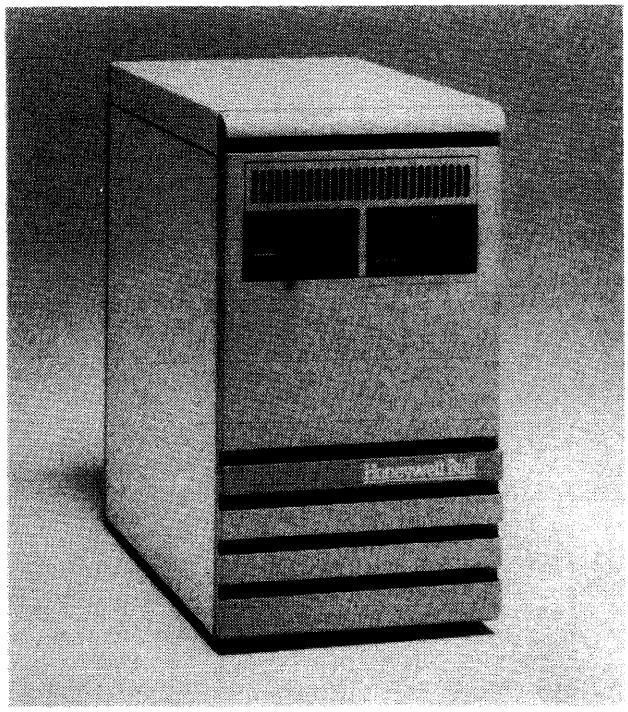
Bull HN Information Systems, Inc.
DPS 6 Plus

MANAGEMENT SUMMARY

EDITOR'S NOTE: *On January 31, 1989, Honeywell Bull Inc. changed its name to Bull HN Information Systems Inc. to reflect the 65.1 percent ownership of the U.S.-based company by Groupe Bull of Paris. The "H" refers to the 19.9 percent interest held by Honeywell Inc. of the U.S., and the "N" reflects the 15 percent interest held by NEC Corporation of Japan. The information which follows is being reissued, using the new name, as a service to our subscribers.*

UPDATE: *Bull HN continues to expand and enhance its DPS 6 Plus product line to compete more effectively with IBM, Digital Equipment Corporation, and the other major mini/superminicomputer-class vendors. Since the last Datapro update, Bull HN announced the DPS 6 Plus Series 210, 220, and 400 superminicomputers. Also of strategic importance is the introduction of communication software that implements the latest International Organization for Standardization (ISO)-recommended standard Open Systems Interconnection (OSI) network applications. Combined with revamped marketing and sales strategies, these products are designed to capture market share from the competition.*

Bull HN, formerly known as Honeywell Bull, introduced the DPS 6 Plus superminicomputers to increase its market ➢



Bull HN has increased the cost-effectiveness of its DPS 6 Plus Series with the introduction of the Series 210, 220, and 400. Shown here is the Series 210, which starts in price at $17,350 and typically supports from 4 to 10 active workstations.

The Bull HN DPS 6 Plus Series systems are an extension of the Bull HN DPS 6 systems for departmental processing. The systems are upward and downward compatible with the DPS 6 computers and support a full complement of database and online transaction processing, networking, PC integration, and office processing tools.

MODELS: DPS 6 Plus Series 210, 220, 400, 410, and 420.
MEMORY: 4M bytes to 64M bytes.
DISK CAPACITY: Up to 9.5G bytes.
WORKSTATIONS: Up to 135 concurrently active workstations.
PRICE: $17,350 to $93,000 for a minimum-configured system unit.

CHARACTERISTICS

MANUFACTURER: Bull HN Information Systems, Inc. 200 Smith Street, Waltham, Massachusetts 02154. Telephone (617) 895-6000.

CANADIAN ADDRESS: 155 Gordon Baker Road, North York, Ontario M2H 3N7. Telephone (416) 499-6111.

DATA FORMATS

BASIC UNIT: 32-bit word.

FIXED-POINT OPERANDS: Fixed-point operands consist of 16-bit single-precision, 32-bit double-precision, or 64-bit quad-word operands. Byte, bit, and multiword operands are also possible. In each single-, double-, and quad-precision operands, the high-order bit of the first word is the sign bit. Signed data is always in twos complement notation.

FLOATING-POINT OPERANDS: Scientific instructions operate on two data types—hexadecimal floating-point and signed binary data. A hexidecimal floating-point number can be 32 bits or 64 bits in length. The exponent is in excess 64 form.

INSTRUCTIONS: The DPS 6 Plus instruction set contains the following:

- **35 double-operand bit instructions. These include 12 instructions for word register, 7 instructions for byte, 2 for mode register, 6 for address register, and 8 for scientific double operand.**
- **33 single-operand bit instructions. These include 9 instructions for modify operands, 3 for control, 5 for bit, 4 for double word, 7 for I/O, and 5 for other functions.**
- **4 short value, immediate instructions.**
- **10 branch on register instructions.** ➢

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CHART A. SYSTEM COMPARISON

MODEL	DPS 6 Plus Series 210	DPS 6 Plus Series 220	DPS 6 Plus Series 400	DPS 6 Plus Series 410	DPS 6 Plus Series 420
SYSTEM CHARACTERISTICS					
Date of introduction	November 1987	November 1987	June 1987	June 1986	June 1986
Operating system	HVS 6 Plus	HVS 6 Plus	HVS 6 Plus	HVS 6 Plus	HVS 6 Plus
Upgradable from	Not applicable	Series 210	Not applicable	Not applicable	Series 410
Upgradable to	Series 220	Not applicable	Not applicable	Series 420	Not applicable
MIPS	0.7 to 1.0	1.0	1.0 to 4.0	1.0 to 4.0	1.0 to 4.0
MEMORY					
Minimum capacity, bytes	2M	4M	2M	4M	8M
Maximum capacity, bytes	16M	16M	8M	16M	64M
Cache memory	8K bytes	8K bytes	16K or 32K bytes	16K or 32K bytes	16K or 32K bytes
INPUT/OUTPUT CONTROL					
I/O system bus	32-bit Megabus	32-bit Megabus	32-bit Megabus	32-bit Megabus	32-bit Megabus
MAXIMUM DISK STORAGE	1.4G bytes	1.6G bytes	4.8G bytes	4.8G bytes	9.5G bytes
NUMBER OF WORKSTATIONS	Typical—4 to 10	Typical—10 to 20	Typical—21 to 35	Typical—36 to 50	Typical—55 to 135
COMMUNICATIONS PROTOCOLS	DSA, RNP, RFA, SNA, BSC, DISOSS, IEEE 802.3 Ethernet, ISO OSI, X.25	DSA, RNP, RFA, SNA, BSC, DISOSS, IEEE 802.3 Ethernet, ISO OSI, X.25	DSA, RNP, RFA, SNA, BSC, DISOSS, IEEE 802.3 Ethernet, ISO OSI, X.25	DSA, RNP, RFA, SNA, BSC, DISOSS, IEEE 802.3 Ethernet, ISO OSI, X.25	DSA, RNP, RFA, SNA, BSC, DISOSS, IEEE 802.3 Ethernet, ISO OSI, X.25
PURCHASE PRICE (basic configuration)	$17,350	$25,000	$33,000	$57,000	$93,000
COMMENTS			Contains one to four central processors.	Contains one to four central processors.	Contains one to four central processors.

share within the minicomputer-class system marketplace. Bull HN holds eighth place in worldwide market share for medium-range computers. Over the years, Bull HN has lost sales to IBM, Digital Equipment Corporation, Unisys, and Hewlett-Packard. These companies launched aggressive marketing campaigns and introduced new, innovative technologies.

