Bull DPS 7 Series

MANAGEMENT SUMMARY

UPDATE: *Bull has substanially changed the DPS 7 line. It now includes 21 compatible models (up from 13 compatible models); it has more subgroups (increased to 5), and includes a new tri-processor. The DPS 7 range is also re-targeted at departmental system users. In addition, all models now have cache memories, and Bull has added two models to the Datanet range of communication processors.*

Since its introduction, the Bull DPS 7 Series has continued steadily on an evolutionary path. The major milestones in the life of the Series included a major restructuring in 1984, the announcement of the top-of-the-line DPS 7/10X7 in September 1986, the announcement of the DPS 7000 Series in April 1987, and the extension of the top-of-the-line Bull DPS 7/1X07 to a full range of six models in September 1987.

Bull SA is divided into three groups: Bull Systèmes, responsible for mainframes, including the DPS 7, DPS 7000, DPS 8, DPS 8000, DPS 88, and DPS 90, as well as minicomputers, including the DPS 4, DPS 4000, DPS 6, and DPS 6 PLUS; Bull MTS, responsible for minicomputers such as the SPS 5, SPS 7, SPS 9, and Mitra, the Micral microcomputer, Questar terminals, and office automation and banking equipment; and Bull Peripheriques, responsible for peripherals such as disks, printers, and magnetic tape units. Bull has approximately 26,000 employees worldwide in 75 countries. Sales rose in 1986 by 9.9 percent over 1985 to 17.7 billion FFr, and net profits totaled 250 million FFr.

The DPS 7 architecture provides multiprocessing capabilities and a high degree of simultaneity. In addition to 1, 2, 3, or 4 central processors, a Bull DPS 7 system contains a number of other processors for specific functions, including the input/output processor, disk processor, magnetic tape processor, unit record processor, and network processor.

▷

The Bull DPS 7 Series can function in departmental environments.

The DPS 7 and DPS 7000 Series of 21 compatible models contains single-, dual-, tri-, and quadri-processor systems divided into 5 subgroups, offering a high degree of reliability through redundancy. All models run under the GCOS 7 operating system. The series is suitable for the medium to large central user who needs distributed processing and networking capabilities, as well as the departmental system user.

MODELS: DPS 7000/10, 7000/20, 7000/30, 7000/40, 7000/50; DPS 7/617, 7/617-SE, 7/717, 7/717-SE, 7/817, 7/817-SE, 7/917-SE, 7/627, 7/727, 7/827, 7/1007-S, 7/1007, 7/1107, 7/1207, 7/1307, and 7/1407.

CONFIGURATION: From 4MB to 64MB of main memory, and 4 to 64 I/O channels.

COMPETITION: IBM 9370, 4300, and 3090 Series, IBM System/38, Hewlett-Packard HP 3000, Sperry 2200 and 1100, Burroughs A and 7900, and Digital Equipment Corporation VAX series.

PRICE: Purchase prices range from approximately 700.000 FF for the entry-level DPS 7000/10 to over 40.000.000 FF.

CHARACTERISTICS

MANUFACTURER: Bull, 121 avenue Malakoff, 75116, Paris, France. Telephone (01) 4502 9090. Telex 614050 F.

COMPANY LOCATIONS: *Algeria:* Cii Honeywell Bull, 5 rue de Nîmes, B.P. 126, Ferhat-Boussad-Alger. Telephone (213) 63 11 21/22; *Argentina:* Bull Argentina S.A.C.I., Carlos Pellegrin 1363, 1041 Buenos Aires. Telephone (54) 394 50 04; *Austria:* Bull AG, Linke Wienzeile 236, A-1150 Vienna 15. Telephone (222) 85 36 01; *Belgium:* Bull SA, Avenue Marnix 28, B1050 Brussels. Telephone (32) 517 8411; *Brazil:* ABC Bull Telematic SA, Avenida Angelica 903, CEP 01227 Santa Cecilia, São Paulo. Telephone (55) 826 30 22; *Cameroon:* CII Honeywell Bull, Rue Ivy Douala, Immeuble CNPS, B.P. 2552, Bonanjo Douala. Telephone (237) 42 18 48; *China:* Bull Beijing Representative Office, Suite 2917, Minzu Hotel, Beijing, China. Telephone (86) 651735); *Congo:* CII Honeywell Bull, Congo, 43 Avenue Paul Doumer, B.P. 961, Brazzaville. Telephone (242) 81 36 44; *Denmark:* Bull A/S, Otto Moonsteds Plads 9, 1563 Copenhagen. Telephone 45 (01) 15 15 07; *Gabon:* CII Honeywell Bull Gabon S.A.R.L., Immeuble Independance, B.P. 2260 Libreville. Telephone (241) 76 07 61; *Greece:* Honeywell Bull AE, Ave. Syngrou 44, B.P. 117027-11710 Athens. Telephone 30 (01) 923 99 918; *Guadeloupe:* Bull, Voie No. 3, Bureaux 13, 14, 15, Zone Industrielle de Jarry, 97122 Pointe-A Pitre. Telephone (590) 26 65 46; *Iraq:* Bull SA, Box 2137, Alwya, Baghdad. Telephone 964 (01) 776 96 43; *Ivory Coast:* Bull SA, B.P. 1580, Abidjan 01. Telephone (225) 32 39 04; *Lebanon:* Honeywell Bull S.A.R.L., Immeuble Marie Hajal-Quartier Martakla, B.P. 60208, Jal El Dib Beyrouth. Telephone (961) 417014; *Lux-* ▶
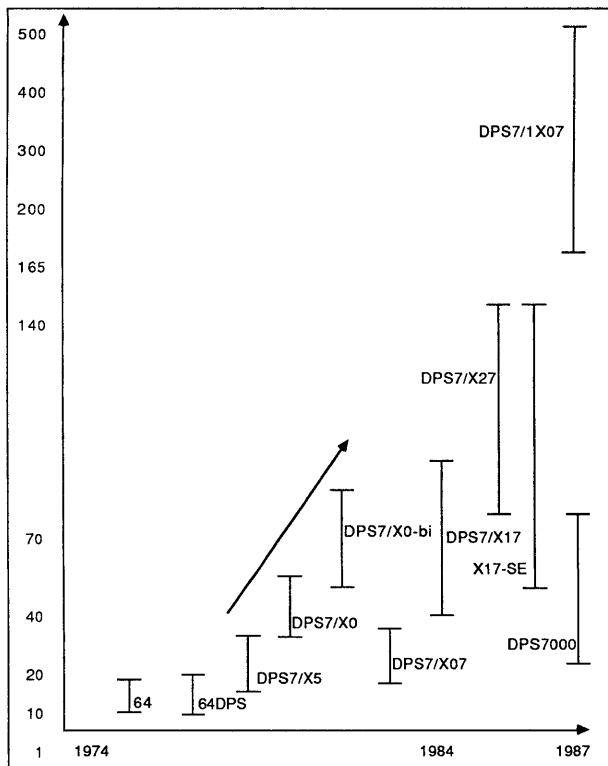
Figure 1. Bull DPS 7 evolution

Simultaneity is achieved at two basic levels: within the main processor and by concurrent operation with the main processor of peripheral and network processors. These ancillary processors all have intelligence and memory and are autonomous within certain limits. The main processor also has a capability for carrying out a number of operations in parallel—such as fetching and decoding instructions, performing arithmetic/logical operations, and finding main memory addresses.

The network processor provides complete facilities for network control and can also be used as a terminal concentrator or as a switch. There are various models available for the different members of the DPS 7 Series. All Datanet processors support connection of the DPS system to public networks, such as Transpac, DATEX-P, NPDN, IBERPAC, etc.

The DPS 7 Series is divided into subgroups which differ mainly in hardware configuration. The subgroups are the single-processor DPS 7000 models; the 7/X17 and 7/X17-SE models; the 7/X27 twin systems which are fault-tolerant versions of the 7/X17 models, and the DPS 7/1X07 top-of-the-range single to quadri-processor models, offering single, dyadic, and fault-tolerant versions. All models have input/output processors and run the GCOS 7 operating system which offers complete compatibility at the operating system level and at the networking level, for which Bull offers networking software under the DSA label, fully compatible with ISO/OSI standards.

The DPS 7/617 and 7/717 are both single-processor systems which comprise up to 24M bytes of main memory, ▷

embourg: Bull, Kalehesbreck, 2A-L1852. Telephone (352) 438584-1; Malagasy: Honeywell Bull Madagascar SA, 12 rue de Nice, B.P. 252, Antananarivo. Telephone (261) 22 407; Martinique: Bull, Immeuble La Rougery, Zone Industrielle de la Jambette, 97200 Fort de France. Telephone (596) 71 42 50; Morocco: Honeywell Bull Maroc SA, 642/646 Boulevard Mohamed V, B.P. 2218, Casablanca. Telephone 212 (2) 47 852; The Netherlands: Bull n.v., Vliegtuigstraat 26, B.P. 9039, 1059CL Amsterdam. Telephone 31 (020) 510 1911; Niger: CII Honeywell Bull Niger, Avenue Charles de Gaulle, B.P. 12013, Niamey. Telephone (227) 72 28 19; Norway: Bull A/S, Tollbugt 32, Postboks 470, Sentrum, 0105 Oslo 1. Telephone 47 (02) 41 80 30; Poland: Bull SA, Infraco-Ulica, Strawki No. 2, Warsaw. Telephone 48 (22) 39 59 54; Portugal: Honeywell Bull Ltda., Avenida 5 de Outubro, 35-6, 1000 Lisbon. Telephone 351 (01) 53 41 81; Reunion Island: Bull SA, 15 Bd. de l'Océan, B.P. 890, 97400 Saint Denis De La Reunion. Telephone (262) 416300; Saudi Arabia: Bull, International Division Middle East (DOD), 36 Rue de la Princesse, 78430 Louveciennes F. Telephone 33 (3) 98 92 50; Senegal: CII Honeywell Bull, Extension Immeuble Kebe, 99 av. Andre Peytevin, P.P. 3183, Dakar. Telephone (221) 21 39 31; Singapore: Bull Far East Ltd., Unit 3105, Hong Leong Building, 16 Raffles Quay, Singapore 0104. Telephone (65) 22 44 133; Spain: Bull SA, Avenida Diagonal 635, B.P. 08028, Barcelone 29. Telephone 31 (3) 330 6611; Sweden: Bull AB, Sveavagen 163, Box 23 137, S-10435 Stockholm. Telephone 46 (08) 28 04 00; Switzerland: Bull AG, Wengistrasse 28-30, CH-8021 Zurich. Telephone 41 (01) 242 12 33; Togo: CII Honeywell Bull, 40 Rue Koyigan, B.P. 7193, Lome. Telephone (228) 21 41 53; Tunisia: Bull SA, 55 Ave. Mohamed V, Tunis. Telephone 216 (1) 28 47 21; United States: Bull Corporation of America, 275 Wyman Street, Waltham, MA 02154. Telephone 1 (61) 895 56 00; Uruguay: Bull del Uruguay SA, Avenida Dr. Luis Alberto de Ferrera, Montevideo 2802. Telephone (598) 819169; USSR: Bull SA, Trekhproudny Pereoulok 11/13, Moscow 103001. Telephone (71) 230 2635.

