietary extensions, and supports floating point calculations in simple (32 bits) and double (64 bits) precision.

There is a 32K byte (LSX 3075) and a 64K byte (LSX 3085) "cache memory" for the CPU; this interacts with the RAM so that the CPU does not have to communicate directly with the main memory but uses the system bus for data exchange.

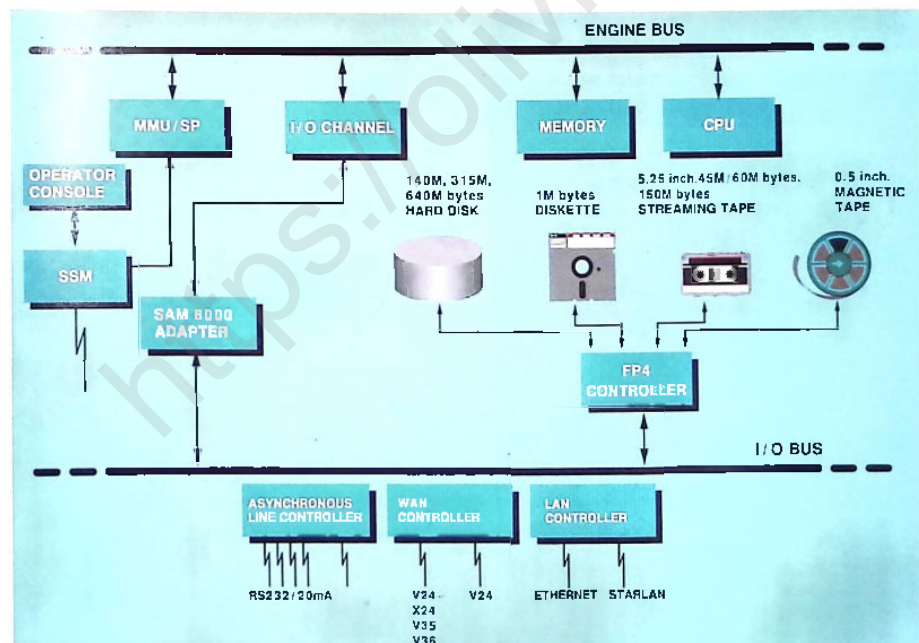
Depending on the model, one or two CPUs may be used; the LSX 3075 uses one and operates at 5 MIPS, while the LSX 3085 uses two and operates at 9 MIPS.

The CPU is supported by the MMU (Memory Management Unit), which handles memory management, initial programme loading and other auxiliary functions.

RAM MEMORY

RAM memory in the LSX 3075/3085 superminis varies from 8M to 64M bytes. It consists of one/two MCU (Memory Control Unit) boards, each one housing 8M/16M/32M byte memory arrays.

Each MCU and corresponding memory arrays can detect single and double bit errors and correct single bit errors.



LSX 3075/3085 architecture

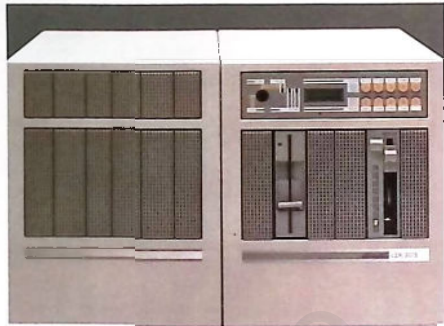
MASS STORAGE DEVICES

Fixed and removable storage devices can be housed in the basic modules of the LSX 3075/3085 systems. Fixed ones are mainly for data storage, while the removable ones are for copying what is in the fixed devices i.e. data back-up.

Each I/O cabinet incorporates up to four devices, two fixed and two removable. Expansion cabinets can be added to the I/O cabinets to house up to eight hard disks.