Since Bull HN wants to gain ground in the minicomputer market, the company has been making some positive moves with its DPS 6 product line. Bull HN is pursuing new technologies and is marketing its systems more aggressively.

The DPS 6 Plus architecture is the new design technology for the DPS 6 computers. DPS 6 Plus is designated as Bull HN's minicomputer architecture up through the 1990s.

The DPS 6 Plus improves upon the DPS 6 design. The earlier DPS 6 was built with 16-bit and combined 16- and 32-bit processing designs, older logic and control circuit design technology, single-processor architectures, and an outmoded operating system. The DPS 6 Plus is based on "true" 32-bit designs, very large scale integration (VLSI) technology, and a multiprocessor architecture. Furthermore, it features HVS 6 Plus, an operating system that provides greater multiprogramming and multitasking capabilities than the GCOS MOD 400 operating system of the DPS 6 computer.

The DPS 6 Plus provides greater price/performance, configurability, expansion, and reliability than a conventional DPS minicomputer. For example, the DPS 6 Plus Series 410, a high-end superminicomputer, provides up to four times more processing power than the DPS 6/85 and DPS 6195, high-end, conventional DPS 6 designs. It also has a starting price identical to the DPS 6/85 and approximately 75 percent less than the DPS 6/95's. Such attributes enhance competitiveness.

- **6 scientific branch on accumulator instructions.**
- **22 branch on indicator instructions.**
- **14 commercial branch instructions.**
- **12 branch on scientific indicator instructions.**
- **12 shift operations instructions.**
- **3 I/O instructions.**
- **51 generic instructions.**
- **16 commercial generic instructions.**

INTERNAL CODE: ASCII.

MAIN STORAGE

GENERAL: The Bull HN DPS 6 Plus computers are virtual memory machines. Each application can use up to 2G bytes of virtual memory space. Each virtual memory space is divided into segments which contain application code, subroutines, and data arrays. Up to 1,024 segments are contained within a virtual memory space. Segments can vary in length but cannot be larger than 2M bytes. Each segment is broken down into pages. Each page measures up to 2K bytes.

Main storage holds the virtual memory pages. The pages are moved to and from main storage on an as-needed basis. Virtual memory pages are brought into and out of main storage under the control of the virtual memory manager within the HVS 6 Plus operating system.

CAPACITY: The main storage (physical memory) capacities of individual DPS 6 Plus Series models are listed in Chart A. Physical memory on the DPS 6 Plus Series 210 and 220 is expanded using 1M-, 2M-, and 4M-byte memory expansion options. The DPS 6 Plus 400 uses 2M- and 4M-byte memory expansion boards to increase main storage size. Memory on the DPS 6 Plus 410 is expanded in 4M-, 8M-, or 12M-byte increments. The DPS 6 Plus 420 uses 4M-, 8M-, and 16M-byte memory expansion boards to increase main storage size.

CHECKING: Error detection and correction (EDAC) memories are standard with all DPS 6 Plus models. EDAC memories use a six-bit Hamming code to detect and correct

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Bull HN introduced the DPS 6 Plus line in 1986 to effectively compete with midrange computers from IBM and Digital Equipment Corporation, its toughest rivals within the small-scale and medium-range multiuser computer market. Before the advent of the DPS 6 Plus models, Bull HN saw its market share shrink year after year as competitors produced computers that could easily outperform the DPS 6 systems. Attempts to upgrade the DPS 6 failed to produce a computer design with enough power to match that of rival machines. Bull HN finally succeeded with the DPS 6 Plus, the first of a new breed of DPS 6 systems that upgraded computing power without sacrificing compatibility with predecessors.

To augment the capabilities of the first DPS 6 Plus computers—the Series 410 and 420—and provide better cost-effectiveness for smaller configurations, Bull HN added the DPS 6 Plus Series 400, 220, and 210 to the DPS 6 Plus product line. The Series 400, 220, and 210 provide a new entry point for DPS 6 Plus computing. The Series 400 moves the high-end DPS 6 Plus Series 4XX power and functionality down to the midrange. The Series 220 and 210 are low-cost, entry-level computers that bring Series 4XX power and functionality to the small business, departmental, and branch office computing.

The Series 400, a low-cost version of the larger DPS 6 Plus Series 4XX models, answers computing requirements at the midrange. It serves to expand computing on the small-scale DPS 6 Plus computers and provides a cost-effective entry point into the large DPS 6 Plus Series 4XX systems. The Series 400 operates at the same MIPS performance level as the 1-to-4 MIPS Series 410 and 1-to-4 MIPS Series 420 but has a starting price that is three fifths of the Series 410's and one third of the Series 420's. It also maintains a configuration that is smaller than that of the larger Series 4XX computers: the Series 400 accommodates up to 21 to 35 concurrent workstations.

The Series 220 and 210, positioned below the Series 400, provide economical DPS 6 Plus computing for users with low-end needs. The Series 220 offers 1.0 MIPS of computing power and effectively supports up to 20 active workstations. The Series 210 functions with 0.7 to 1.0 MIPS and effectively supports from 4 to 10 active workstations. A Series 210 costs $17,350 for a basic system, or 52 percent less than a Series 400.

To encourage customer investments in the DPS 6 Plus product line, Bull HN made the DPS 6 Plus models program, file, and data compatible with the DPS 6 family, despite differences in system architectures. The HVS 6 Plus operating system of the DPS 6 Plus protects software investments in system migrations and supports some bottom-to-top software development and execution. Applications developed on the DPS 6 can move to a DPS 6 Plus without undergoing modification.

All the DPS 6 Plus computers implement an "open network computing" philosophy to attract customers with multiple vendors and architectures. The DPS 6 Plus' com-

all internally caused single-bit errors and to detect all double-bit errors. With EDAC memory, address parity accompanies the most significant eight bits on the address bus. When memory detects an error on those bits, it does not respond; the result is a bus time-out. Each device controller/communication processor on the Megabus checks parity on information received from the Megabus and indicates an error by setting a parity error status bit.

STORAGE PROTECTION: The DPS 6 Plus has a ring-based protection mechanism supporting ring brackets; gate segments; and readable, writable, executable, and callable segment attributes. Also provided are call/return instructions and pointers with a protection mechanism.

CACHE MEMORY: The DPS 6 Plus Series 2XX computer and the mono- and dual-processor DPS 6 Plus Series 4XX computers each have one cache. The tri- and quad-processor DPS 6 Plus Series 4XX computers each have two caches. By using a cache, the central processor has high-speed access to frequently used data and instructions. This improves systems performance since fetching instructions and data in cache memory is faster than accessing instructions and data within memory. The utilization of cache memory overcomes the discrepancy between the memory cycle speed and the faster data-access rate of the central processor.