DISTRIBUTORS: Bull has agents in the following countries: Bolivia, Chile, Djibouti, Egypt, Finland, Guinea, India, Indonesia, Kuwait, Mauritius, New Caledonia, Paraguay, Peru, Tahiti, United Arab Emirates, and Venezuela.

MODELS: DPS 7000/10, 7000/20, 7000/30, 7000/40, 7000/50, DPS 7/617, 7/617-SE, 7/717, 7/717-SE, 7/817, 7/817-SE, 7/917-SE, 7/627, 7/727, 7/827, 7/1007, 7/1007-S, 7/1107, 7/1207, 7/1307, 7/1407.

DATE ANNOUNCED: 7/X17, 7X27 models—September 1984; 7/X17-SE models—June 1987; 7/1X07—September 1987; 7000 models—April 1987.

FIRST DELIVERY: 7/X17, 7/X27—April 1985; 7/X17 SE—October 1987; 7/1X07—April 1988; 7000 models—April 1987.

NUMBER INSTALLED TO DATE: About 2,500.

DATA FORMATS

BASIC UNIT: 8-bit byte plus one parity bit. Data paths are four bytes (32 bits) wide, while addresses and commands use an independent 28-bit path. Data can be interpreted as binary, decimal, hexadecimal, or alphanumeric. Data bits are interpreted in groups of four (packed decimal) or eight (alphanumeric EBCDIC), or in strings of 16 to 64 bits (binary digits). The strings can be interpreted as signed or fixed-point operands with single- (16-bit) or dou- ▶
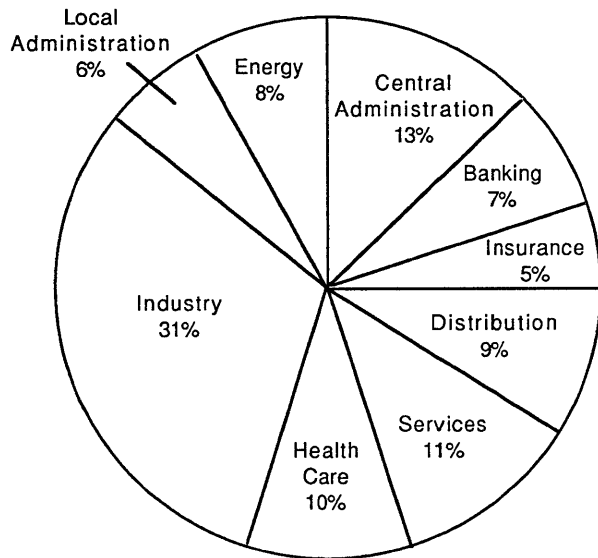
Bull DPS 7 Series

Bull DP7

Figure 2. Bull DPS 7 principal applications.

one 16K-byte block of cache memory, eight standard I/O processors, two network processors, and a number of disk,

ble- (32-bit) precision formats. The scientific instruction set, used for floating-point operations, provides the capability for 128-bit quad words.

FIXED-POINT OPERANDS: 1 to 16 bytes (1 to 31 digits plus sign) in packed decimal; one half word (15 bits plus sign) or full word (31 bits plus sign) in binary.

FLOATING-POINT OPERANDS: 1, 2, 3, or 4 words, consisting of a sign bit, a 7-bit exponent, and a 24-bit, 56-bit, or 112-bit fraction.

INSTRUCTIONS: The DPS 7 systems are microcoded machines that can serve as upgrades to Level 64 and 64/ DPS systems through the execution of the appropriate instruction set.

INTERNAL CODE: EBCDIC.

MAIN STORAGE

Memory is organized into consecutively numbered byte locations. Four-byte blocks are always accessed regardless of operand size. Halfword (16-bit) operands must begin on even-numbered byte locations, and full-word (32-bit) and double-word (64-bit) operands must begin on byte locations divisible by 4.

TYPE: 64K-bit MOS chips. Current Mode Logic (CML), a fast, low-power, low-heat technology is used. CML has a
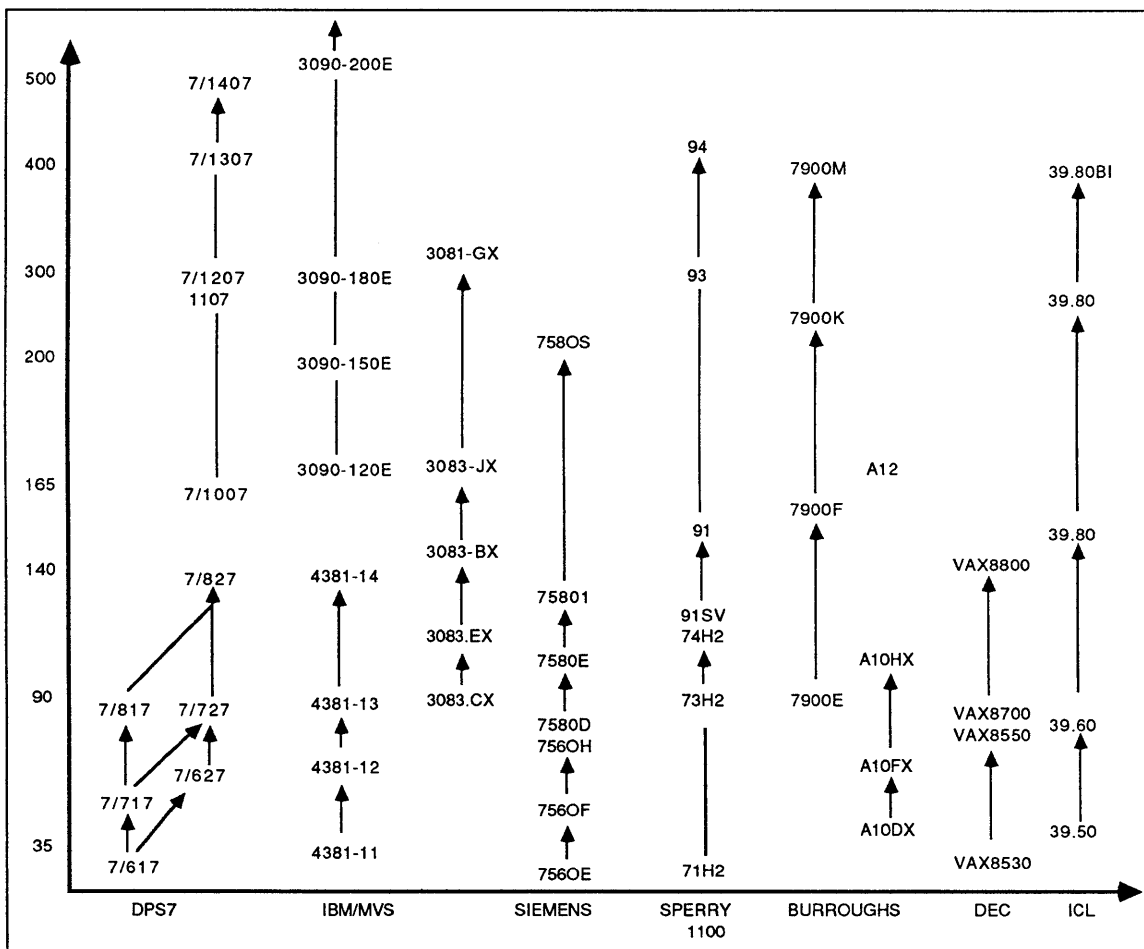

Figure 3. Bull DPS 7 competitive position

Bull DPS 7 Series

TABLE 1. CHARACTERISTICS OF THE BULL DPS 7 SERIES

Model	7/617	7/717	7/817	7/617-SE	7/717-SE	7/817-SE	7/917-SE
Central processors	1	1	2	1	1	2	4
Cycle time, ns	150	107.5	107.5	150	107.5	107.5	107.5
Main memory							
Minimum, MB	2	4	6	4	8	8	8
Maximum, MB	16	24	32	12	16	16	24
Cache memory, KB	16	16	32	16	16	32	64
Input/Output							
I/O Processors	4-12	4-16	8-16	7	8	11	24
Disk processors (MSP)	2	2	4	4	0	0	0
Single/dual channel	2-6	2-8	2-8	2-3	2-5	2-8	2-10
Single/dual access spind.	4-48	4-64	4-64	4-24	8-40	8-64	8-70
Magnetic tape processors MTP							
Accesses	1-2	1-4	1-4	1	1-4	1-4	1-6
Magnetic tape drives	1-16	1-32	1-32	1-8	1-32	1-32	1-48
Printers							
Impact	12	20	20	4	4	4	4
Non-impact	2	2	2	1	1	1	1
Network processors	1-2	1-2	1-4	1-2	1-2	1-4	1-4
Number of lines (max.)	158	286	572	158	286	572	572
Operating system							
GCOS 7-AS	No	No	No	No	No	No	No
GCOS 7-LS	Yes	Yes	Yes	No	No	No	No
GCOS 7-XLS	No	No	No	Yes	Yes	Yes	Yes

▷ magnetic tape, and unit record processors. The dual-processor 7/817, in its basic configuration, comprises 6M bytes of main memory, two blocks of cache memory, eight I/O processors, and four network processors. Main memory can be expanded to 32M bytes. An additional eight I/O processors can be supported. Disk, magnetic tape, and unit record processors are available.

The 7/617-SE, 7/717-SE, and 7/817-SE have the same architecture and the same levels of power as the 7/617, 7/717, and 7/817. The 7/817-SE is a dyadic system with main memory ranging from 8MB to 16MB, and the 7/917-Se is a quadri-processor with a main memory ranging from 8MB to 24MB. The principal characteristic of the 7/X17 models is that they can be upgraded on site to the 7/X27 redundant models.

The three 7/X27 models, the 7/627, 7/727, and 7/827, are fully redundant versions of the 7/617, 7/717, and 7/817 systems, respectively. For example, the 7/727 configuration can contain twice as many processors and peripherals as the 7/717. A typical 7/727 configuration would consist of two central processors, 8M to 32M bytes of main memory, two blocks of cache memory, from eight to thirty-two I/O processors, up to 70 disk drives and 64 magnetic tape units, and four network processors handling a maximum of 286 communication lines. The 7/827, is a quadri-processor system which provides full duplication of the 7/817, except that main memory ranges from a basic 12MB to 32MB. ▷

▶ propagation time of one nanosecond per logic port. In addition, the DPS 7 uses a multilayer micropackaging technique that supports 10,000 to 15,000 functions per board. The CML technology used is the result of cooperation by Bull in Europe, Honeywell in the United States, and the Nippon Electric Company in Japan. Micropackaging is the result of research and development work at Bull Laboratories.

CYCLE TIME: See Characteristics Table.