The storage devices are:

- Fixed:
 - 5.25", 140M, 315M and 640M byte SCSI hard disks
- Removable:
 - 5.25", 1M byte diskette
 - 5.25", 45M/60M byte streaming tape
 - 5.25", 150M byte SCSI streaming tape
 - 0.5", 1600/6250 bpi SCSI magnetic tape



LSX 3075 with mass storage devices

The diskettes and streaming tape are housed in the I/O cabinets and the magnetic tape is installed in one of the storage device cabinets connected to the I/O cabinets. Each cabinet can house up to 4 hard disks if there is a magnetic tape, and 8 hard disks if there is no magnetic tape.

The storage devices are driven by a "FP4" controller that can handle all the devices, fixed and removable. System mass memory can be increased by installing up to 3 "FP4/D" controllers for hard disk. Each can drive 6 hard disks, which means that the maximum number of SCSI hard disks possible for the system is 18.



LSX 3075

SUMMARIZING THE LSX 3000 SYSTEMS

The following table gives a summary of the main characteristics of the LSX 3000 systems, grouped according to range.

LOW-RANGE PRODUCTS

Products in this range can run either X/OS or MOS operating systems.

	LSX 3010	LSX 3015
MIPS	2	2
CPU clock (MHz)	20	20
Number of processors	1	1
Mathematical coprocessor	yes	yes
Cache memory (K byte)	no	no
System bus speed (Mbyte/s)	10.6	10.6
RAM (M bytes)	4-14	4-12
X/OS work-stations (max.)	16	16
MOS work-stations (max.)	8	8
Hard disk capacity (M bytes)	80-1920	140-1280

HIGH-RANGE PRODUCTS

Products in this range run X/OS operating system only.

	LSX 3075	LSX 3085
MIPS	5	9
CPU clock (MHz)	10	10
Number of processors	1	2
Mathematical coprocessor	yes	yes
Cache memory (K bytes)	32	64
System bus speed (M bytes/s)	61.5	61.5
RAM (M bytes)	8-64	8-64
X/OS work-stations (max.)	96	192
MOS work-stations (max.)	—	—
Hard disk capacity (M bytes)	140-11520	140-11520

MEDIUM-RANGE PRODUCTS

Products in this range can run either X/OS or MOS operating systems.

	LSX 3020	LSX 3025	LSX 3035	LSX 3045
MIPS	2	2	3,5	6
CPU clock (MHz)	16	16	30	30
Number of processors	1 (*)	1	1	2
Mathematical coprocessor	yes	yes	yes	yes
Cache memory (K bytes)	8	8	16	32
System bus speed (M bytes/s)	18	18	18	18
RAM (M bytes)	4-14	4-14	4-64	4-64
X/OS work-stations (max.)	32	32	48	64
MOS work-stations (max.)	16	16	32	48
Hard disk capacity (M bytes)	140-2560	140-7680	140-7680	140-7680

(*) Upgrading possible to 2/3 processors.

UPGRADING THE LSX 3000 MINICOMPUTER FAMILY

All the medium-high range LSX 3000 models (LSX 3020, LSX 3035 and LSX 3075) can be upgraded from single to multiprocessor versions. It's possible to upgrade the LSX 3025 model to LSX 3035/3045.

AUXILIARY SERVICES

Several devices are available for the LSX 3000 minicomputers to provide the following auxiliary services:

- **automatic switch-on:** for "Unattended" mode operations: switching on the system on receiving a telephone call; switching the system on or off at a pre-set date or time at a command from the Real Time Clock device; switching off the system by software command. These features are usually used for short operations outside normal working hours, when the operator is absent.
- **real time clock:** provides the system with the exact hour/minute/second and day/month/year.
- **remote diagnostics:** provides functions to diagnose and localize system faults from a remote service centre. The centre is connected to the system by a switched line and a special hardware device.
- **UPS (Uninterruptable Power Supply):** powers the system for a certain period of time when there is a power failure or a drop in voltage. The hardware component for this feature is a battery charger and batteries with an average life of 5 years. It is connected between the power supply leads and the computer.

Reliability and ergonomics

Special attention has been paid in designing the ergonomic aspects of the LSX 3000 minis, making them highly reliable, efficient and comfortable to use.

