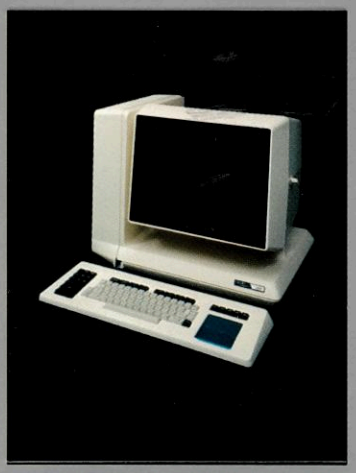
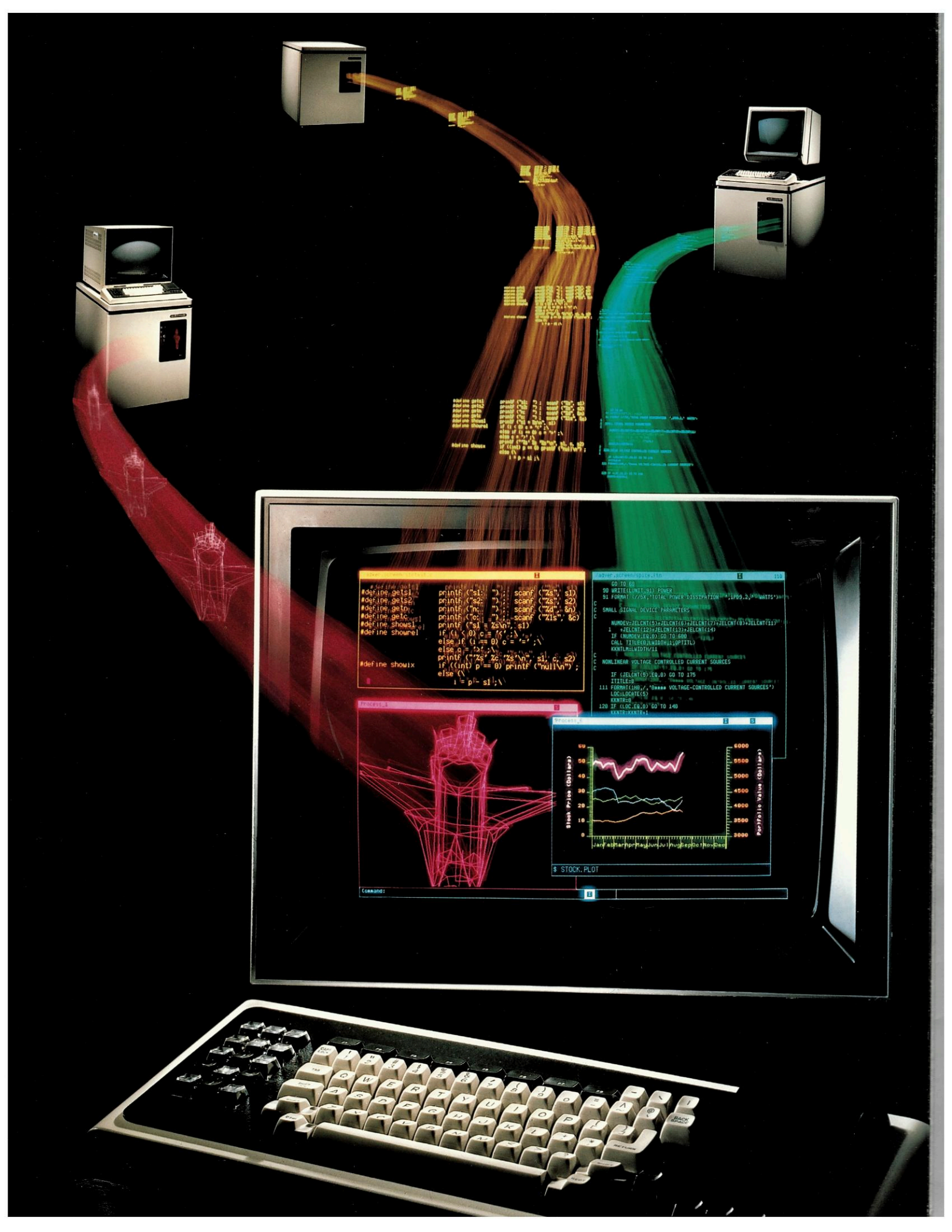
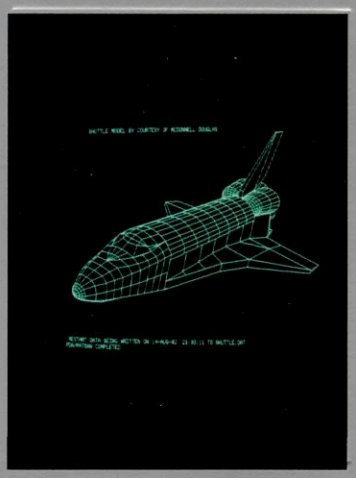
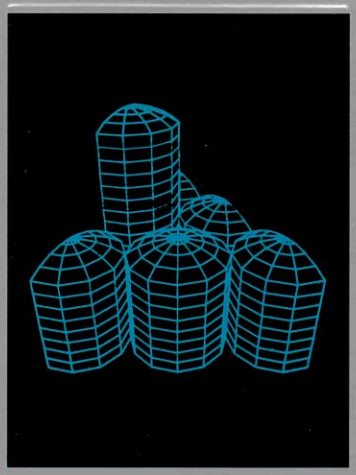
D O M A I N