CAPACITY: See Characteristics Table.

CHECKING: Each item of stored data is monitored by a Hamming code (one byte for every 8 data bytes) which corrects single-bit errors and detects double-bit errors. Parity checks are performed to ensure data integrity. All registers and calculation circuits include a key check.

Diagnostic microprograms are launched at each system initialization or at the operator's request by the main processors and by peripheral processors to verify their operation. The support system launches checkpoints when there is an irretrievable error or a power loss.

In the event of an error, a retry is activated. The retry can be initiated by firmware for a microinstruction or an instruction, or by software for a group of instructions or input/output commands. Retries can be initiated several times. Whenever an error is detected and a retry is attempted, the event is recorded in an error log. An error report, subsequently produced, indicates the origin of each error, speeds up diagnosis, and implements fast, corrective intervention.

STORAGE PROTECTION: In the GCOS 7 environment, to avoid artificial restrictions on the placement of segments ▶

DECEMBER 1987

Bull DPS 7 Series

TABLE 1. CHARACTERISTICS OF THE BULL DPS 7 SERIES (Continued)

Model	7/627	7/727	7/827	7/1007 -S	7/1007	7/1107
Central processors	2	2	4	1	1	2
Cycle time, ns	150	107.5	107.5	45	45	45
Main memory						
Minimum, MB	4	8	12	24	24	24
Maximum, MB	24	32	32	24	32	32
Cache memory, KB	32	32	64	32	32	64
Input/Output						
I/O Processors	8-24	8-32	16-32	16	24-32	24-32
Disk processors (MSP)						
Single/dual channel	4-10	4-10	4-10	2-10	2-16	2-16
Spindles (single/dual access)	8-70	8-70	8-70	8-80	8-128	8-128
Magnetic tape processors (accesses)	2-4	2-8	2-8	2-4	2-4	2-4
Magnetic tape drives	2-32	2-64	2-64	2-32	2-32	2-32
Impact printers	24	40	40	3	3	3
Non-impact printers	2	2	2	2	2	2
Network processors	2-4	2-4	2-4	1-4	1-4	1-4
Number of lines (max.)	158	286	572	572	572	572
Operating System						
GCOS 7-XLS	Yes	Yes	Yes	Yes	Yes	Yes

▷ The six DPS 7/1X07 models represent a major extension of the Bull DPS 7 top-of-the-line offer. The 7/1007 model is a single-processor system equipped with 24 to 32M bytes of main memory, two 16KB blocks of cache memory, 24 to 32 I/O processors, and four network processors. Its processing power level exceeds that of the 7/827.

The 7/1007-S is a 24MB cost/performance, efficient version of the 7/1007. It provides the Bull DPS 7 with an entry into the very large systems field. The 7/1107 is a dyadic system with a basic configuration of 24M bytes of main memory, 64KB of cache memory, 24 I/O processors, and four network processors.

The 7/1207 and 7/1407 models are fully redundant versions of the 7/1007 and 7/1107 models. The largest 7/1407 quadri-processor can thus attain a maximum of 64M bytes of main memory, 128KB of cache memory, 64 I/O processors, 32 disk processors, eight magnetic tape processors, and four network processors.

The 7/1307 is a tri-processor system comprised of three central processors operating in a fully redundant system environment.

The GCOS 7 operating system runs on all DPS 7 models. The principal task of GCOS 7 is optimizing program handling and dividing programs into segments which are fully relocatable and can be swapped in and out of memory as needed. Optimization of the processes associated with tasks—that is, getting them in and out of memory and synchronizing the in/out phase—is effected through firmware. When a program can be broken down into a ▷

▶ in memory, the DPS 7 protects every segment individually with an automatic system of rings and protection levels. This protection system, implemented by hardware and firmware, protects segments on the basis of the information they contain rather than by their physical locations.

The main processor, while executing a process, can be at one of 4 levels of privilege, called rings. The rings are numbered from 0 to 3, with 0 being the most privileged. A ring number is allocated to each segment when it is created; when the process is entered, the main processor adopts this ring number. Each segment is allocated 3 protection levels, one for each possible use. Each level can be anywhere within the range of 0 to 3. At every reference to an address in a segment, the protection level for the relevant type of use is checked against the current ring number of the main processor. Access is allowed only under the following conditions: for read and write access, the ring number is less than or equal to the protection level; for execute access, the ring number is within the range between the write and execute protection levels. At linking time, the programmer specifies protection levels to control access to program segments from other active programs.

An extension to the protection system is the capability to flag segments as completely unwritable. This feature guards against the most frequently encountered programming errors. The compilers always generate code and data in separate segments. By flagging the code segments as unwritable, the system prevents the code from being modified during execution.

RESERVED STORAGE: There is a reserved area in main memory for channel programs and tables describing the actual configuration. The boundary address is held in a special register (BAR). This reserved area is of variable length, approximately 20KB.

CENTRAL PROCESSORS

The DPS 7000 models are single-processor systems, as are the 7/617, 7/717, 7/617-SE, 7/717-SE, 7/1007-S and 7/ ▶

Bull DPS 7 Series

TABLE 1: CHARACTERISTICS OF THE BULL DPS 7 SERIES (continued)

Model	7/1207	7/1307	7/1407
Central process.	2	3	4
Cycle time ns.	45	45	45
Main memory			
Minimum (MB)	48	48	48
Maximum (MB)	64	64	64
Cache memory (KB)	64	96	128
I/O processors	48-64	48-64	48-64
Disk processors			
(single/dual)	2-32	2-32	2-32
Spindles (single dual accesses)	8-200	8-200	8-200
Magnetic tape processors	2-8	2-8	2-8
Magnetic tape drives	2-64	2-64	2-64
Impact printers	6	6	6
Non-impact printers	2	2	2
Network processors	1-4	1-4	1-4
Number of lines (maximum)	572	572	572
Operating system GCOS 7-XLS	Yes	Yes	Yes

number of subtasks that can be executed in parallel, the firmware synchronizes the operation.

Programming languages supported by the Bull DPS 7 Series include Cobol, Fortran, RPG2, Pascal, C, and GPL1. For interactive purposes, APL is supported. Menu-driven facilities include a command language generator and interactive data management utilities.

The DPS 7 range offers a very wide variety of peripherals with the accent on disks and terminals. DPS 7 systems can be coupled to share peripherals. Such configurations enable peripheral and network processors to be switched between two DPS 7 systems.

For communications, Bull offers the Datanet range of processors, which includes six models: DN 7130, DN 7131, DN 7132, DN 7133, DN 7135, and DN 7136. Bull also has subdivided the Questar terminal family into the Questar 400 range of intelligent workstations and the Questar 210 color or monochrome display terminals.

COMPETITIVE POSITION

The DPS 7 line is designed for general business applications, ranging from manufacturing to office automation. A wide variety of activities can be handled by the system, such as administration, management, and distribution. DPS 7 systems have been installed in all types of organizations including banks, local and national administration buildings, and private businesses. The markets covered by the DPS 7 are medium to large organizations needing a

1007 models. The 7/817 and 7/817-SE, and 7/1107 are dual-processor machines. The 7/X27 systems are fault-tolerant versions of the 7/X17 models, and the 7/1207, 7/1307, and 7/1407 systems are fault-tolerant versions of the 7/1007 and 7/1107 models. The 7/627, 7/727, and 7/1207 have two central processors, the 7/1307 has three, and the 7/917-SE, 7/827, and 7/1407 are quadri-processor systems.

DPS 7 central processors are composed of 7 mini-machines, a control store, a processor bus, and cache memory on all models. This processing system is connected via its cache memory with the central bus, which also services main memory and any input/output processors. The I/O processors have their own control stores and main memories and are connected to the peripheral processors, which also have their own control stores and main memories. This distributed architecture enables various subsystems to operate simultaneously, allows subsystems to communicate with each other without tying up the main processor, and provides flexibility in distributed processing network environments.

The mini-machines in the main processor are Pilot Machine (PIM), Address Calculation Machine (ACM), Data and Instruction Management Machine (DIM), Arithmetic and Logic Machine (ALM), Scientific Calculation Machine (SCM), Timer, and Maintenance Interface Machine (MIM).

CONTROL STORAGE: Control store contains firmware held in 56-bit words. Each word contains the instructions to be executed by the mini-machines during a single cycle. The sequencing of firmware instructions is controlled by the Pilot machine. Short instructions require two microcode words; more complex instructions can require several dozen.

Bull DPS 7 Series

TABLE 2. MASS STORAGE

MODEL	MSU 0395	MSU 4102	MSU 1007	MSU 4801
Type	Removable	Fixed	Fixed	Fixed
Number of spindles per unit	1	1	2	4
Capacity	300MB	500MB	2 X 500MB	4 X 500MB
Tracks per surface	808	1,422	1,422	1,422
Surfaces per pack/spindle	19	12	12	12
Average seek time (ms)	30	20	20	20
Average access time (ms)	38	28	28	28
Average latency (ms)	8.3	8.3	8.3	8.3
Data transfer rate (K bps)	1210	1815	1815	1815
Controller model	MSP 4270	MSS 4102	MSP 4371	MSS 4801
Supported by system models	All, except DPS 7000	DPS 7000	X/17,X/27 X/17-SE	1X07

▷ centralized system, but which can also use other Bull products in a distributed fashion, usually the DSA networking facilities. With the fault-tolerant 7/X27 and 7/1X07 models at the top end of the series, Bull is also aiming at large companies which require a high degree of system reliability.

The DPS 7/X17 and /X27 Series compete generally with the IBM 4300 Series, and the DPS 7/1X07 Series with the IBM 3090 Series. Specifically, the 7/617 is comparable with the IBM 4381-21, the 7/717 with the 4381-22, the 7/817 or 7/727 with the 4381-23, and the 7/827 with the 4381-24. The 7/1007 competes with the IBM 3090-120E, the 7/1107 or 7/1207 with the 3090-180E, and the 7/1407 with the 3090-200E. Other competition includes the Siemens 7.500 Series, the Hewlett-Packard 3000 Series, and the Sperry 1100 Systems.

Competitors to the DPS 7000 range include minicomputers such as the IBM System 38, the new IBM 9370 and Sperry 2200 midframe series, the Hewlett-Packard HP 3000, and Digital Equipment Corporation's VAX family. In Europe, Bull views Digital Equipment Corporation as more of a competitor than IBM because Digital has developed good applications packages that can compete with Bull's packages in the vertical marketplace. Bull does not sell the DPS 7 in the scientific marketplace as yet, but might do so in the future.

ADVANTAGES AND RESTRICTIONS

The uniformity of the GCOS 7 operating system for all twenty-one models in the DPS 7 line offers many benefits to users, the most notable of which is the capability of upgrading from entry-level models all the way to the top of the line with little or no change in software. Communications software running under GCOS 7 integrates the Bull Questar 200 and 400 terminals and workstations and the Bull Micral 30, 40, and 60 microcomputers in the DPS 7 environment. Users can be assured that their DPS 7 systems will form an integral chain in their overall office automation strategies.