CENTRAL PROCESSORS

GENERAL: The DPS 6 Plus Series 210 and 220 each have a central processing subsystem that contains the following:

- **One 32-bit central processing unit (CPU)—includes a commercial instruction and a scientific instruction processor.**
- **One virtual memory management unit (VMMU)—provides full virtual memory management and addressing.**
- **A memory controller—enables the CPU to address code and data within main storage.**
- **An 8K-byte cache.**

The central processing subsystem of the DPS 6 Plus Series 400, 410, and 420 consists of the following major components:

- **One to four 32-bit CPUs.**
- **A VMMU.**
- **A memory controller.**
- **One or two 16K-byte caches.**
- **A shadow processing set—duplicates the processing of the CPU and VMMU to increase processing integrity. It provides a second CPU which is paired with the main CPU and a second VMMU which is paired with the main VMMU. The paired processors work in concert and constantly cross-check and verify each other's results. A message is sent to the system operator or application when one processor does not agree with its partner.**
- **An interprocessor communication feature—coordinates and synchronizes the component CPUs. The multiple CPUs are configured into a tightly coupled architecture where all processors share main storage, peripherals, and**

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CHART B. MASS STORAGE

MODEL	MSU9901 and MSU9902	MSU9911 and MSU9912	MSU9931 and MSU9932	MSU9941, MSU9942, and MSU9943
Type	Fixed	Fixed	Fixed	Fixed
Drives per controller	4	4	4	2
Formatted capacity per drive, megabytes	132	413	295	142
Average seek time (milliseconds)	30	20	18	4
Average latency (milliseconds)	8.3	8.3	8.3	12.5
Average access time (milliseconds)	38.3	28.3	26.3	16.5
Data transfer rate	1.2M bytes/sec	1.8M bytes/sec	1.8M bytes/sec	1.2M bytes/sec
Supported by system models	Series 400, 410, and 420	Series 410 and 420	Series 210, 220, 410, and 420	Series 400, 410, and 420
Purchase Price	$14,500 for MSU9901; $12,000 for MSU9902	$21,000 for MSU9911; $18,500 for MSU9912	$13,000 for MSU9931; $11,000 for MSU9932	$8,500 for MSU9941; $7,000 for MSU9942; $7,000 for MSU9943
Comments	MSU9901 is the 1st and 4th unit. MSU9902 is the 2nd and 3rd unit.	MSU9911 is the 1st and 4th unit. MSU9912 is 2nd and 3rd unit.	MSU9931 is primary device. MSU9932 is 2nd, 3rd, and 4th device.	MSU9941 is primary unit. MSU9942 is 2nd and 4th unit in a cabinet. MSU9943 is the third unit.

munications and networking provide the openness required in a departmental and distributed processing environment. Tools are available to:

- Support Bull HN MS-DOS PC-compatible personal computers.
- Communicate with Bull HN DPS 6 microcomputers, minicomputers, and superminis.
- Interface with Bull HN DPS mainframes.
- Function on an IBM Systems Network Architecture (SNA), Bisynchronous Communications (BSC), or Distributed Office Support System (DISOSS) network.
- Interface with computers that use International Organization for Standardization/Open Systems Interconnection (ISO/OSI)-recommended network application services (i.e., Message Handling System—MHS, and File Transfer, Access, and Management—FTAM) on the X.25 packet-switching public data network.

Bull HN also fits its DPS 6 Plus computers with system integration services for systems networking. These services establish the solution for a networking requirement that cannot be provided through readily available Bull HN products. The systems integration services design, develop, and install the interfaces or acquisition of third-party products that allow incompatible computers to interact.

To further highlight the DPS 6 Plus as a "true" departmental system, Bull HN promotes the DPS 6 Plus' capabilities of supporting MS-DOS-based and IBM PC-compatible Personal Computers. PC integration tools allow the microcomputers to access DPS 6 Plus programs and data, and to use the DPS 6 Plus as a resource server and a gateway to other systems within the network.

work loads and where a single operating system is used to control all the processors.

Also included within the core of the DPS 6 Plus Series 4XX systems is the System Management Facility (SMF). SMF executes system console functions.

CONTROL STORAGE: Like all conventional superminicomputers, the DPS 6 Plus computers rely on microcode to execute the instruction set. The microinstructions and microprograms are contained in the control store.

REGISTERS: There are 40 program-visible registers, including seven 16-bit general word operand registers, ten 32-bit address registers, seven 32-bit double word registers, two 16-bit (one for process status security and one for ring alarm) and ten 8-bit control registers, three 64-bit scientific accumulators (variable length contains hexidecimal floating-point values of two or four words in length), and one 64-bit descriptor segment base register that defines the processor addressing mode and the address space of the current process.

Of the ten 32-bit address registers, seven are base registers for formulating addresses pointing to an instruction, data, or arbitrary location in virtual memory; they have an automatic increment/decrement capability to allow for easy use for stacks, queues, and program loops. Of the remaining three registers, one is a program counter, one is a stack pointer, and one is a remote descriptor base register.

ADDRESSING: The addressing modes for the DPS 6 Plus systems include indexing, indirect addressing, base plus displacement, program counter relative, automatic increment/decrement base plus displacement plus offset, and others.

INTERRUPTS: Interrupts on the DPS 6 Plus systems are generated in five ways: 1) externally by peripheral requiring service; 2) watchdog timer runout; 3) realtime clock runout; 4) time slicer clock runout; 5) or a report of a state change in a central subsystem, in cabinet temperature, or in a power supply. These interrupts are typically sensed 1) between instructions; 2) internally during the execution of an instruction; 3) via the interprocessor instruction; and 4) through an incipient power failure. There are 64 interrupt vectors in 128 dedicated locations.

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CHART B. MASS STORAGE (Continued)

MODEL	—	MSU9203	MSU9204	—
Type	Fixed	Fixed	Fixed	Fixed
Drives per controller	2	2	2	4
Formatted capacity per drive, megabytes	37	68	142	595
Supported by system models	Series 210 and 220	Series 210 and 220	Series 210 and 220	Series 400, 410, 420
Purchase Price	Not available.	Not available.	Not available.	Not available.

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

Bull HN has expanded its customer service program to include multilevel servicing, system start-up services, and fixed and customized consulting services for system design, development, installation, and management. Furthermore, Bull HN is now honing its troubleshooting services. By improving product maintenance and customer support services, Bull HN stands a better chance of keeping existing customers and finding new ones.

To make the Bull HN DPS 6 Plus even more appealing, Bull HN is ensuring that applications solutions are readily available. The major source of applications software is alliances with independent software developers and value-added resellers (VARs). The alliances allow Bull HN's customers to access the services of the independent software and system suppliers. Upon discovering a customer's application needs, Bull HN helps the customer establish contact with the appropriate data system suppliers.

Bull HN focuses on a wide spectrum of computing scenarios in marketing the DPS 6 product. Primarily, the vendor seeks high-volume sales among large corporations, government agencies, and public and private institutions. In such environments, the DPS 6 Plus computers function as either standalone or distributed departmental processors that communicate with other networked departmental systems or host mainframe-class systems. In addition, Bull HN concentrates on selling DPS 6 Plus computers to smaller organizations to support business operation and professional and clerical automation at the departmental, distributed branch, and central processing level.

Bull HN also is expanding the role of its DPS 6 Plus computers within the business data processing marketplace. The company is trying to place more computers within the service industry. Although Bull HN has installed DPS 6 Plus systems in a variety of service sector industries—such as banking, wholesale/distribution, and health care—the company has never concentrated in these sectors. Current marketing plans direct the sales force to call on a greater number of service-oriented businesses while maintaining and expanding sales within the manufacturing environment and government and public service sector—Bull HN's traditional stronghold.