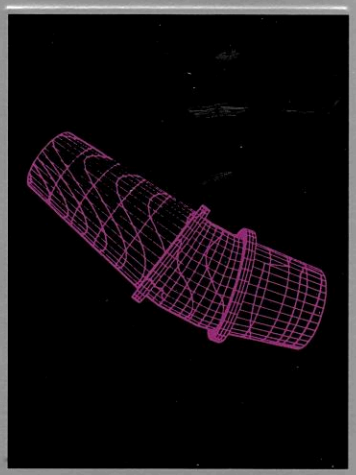


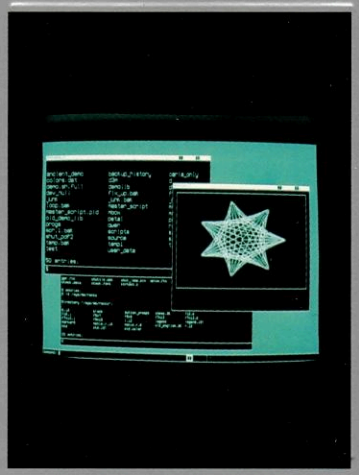
apollo


#define gets1
#define gets2
#define getn
#define getc
#define show1
#define show2
#define showx
printf ("s1: "); scanf ("%s", s1)
printf ("s2: "); scanf ("%s", s2)
printf ("n: "); scanf ("%d", &n)
printf ("c: "); scanf ("%1s", &c)
printf ("s1 = %s\n", s1)
if (i < 0) c = '<' ;\
else if (i == 0) c = '=' ;\
else c = '>' ;\
printf ("%s %c %s\n", s1, c, s2)
if ((int) p == 0) printf ("null\n") ;
else {\
i = p - s1 ;\
GO TO 60
90 WRITE(LUNIT,91) POWER
91 FORMAT (//5X,'TOTAL POWER DISSIPATION ',1PD9.2,' WATTS')
SMALL SIGNAL DEVICE PARAMETERS
NUMDEV=JELCNT(5)+JELCNT(6)+JELCNT(7)+JELCNT(8)+JELCNT(11)
1 +JELCNT(12)+JELCNT(13)+JELCNT(14)
IF (NUMDEV.EQ.0) GO TO 600
CALL TITLE(0,LWIDTH,1,OPTITL)
KKNTLM=LWIDTH/11
NONLINEAR VOLTAGE CONTROLLED CURRENT SOURCES
IF (JELCNT(5).EQ.0) GO TO 175
ITITLE=0
111 FORMAT(1H0,/,'0**** VOLTAGE-CONTROLLED CURRENT SOURCES')
LOC=LOCATE(5)
KKNTR=0
120 IF (LOC.EQ.0) GO TO 140
KKNTR=KKNTR+1
Stock Price (Dollars)
Volume (100)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
$ STOCK.PLOT
Command:









D O M A I N

Introducing Apollo Domain

Imagine a very large computer system with large main memory and disk storage, high-performance graphics terminals, and a high-speed internal bus connecting the components. Suppose this internal bus could be lengthened dramatically without sacrificing performance. Then suppose that the rest of the large computer system could be divided into dozens of smaller computers, each retaining all the essential characteristics of the original. Finally, suppose all these smaller computers could plug into that extended bus.

In essence, we've just described Apollo Computer's DOMAIN system.

A DOMAIN system is an integrated computer environment, consisting of from as few as one to as many as several hundred nodes, tied together by a high-speed, baseband communications network. Each node is a powerful, 32-bit computer, with up to 3.5 megabytes of main memory, sophisticated multi-window graphics capabilities, its own optional disk and peripherals, and the ability to support multiple concurrent processes, with each process having a virtual address space of up to 16 megabytes. In addition, each node has free access to data and programs stored at any other node, *just as though these data and programs were local.*

Today, DOMAIN systems are at work in a wide range of application/market areas. These include:

- interactive computer-aided engineering and computer-aided design applications in the fields of electrical, mechanical, architectural, engineering and construction, and mapping,
- solving large-scale engineering/scientific problems in areas such as structural and finite element analysis,
- computer science, including research, language development, and the teaching of computer science,
- computer-aided software engineering, aimed at increasing programming productivity through the development of a powerful "programmer's work-bench" capability,
- publishing, making use of DOMAIN's text processing, font generation, and graphics capabilities,
- interactive financial modeling, simulation, and statistical analysis, utilizing DOMAIN's ability to run large-scale programs and manipulate large databases,
- computer-aided manufacturing.