Bull has greatly increased the overall performance of the range with the addition of the compact MSU 1007 high-capacity disks. These units supply 2 billion bytes in a low-boy cabinet on the basic model. ▷

▶ The control store of the main processor is loaded at the initialization of the system. It can contain up to 64K words, enabling the execution of the 64/DPS instruction set. Depending on the model, TTL (transistor-to-transistor logic) or CML (Current Mode Logic) technology is employed. Each firmware word is accompanied by 8 bits of autocorrection code.

Firmware in the DPS 7 also carries out functions traditionally performed by software. These include task management, procedure calls, data protection, etc. The use of firmware also permits the DPS 7 to implement the machine instruction sets of the 64/DPS running under GCOS 7, while providing software access to the firmware functions of the DPS 7.

The GCOS 7 operating system makes use of the task management mechanisms implemented in firmware. The main processor can recognize and control a task—a unit of a program more significant than a single instruction. A task is a sequence of interdependent instructions. A program can comprise a number of tasks, each able to execute in parallel with the others (multitasking).

A process consists of all the data and executable code associated with a task plus a process control block, a data structure recognized and manipulated by firmware. When the process stops running for any reason, a snapshot is taken of the main processor's status and stored in the process control block. When the process is restarted, the main processor is reset according to the snapshot, and the process continues where it left off. Completely automatic, the mechanism for storing and reloading the process works without any software intervention. The DPS 7 can simultaneously recognize many processes, and their execution can be synchronized according to a multilevel priority system.

The DPS 7 uses firmware-controlled semaphores to interpret external events such as physical input/output termination, peripheral interrupts, operator interrupts, and messages from terminals. Via semaphores, it also synchronizes the execution of competing processes, passes messages between processes, and controls competing demands for system services.

A semaphore is a group of words containing a counter and a pointer to an associated queue. When the semaphore counter is negative, all the resources associated with it are busy, and processes are awaiting completion. When the counter is positive, all processes are satisfied and resources are free. When the counter is zero, all resources are busy, but no processes are waiting. This mechanism can be used in any situation involving processes waiting for the completion of any operation. ▶

Bull DPS 7 Series

TABLE 3. MAGNETIC TAPE UNITS

MODEL	MTS 4101	MTU 0427	MTU 0437-MTU 4103*	MTU 0537-MTU 4104*	MTU 0637-MTU 4105*
FORMAT					
Number of tracks	9	9	9	9	9
Recording density (bpi)	1600	1600/6250	1600/6250	1600/6250	1600/6250
Recording mode	PE	PE/GCR	PE/GCR	PE/GCR	PE/GCR
CHARACTERISTICS					
Controller models	MTS 4101	MTS 4370	MTP 4472/4572, MTP 4102*	MTP 4472/4572, MTP 4102*	MTP 4102*
Drives per controller	1	1-4	1-8/1-16	1-8/1-16	1-8/1-16
Tape speed (ips)	25/75	25/75	75	125	200
Data transfer rate (K bps)	120	468	468	781	1250
Supported by system models	7000/10 & 20	7000	X/17/X27/X17-SE 7000/20 to 50*	X17/X27/X17-SE 7000/20 to 50*	X17/X27/X17-SE 7000/20 to 50* 1X07

The DPS 7 line conforms to Bull's BlueGreen office integration strategy in that the six models of Bull's Datanet network processor integrate the features of the BlueGreen distributed data processing systems. This integration is achieved through Bull's ISO/DSA network architecture. The BlueGreen approach is especially advantageous in the areas of corporate information sharing and communications.

Redundancy is an important consideration for potential buyers, and this feature is supplied by the -27 dual-processor and quadri-processor systems, as well as the 1207, 1307, and 1407 dual-,tri-, and quadri-processor systems. The -17 models of the series can evolve into redundant 27 models, and the 1007/-S or 1107 models into the redundant 1207, 1307, and 1407 models if customers want that capability.

As the use of graphics becomes more widespread in businesses, users are looking for software that can fill that need. Bull has responded to the graphics demand by supplying GRAPH 7, a graphics package that runs on the DPS 7 systems under GCOS 7. The functions supported by GRAPH 7 include data analysis, decision support, report generation, map making, and diagrams. The two components of GRAPH 7 are DI3000, a set of Fortran sub-programs for the creation of two- and three-dimensional figures, and BUSINESS, an interactive product adapted to business graphics.

Bull's other efforts in the software area are reflected by agreements made with software houses that enable the company to increase the number of software packages that can be run on its products. A notable example of Bull's commitment to software expansion is Bull's joint agreement with CINCOM SA for the promotion of the MANTIS fourth-generation system. MANTIS is fully integrated with GCOS 7 and can be used with traditional UFAS and IDS 2 files, and also with dedicated files.

Another recent joint agreement with ORACORP has extended the GCOS 7 offer to include ORACLE, the internationally renowned relational database management system that use SQL, the ANSI and OSI adopted relational database management language standard. Bull has also entered into agreements with STEEB of West Germany and Thom'6 of the French Thomson Group.

The DPS 7 has an automatic firmware-implemented feature called the "call/exit" mechanism which is available with the GCOS 7 environment. Between entry to and exit from a procedure, the call to that procedure is represented by a record containing a work area, a save area, and a communications area. Whenever a call instruction is executed, this record is created and placed in a last-in/first-out (LIFO) queue called a stack. Whenever an exit instruction is executed, the last record placed in the stack is removed. There is one stack for each active process, and whenever a process is initiated, it is automatically provided with extra segments for the stack.

After a call instruction, the record placed in the stack contains all the local variables for the calling procedure, the contents of all the main processor's registers at the time of the call, the contents of the main processor's instruction counter at the time of the call, and any parameters to be passed to the called procedure.

When the exit instruction is executed, the registers and instruction counter are automatically restored from the record removed from the stack so that the calling procedures can continue processing.

REGISTERS: There are eight 32-bit Base Registers for internal address computation, sixteen 32-bit General Registers for data handling and indexing, four 64-bit Scientific Registers for floating-point data handling, one 32-bit Stack Register pointing to the stack associated with the running process, and one 28-bit Boundary Address Register holding the lowest absolute main memory address accessible by software.

ADDRESSING: Running under GCOS 7, the relative addressing mechanism is based on segmentation, and its aim is to make optimum use of memory space. Each program is executed as a collection of fully relocatable segments. A segment can reside in different places. As a program is being executed, its constituent segments can be moved within memory to make room for other programs, and, at a given point in time, some of its segments can be temporarily removed from memory and placed on disk.

INDEXING: 15 levels.

INSTRUCTION REPERTOIRE: The repertoire consists of 195 instructions, including operations for address computations, and arithmetic instructions for performing decimal and binary operations on packed or unpacked data. Operands can be binary, fixed-point, or decimal in packed or unpacked format, bytes, byte strings, or bit strings. The Scientific Instruction Set adds 26 instructions to the standard set.

Bull DPS 7 Series

TABLE 4. PRINTERS

MODEL	PRT 7220/30	PRU 0705/4101	PRU 1115/6, PRU 4102	PRU 1515/6, PRU 4103	PMS 0090
Type	Serial	Belt	Belt	Belt	Non-impact
Maximum speed	400 cps	750 lpm	1,180 lpm	1,540 lpm	90 ppm
Print positions	136	136	136	136	136/160
Horizontal spacing (char./in.)	10	10	10	10	1 to 24
Vertical line spacing (lines/in.)	—	6 or 8	6 or 8	6 or 8	1 to 18.5
Vertical format	Program-controlled	Program-controlled	Program-controlled	Program-controlled	Program-controlled
Character sets	96	48/63/94	48/64/96/special	48/64/96 special	163
Slew speed (in./sec.)	—	25	25	44	—
Powered paper stacker	—	Optional	Standard	Standard	Standard
Printer dimensions (h x w x d)	6.3 x 25 x 16	39 x 36 x 26	45 x 36 x 26	45 x 36 x 36	45 x 60 x 30
Controller models	Integral	Integral	Integral	Integral	Integrated MPC
Supported by system models	All	All	All	All	All

▷ Bull has signed still another joint promotion agreement for a set of packages developed by the French software house CISI to enable noncomputer specialists to use the solution center facilities offered on the DPS 7. This facility, known as INFOSERVICE 7, provides direct access to databases.

USER REACTION

The 1987 Datapro U.S. survey of mainframe users has given the Honeywell DPS 7 the highest *Overall Satisfaction* rating of any of the machines rated by users. It received a 3.59 from a scale based on 4.0. The DPS 7 received outstanding results for categories such as *Ease of Operation*—3.59, *Reliability of Mainframe*—3.72, and *Reliability of Operating System*—3.65, all key factors in system performance.

U.S. Survey Ratings of Honeywell DPS 7

	Weighted Average
Ease of Operation	3.59
Reliability of Mainframe	3.72
Reliability of Peripherals	3.35
Maintenance Service	
Responsiveness	3.50
Effectiveness	3.36
Technical Support	
Troubleshooting	3.22
Education	2.92
Documentation	2.80
Manufacturer's Software	
Operating System	3.65
Compilers & Assemblers	3.52
Applications Programs	2.86
Ease of Programming	3.45
Ease of Conversion	3.37
Overall Satisfaction	3.59

The Honeywell DPS 7 was also rated by users (14) in Datapro's 1987 survey of British Users of Mainframes. The ratings follow.

British Survey Ratings of Honeywell DPS 7

	Weighted Average
Ease of Operation	2.93
Reliability of Mainframe	3.00
Reliability of Peripherals	3.00

▷ **CACHE MEMORY:** All DPS 7 and DPS 7000 models have cache memory units. These units accommodate very fast access storage for data and instructions. Data and instructions stored in cache can be made available to the main processor up to five times as quickly as would be the case if they were retrieved from main memory. Cache memory is implemented in CML technology.

Data is held in cache memory in blocks of 16 consecutive bytes accompanied by autocorrection code. The 7/617, 7/717, 7/617-SE, and 7/717-SE have a capacity of 16KB; models 7/627, 7/727, 7/817, 7/817-SE, 7/1007-S, and 7/1007 have 32KB; models 7/827, 7/917-SE, 7/1107, 7/1207, and the 7000 Series have 64KB; model 7/1307 has 96KB, and the 7/1407 has 128KB of cache memory. For reference purposes, cache memory is divided into 256 areas of 4 blocks each.

INTERRUPTS: There are no interrupts as such. Any hardware or software event is handled through semaphores, combined with a masking feature that is used when high-priority events occur.

INPUT/OUTPUT CONTROL

I/O CHANNELS AND PROCESSORS: The number of I/O processors supported by a system ranges from a minimum of four on the 7/617 to a maximum of 64 on the 7/1407.