WORK-STATIONS

The work-stations for use with the LSX 3000 minicomputers, covering a wide range of user needs, are listed below:

- For the LSX 3000 MOS models:
 - ELB 3684 work-station
- For the LSX 3000 X/OS models:
 - Olivetti WS 785 and WS 785/PC VT220-compatible terminals
 - Graphic work-station

In addition, the following Olivetti MS-DOS based systems can also be connected, using either RS232C or local network connections:

- PC (Personal Computer)
- PB (Personal Computer for Business)
- ORS (Olivetti Retail System)
- ETV (electronic typewriting video system)

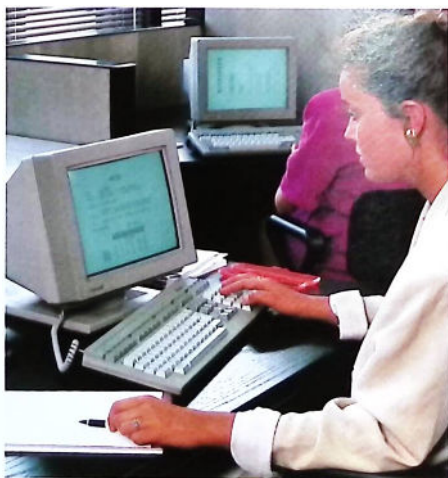
VT220-COMPATIBLE WORK-STATIONS

The work-stations used are:

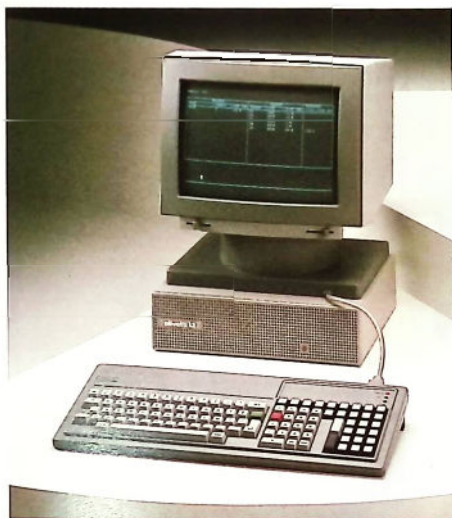
- WS 785 (for X/OS-based systems)
- WS 785/PC (for X/OS-based systems)

They are both desk-top terminals with stand supporting a 14" monochrome tilting and swivelling video screen, but differ in the keyboard. The WS 785 has an industry-standard keyboard, while the WS 785/PC has a Personal Computer keyboard. Both types have a VT220 layout, are low profile and available in various national versions.

Both the WS 785 and WS 785/PC can be connected to a printer for local operations.



Olivetti WS 785 work-station



ELB 3684

ELB 3684 WORK-STATION

The ELB 3684 is an Olivetti proprietary work-station for transaction processing. It has an alphanumeric monochrome video screen, keyboard and minibox.

The videos have 9" or 15" screens, anti-glare filter, a stand for screen rotation and tilt, and adjustable brightness and contrast controls.

The keyboards come in alphanumeric or numeric versions, with or without keys - the keys are used to protect against unauthorized access.

The minibox contains all the work-station electronics (video/keyboard controller etc.), and can connect two RS232C interface peripherals (printer, cash adapter etc.). As an option, an additional board can be installed to connect two more TTL interface peripherals (Pin-pad, badge reader/writer).

GRAPHIC WORK-STATION

X/OS-based LSX 3010/3015/3020/3025/3035/3045 systems can connect a graphic work-station, using a specific graphics board.

A graphic work-station consists of a colour graphic video screen, a PC-type keyboard and a mouse.

The graphic work station is provided with a 19" high resolution colour display that uses 1280x1024 pixels and 256 colours selected from a 16.7 million colour table.