In all of these areas, Apollo is in the business of supplying sophisticated, high-performance, personal, network-based computer systems for enhancing the productivity of technical professionals.

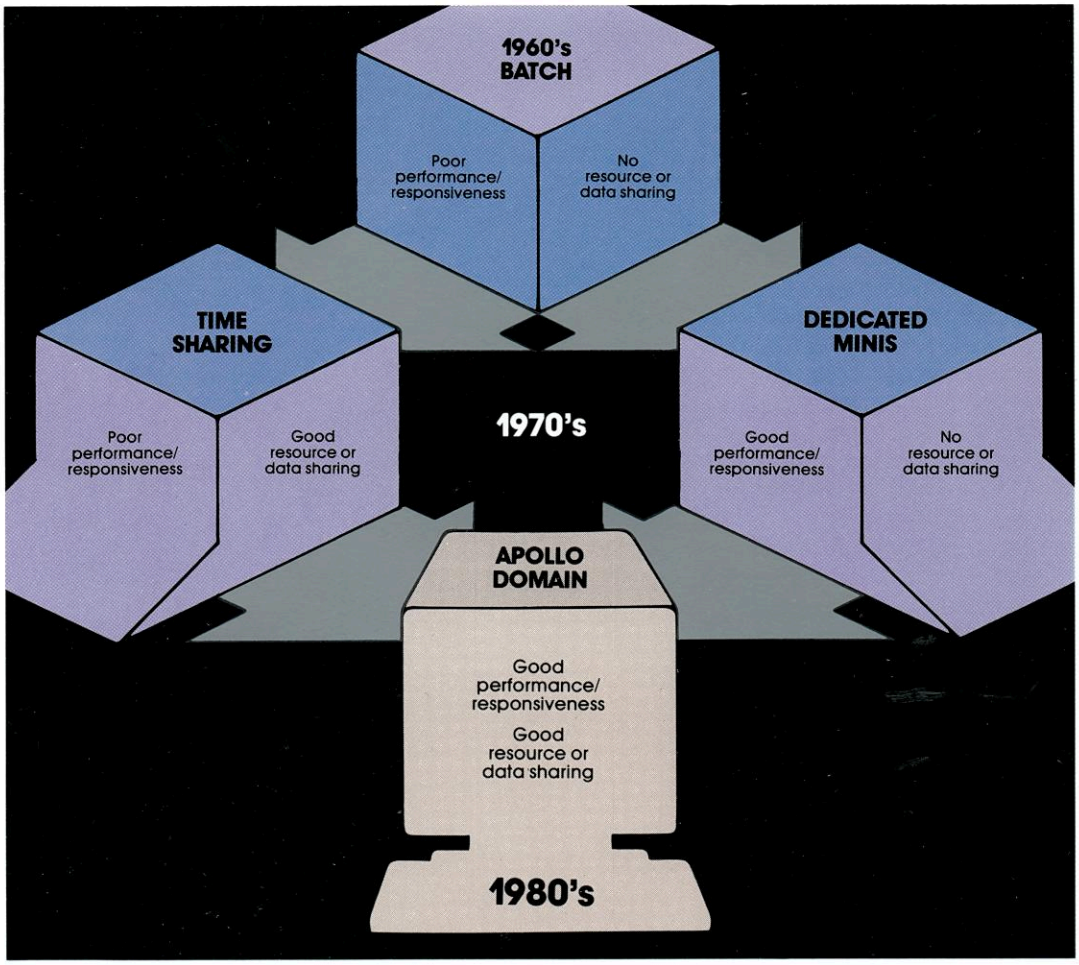
DOMAIN systems offer an extraordinary range of capabilities, including:

- *power* to run mainframe-scale FORTRAN programs,
- high resolution *graphics,* closely-integrated for maximum performance,
- a high-speed *local area network* architecture, providing economical resource sharing, low entry cost, and incremental growth,
- a compatible *growth path,* providing long-term protection for users' investments in application software and peripheral hardware as the DOMAIN technology advances,
- high *system availability* and ease of maintenance.

With these unique capabilities, DOMAIN makes possible an entirely new concept: a flexible, integrated computing environment in which mainframe power is readily available at each user's desk.

Mainframe Power

The Apollo DOMAIN system delivers power and performance that have previously been available only on large-scale, batch-oriented mainframes or timesharing networks.



An important development in the evolution of high performance computer systems

In the 1970's, timesharing and dedicated minicomputers emerged as alternatives to the centralized batch-processing mainframe computer. Now, in the 1980's, the DOMAIN system incorporates the strengths of both, with none of their disadvantages. Like timesharing, DOMAIN offers the economy of shared resources and the power of big-computer architecture, plus an unprecedented level of communication among users. At the same time, each DOMAIN user has his own dedicated computer. Unlike a dedicated minicomputer, however, a single DOMAIN node has the resources – including virtual memory, large-scale shared disk storage, and high resolution graphics – to handle even very demanding engineering and scientific applications which would otherwise require a mainframe. Yet a single DOMAIN node costs a small fraction of the price of a large mainframe. And several hundred DOMAIN nodes can be integrated to create a single powerful computing environment.