The 7/X17, 7/X27, 7/X17-SE, and 7/1X07 models contain an integrated Service and Unit Record Processor (SURP), but, apart from this, the configuration can be tailored to suit the user. Additional service and unit processors can be added on most models. A SURP handles two essential functions:

- **As a service processor, SURP carries out system initialization and maintenance, using dedicated channels to the main and peripheral processors.**

- **As a unit record processor, SURP controls printers and the system console.**

Single-channel or dual-channel disk processors support disk drives. The difference between them is that a single-channel processor controls up to 9 disk accesses and a dual-channel processor can monitor up to 18. The dual-channel controller also allows simultaneous access in read and write modes to the same disk unit.

Two types of magnetic tape processors are offered:

- **Type 1: one level of simultaneity, handles up to eight 9-track PE tape drives of 1600 bpi, and supports a transfer rate of 120KB per second.**

Bull DPS 7 Series

TABLE 5. COMMUNICATIONS CONTROL

Model	DN7130	DN7131	DN7132	DN7133	DN7135	DN7136
Number per system	1/4	1/4	1/4	1/4	1	1
Host couplers	1	2	2	4	1	1
Communications lines (max.)	23	47	79	143	15	7
Memory (min./max.—MB)	1/2	1/2	1/2	1/2	1/2	1
Maximum, MB	24	32	32	24	32	32
Line controllers (max.)	2	3	5	9	1	1
Line adaptors—V.24/syn., V.11, V.24 async.	6	12	20	36	3	1
Among which are V.24, V.11, V.35, X.21 HDLC adaptors	5	7	11	23	3*	1*
High-speed controllers—max.	—	—	2	2	—	—
V.35/X.32 HDLC lines	—	1/2	1/2	1/2	—	—
ISO 8802.3 controllers	1	2	2	2	—	—
LAN access points	1	1/2	1/2	1/2	—	—
Supported by system models	X17, X27, 7000	X17 X27/ 7000/ 20-50	X17 X27 X17-SE 1X07 7000/ 20-50	X17 X27 X17-SE 1X07 7000/ 30-50	7000	7000/ 10,20

*X.21 HDLC adapter for NPDN only (Scandinavian network)

▷

	Weighted Average
Maintenance Service	
Responsiveness	3.14
Effectiveness	2.86
Technical Support	
Troubleshooting	2.29
Education	2.43
Documentation	2.36
Manufacturer's Software	
Operating System	3.00
Compilers & Assemblers	3.07
Applications Programs	2.17
Ease of Programming	2.57
Ease of Conversion	2.62
Overall Satisfaction	2.93

The 1987 Datapro Survey of French Users of Mainframes produced the following ratings for the Bull DPS 7.

French User Survey Ratings of Bull DPS 7

	Weighted Average
Ease of Operation	3.00
Reliability of Mainframe	3.46
Reliability of Peripherals	3.02
Maintenance Service	
Responsiveness	3.15
Effectiveness	3.12
Technical Support	
Troubleshooting	2.76
Education	2.61
Documentation	2.23
Manufacturer's Software	
Operating System	3.17
Compilers & Assemblers	3.18
Applications Programs	2.89
Ease of Programming	2.91
Ease of Conversion	2.84
Overall Satisfaction	3.00 □

▶ • **Types 2: handles 9-track PE/GCR (phase-encoded/ group-coded recording) drives with 1600/6250 bpi and transfer rates up to 1250KB per second at 6250 bpi.**

The single-channel version provides one level of simultaneity and supports up to eight tape units, whereas the dual-loss version provides two levels of simultaneity and supports up to 16 tape units per processor.

I/O PROCESSORS: Each I/O processor has a control store of 4K-bit words, a main memory of 2KB, and a maintenance interface. Via a common memory interface unit, the I/O processor can transfer data to either the cache memory or the system's main memory. The number of I/O processors ranges from a minimum of 4 on the DPS 7000 Series and the 7/617 and 7/717 models to a maximum of 64 on the 7/1207, 7/1307, and 7/1407 models. I/O processor capabilities for the redundant systems are twice those for the non-redundant models.

To help ensure system availability, the DPS 7 includes special channels that allow diagnostic tests to be run and the system to be reconfigured without interrupting user service.

Input/output operations are handled by an input/output processor, and peripheral or network processors. The input/output processor controls access to main or cache memory resulting from the execution of a channel program associated with an I/O request and generated by the main processor. The main functions of the I/O processor are consequently the reading or writing of data and the reading of channel commands. The peripheral and network processors control the exchange of data with the peripheral or network component involved in the request.

Each input/output processor is a fully independent unit controlling the transfer of data in parallel with other I/O processors in an I/O processor group. An I/O processor group can contain up to sixteen I/O processors, and DPS 7000, 7/X17, and 7/X27 systems can contain one or two groups depending on the model, and 7/1X07 systems, from one to four.

Firmware held in a control store of 4K words manages the operation of an I/O processor. Each word contains 48 bits plus 8 autocorrection bits. ▶

Bull DPS 7 Series

➤ An I/O processor also has a memory of 2KB for holding sequences of channel commands being executed and data in transit. Data can be sent to main memory or cache memory in blocks of 16 bytes (a block size which optimizes the bus). This transfer is independent of the transfer speeds of individual peripherals.

Transfers of data to main or cache memory are controlled by a memory interface unit which is common to a group of I/O processors. Each I/O processor group also contains a maintenance interface which enables the service and unit record processor to initialize and test I/O processors. Each I/O processor, and consequently each channel, has a throughput of up to 2.5MB per second. The throughput of a group of I/O processors is up to 20MB per second. These rates permit the execution of more than 300 channel programs per second on a group of I/O processors.

A disk, magnetic tape, or network processor is connected to an I/O processor via a PSI (Peripheral Standard Interface) channel. This channel provides a data path for the transfer of one byte of data plus parity and the transfer of a control signal indicating the sending of a byte, acceptance of a byte, etc. The PSI standard specifies the protocol used in a data transfer for the purpose of executing a channel program, chaining commands, multiplexing several channel programs, etc.

After generating a channel program and requesting its execution, a main processor does not intervene further. Consequently, input/output operations can be executed in parallel with main processing. When a channel program has terminated, the I/O processor informs the Pilot machine.

Another important architectural feature is that there is no direct link between peripherals and main processors. Via the bus, a main processor can launch an input/output operation on any peripheral. The disconnection of a main processor in a dual- or quadri-processor configuration does not affect the availability of peripherals to the other main processors.

Peripheral devices and network components on all models are controlled by specialized peripheral and network processors. Each processor is connected either directly to an I/O channel, or to an I/O processor in the central system.

SIMULTANEOUS OPERATIONS: The peripheral processing subsystems operate simultaneously with the central processor. Each subsystem operates under control of a microprogrammed disk or magnetic tape processor. Each peripheral processor contains its own arithmetic and logic unit, read/write memory, and read-only memory and is attached to the central system through a high-speed channel. The maximum total data rate for each of these systems is listed in the Characteristics Table. All devices and terminals attached to a service unit record processor can operate concurrently. Mechanical operations on a disk or tape subsystem, such as seek and rewind, can proceed simultaneously with a data transfer on the same subsystem.

MASS STORAGE

Bull currently offers two families of disk drives for the DPS 7 systems.

MSU0395 MASS STORAGE UNIT: This unit contains 300MB of data in removable disks. Average access time is 38 ms and the transfer rate is 1.2MB per second.

MSU4102/1007/4801 MASS STORAGE UNIT: These units consist of a single cabinet housing one 500MB fixed disk pack for the MSU4102, two 500MB fixed disk packs for the MSU1007, and four 500MB fixed disk packs for the MSU4801, yielding total unformatted storage capacities of 500MB, 1,000MB, and 2,000MB. Each disk pack has 12 data surfaces, with 30,240 bytes per track and 1,433 tracks per surface. The average seek time is 20 milliseconds; average rotational delay is 8.3 milliseconds. The peak transfer rate is 1.8MB per second. Rotational speed is 3,600 rpm. Each pack is accessed individually by a direct attachment to the mass storage processor, housed in the same cabinet.

The validity of record information is ensured by the insertion of characters of check information (EDAC code—Error Detection and Automatic Correction). In each block of data, data integrity is enhanced by the automatic detection of defective tracks and the bypassing of these areas when writing to disk. A write-protect capability allows the user to protect the disk pack individually against inadvertent writing. Online error and status reporting to the central system supports software-controlled diagnosis of the electronics. A built-in hardware diagnostic capability supports rapid offline diagnosis and testing.

INPUT/OUTPUT UNITS

MTP 4472/4572/4102 MAGNETIC TAPE PROCESSORS: These units control 9-track tapes with recording densities of 1600 or 6250 bpi. The MTP 4472 controls up to eight units in its single-access version; the dual-access version MTP 4572 controls up to 16 units. The MTP 4572 is connected to the central system of the DPS 7 via two input/output processors. The 4102 single-access processor is designed to be mounted on DPS 7000 systems only.

Each MTP can be fitted with an optional manual channel switch, permitting it to be shared by two DPS 7 systems in a coupled configuration.

MTU0427 MAGNETIC TAPE UNIT: This compact, top-loading unit operates in start/stop and streamer modes at 25 and 75 ips respectively. It is a 9-track PE/GCR unit that handles 1600 or 6250 bpi tape densities at a maximum data transfer rate of 468KB/sec.

MTU0437/4103 MAGNETIC TAPE UNIT: This unit operates at 75 inches per second and transfers data at a maximum rate of 468KB per second. Tape density is 1600 or 6250 bpi. The 4103 can be mounted on DPS 7000 systems only.

MTU0537/4104 MAGNETIC TAPE UNIT: This unit has the same specifications as the MTU0437 except that the operation speed is 125 inches per second, yielding a maximum transfer rate of 781KB per second. The 4104 can be mounted on DPS 7000 systems only.

MTU0637/4105 MAGNETIC TAPE UNIT: This unit has the same specifications as the MTU0437 and MTU0537 except that operation speed is 200 ips, yielding a maximum transfer rate of 1250KB per second. The 4105 can be mounted on DPS 7000 systems only.

MTS4101 MAGNETIC TAPE SUBSYSTEM: This subsystem consists of a blocked configuration consisting of a single-channel, magnetic tape processor and one 1600 bpi, phase-encoded, 25 or 75 ips, 120KB/sec. tape unit. This subsystem cannot be extended, and is designed to be mounted on the DPS 7000/10 and 20 models only.

MTS4370 MAGNETIC TAPE SUBSYSTEM: This subsystem consists of a blocked configuration made up of a single-channel magnetic tape processor and a 1600/6250 bpi, PE/GCR, 25 or 75 ips, 468KB tape unit. This subsy- ➤

Bull DPS 7 Series

➤ stem can be extended to include a maximum of four tape units and is designed to be mounted on DPS 7000 models only.

MTS4572 MAGNETIC TAPE SUBSYSTEM: This subsystem consists of a blocked configuration made up of a dual-channel magnetic tape processor and two 200 ips, PE/GCR 1600/6250 bpi, 1250KB/sec. tape units. This subsystem can be extended to include a maximum of 16 X 781KB/sec. or 1250 KB/sec. tape units and is designed for DPS 7/1X07 systems only.