Bull HN also plans to grow its installed base of DPS minicomputers within the manufacturing sector by placing more emphasis on sales within process manufacturing. Bull HN's market penetration is mainly in discrete manufacturing; sales among process manufacturers are relatively weak. Thus, recognizing a market opportunity, Bull HN directed its marketing and sales forces to find more

INPUT/OUTPUT CONTROL

The DPS 6 Plus systems use an extended version of Bull HN's proprietary Megabus to interconnect the peripheral device controllers and communications processors with the central processor and main storage. The extended Megabus is a split, bidirectional asynchronous bus with a 13.3M-byte bandwidth. The extended Megabus supports full 32-bit addressing and integrity features, and provides parity on the control and address lines. The extended Megabus also provides automatic retry in the event of parity errors.

CONFIGURATION RULES

GENERAL: The standard DPS 6 Plus comes with one 32-bit central processor; 2M bytes of main storage; a 650K-byte diskette drive; one 37M-byte fixed disk drive; one streaming tape drive; and six communications ports. An 8K-byte cache is optional. A fully configured Series 210 features the following:

- **A maximum of 16 bytes of main storage. The standard 2M-byte memory is increased using 1M-, 2M- and 4M-byte memory expansion options.**
- **A maximum fixed disk storage capacity of 1.5G bytes. Available options include 37M-, 68M-, 142M-, and 295M-byte fixed disk drives.**
- **Multiple streaming cartridge tape drives or reel-to-reel tape units.**
- **Up to 40 communications ports for workstation and system-to-system communications lines.**
- **A maximum of 40 hardwired workstations—terminals, printers, and personal computers.**
- **A variety of remote communications and wide area network interface protocols.**
- **One Ethernet local area network (LAN) interface.**

The basic DPS 6 Plus Series 220 features a 32-bit central processor with an 8K-byte cache; 4M bytes of main storage; a 650K-byte diskette drive; one fixed disk drive; one streaming tape drive; and 12 communications ports. A fully configured Series 210 contains the following:

- **A maximum of 16M bytes of main storage. The standard 4M-byte memory is expanded in 2M- and 4M-byte increments.**
- **A maximum fixed disk storage capacity of 1.6G bytes. Available options include 37M-, 68M-, 142M-, and 295M-byte fixed disk drives.**
- **Multiple streaming cartridge tape drives or reel-to-reel tape units.**

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CHART C. WORKSTATIONS

MODEL	HDS7302 and HDS7304	HDS7505 and HDS7605	HDS7807 and HDS7807	VIP7813 and VIP7823	VIP7814 and VIP7824
DISPLAY PARAMETERS					
Screen size	12 inches	14 inches	14 inches	12 inches	12 inches
Max. chars./screen	2,000	2,000	2,000	2,000	2,000
Screen format (lines x chars.)	25 x 80	25 x 80	25 x 80	25 x 80	25 x 80
Character phosphor	Green	Green	Green or amber	Green or amber	Green or amber
Total colors/no. simult. displayed	None	None	None	None	None
KEYBOARD PARAMETERS					
Style	Typewriter	Typewriter	Typewriter	Typewriter	Typewriter
Character/code set	ASCII	ASCII	ASCII	ASCII	ASCII
Program function keys	Yes	Yes	Yes	Yes	Yes
TERMINAL INTERFACE	RS-232-C or RS-422-A	RS-232-C or RS-422-A	RS-232-C or RS-422-A	RS-232-C or RS-422-A	RS-232-C or RS-422-A
PURCHASE PRICE	$850 for HDS7302; $850 for HDS7304	$995 for HDS7505; $955 for HDS7506	$1,200 for HDS7807; $1,200 for HDS7808	$2,350 for VIP7813; $2,350 for VIP7823	$2,700 for VIP7814; $2,700 for VIP7824
COMMENTS				Has a 72-line scroll feature.	Has a printer port.

customers within the process manufacturing sector—a virtually untapped source for DPS 6 Plus systems sales.

Bull HN deploys a well-seasoned direct sales force, having particular expertise in selling manufacturing, trade, service, and public sector industries systems for its DPS 6 Plus computers. In addition, Bull HN supplements direct sales activities through third-party distribution channels. By employing distributors, dealers, value-added resellers (VARs), and systems integrators, Bull HN gains additional market visibility for its DPS 6 Plus systems to customers not reached by its direct sales force.

To increase market penetration, Bull HN recently increased the size of its direct and indirect sales channel. By increasing the size of its direct sales force and by adding more distributors, dealers, and value-added resellers to its network of existing resellers, Bull HN increases sales potential.

COMPETITIVE POSITION

Although the DPS 6 Plus product line faces many competitors, its toughest competition comes from Digital Equipment and IBM. Digital Equipment Corporation and IBM hold the largest percentage of systems within the DPS 6 Plus' primary target markets—online transaction processing and professional support within manufacturing and government/public service organizations. Furthermore, Hewlett-Packard poses a strong challenge to Bull HN in the manufacturing sector. Although Hewlett-Packard is not as powerful as IBM or Digital Equipment Corporation, its revamped marketing and sales strategies and its revolutionary computer designs do present obstacles.

The DPS 6 Plus product line encounters both advantages and disadvantages when compared with Digital's VAX, IBM's Application System/400 (AS/400), and Hewlett-Packard's HP 3000 computers. For example, although the 1-MIPS Series 220 is cheaper than the Digital Equipment Corporation MicroVAX 3500, it does not have the processing power of the 2.5-MIPS MicroVAX 3500. As an-

- **Up to 40 communications ports for workstation and system-to-system communications lines.**
- **A maximum of 40 hardwired workstations.**
- **A variety of remote communications and wide area network interface protocols.**
- **One or two Ethernet LAN interfaces.**

The basic DPS 6 Plus Series 410 includes a central processing subsystem with one 32-bit central processor and a 16K-byte cache memory; 4M bytes of main storage; a 650K-byte diskette drive; and a 16-line communications controller with four RS-422-A ports. It expands to where it accommodates the following:

- **A central subsystem with up to four 32-bit central processors and two 16K-byte caches.**
- **A maximum of 16M bytes of main storage. The standard 4M-byte memory is expanded with 4M-, 8M-, and 12M-byte memory expansion options.**
- **A maximum fixed disk storage capacity of 4.8G bytes. Available options include 132M-, 142M-, 295M-, 413M-, and 515M-byte fixed disk drives.**
- **Multiple streaming cartridge tape drives or reel-to-reel tape units.**
- **Up to 64 communications ports for workstation and system-to-system communications lines.**
- **A maximum of 64 hardwired workstations.**
- **A variety of remote communications and wide area network interface protocols.**
- **One or two Ethernet LAN interfaces.**

The basic DPS 6 Plus Series 420 includes a central processing subsystem with one 32-bit central processor and a 16K-byte cache memory; 8M bytes of main storage; a 650K-byte diskette drive; and a 16-line communications controller with four RS-422-A ports. A fully configured Series 420 has the following:

- **A central subsystem with up to four 32-bit central processors and two 16K-byte caches.**
- **A maximum of 64M bytes of main storage. The standard 8M-byte memory can be expanded with 4M-, 8M-, and 16M-byte memory expansion options.**

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CHART C. WORKSTATIONS (Continued)