Big computer power in each DOMAIN node

Every DOMAIN user has at his command a dedicated computer whose functionality is comparable to that of traditional mainframe. Each DOMAIN node includes a state-of-the-art, 32-bit processor; from .5 to 3.5 megabytes of main memory, implemented with advanced 64 kilobit RAM technology, with error checking and correction (ECC) available; optional dedicated high-speed disk drives, line printers, and other peripherals; and a network-wide virtual memory operating system supporting up to 15 concurrent processes per node, each process able to address up to 16 megabytes of virtual memory.

Performance enhancement module

DOMAIN computing power is extended by the performance enhancement module. The module contains both cache memory and a floating point processor on a single printed circuit board. The 4-kilobyte cache memory reduces effective memory cycle time, so the processor spends less time waiting for instructions and data fetches.

The floating point processor portion of the performance enhancement module provides single precision (32 bits) and double precision (64 bits) floating point arithmetic functions, plus several special-purpose instructions, including register-state save and restore, and a polynomial evaluation primitive.

High Resolution Graphics

The DOMAIN system offers more advanced, more closely-integrated graphics capabilities than any other computer system even approaching its price. These capabilities include monochromatic or color bit-mapped displays; display management software that allows the user to present a practically unlimited number of views on the screen simultaneously, and to move among them as freely as if they were pieces of paper on a desk; and a graphics touch pad that puts control of the display screen literally at the user's fingertips.

Bit-mapped display

Each of the DOMAIN bit-mapped, raster-scan displays incorporates an independent RAM memory: 128 kilobytes for the monochromatic displays and one megabyte or optional two megabytes for the color display. The contents of RAM memory are directly mapped onto a high-resolution screen for detailed presentation of both character fonts and graphic images. The screen is constantly refreshed, and changes in the bit-map memory are instantaneously displayed on the display screen. A complete new screen can be constructed in as little as a fraction of a second. This bit-map memory is directly addressable by the CPU, allowing programs to easily modify its contents. However, the display controller is a separate device on the node's internal bus, so the display can be constantly refreshed without involving the CPU.

Multiple-window display

The bit-mapped display supports multiple windows, which can be presented side by side or overlaid in whole or in part. The display manager allows any window to be brought into full screen view instantly. This windowing capability allows the operating system to support multiple command environments simultaneously.

Separate windows provide "virtual terminals" connected to multiple programs and data. Because there is no need to wait for one program's completion before starting to work with another, it is possible to move from one window – and one program context – to another with complete freedom. This new mode of concurrent interaction saves precious time in the software development and debugging cycle.