SERVICE AND UNIT RECORD PROCESSOR (SURP): This integrated controller has 5 device ports plus ports dedicated to the console. A second processor, the SURP 4371, can be added, providing 3 more device ports. Each peripheral device connects to a device port via an addressing attachment.

PRT 7220/7230 SERIAL PRINTER: This table model unit is a pin impact matrix printer that can be connected directly to operate as the system printer from small system configurations or indirectly to online workstations or concentrators for hardcopy printouts. The maximum print speed is 400 cps (QTD mode) on 136 columns at 10 characters per inch. Twelve character sets are available as well as three standard bar code sets. Users can choose fanfold or individual document feeder paper options.

PRU 0705/4101 LINE PRINTER: This unit has print belts with flexible fingers. The nominal speed of the PRU 0705 is 650 lines per minute, the speed depending on the belt type and character set used:

48-character set—750 lpm
63-character set—650 lpm
94-character set—500 lpm

Belts are provided for individual countries and also for accounting applications. There are 136 print positions per line at 10 characters per inch. An English or French operator panel is offered. The 4101 can be mounted on DPS 7000 systems only.

PRU 1115/1116/4102 LINE PRINTER: This printer operates at a nominal speed of 900 lines per minute. Its speed depends on the character set used:

48-character set—1,180 lpm
64-character set—900 lpm
96-character set—686 lpm

There are 136 print positions per line at 10 characters per inch. Special character sets are also available. An English or French operator panel is offered. The 4102 can be mounted on DPS 7000 systems only.

PRU 1515/1516/4103 LINE PRINTER: This printer operates at a nominal speed of 1,200 lines per minute. The speed depends on the character set used:

48-character set—1,538 lpm
64-character set—1,200 lpm
96-character set—940 lpm

Special character sets are also available. There are 136 print positions per line at 10 characters per inch. An English or French operator panel is offered. The 4103 can be mounted on DPS 7000 systems only.

PMS0090 NON-IMPACT PRINTER: This unit is a magnetographic, non-impact printing system comprised of a

1MB processor, 640KB diskette, disk control unit, communications controller, console, and the printing unit. Its nominal speed is 90 pages per minute with 136 to 160 print positions per line, highly variable horizontal spacing of from 1 to 24 characters per inch, and vertical line spacing of from 1 to 18.5 lines per inch.

In addition to operating in direct online mode, the system can be connected by a communication link with one or more host systems or can operate in standalone mode.

COMMUNICATIONS CONTROL

In addition to directly supporting terminals, a DPS 7 system can support one or more remote batch, interactive job entry, or transaction processing DPS 6 satellite systems. DPS 7 systems can also be configured into dual, coupled systems that can share the same database and peripherals.

The Bull Datanet 7100 processors are designed to act as front end to Bull mainframes, such as the DPS 7. The Datanet operates within Bull's Distributed Systems Architecture (DSA) environment and supports Bull's BlueGreen strategy, which is intended to provide improved networking capacities and compatibility across its entire product range.

Datanet supports the rules and protocols of the International Standards Organization's Open Systems Interconnection (OSI) in which all components in a network cooperate as peers with no hierarchical or other specific function required. DSA supports most public or private X.25 packet-switched and X.21 circuit-switched networks. It uses the HDLC protocol.

The Datanet range consists of six separate models: DN7130, DN7131, DN7132, DN7133, DN7135, and DN7136. They are based on Bull DPS 6 computer architecture. A basic Datanet configuration consists of a 16-bit central processor and 1MB to 2MB of main memory. Modular in design, the Datanet ranges have Megabus asynchronous bus links to all major modules, including the processor, performance and power extensions, and memory and device controllers. The DN7130 supports up to 23 communications lines, the DN7131 up to 47, the DN7132 up to 79, and the DN7133 up to 143 lines. The DN7135 and DN7136, designed to operate on the DPS 7000 Series support 15 and 7 communications lines, respectively.

A host subsystem inside each Datanet model ensures connection to host computers through specialized microprogrammed couplers plugged into the Megabus. The host couplers provide the interface channel between the Datanet and the PSI channel of the DPS 7. Multiple couplers can be configured on a single Datanet, each providing the interface for one host channel. Channels can belong to the same or different hosts. Of the six Datanet models, DN7130, DN7135, and DN7136 provide one host connection, DN7131 and DN7132 provide two, and DN7133 provides four. The couplers offer format conversion, control interface logic, and they support tests and downline loading. On DPS 7 mainframes, the host/Datanet connection is governed by the DSA Transport Protocol layer.

Communications within the primary network conform to the layered ISO and DSA protocols. Elements of the primary network can include Datanet and distributed DPS 6 systems. Datanets can be configured as front ends, concentrators or switches, and can provide access to any type of host system or secondary network. Connections are made via dedicated lines or via packet switched or circuit switched networks using the HDLC protocol. ➤

Bull DPS 7 Series

The secondary network includes terminals and computers that do not contain their own DSA mailboxes. Their physical connection can be local (direct-connect) or remote (via a modem over switched or dedicated lines or circuit or packet switched networks). Protocols supported by the secondary network include TTY, RCI, VIP, BSC, and X.25. Datanets can be used to build a private X.25 network in which non-Bull systems can be linked up via a PASS-THROUGH function in an ISO-DSA environment.

Since Bull's version of DSA complies with the International Standards Organization's OSI reference model, the Datanet provides a natural connection point to ISO-based workstations from other vendors. These are able to access Bull DSA applications via the Open Systems Facilities (OSF) feature in Datanet's DNS (Distributed Network Supervisor) operating system. The OSF package also enables the Datanet to act as a DSA/SNA gateway providing IBM SNA access and file transfer between Bull and IBM mainframes via Bull's proprietary Unified File Transfer (UFT) application.

The lynchpin of Bull's communications strategy is the Blue-Green concept. Originally launched at SICOB in September 1985, BlueGreen is an innovative approach to corporate information processing and communications. BlueGreen refers to the capability of linking Bull's various data processing, communications, and office automation products to ensure that communications can occur between corporate, departmental, and group/personal computer systems.

Depending on the size and nature of the business, the central system in the BlueGreen concept can be a Bull DPS 4, DPS 4000, DPS 7, DPS 7000, DPS 88, DPS 90, DPS 8000 or other mainframe. Within the BlueGreen configuration, a Bull DPS 6 running the DOAS 6 distributed office automation system acts as the file station, and workstations can be based on the Bull Questar 200 or 400 terminals, Bull Micral 35, 40 or 60 microcomputers, or other systems. The Blue-Green strategy encompasses all the major data processing and communications functions such as file creation, storage/classification, processing, retrieval, queries, and communications.

Datanet processors make it possible to respond to and support the following types of procedures and terminals:

- Asynchronous, character mode line procedure

- KSR 33/35

    TN 300/1200
    TTU/8124/8126
    DTU 7172 (DTU 7171 mode)
    DKU 7001

- VIP synchronous line procedure

    HDLC
    VIP 7001/7002
    VIP 770/7760
    TTU 8221/8223
    STS 2840
    BSC

- 3270 synchronous line procedure

    Questar 200 Series range of synchronous and asynchronous display terminals and monochrome and color cluster display terminals.

    Questar 400 Series intelligent distributed processing terminals, connected via Datanet 7100 either by emulating a

Bull DK 7107 terminal, by an X.25 link through DSA and the UFT package, or by emulating IBM 3270. Questar 400 workstations can also be linked via applications programs such as Microfit 400, based on the Microfit 7 data transfer package. Microfit 7 enables users to set up a distributed information system based on Questar 400 terminals and Micral 35, 40 or 60 personal computers.

- Satellite Systems

    DPS 6
    BlueGreen

- Public networks

    X.25 virtual-circuit packet switching, e.g., DATEX P, TRANSPAC

    X.21 circuit switching, e.g., DATEX

OPERATING SYSTEM

All DPS 7 models run under the GCOS 7 operating system which is available in three versions according to the size and type of the machine. GCOS 7-AS is available on the DSP 7000 Series; GCOS 7-LS on all 7/X17 and 7/X27 models, and GCOS7-XLS on the 7/727 and 7/827, as well as on all 7/X17-SE and 7/1X07 models. The XLS version can handle the connection of up to 2,500 terminals.

GCOS 7 supports batch, remote batch, transaction, and interactive processing. Within GCOS 7 are three sets of products for development, production, and information processing.

The development system contains high-level languages, program generators, and interactive facilities such as debugging. The production system, which is intended for use in the processing of large amounts of data, includes the database management system, transactional monitor, and recovery tool. The information system is designed for nonexperienced users and contains a data and document handling system, and a graphics display.

The nucleus within GCOS 7, called System Support, allocates basic system resources, and includes:

- Virtual Memory Manager

- CPU Dispatching Automatic Control Manager

- Peripheral Interrupt Manager

- Device, Volume, and File Manager

- Online tests and diagnostics

In addition to System Support, Supervisory Functions are available under GCOS 7 for all three versions of the operating systems (AS, LS, and XLS). These are:

- Menus

- Job management, including accounting and output reports

- FORMGEN, screen form generator

- Security and recovery mechanisms, including logging and checkpoint-restart

Bull DPS 7 Series

➤ • Data management, including sort and merge of files, and privacy and access rights functions

• Program management, including library, text editor, linkage editor

GCOS 7-LS also contains the following functions: physical memory management, multiprocessor management, management of over 40 simultaneous interactive users, and virtual memory management of several disks. GCOS 7-XLS supports up to 200 simultaneous, interactive users.

The file management routines of GCOS handle allocation and deallocation of space for files, automatic label checking, automatic volume recognition, control of multiple concurrent accesses to files, and control of multiple copies and generations of files through the catalog. Additionally, they provide various access methods to different file organizations and they also provide file and volume utilities to support file housekeeping.

Disk files can be shared under GCOS 7. However, if file sharing is required, multiple access can occur only in read mode. If different jobs are to be run in parallel, GCOS provides General Access Control. GAC ensures the prevention of uncontrolled file updates and the establishment of coherent values of data stored in one or more files or databases, where such items are linked by logical relationships. GAC is needed only when concurrent updates are required. The sharing of a file in read mode only does not require any special action or the use of GAC.

The main file access system of GCOS 7, the Universal File Access System (UFAS), replaces random, sequential, and indexed sequential files. UFAS satisfies all the requirements of the ANSI Mass Storage Task Group recommendations for sequential, relative, and indexed access. It is independent of device characteristics, file organization, media addresses, and media formats.

Programs can access data sequentially, randomly by key, directly, or directly by relative position on the same UFAS file. The access method can change every time the file is accessed. UFAS file scan can be indexed or nonindexed. If indexes are used, they can be multiple-level, and records with indexes can be intermingled with records without indexes. UFAS can handle fixed-length, variable-length, and dynamically variable records, and a UFAS file can contain a mixture of different record types.