MODEL	VIP7815 and VIP7825	VIP7816 and VIP7826	VIP7201	PC/ET, PC XT, and PC/AP	PC/AP-X and PC/SP
DISPLAY PARAMETERS					
Screen size	15 inches	12 inches	—	—	—
Max. chars./screen	2,000	2,000	2,000	2,000	2,000
Screen format (lines x chars.)	25 x 80	25 x 80	25 x 80	25 x 80	25 x 80
Character phosphor	Green	Green	Green	Monochrome or color	Monochrome or color
Total colors/no. simult. displayed	None	None	None	64 total; 16 simultaneously displayed	64 total; 16 simultaneously displayed
KEYBOARD PARAMETERS					
Style	Typewriter	Typewriter	Typewriter	Typewriter	Typewriter
Character/code set	ASCII	ASCII	ASCII	ASCII	ASCII
Program function keys	Yes	Yes	Yes	Yes	Yes
TERMINAL INTERFACE	RS-232-C or RS-422-A	RS-232-C or RS-422-A	RS-232-C or RS-422-A	RS-232-C, RS-422-A, Ethernet	RS-232-C, RS-422-A, Ethernet
PURCHASE PRICE	$3,095 for VIP7815; $3,095 for VIP7825	$3,350 for VIP7816; $3,350 for VIP7826	$795 for VIP7201	—	$2,950 for PC/AP-X; $5,880 for PC/SP
COMMENTS	Has a 72-line scroll feature and a printer port.	Has a printer port.	Has a printer port.	A series of IBM PC/XT/AT-compatible MS-DOS microcomputers.	The PC/AP-X is a PC AT-compatible microcomputer with a 80286 chip. The PC/SP is a PC AT-compatible microcomputer with a 80386 chip.

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

other example, a 4-MIPS multiprocessor Series 410 outperforms the IBM AS/400 Model 50 but does not match the AS/400 Model 50 in configurability and expandability. Furthermore, the Series 420 offers more performance and configurability than the Hewlett-Packard HP 3000 Series 925LX offers more price/performance and cost-effectiveness than the Series 420.

The other primary competition for the DPS 6 Plus Series comes from Data General with its Eclipse MV series; Wang Laboratories with its VS Systems series; Prime Computer with its Prime 50 Series; and NCR with its Tower and 10000 Series computers. These vendors and their respective products are actively competing with the DPS 6 Plus in the areas of online transaction processing, management information, professional automation, and office automation systems. Generally, when compared to the offerings from vendors such as Data General, Wang Laboratories, Prime, and NCR, the DPS 6 Plus computers provide greater price/performance and compete well in configurability and functionality.

Although the DPS 6 Plus product line remains competitive, it is highly unlikely that users will replace a comparative system from a competitor with a DPS 6 Plus. Customers rarely change vendors or computer architectures, because of the high cost of the migration. The DPS 6 Plus product line does, however, give Bull HN a better chance to compete with Digital Equipment, IBM, and others for new corporate accounts or for the first-time automation sale.

ADVANTAGES AND RESTRICTIONS

System-wide compatibility represents one of the primary advantages of the DPS 6 Plus Series computers. The DPS

- **A maximum fixed disk storage capacity of 9.5G bytes. Available options include 132M-, 142M-, 295M-, 413M-, and 515M-byte fixed disk drives.**
- **Multiple streaming cartridge tape drives or reel-to-reel tape units.**
- **Up to 160 communications ports for workstation and system-to-system communications lines.**
- **A maximum of 160 hardwired workstations.**
- **A variety of remote communications and wide area network interface protocols.**
- **One or two Ethernet LAN interfaces.**

WORKSTATIONS: The DPS 6 Plus computers can be configured with several types of alphanumeric, interactive display terminals. They also can be configured with MS-DOS-oriented, IBM PC-compatible Personal Computers. Personal computers must be configured with asynchronous terminal emulation packages to access DPS 6 Plus applications and resources.

Workstations on the DPS 6 Plus Series 2XX computers communicate with the DPS 6 Plus host via the *Multifunction Line Controller*, *Asynchronous Communications Line Controller*, or the *MLX-16 Multiline Communications Processor*. The DPS 6 Plus 4XX computers' workstations attach to the host via the *MLX-16 Multiline Communications Processor*. The Multifunction Line Controller and the Asynchronous Communications Line Controller each provide connectivity for up to six workstations. The MLX-16 Multiline Communications Processor can accommodate up to 16 communications lines for workstation connection. Each line supports one workstation device. The Multifunction Line Controller, Asynchronous Communications Line Controller, and the MLX-16 Multiline Communications Processor are described fully in the COMMUNICATIONS CONTROL section of this report.

DISK STORAGE: The DPS 6 Plus Series 210 supports one 650K-byte diskette drive and one to six fixed disk drive units. The DPS 6 Plus Series 220 accommodates one

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CHART D. PRINTERS

MODEL	PRU9901	PRU9902	PRU9903	PRU9904
Type	Band	Band	Band	Band
Speed	300 lpm	600 lpm	900 lpm	1,200 lpm
Paper size	3 to 15 inches wide	3 to 15 inches wide	4 to 19 inches x 3 to 11 inches	4 to 19 inches x 3 to 11 inches
Horizontal character spacing (char./inch)	10	10	10	10
Vertical line spacing (char./inch)	6, 8	6, 8	6, 8	6, 8
Controller/Interface	RS-232-C or RS-422-A interface	RS-232-C or RS-422-A interface	RS-232-C or RS-422-A interface	RS-232-C or RS-422-A interface
Graphics capability	No	No	No	No
Purchase Price	$11,500	$14,450	$26,000	$33,000
Comments				

CHART D. PRINTERS (Continued)

MODEL	PRU7070, PRU7071, and PRU7072	PRU7075, PRU7076, and PRU7077	PRU7170, PRU7171, and PRU7172	PRU7175, PRU7176, and PRU7177
Type	Dot matrix	Dot matrix	Dot matrix	Dot matrix
Speed	100 cps	100 cps	150 cps	200 cps
Paper size	3 to 10 inches wide	3 to 15 inches wide	3 to 15 inches wide	5 to 15 inches wide
Horizontal character spacing (char./inch)	5.0, 8.3, 10.0, 16.7	5.0, 8.3, 10.0, 16.7	5.0, 6.0, 8.3, 10.0, 12.0, 16.7	5.0, 6.0, 7.5, 8.3, 10.0, 12.0, 15.0, 16.7
Vertical line spacing (char./inch)	6, 8	6, 8	6, 8, 12	6, 8, 12
Controller/Interface	RS-232-C or RS-422-A interface	RS-232-C or RS-422-A interface	RS-232-C or RS-422-A interface	RS-232-C or RS-422-A interface
Graphics capability	Yes	Yes	Yes	Yes
Purchase Price	$995	$1,495	$1,795	$2,450
Comments	Has an 80-column print line.	Up to 132 characters can be printed per line.	Has a 132-column print line.	Prints up to 132 characters per line. Can print bar codes.

6 Plus Series 200 and the Series 400 superminicomputers maintain object-code compatibility with one another. The HVS 6 Plus operating system supports the portability of applications developed on one DPS 6 Plus model to another without programming modification. Such compatibility preserves in software investments, thus prompting system migration and bottom-to-top and top-to-bottom application development.