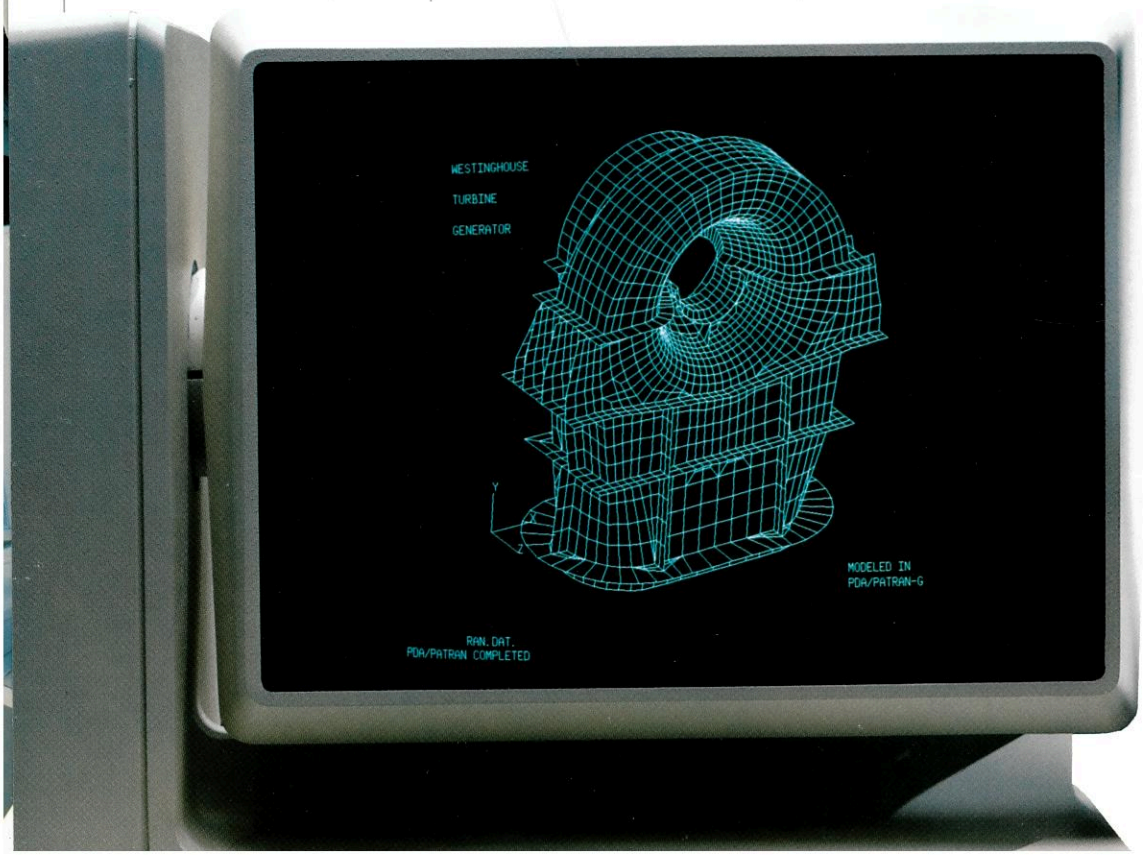
Display hardware

Two monochromatic DOMAIN display screens are available in 17- or 19-inch, horizontally oriented (landscape) displays. Each display has a visible field of 1024 x 800 pixels. For user comfort, each screen has a brightness control, and produces either a black-on-white or a white-on-black display.

The DN300 Desktop Computational Node places mid-range 32-bit supermini performance on every user's desk. In a single package, it delivers virtual memory capability, up to 1.5 Mbytes of main memory, high-performance graphics (1024 x 800 pixels), and access to the 12 Mbit per second DOMAIN local-area network.

The third DOMAIN display is a 19-inch, highly interactive, color unit that incorporates all of the features of the monochromatic displays, plus a long list of others, including: high resolution 1024 x 1024 pixel views, with each pixel 4 or 8 bits deep (supporting 16 or 256 colors); up to 2MB of dedicated display memory; hardware raster ops; hardware pan and zoom; area fills; high-performance vector generation; and a 20 megabits/sec/plane high speed memory to memory transfer (Bit BLT) capability.

All of the DOMAIN displays include a keyboard with user-programmable keys. These keys can be defined by the user for each virtual terminal.



A High-Performance Network

The DOMAIN system incorporates a demand-paging network that allows all network users to share system resources – data, peripherals, and software – automatically, at disk speeds, while running their programs, large or small, concurrently and independently.