MS-DOS BASED SYSTEMS

All MS-DOS based systems are either general-purpose Personal Computers (PC) (M290, M380 etc.) or specialized ones dedicated to a specific applications sector such as PB. They can be used both as PCs and as ELB 3684 emulators (MOS) or WS 785 emulators (X/OS). Unlike traditional work-stations, they have their own CPU and RAM memory, so can perform functions autonomously without having to request support from the minicomputer each time - this significantly reduces the work load of the minicomputer.

PRINTERS

A huge choice of printers is available for the LSX 3000 series, offering single sheets and continuous forms, and meeting differing requirements in terms of quality and output.

Using the RS232C interface, all the printers connect to a controller installed in the basic module, or to the work-station adapter.

The variety of printers means optimisation of system configuration to cover varied user requirements. All the following are available:

- Work-station printers
- General-purpose printers
- Laser printers (page printers)
- High-speed printers (for large print volume applications)

The following versions of the above models are available:

Olivetti version: conforming to the Olivetti standard for commands, communication protocol and character set.

PC/IBM version: conforming to the IBM PC "de facto" standard for commands, communication protocol and character set.

IBM/PC modified version: conforming to the IBM/PC "de facto" standard for commands and communication protocol; command set is the 8-bit ISO-ECMA.

Choice of printer version is dictated by the operating system installed.

WORK-STATION PRINTERS

These printers (DM 309 and DM 324) are connected to the individual work-station by the adapter module. They are particularly useful for local activities such as hard copy printouts.



DM 309

GENERAL PURPOSE PRINTERS

These printers (eg DM 400) provide functions for various application sectors: high speed print (Draft mode), quality print (LQ: Letter Quality; CQ: Correspondence Quality; NLQ: Near-Letter Quality).



DM 400

LASER PRINTERS (PAGE PRINTERS)

These laser printers (PG 208 M1/M2 and PG 306) are for applications requiring high speed and quality print.



PG 208

HIGH SPEED PRINTERS

These printers (eg PR 4600) work by impact on a continuous character band, and produce a large volume of printouts.