Bull HN invested substantial resources to ensure that the DPS 6 Plus models remain program, file, and data compatible with the DPS 6 computers—the predecessors to the DPS 6 family—despite the differences in system architectures. The HVS 6 Plus operating system provides protection for earlier DPS 6 software investments in system migrations to the DPS 6 Plus and provides a measure of bottom-to-top software development and execution.

DPS 6 applications written in higher level languages, such as Cobol, on the most recent releases of GCOS MOD 4 operating system can be migrated to the HVS 6 Plus operating system environment without modifying the source code. Recompilations are necessary, however, if the application is to take advantage of the performance gains offered by the DPS 6 Plus architecture. Rewrites are necessary for the application program to capitalize on the HVS 6 Plus operating features.

Customers have ample flexibility in moving to a DPS 6 Plus computer from a DPS 6. Native mode applications can communicate with applications running in the

650K-byte diskette drive and one to eight fixed disk drives. Series 210 addresses fixed disk storage requirements using one or two 37M-, 68M- or 142M-byte fixed disk drives and up to four 295M-byte fixed disk drives. Fixed disk storage requirements on the DPS 6 Plus Series 220 are met with one to four 37M-, 68M-, or 142M-byte fixed disk drives and from one to four 295M-byte fixed disk drives.

The DPS 6 Plus Series 400 and Series 410 each support from one to eight disk drives and the Series 420 accommodates up to 16 disk drive models. Available options include 132M-, 142M-, 295M-, 413M-, and 515M-byte fixed disk drives and 40M-, 67M-, 80M-, and 256M-byte removable disk drives. Disk drives attach to the Series 4XX host via the following controllers:

MAGNETIC TAPE UNITS: Cartridge tape drives and reel-to-reel tape drives provide for online storage backup, archival storage, data exchange, and software distribution. The cartridge tape drive places 64M bytes of data on each tape cartridge. The reel-to-reel tape drives utilize 0.5 inch media and read and write in either the 1600- or 6250-bits-per-inch (bpi) mode at up to 75 inches per second (ips). The Universal Peripheral Controller (UPC) connects the magnetic tape drives to the host processor.

PRINTERS: A variety of printers is available. The band line printers output text, numerics, and special character sets at maximum print speeds ranging 300 to 1,200 lines per minute (lpm). The matrix serial printers run at maximum speeds ranging from 100 to 400 characters per second (cps). The daisywheel printers provide letter-quality printing at maximum speeds ranging from 50 to 400 cps. The laser printer outputs documents, images, and graphics at up to eight pages per minute (ppm). The printers attach to

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CHART D. PRINTERS (Continued)

MODEL	PRU7270, PRU7271, and PRU7272	PRU7200, PRU7201, and PRU7202	PRU7220, PRU7221, and PRU7222
Type	Dot matrix	Daisywheel	Daisywheel
Speed	400 cps	55 cps	50 cps
Paper size	3 to 15 inches wide	Up to 15 inches wide	Up to 22 inches wide
Horizontal character spacing (char./inch)	5, 10	10, 12, 15	10, 12, 15
Vertical line spacing (char./inch)	6, 8	6, 8	6, 8
Controller/Interface	RS-232-C or RS-422-A interface	RS-232-C or RS-422-A interface	RS-232-C or RS-422-A interface
Graphics capability	Yes	No	No
Purchase Price	$3,095	$3,350	$4,550
Comments	Has an 132-column print line.	Has a 13.2-inch print line.	Has a 19.6-inch print line.

CHART D. PRINTERS (Continued)

MODEL	PRU7230, PRU7231, and PRU7232	PRU7250, PRU7251, and PRU7252	PRU7260, PRU7261, and PRU7262
Type	Daisywheel	Daisywheel	Laser
Speed	80 cps	400 cps	8 ppm
Paper size	Up to 15 inches wide	Up to 15 inches wide	8.5 inches wide x 11.5 inches long
Horizontal character spacing (char./inch)	10, 12, 15	—	10, 12, 15
Vertical line spacing (char./inch)	6, 8	6, 8	6, 8, 12
Controller/Interface	RS-232-C or RS-422-A interface	RS-232-C or RS-422-A interface	RS-232-C or RS-422-A interface
Graphics capability	No	No	Yes
Purchase Price	$4,550	$3,495	$3,600
Comments	Has a 13.2-inch print line.	Has a near letter quality print mode.	

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

compatibility mode and vice versa. Furthermore, the HVS 6 Plus' DPS 6 compatibility mode permits customers to develop applications that will run on the GCOS MOD 400 systems with little or no modification.

In some cases, there are in-place upgrade options for moving from one DPS 6 Plus computer to another. By simply swapping circuit boards and adding or replacing hardware options, the Series 210 can be transformed into a Series 220 and the Series 410 can be transposed into a Series 420.

In other cases, there are no cost-effective features for migrating to a high-performance model from a smaller scale system. Moving from a DPS 6 Plus Series 210 or a Series 220 to a Series 400, 410, or 420 and from a Series 400 to a Series 410 or 420 requires reinvestments in the system's main unit; i.e., the system processing unit boxes must be exchanged when moving between systems. Such migrations are costly, since the entire investment in the main unit is lost. Having to replace the entire main unit requires more effort and more expense than performing an upgrade by simply replacing or adding a few circuit boards, as in a field upgrade.

Moving from the DPS 6 to the DPS 6 Plus is a fairly expensive venture. The move requires the replacement of the main processing cabinet and some mass storage devices. Furthermore, a new operating system and associated tools and applications must be installed. Also, as

the DPS 6 Plus system through the Universal Peripheral Controller or the asynchronous/synchronous communications options.

MASS STORAGE

See Chart B for a description of the mass storage devices.

INPUT/OUTPUT UNITS

Chart C contains a description of the workstations that are supported on a DPS 6 Plus system. Chart D shows the type of printers that function within a DPS 6 Plus system. Chart E contains a description of the magnetic tape devices that the DPS 6 Plus accommodates.

COMMUNICATIONS CONTROL

GENERAL: The DPS 6 Plus communications options provide asynchronous, synchronous, and IEEE 802.3 local area network communications capabilities. The asynchronous lines carry communications between the host and host-attached workstations—terminals, printers, and personal computers. The synchronous lines and IEEE 802.3 Ethernet are primarily used for system-to-system communications.

Asynchronous and synchronous communications on the DPS 6 Plus Series 2XX computers are provided by the Multifunction Line Controller, Asynchronous Communications Line Controller, and the MLX-16 Multiline Communications Processor. The DPS 6 Plus 4XX computers

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CHART E. MAGNETIC TAPE EQUIPMENT

MODEL	MTU9901 and MTU9902	MTU9921 and MTU9922
TYPE	0.25-inch cartridge	0.5-inch streaming
FORMAT		
Number of tracks	11	9
Recording density, bits per inch	8,000	1,600; 6,250
Recording mode	Bit serial	PE; GCR
CHARACTERISTICS		
Drives per controller	1	4
Storage capacity, bytes	64M per cartridge	30M per tape reel in PE mode; 140M in GCR mode
Tape speed, inches per second	55	75
Data transfer rate, units per second	55K bytes	40K to 120K bytes in PE mode; 156K to 496K bytes in GCR mode
Streaming technology	—	75 ips
Start/stop mode speed	—	25 ips
PURCHASE PRICE	$2,700 for MTU9901; 3,900 for MTU9902	$17,900 for MTU9991; 17,900 for MTU9992
COMMENTS	MTU9901 resides within the main system cabinet. MTU9902 is a tabletop unit.	MTU9921 is the primary unit within a cluster. MTU9922 is an add-on unit.