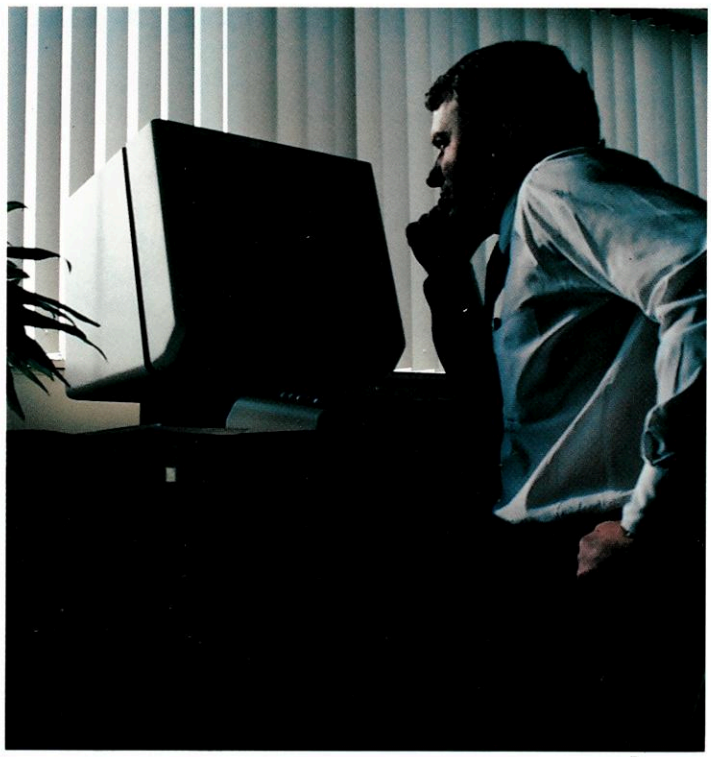
A different sort of network

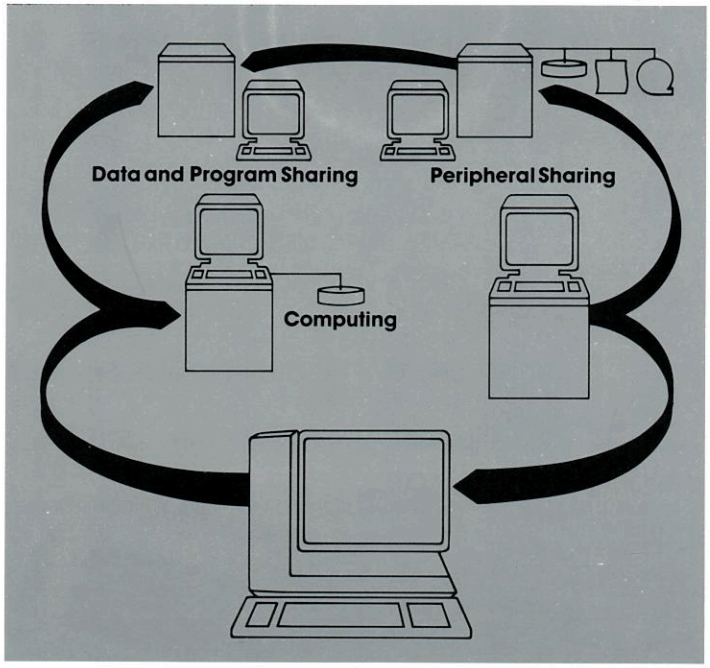
In the traditional sense, the DOMAIN system isn't really a "network" at all. The term "network" usually implies a system of scattered computers and terminals, tied together by low-performance communications lines. Because moving information across them is clumsy, slow, and expensive, traditional networks are preoccupied with layers of communications protocols.

In contrast, each DOMAIN node has direct access to data and devices anywhere in the system, as though they were local. And communication is at 12 megabits per second, the speed you'd expect for internal operations.

The DOMAIN network is a token-passing, base-band, high-speed local bus.

It's a highly flexible communication channel, over which text, graphic images, engineering documents, reference materials, letters, and memos, along with directories are made available instantly to the entire user community.





Demand-paging network

DOMAIN is the first computer system to extend the concept of demand-paging, common to many virtual memory computers, across an entire multi-user network. Under the DOMAIN demand paging-concept, when a user requests access to a file on either a local or a remote disk, the disk immediately passes to the main memory of the user's node a 1024-byte "page" containing the requested data. Additional data is sent, page-by-page, on demand. This demand-paging concept is both fast and efficient. Only the data that is requested is sent, so there are no long delays while an entire file is moved: processing can start immediately. At the same time, data is sent in sufficiently large blocks so that the number of data transfers is relatively low. And, of course, each page of data is transmitted at very high speed (12 million bits per second), so throughput is high and response is very rapid. Because data is sent a page at a time, no single user can tie up the network for long periods with bulk transmissions.

Fast Dependable system response

Predictable response is a critical factor in user satisfaction and productivity. In timesharing systems, users find themselves frustrated by delays whenever the central computer is heavily loaded. A dedicated minicomputer can be brought to a standstill by even a relatively small peak in computing demand. In the DOMAIN system, each time a new user is added, another node – itself a dedicated computer system – is also added. Therefore, instead of *diluting* computer power, the addition of users actually *expands* total system capability, and response remains fast, consistent, and predictable.

S O F T W A R E

Software and Peripheral Tools You Need

The DOMAIN system is a complete, integrated hardware/software system. It incorporates a powerful operating system, high level programming languages, a library of program development tools, and a wide selection of peripheral devices, including a variety of disk memories and printers.

A network-wide virtual operating system

The DOMAIN system includes an advanced, network-wide virtual-memory operating system, geared to supporting highly interactive operations. It uniquely takes the concepts of a virtual memory operating system, supporting multiple, concurrent processes, and extends these concepts from a single user context across the entire DOMAIN network. The operating system's "object-orientation" treats each element in the system environment – programs, data, files, records, peripherals, etc. – as a unique object. A 64-bit identifier code gives the operating system the ability to assign unique names to every object ever created on any DOMAIN network. This capability lets the operating system support literally thousands of concurrent processes.

The operating system also supports AUX – based on UNIX* System III – that runs as an autonomous subsystem in one or more of the available user processes. Users can switch from one process to another with a single keystroke.

Powerful software support tools

The high-productivity DOMAIN programming environment includes ANSI-standard Fortran 77, Pascal, and C, a wide range of standardized software tools, and a highly consistent, yet flexible, command environment.

DOMAIN's standardized software tools allow programmers to develop large, complex programs by piping data through many smaller, simpler programs, with the output of one small program becoming the input for the next. Large programs can be built faster and at lower cost, and debugging and program updating are far simpler for the life of the program.

DOMAIN's powerful graphics capabilities are enormously useful in program development. Programmers can use DOMAIN's powerful screen editor to view separate windows for each function and move freely from task to task, from environment to environment.

Key software support capabilities include: an advanced high-level language debugger; X.25, IBM HASP and 3270 communications support; asynchronous ASCII terminal emulation; a powerful font editor allowing users to interactively create and modify character sets and graphic symbols; 44 graphics primitives callable from user programs, including raster ops; full support of the Core graphics package, the proposed device independent standard for interactive graphics; a flexible interprocess communications facility; support for remote diagnostics; an online HELP! facility.