PR 4600

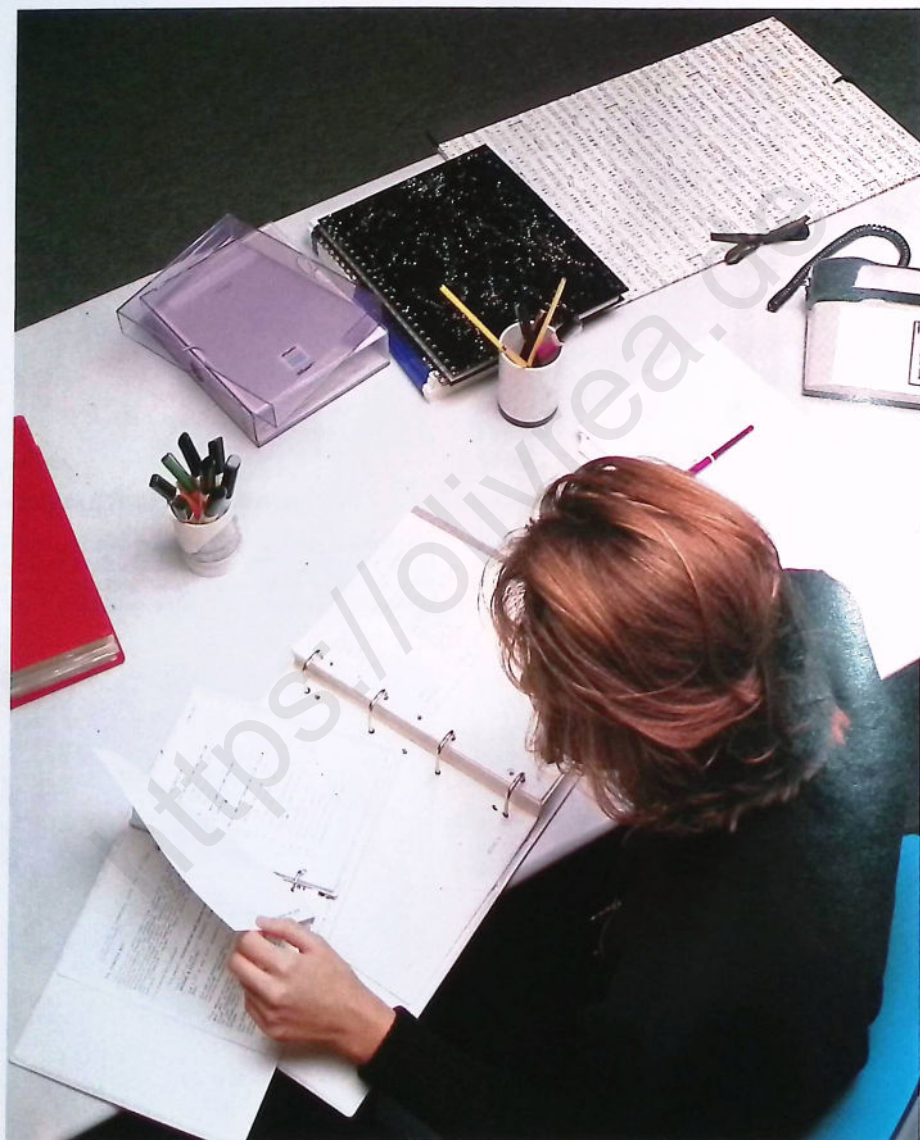


Document reader

OPTIONAL MODULES

Various optional modules can be connected to the LSX 3000 MCB systems:

- serial interface modules:
 - PIN pad
 - Badge reader
 - Badge reader/writer
- RS232C serial interface modules:
 - MICR document reader
 - MICR document reader/encoder
 - MICR document and badge reader
 - Cash adapter
 - CAT (Customer Activated Terminal)
 - Optical signature control system
 - Scientific measuring instruments
 - Input/output graphic devices (eg tablet, plotter)



6. Documentation

COMMERCIAL-TECHNICAL DOCUMENTATION

The LSX 3000 minicomputer family commercial-technical documentation gives all the information for programming and operating in X/OS and MOS environments.

The documentation is composed of a basic set of documents and a group of optional publications describing the optional hardware or software components, such as:

- Programming language manuals: BASIC, COBOL, PASCAL, etc.
- Environmental software manuals: MTX, DMS, ORACLE, etc.
- Peripheral manuals: printers, cash adapter, etc.

in accordance to the minicomputer configuration used and the user activities involved.

The LSX 3000 documentation provides easy-to-access information with manuals classified into groups of user libraries, grouping documents together logically according to particular product aspects or type of software used:

- Predelivery documentation
- System Overview
- LSX 3000 X/OS Operating System
- LSX 3000 MOS Operating System
- LSX 3000 X/OS Development Environment
- LSX 3000 MOS Development Environment
- Field Support Documentation
- Communications
- LSX 3000 X/OS Programming Languages
- LSX 3000 MOS Programming Languages
- Data Management and Services
- Environmental Software
- Terminal Emulators

- Networking
- Application Packages

Software Kits

All the software products available for the LSX 3000 X/OS and MOS environments are distributed as software kits.

A software kit is made up of:

- storage devices (one or more),
- manuals describing how to configure, install, and use the software packages.

FIELD ENGINEERING DOCUMENTATION

The LSX 3000 field engineering documentation provides information for field engineers, laboratory technicians and system specialists. Field engineering documentation is grouped into three main categories:

- Manuals for field engineers doing services at the customer premises:
 - Service Manual
 - Mechanical Spare Parts Catalogue
 - General Service Manual
 - Functional Checks Manual
- Manuals for laboratory technicians performing repairs at the repair workshop:
 - Theory of Operation
 - Electronic Component List
 - Schematics
- Manuals for repairing storage devices and peripherals at the customer premises and repair workshops.

Every LSX 3000 minicomputer model is documented separately with a Service Manual.

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6285 Hitzkirch, Industriestrasse 2
Telefon 041-85 01 85
Telefax 041-85 38 85

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