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stated previously, applications will have to undergo modifications and recompiles to benefit from the DPS 6 Plus and HVS 6 Plus architecture.

A substantial portion of the input/output (I/O) device investment is saved when moving from the DPS 6 to the DPS 6 Plus. Because of common I/O mechanisms, the DPS 6 Plus computers support many of the same peripherals as the DPS 6 systems. This protects investments in terminals, PC workstations, and printers and some mass storage devices when upgrading.

The lack of readily available application systems has been a problem for DPS 6 and DPS 6 Plus customers. Although Bull HN and independent software houses provide general and industry-specific application systems for the DPS 6 and DPS 6 Plus computers, only a limited amount of applications software is available. Datapro's *Directory of Software* lists only a small number of applications for each type of general-purpose or vertical market application—e.g., accounting, engineering, education, insurance, banking, and retail. In contrast, the IBM System/370-architecture systems and Digital Equipment VAX computers have access to a multitude of general-purpose and vertical market application systems.

Because Bull HN customers have a hard time finding required application systems, many of them must either develop their own applications, customize packaged software, or contract with software houses to develop the application system. In any case, application acquisition requires extra effort and expense for customers.

To ease the application development burden, Bull HN provides several application development aids for those customers building application systems. The application development and maintenance tasks are reduced when programmers employ products such as the System-80 Cobol code generator, the Pro-IV application development tool set, the Info application developer, and the DEF-II

employ the MLX-16 Multiline Communications Processor for asynchronous and synchronous communication line control.

The *Multifunction Line Controller, Asynchronous Communications Line Controller*, and the *MLX-16 Multiline Communications Processor* reside on the Extended Megabus. Each controller provides an interface between the system processor and multiple asynchronous and synchronous data communications devices. The primary function of each communication controller is to transfer data between main storage and the communications channels.

The Multifunction Line Controller supports up to six communications lines. Of the six lines, three are configured for asynchronous communications, two are configured with either asynchronous or synchronous protocols, and one supports an auto call adapter.

The Asynchronous Communications Line Controller only supports asynchronous communications lines. It can be configured with up to six lines. Each line provides a point-to-point interface between the host and the workstation or communications device.

The MLX-16 accommodates up to 16 communications lines. The communications lines can be configured for asynchronous or synchronous operation. The asynchronous lines support RS-232-C, RS-422-A, MIL-STD-188-C, and Current Loop interfaces and the synchronous lines support RS-232-C, RS-422-A, MIL-STD-188-C, X.21, V.35, and 301/303 broadband interfaces. The asynchronous lines can be configured to run at up to 19.2K bits per second (bps). The synchronous lines can be configured to operate at up to 56K bps. Simultaneous use of the maximum number of lines or 19.2 or 56K bps applications is subject to a maximum throughput rate of 36,000 characters per second.

The DPS 6 Plus computers are connected to an IEEE 802.3-recommended Ethernet LAN through an intelligent controller known as the *Local Area Controller Subsystem (LACS)*. LACS contains the hardware and transport and interface programs required to connect a DPS 6 Plus to a IEEE 802.3 Ethernet network. It uses the Carrier-Sense Multiple Detection/Collision Detection (CSMD/CD) for media access; features a 10M-bit-per-second (bps) data transmission rate; and implements the International Orga-

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data entry programming facility. These tools provide programming professionals with automated design and development tools for reducing the complexities and costs associated with traditional programming and systems development. With these tools, programs are built, installed, and serviced at a quicker pace than with traditional programming and system development methods.

With the DPS 6 Plus Series 400, 410, and 420 computers, horizontal expansion options are available to increase processing power. Customers can move to more processing power by simply adding central processors to the existing configuration to meet work load demands and reduce bottlenecks. The multiprocessor upgrade options enable customers to double or quadruple system performance without the cost of installing a complete new system. For example, a Series 410 customer can start out with a system containing one central processor that contributes to the system's capability of running data at 1 MIPS and move to a system that contains four central processors and provides approximately 4 MIPS. All of the processors are contained in one system unit. Customers do not have to exchange processor unit boxes as processing power is increased; bring in full-scale computer systems to off-load functions from the primary system to meet overall system performance requirements; or move to a system that is not within the DPS Plus product line.

The DPS 6 Plus Series 400, 410, and 420 computers provide a high degree of system availability, which is critical for online transaction processing and operational support system settings. Downtime within the mission-critical application environments means a loss of revenue or productivity. The shadow processor feature, multiprocessor architecture, and the power failure recovery features enable the DPS 6 Plus computer to continue to operate despite a central processor or power failure, thus preserving productivity and profitability. Although the DPS 6 Plus systems provide a high degree of uptime, they cannot be considered true fault-tolerant systems because the disk systems and bus structure are not duplicated.

The DPS 6 Plus' communications and networking are advantageous. Because the DPS 6 Plus is designed for distributed data processing environments, its communications and networking capabilities are particularly important. The data communications tools used on the computers provide flexibility in creating networking and distributed processing environments within a Bull HN shop and provide the open connectivity required in departmental processing.

The DPS 6 Plus PC integration support enables Bull HN MS-DOS-based microcomputers and IBM PCs or compatibles located throughout a department or organization to access DPS 6 Plus applications and files and to use the DPS 6 Plus as a gateway to other computer systems. The Distributed Systems Architecture 6 (DSA6) software system provides the DPS 6 Plus computers with the facilities to perform virtual terminal, file transfer, remote batch, and program-to-program communications with each

nization for Standardization (ISO) Open Systems Interconnection (OSI) communications standards for data transport.

SOFTWARE

GENERAL: The basic DPS 6 Plus system package includes the operating system. System-level applications, such as the database, programming languages, and communications options, are packaged as add-on options.

OPERATING SYSTEM: The Bull HN *High-performance Virtual System 6 Plus (HVS 6 Plus)* operating system runs across the entire DPS 6 family. Key features of the HVS 6 Plus operating system include the following:

- **Multiprocessing support.**
- **Time slicing.**
- **Virtual memory management.**
- **Automatic disk caching.**
- **Extensive file system.**
- **Power failure/resumption facility.**
- **Automatic system configuration.**
- **User statistics and accounting information.**
- **Diagnostic tools.**
- **Command-level and menu-level user interfaces.**
- **Security system.**
- **Integral file processing tools.**
- **Electronic mail facility.**
- **Program development tools.**
- **Integral communications and networking utilities.**

HVS 6 Plus performs multiprogramming and multitasking for a single or multiple-central processor system. The task manager schedules tasks according to priority; returns control to interrupted tasks; and synchronizes, suspends, and terminates tasks running on single- or multiple-processor systems. Memory protection prevents programs from interfering with other programs or the operating system. Additionally, a time-slice algorithm prevents tasks from dominating central processor resources at the expense of competing tasks.

A single copy of HVS 6 Plus controls all of the central processors in a multiprocessor architecture. HVS 6 Plus tightly couples all of the multiple processors into a peer-to-peer relationship. In the peer-to-peer relationship, the central processors share main memory as well as the processing work loads. In the event of a processor failure, the other processor can continue to operate.