The DOMAIN system also supports its own database management system. DOMAIN Distributed Data Management (D3M) lets users organize and access information located anywhere in a DOMAIN processing network. Users can combine whole or partial views of many individual databases into a single, logical database for both query and update. D3M includes ease-of-use features such as an interactive database description tool, an aggregate schema compiler, implicit disk allocation and a complete report writing package specifically tailored for the non-programmer.

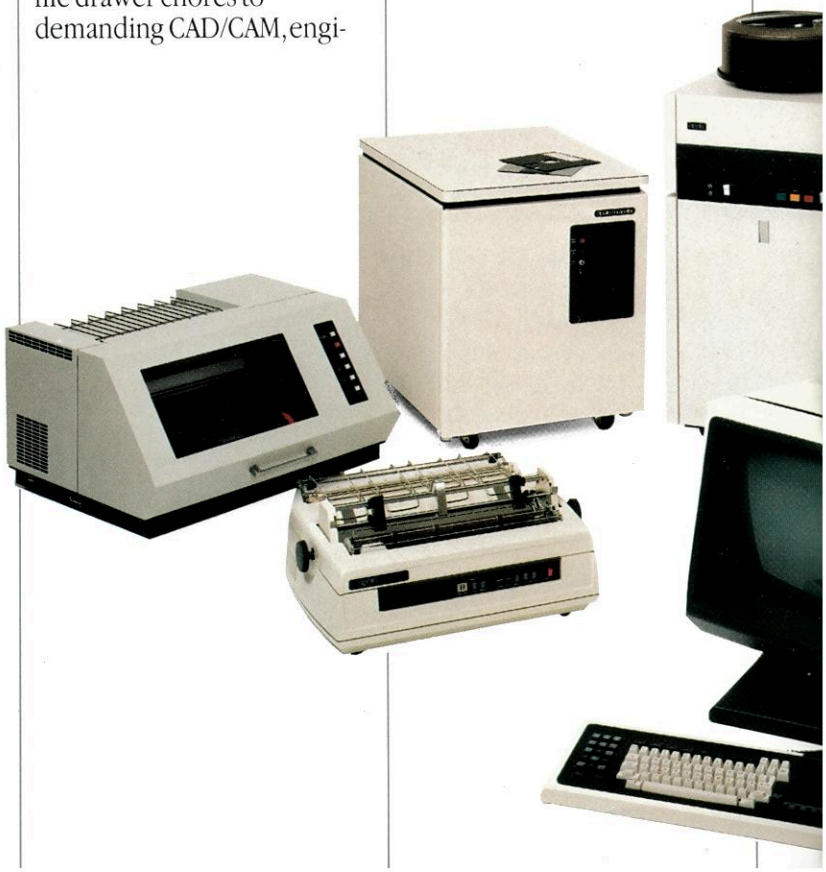
D3M integrates the runtime efficiency of the CODASYL network data model with the personal productivity advantages of relational access to span a spectrum of data management applications – simple file drawer chores to demanding CAD/CAM, engineering, scientific and software development.

In addition to the Apollo software described above, a growing library of third-party software can provide support for scientific, engineering, modeling, CAD/CAM, and decision support applications.

Full range of peripherals

A full range of peripheral devices is available for DOMAIN systems. For high-speed, on-line mass storage, disk units available include 34-, 68-, 158-, and 300-megabyte disk drives. A full complement of line printers and letter-quality printers is also available, as are magnetic tape units.

The DOMAIN Server Processor, DSP80, lets users connect a wide variety of shared peripheral devices to a DOMAIN system. The DSP80, an integral part of the Apollo DOMAIN architecture, is compatible with Apollo's entire series of computational nodes.



B E N E F I T S

Apollo Benefits

A single-node DOMAIN system provides all the essential performance characteristics of any DOMAIN system. Yet a single DOMAIN node can be purchased at a fraction of the cost of a mainframe. In fact, at a cost much more in line with that of a traditional single-user minicomputer.

Low entry cost

Low entry cost means that people with mainframe needs and minicomputer budgets can get into operation initially with a small, low cost DOMAIN system, and then add to that system. In the long run, this makes a lot more sense than buying a make-do minicomputer today that can never be expanded to meet ultimate needs.

DOMAIN's office environment saves space and reduces the need for costly site preparation, air conditioning, power, lighting, and security systems.