The file organization of a UFAS disk file is based on control intervals and control areas containing embedded freespace, thereby eliminating the need for overflow areas. When records are inserted into a UFAS file, they can be physically located in their logical positions on the file; access time is reduced and the need for frequent reorganization removed. In addition, the physical record sizes in a UFAS file are independent of the lengths of the logical records. When the file is moved from one medium to another, the physical record size can change to adapt to the new medium without affecting the file or the programs using it.

UFAS includes access to specific file items by any one of 15 characteristics without a prior sort. A dynamic file extension facility allows extension of files as required.

GCOS also supports classical files with the Basic File Access System (BFAS). BFAS includes three subsystems:

• Basic Sequential Access, which supports sequential files on disk units, EBCDIC code, and on tape using either EBCDIC or ASCII code. Records can be fixed, variable, or undefined.

• Basic Indexed Sequential Access, which supports indexed sequential files on disk. Files can have up to six levels of index, with the highest level index being resident in memory. Overflow space can be reserved within the prime data areas on separate cylinders within the file.

• Basic Direct Access, which supports access by relative record number and by complete or partial physical address to disk-based files. Basic Direct Access includes a number of established randomizing algorithms.

DATA COMMUNICATIONS SOFTWARE

The GCOS 7 data communications software, together with the communications hardware and firmware, handles networks through DN 713X. A network can include switched, private, and direct-connect lines as well as a variety of terminal types.

The *Frontal Network Processor Support* (FNPS) system manages the interface between DPS 7 and Datanet. It consists of two modules:

• A transport module that provides realtime functions when data is exchanged between a DPS 7 and Datanet 7100;

• An administration module which, among other functions, generates Datanet software and sends statistics collected by the Datanets to GCOS 7 system files.

FNPS is mandatory when users connect a Datanet to a DPS 7 system. FNPS-AS runs in a GCOS 7-AS environment and can handle one or two Datanets. FNPS-LS and XLS run in GCOS 7-LS and XLS environments and can handle up to four Datanets.

Transaction Driven System (TDS Standard Processor) is a conversational system for handling a message entered by a user via a terminal; the initiation of a processing routine specific to that type of message; the processing of the message; and the response sent to the terminal. A library of mostly user-written transaction processing routines (TPRs) corresponds to the various types of messages accepted by the system. TDS can handle several dozen different transaction types in a single session. Time and memory space are optimized by utilizing a single copy of a TPR even though the requests for that TPR may come from different terminals. TDS provides a batch interface allowing batch programs to interface with it as if they were terminals. This facility is particularly useful in debugging the transaction system without incurring realtime constraints. TDS has access to all files supported by GCOS as well as concurrent access control, journalization, and file recovery of UFAS files. Security is provided through controlled file access and authority codes. All input messages to TDS are journalized to guard against information loss.

The optional *Transactional Context Restart Facility (TCRF)* is used to restart interrupted transactional applications in TDS in the event of a system breakdown or on a backup system in a minimum amount of time, without stopping the system from operating. Warm start is effected by fully transferring the transactional environment, including the After Log of the interrupted system. The backup system does not have to be coupled to the failed system, but it must not be operating in transactional mode to avoid conflicting with the After Log.

GT.Writer provides SYSOUT functions for terminal users. The end user visibility is the same as for the standard GCOS 7 output writer. The principal features of this optional package include support for up to 450 terminals; network ➤

Bull DPS 7 Series

▶ administrator concept; access from TDS, IOF, and batch programs; unique set of operator commands; restart after failure; support of any terminal recognized by GCOS 7; output security and privacy; and output rerouted from GT. Writer to the main printer or an RBF (Remote Batch Facility) station.

The *Remote Batch Facility Level 6 (RBF)* is used to receive jobs from a DPS 6 or its predecessor, the Mini 6, to request execution on DPS 7 and to send output reports to the DPS 6/Mini 6. These activities run simultaneously on disk, diskette, or magnetic tape.

The *File Transfer Facility Level 6 (FTF 6)* is used for exchanging files between a DPS 7 and a DPS 6/Mini 6. Files to be transferred must be organized sequentially with fixed-length records.

The *DSA File Transfer/Unified File Transfer (UFT)* package is used to transmit data bidirectionally between two DPS 7s via a DSA primary network. It also allows data to be exchanged with other products that have their own UFT. Data is transmitted record by record, regardless of the organization of the file supported by GCOS 7. Data held in the records can be compressed prior to transmission. Each DPS 7 can transmit several files simultaneously.

Distributed Job Processing (DJP) ensures that the full power of GCOS 7 software can be used in a distributed environment. DJP provides dialog between DPS 7 systems in a DSA network. Its main functions include submitting batch reports; receiving output reports; monitoring remote batch jobs; routing user messages to a system within the network; working in interactive mode between two DPS 7 systems; automatically chaining or initiating remotely submitted batch jobs at a given time.

Use of the DJP depends on the presence of a DSA File Transfer (UFT).

Microfit 7 is a data transfer package that is used to set up links between DPS 7, Questar 400, workstations, and Bull Micral 30 and 60 microcomputers within a GCOS 7 information system which can easily be accessed by non-data processing specialists.

Tempus—Link offers users the possibility of handling standard MS/DOS microcomputer virtual diskette space on a DPS 7, which, as a result, becomes an MS/DOS microcomputer server. This new function enables the user to secure local files on a DPS 7 and to transfer them other microcomputers connected to the same DPS 7. This storage function is dynamic, thereby allowing the microcomputer user to work with a work space that is the sum of the space available on the microcomputer, plus that which is allocated as virtual diskette work space on the DPS 7. This arrangement frees the user from operating restrictions that arise from the relative limitation of storage space on the microcomputer. Tempus-Link also supports the development of cooperative applications between the DPS 7 and MS/DOS microcomputers.

DOF7: Distributed Operating Facilities—GCOS 7 makes available to the user a set of tools for reducing costs and providing flexibility in the organization of operation.

DOF7-OL: Operation Without Operator—This option supports the operation of a standalone DPS 7 site without a local operator. After power-on of the configuration by a non-specialized person, the GCOS 7 system is automatically and silently initialized and the commands recorded in a file. Upon reception of the System Ready message on remote control, the production can begin.

DOF7-MC: Multi-Console Operation—Used on a DPS 7 site, this option enables the distribution of operation over several consoles designated by function: disk management, tape management, printer management, etc. These consoles can be remote in separate rooms. All messages and commands from the various operators are archived in the same file, enabling future analyses to be made. This function accommodates a dynamic reconfiguration of consoles in case one of them becomes unavailable. In case of unavailability of the system console, it is also possible to switch operation to another console without stopping the system.

DPS7-RMOS: Remote Control Operation—In the ISO/DSA network of DPS 7, the operator of a DPS 7 can follow and control through the option the operation of all the DPS 7s of the network, regardless if they are on the same site or remote. The operator chooses the messages to be received (filtered or not). It is possible to have several operators simultaneously using this option on the same DPS 7 network. In a distributed systems network, this function makes it possible to concentrate the operator functions on a single console, therefore eliminating remote operator consoles.

DATABASE MANAGEMENT SOFTWARE

DATABASE MANAGER (DBM): This package manages, administers, maintains, and monitors an IDS II (Integrated Data Store) database. It includes an integrated IDS II database manager; a database utility for creating, administering, and validating IDS II databases; a DB DIALOG utility for interactive dialog with a database by means of direct use of the DML Cobol verbs related to IDS II databases.

DBM DATABASE REORGANIZATION (DBREORG): This package can be used by the database administrator to alter the organization of the database, and in some cases, to modify its content. The reasons for reorganizing the database include database is full; schema no longer satisfies requirements; performance is inadequate.

DBREORG runs in interactive or batch environments.

IQS-GCOS 7 INFORMATION SYSTEM: An interactive data query language, IQS gives users fast access to company data. The information is displayed on a screen or printed in a standard format. IQS furnishes a virtual view of data to suit the user's requirements. It consists of the following modules:

- IQS: Basic Functions—designed for data processing staff who have an in-depth knowledge of the system. It allows them to develop simple or complex inquiries to solve users' problems.

- IQS: Line Driven—designed for occasional users of IQS in which inquiry is built up one line at a time;

- IQS: Menu Driven—provides inexperienced users with menus at all stages of inquiries;

- IQS: Update—allows users to modify data. It is covered by all the data protection and integrity features contained in GCOS 7. If several users working from the same virtual view of data are modifying data at the same time, the General Access Control Option is required.

ORACLE from ORACORP, based on the SQL standard, is a relational database management system, which has been primarily designed for the building of information systems but can also be used in the development of light applications. ORACLE includes an integrated data dictionary and a ▶

Bull DPS 7 Series

▶ fourth-generation language conforming to SQL standards. The DPS 7 offer is based on Version 5.1 of ORACLE, which is comprised of a DBMS, its data dictionary, and various application development tools. ORACLE components include:

- SQL*PLUS query language

- SQL*FORMS interactive applications generator

- PRO*LANGUAGE precompilers that enable SQL commands to be included in 3rd generation languages

- SQL*NET for simultaneous access to several ORACLE databases located on various DPS 7 systems or MS/DOS microcomputers

ORACLE is an example of the capacity of the DPS 7 to accept applications developed in SQL on other mainframe or micro hardware.

PRODUCTIVITY AIDS

INTERACTIVE DEVELOPMENT FACILITY (IDF): IDF operates in an interactive GCOS 7 environment and enables the system administrator to control access to data contained in files according to the needs of the various system users (catalog); manage files and volumes (interactive utilities); build well-defined fields of activity for the various system users through Command Management.

Command Management is a menu-oriented processor that operates in incremental modes with user aids. It features the following three functions: enables users to create and maintain their own user commands written in GCL; enables users to group system commands and user commands into fields of activity such as payroll, inventory, or accounts; enables users to create and manage the links between the environments and the catalog, basically relating an environment to one or more users.

FULL SCREEN EDITOR (FSE): FSE is a GCOS 7-based text editor that provides full screen creation and maintenance of library files. FSE is menu-driven and contains an extensive help system.

INTERACTIVE DESIGN APPROACH (IDA): IDA consists of three modules:

- IDA-DSL SPEC provides development teams with tools for defining specifications for applications such as procedures, data, data transformation rules. Organizational resources are introduced and checked via the Dynamic Specification Language (DSL) nonprocedural language.

- IDA-DSL SIMU simulates systems specified via IDA-DSL SPEC according to the simulation procedures entered by the analyst.

- IDA-DSL PROTO uses prototyping parameters to build a reduced-scale prototype of the systems specified via IDA-DSL SPEC.

SINDIA 7 is both a method and a set of tools for simplifying the development of transaction processing applications running under TDS. Based on an approach that breaks down the dialog into several basic processing units, SINDIA 7 handles applications analysis, transaction definition, transaction environment definition (forms, messages, etc.), prototyping, program definition, documentation generation, and applications maintenance.

SINDIA 7 enables users to generate applications using synchronous VIP and Questar terminals, including color terminals.