DOMAIN SYSTEM NODES			
	DN300	**DN420**	**DN600**
Central Processor	32-bit, VLSI Processor		
Main Memory Supported	.5 to 1.5 Mbytes	.5 to 3.5 Mbytes	
Virtual Address Space	16 Mbytes per process; up to 15 concurrent processes per user		
Performance Enhancements		4 Kbyte bipolar cache memory Single and double precision hardware floating point	
Display Units High resolution, bit-mapped with detached keyboard	17-in., 1024x800 black and white horizontally oriented "landscape" display	19-in., 1024x800 pixel black and white horizontally oriented "landscape" display	19-in., 1024x1024 pixel color horizontally oriented "landscape" display
touch pad	OPTIONAL	STANDARD	STANDARD
Local Area Network	12 Mbit/second token passing baseband communications network Up to 3,280 feet (1 kilometer) separation between active nodes Several hundred nodes per network		
Software Support	AEGIS, Object-oriented, network wide, demand paged virtual memory operating system AUX-Software environment based on UNIX System III™ ANSI FORTRAN 77, Pascal, C, high level language debugger Domain Distributed Data Management System (D3M) X.25, IBM 3270, HASP support 44 graphics primitive instructions, SIGGRAPH CORE graphics package		
Node-Based Peripheral Support	34 Mbyte Winchester 1.2 Mbyte diskette 60 cps letter-quality printer	34, 68, 158 Mbyte Winchester disks 300 Mbyte storage module disk 1.2 Mbyte diskette 1600 bpi, 9-track tape drive 60 cps letter-quality printer 300 lpm and 600 lpm line printers 5-slot IEEE-796 Multibus™ adaptor Interface to Versatec printer/plotter	
DSP80 Domain Server Processor: Network-Wide Peripheral Support	300 Mbyte storage module disk; 1600 bpi, 9-track tape drive; 60 cps letter-quality printer; 300 lpm and 600 lpm line printers; 5-slot IEEE-796 Multibus™ adaptor; Interface to Versatec printer/plotter		

UNIX is a trademark of Bell Laboratories
MULTIBUS is a trademark of INTEL Corp.

Incremental growth

Once installed, a DOMAIN system grows naturally and easily. As demand increases, new nodes can be added to fit those demands exactly. The system grows in small, inexpensive steps over time, rather than in great budget-wrenching leaps every few years. You don't have to buy a lot of expensive over-capacity. And you can start treating system growth as an orderly, continuous process.

High availability

High availability is an inherent characteristic of the DOMAIN system. The failure of a single DOMAIN node has no impact on the rest of the system.

The DOMAIN network is also inherently easy to maintain. A malfunctioning node can be immediately taken off-line and diagnosed. Suspect elements can be unplugged and swapped for tested spares, and the node can be back on-line with an absolute minimum of downtime.

Routine maintenance may be performed on one node at a time, at the convenience of individual users, rather than on a rigid schedule that shuts down the whole system at once.

Long-term investment protection

The DOMAIN system has been designed around a high-level architecture that makes it far less susceptible to technological obsolescence than other systems. Today, DOMAIN uses advanced, 32-bit microprocessor technology. But the essential organization of the system transcends currently available chip-level architecture. DOMAIN users will be able to move from today's technology without abandoning their current investment in software.

*UNIX is a trademark of Bell Laboratories.

Apollo: The Company Behind the System

A major new enterprise

Apollo Computer Inc. is a major new enterprise in the computer industry. Apollo was founded by a team of proven, senior management officials of several of the most innovative and successful companies in the computer industry. Apollo is a full service computer company: we design, manufacture, sell, and support integrated hardware/software systems. We are committed to continued technological leadership, aggressive market penetration, full customer support, and rapid growth. We intend to be an important force in the growing computer markets of the 1980's, and beyond.

Technology driven/ market oriented

Apollo was founded to take advantage of the explosion in

computer technology of the early 1980's. But technological leadership is only one side of Apollo's unique profile.

Unlike most young companies in high technology industries, Apollo is committed to serving the needs of the market as much as it is to exploiting the opportunities presented by technology. There are Apollo field marketing centers in the major computer markets of the United States, Europe, and the Far East, including Japan. Our marketing force of experienced computer professionals has been organized to serve end-users in science, engineering, research, education, government, and business, providing the computing capabilities needed to solve large-scale computational problems at a cost considerably below that of traditional scientific mainframe computers. At the same time, cooperation with proven suppliers of software systems enables us to achieve significant penetration of additional markets.

Commitment to customer support

While Apollo has made a major commitment to building a strong field marketing force, we have also made an equal commitment to support what we sell: we will not put a sales representative in the field without a systems support representative beside him. In addition, each of our sales offices is also a service depot, fully stocked with spares. And, of course, Apollo has a continuing commitment to long-term system compatibility, ongoing system upgrading, and product reliability, availability, and maintainability.

North American Sales and Service Offices

Northeast District:

Boston, Massachusetts 617/872-4802
New York, New York 212/557-7180
Philadelphia, Pennsylvania 215/964-8510

North Central District:

Minneapolis, Minnesota 612/835-4541
Chicago, Illinois 312/397-0667
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Detroit, Michigan 313/559-0511

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Los Angeles, California 213/883-5111
Orange County, California 714/768-2988
Seattle, Washington 206/453-5544
Portland, Oregon 503/641-6948

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