DATA DICTIONARY: This information on a user's files, programs, transactions, procedures, and data.

PROGRAMMING LANGUAGES

Bull provides Cobol, RPG II, Fortran, Pascal, C, APL, and GPL (GCOS Programming Language) for the DPS 7.

Cobol: DPS 7 Cobol conforms to ANSI 74 standards, including those of the MSTG (Mass Storage Task Group).

RPG: The RPG II language processors used in the DPS 7 system permit the interchange of data files among RPG II, Fortran, and Cobol programs. Object programs written in RPG II can also be linked with programs written in Cobol, Fortran, or other languages.

Fortran: DPS 7 Fortran meets the ANSI 77 standard and provides several extensions.

The language processor consists of two packages: the Fortran compiler and the Fortran runtime package. Fortran requires the implementation of the scientific instruction set. The language processor executes either in compile-only environment (with or without the production of compile units) or in a compile-and-go environment in which the output is submitted directly to a linking loader and the resulting program is executed as part of the job stream.

APL: APL is designed to be used by non-data processing personnel. APL is implemented in a GCOS 7 interactive environment and from specialized terminals (for example, from the Anderson-Jacobson AJ 510 terminal).

GCOS 7 APL makes it possible to work on scalar variables, vectors, sets, and tables with a maximum of 15 dimensions. The usual functions of APL are available, and users can define and integrate their own functions.

Pascal: The GCOS 7 Pascal processor handles three language levels: Pascal as specified by ISO 7185 standards (including adjustable array parameters); SOL Pascal which features additional specifications to the ISO standards such as separate compilation of routines, calls to procedures written in other languages, and dynamic file assignment; and GCOS 7 Pascal which features several additional features such as string handling.

C: The C language is increasingly being used by independent software producers. The DPS 7 version of C conforms to the recommendations put forward by Kernigham and Richie.

GPL: The GCOS Programming Language (GPL) is oriented toward the development of system software. Similar in some ways to PL/1, GPL has a free format syntax capable of manipulating strings of bits and list structures, and has powerful data declaration and manipulation capabilities.

APPLICATIONS SOFTWARE

Bull states that software houses are increasingly developing application programs and languages that will run under GCOS 7, one of which is CINCOM SA, with whom Bull has signed a joint agreement for the promotion of the MANTIS fourth generation system. MANTIS is fully integrated within GCOS 7 and can be used either with traditional ▶

Bull DPS 7 Series

➤ UFAS and IDS 2 files or with dedicated files. The system is now operational on Bull DPS 7 sites in Europe.

A set of application packages, such as the MRP II-based IMS 7, covers manufacturing requirements for management and communications in the areas of accounting, procurement, sales, production, research, and decision support. Agreements have been signed with STEEB of West Germany, SPA, McCormack and Dodge, and THOM'6 of the French Thomson Group to satisfy the specific needs of the various countries covered by Bull's sales network.

In January 1985, Bull signed a joint promotion agreement for a set of packages developed by the French software house CISI to enable noncomputer specialists to use the solution center facilities offered on the DPS 7. This facility, known as INFOSERVICE 7, provides direct access to databases. It consists of the three following modules:

- ATHESA—interactive querying and analysis of hierarchical databases;

- PRIAM—software handling analysis and modeling for management of numerical tables; and

- CISIGRAPHE—software for graphic formatting of data.

BULL APPLICATIONS SOFTWARE:

MISTRAL V5: MISTRAL V5 is an information retrieval package which can be accessed from videotex terminals. The extended version offers document base creation and query facilities without any limitation on the number of users. Its main functions are retrospective search for use when a user requires all the information available on a particular subject; and selective dissemination for use when a user needs updating on the latest documentation available in a particular field.

The MISTRAL V5 FULL TEXT module supplies document base management facilities in full text format. MISTRAL V5 FACTUAL DATA enables the user to administer numerical databases. Calculations can be made on the information contained in the database, and the results are presented in tabular form via a simple non-procedural language.

DOAS: High-level, distributed office automation software, DOAS handles the creation, filing, consulting, and flow of all documents in an organization. The DOAS-DESK and FILING APPLICATION 7 filing systems enable word processing applications on Bull Questar 400 stations to coexist with processing applications under GCOS 7. The DOAS-MAIL SERVER 7 name and message server allows integration into a distributed electronic messaging system (X.400 standards). DOAS-DEVELOPMENT TOOLS 7 ensures access to the previously mentioned functions by any other central data processing application.

GAV 7: This package simplifies the creation of TDS-based videotex applications. It furnishes a dedicated videotex service with the following functions: interface to user applications, screen management, message distribution and handling, document creation and management, and videotex administration (statistics and user billing).

GRAPH 7-DI3000 A graphics package, GRAPH 7-DI3000 includes a set of Fortran subprograms which enable programmers to create and manipulate two- and three-dimensional objects. It offers general graphics tools such as image building and graphic primitives, 2-D view generation, and

editing tools. Specialized functions are available for scientific, technical, typographical, and cartographical applications.

CS—Financial Control System.

GRAPH 7-BUSINESS: An interactive product, GRAPH 7-BUSINESS is particularly suitable for the creation of business graphics. It is designed for the nonspecialist user and is accessible through a menu interface.

LIS-V2: A statistical inquiry package, LIS-V2 is an interactive decision support tool which can be adapted for use with national languages. Written in APL, LIS-V2 uses Questar terminals to extract information from a database. It produces statistical data in the form of graphs or bar charts, or as files which can be directly accessed by GRAPH 7.

AJACS (Automatic Job Accounting System): AJACS is offered in an entry version and an extended version. Operating in a batch environment, the entry version generates reports for monitoring the computer system and for optimizing the overall work load. The extended version is a comprehensive system for control, billing, performance evaluation, and computer resource planning. It prints several types of reports, such as tables and graphs using information provided by GCOS 7.

IMS 7 (Industrial Management System): IMS 7 is a set of modules designed for manufacturing companies. The following applications are covered: inventory management, customization of applications, bill of materials, orders and demands, materials requirement planning, standard cost control, materials management (runtime option), materials management (source code option), work center and routing management, production control, finite capacity option, master production scheduling, statistical forecasting, and purchasing.

FCS-EPS Financial Control System: FCS-EPS is a financial language that includes functions for forecasting, tax calculations, inflation accounting, and statistical analysis.

REMOTE MAINTENANCE SYSTEM DPS 7: RMS DPS 7 consists of a remote console interface adapter and software diagnostic interface modules to provide an extension to the system console for field engineers. The engineers are remotely located and connected via phone lines. Remote Maintenance System DPS 7 supplies the capability for troubleshooting hardware and firmware problems as well as software bugs. With this facility, key diagnostic programs that occur under DPS 7 GCOS can be remotely executed; correction of many software difficulties can be accomplished without on-site visits. Remote Maintenance System DPS 7 operates only when the system is in maintenance mode and provides documentation of all communications via the system console.

SERVICE AND SUPPORT

MAINTENANCE: The 1-year and 3-year basic monthly rentals entitle the user to 176 hours of central processor usage per month with on-call remedial maintenance between the hours of 8 a.m. and 6 p.m. on Mondays through Fridays. For scheduled usage beyond this period with on-call maintenance service, the user pays an additional charge which is a fixed percentage of the monthly maintenance charge. As an alternative, the user can obtain on-call maintenance service at standard hourly rates.

TRAINING: Courses lasting between 2 and 9 days are available and must be paid for separately by the customer. ➤

Bull DPS 7 Series

➤ Introductory courses are run for both hardware and software, and more detailed software courses cover programming using high-level languages, IDS II database management system, QUERY, MISTRAL V5, and videotex.

DOCUMENTATION: Complete documentation in French and English can be obtained from Bull's documentation center at the following address: CEDOC, Parc Industriel d'Incarville, B.P. 110, 27100 Le Vaudreuil Ville Nouvelle, France.

PRICING

EQUIPMENT: DPS 7 equipment is available for purchase or for rent under a 1-year, 3-year, or 5-year lease.

SOFTWARE: Generally, the basic operating system, basic job management and file systems, programming tools such as linking and debugging aids, the job control language, and conversion aids are provided at no additional cost. Monthly license fees are charged for language processors, utilities, application packages, communications software, and advanced job management and file systems.

Bull DN 7130 (hardware and software) with operator console, 1 MB of main memory, 1 host attachment, 15 synchronous/asynchronous lines, and 1 local area network controller: purchase price—343.000 FF; monthly maintenance charge—2.039 FF; monthly software rental—3.730 FF.

Bull DN 7133 (hardware and software) with operator console, 2 MB of main memory, 4 host attachments, 119 synchronous/asynchronous lines, 6 HDLC lines, 1 high-speed controller: purchase price—2.310.000 FF; monthly maintenance charge—11 210 FF; monthly software rental—8.130 FF.

EQUIPMENT PRICES

		Purchase Price (FF)
DPS 7/617	6MB main memory, 5000MB disk store, 4 magnetic tapes (1250KB), two 1,180 lpm printers, and 1 network processor with 13 lines	6.000.000
DPS 7/627	6MB main memory, 5000MB disk store, 4 magnetic tapes (1250KB), two 1,180 lpm printers, and 1 network processor with 13 lines	8.300.000
DPS 7/717	8MB main memory, 10,000MB disk store, 4 magnetic tapes (1250KB), two 1,180 lpm printers, and 1 network processor with 35 lines	9.100.000
DPS 7/727	8MB main memory, 10,000MB disk store, 4 magnetic tapes (1250KB), two 1,180 lpm printers, and 1 network processor with 35 lines	11.900.000
DPS 7/817	8MB main memory, 20,000MB disk store, six magnetic tapes (1250KB) two 1,180 lpm printers, and 1 network processor with 51 lines	13.600.000
DPS 7/827	8MB main memory, 20,000MB disk store, six magnetic tapes (1250KB) two 1,180 lpm printers, and 1 network processor with 51 lines	17.500.000
DPS 7/717-SE	8MB main memory, 5000MB mass storage, two 6250 bpi and 200 ips tape drives, one 1180 lpm printer, 1 DN7130 Datanet network processor with 15 communication lines.	4.380.000
DPS 7/817-SE	16MB main memory, 10,000MB mass storage, two 6250 bpi and 200 ips tape drives, one 1180 lpm printer, one Datanet 7131 network processor with 31 communication lines	7.140.000
DPS 7/1007-S	24MB main memory, 8000MB mass storage, two 6250 bpi and 200 ips magnetic tape drives, two 1500 lpm printers, one DN7132 network processor with 51 communications lines	10.305.000
DPS 7/1107	32MB main memory, 16,000MB mass storage, two 6250 bpi and 200 ips magnetic tape drives, two 1500 lpm printers, one DN7133 network processor with 75 communication lines	20.625.000
DPS 7/1407	48MB main memory, 16,000MB mass storage, two 6250 bpi and 200 ips magnetic tape drives, two 1500 lpm printers, two DN7133 network processors with a total of 150 communication lines ∎	37.016.000