The HVS 6 Plus executive enables each application program to use up to 2G bytes of virtual memory space. The virtual memory management program within the executive is responsible for allocating space, performing address mapping, and the loading and unloading of pages within an application program.

Each virtual memory space is divided into segments which contain application code, subroutines, and data arrays.

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other, DPS 6 systems, and DPS mainframes. The Remote Network Processor DPS 6 system enables DPS 6 Plus computers to perform interact with Bull HN DPS mainframes.

The Open Systems Interconnection/Distributed Systems Architecture 6 (OSI/DSA6) product enables DPS 6 plus computers to participate in an International Organization for Standardization/Open Systems Interconnection (ISO/OSI) network with other computers implementing the ISO/OSI-recommended communications protocols, basic network management facilities, and upper level application services (i.e., electronic messaging and mail and file transfer, access, and management). The SNA communications tools permit DPS 6 Plus computers to communicate with IBM System/370-architecture mainframe and supermini host systems. The BSC communications utilities permit the Bull HN computers to participate in a bisynchronous (BSC) IBM network. ONElink DISOSS Services enables the DPS 6 Plus computer to fully participate in an IBM Distributed Office Support System (DISOSS) network.

The SNA, BSC, and DISOSS emulators are very important to the DPS 6 Plus Series approach to networking and distributed processing. Such facilities are needed in those departmental or distributed processing environments where departmental systems are frequently called upon to access data, files, and application services residing in IBM mainframe environments.

A significant component for DPS 6 Plus to IBM mainframe communications is the SNA-Application Interface Facility (SNA-AIF), an Advanced Peer-to-Peer Communications/LU6.2 (APPC/LU6.2) support facility. This facility enables DPS 6 Plus computers to establish sessions with applications on IBM mainframes without running the multiple layers of emulation that are usually required to communicate with these systems. This reduces the complications and performance degradations caused by file format limitations and emulation overhead. Moreover, this facility offers a transparent interface between DPS 6 Plus and IBM System/370 computers for distributed processing tasks.

Of special significance within the DPS 6 Plus' distributed processing scheme is the IEEE 802.3 Ethernet local area network (LAN) support. By employing Ethernet, the DPS 6 Plus provides a common communications channel for interacting with other Bull HN computers that are compatible with the DSA network and with non-Bull HN small-, medium-, and large-sized computers that implement the ISO/OSI communications and networking model. With IEEE 802.3 Ethernet, costs for system interconnection are reduced and data transfer speeds are increased relative to those afforded by hard-wired communications schemes.

The DPS 6 Plus computers' microcomputer integration tools are essential within today's information system arena. Once attached to the host, the MS-DOS IBM-

Segments can vary in length and are broken down into pages. HVS 6 Plus' virtual memory management program manipulates pages of virtual memory. Pages are brought into main storage one at a time, on demand; that is, only the referenced pages are loaded. When memory is fully occupied by running programs, newly requested pages replace the least recently used pages in memory. Protection mechanisms restrict read, write, and execute access to identified tasks having privileged access levels.

The Automatic Disk Cache of HVS 6 Plus increases the speed of disk read operations. The Automatic Disk Cache stores frequently referenced disk data in buffer memory. When a disk read request is issued, the buffer is searched before the disk. Data found within the buffer is transferred to main memory via a memory transfer; the disk is not accessed. This improves systems performance since fetching data in the cache memory is faster than accessing data on disk. The cache works at speeds much greater than the disk and eliminates the times required to access the disk, find the data on the disk, and transfer the data to main memory.

HVS 6 Plus' file system allows programs to access files via sequential, relative, random, and indexed sequential access methods. Concurrent access to shared files is controlled by file-usage security (i.e., exclusive, read-only, and read/write privileges) and record and file locking. Files can be dynamically created, expanded, and deleted. A single file can span across two or more physical volumes. The file system performs disk space allocation, buffer management, and record blocking/deblocking.

Included within the file system are extended character set support, a file recovery facility, and Remote File Access (RFA). Extended character set support enables international character sets to be added to the native character set. The file recovery facility enables a file to be restored to its original state in the event of a system or program failure. RFA allows applications on remote computers to access files, terminals, printers, disks, and tapes on another computer as though they were locally attached.

The power restart facility preserves main memory for a short while in the event of a power failure and reconnects all peripheral and communications devices when power is restored. It also restarts all the tasks that were in execution. The checkpoint/restart facility eliminates the rerunning of jobs in their entirety after a major system or environment malfunction. After a malfunction is corrected, the facility resumes processing at a user-established checkpoint rather than at the program's first step.

The HVS 6 Plus auto configurator utility is used to configure the operating system when it is first installed and when significant changes are introduced, such as the addition of new hardware and software. The auto configurator automatically determines the hardware configuration details and the set of installed software, and generates the appropriate configuration files, system start-up files, default user registration, and perforamnce-optimizing system parameters. A series of self-guiding screen forms, with help facilities, allows the system administrator to specify unique features for the system.

System resources are protected against unauthorized access through registration procedures. Each user registered with HVS 6 Plus must supply a user identification and assigned password to log on to the system. Control lists for files and directories determine which system resources the user can employ and which data can be accessed.

Execution Control Language (ECL) and Operator Control Language (OCL) are the command languages. ECL is used to start and control application tasks, to handle all file-

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compatible Personal Computers reduce peripheral cost, provide users with access to both host and microcomputer applications, broaden information access capabilities, and improve host performance and throughput by conducting specialized or localized processing.

One requirement for a departmental processor or end-user-oriented system is simplified operator/end-user interaction. The DPS 6 Plus meets the requirement by offering simplified command languages for system administrator functions and a menu-driven interface system with online help facilities.

As indicated earlier, Bull HN now offers an extensive set of customer and product support programs. Included are several levels of maintenance support for computer processors and peripherals; several levels of software support; standardized and tailorable consulting services for all stages of technology and applications acquisition; and a set of educational training courses.□

related functions, and to submit batch jobs. OCL is used by the system operator to interrogate the system and control its functions, and to manage resources. Both languages feature a simplified command format and commonly used default conditions.

The User Productivity Facility (UPF) provides an end-user-oriented interface to the operating system and associated system utilities. It also provides an end-user-oriented interface to system software subsystems and end-user applications. The programming tools provided with UPF allow users to add system-level and end-user function applications to the UPF environment and to customize UPF tools for their installation.

USF aids users in learning and running system facilities and applications by providing menus, forms, and help files which guide users through system capabilities. By incorporating the USF into system facilities, workstation operators can access system and user components through a user-oriented language instead of through complex commands.

System resources are protected against unauthorized access through registration procedures. Each user registered with HVS 6 Plus must supply a user identification and assigned password to log on to the system. Control lists for files and directories determine which system resources the user can employ and which data can be accessed.

HVS 6 Plus provides a full set of file processing tools. Major facilities include a sort/merge utility, a copy utility, a compare program, a save/restore facility, and a full-screen text editor.

Program development can be performed in an interactive or batch mode. Major HVS 6 Plus facilities include a symbolic debugger, a line editor, a full-screen editor, a linker, and online program testing and analysis tools.

The HVS 6 Plus communications system supports both asynchronous and synchronous communications lines. It also includes an integrated interface to Ethernet local area networks (LANs). Applications interface with the communications system either at the physical I/O level; through the file system; or through a high-level, programming-language interface.

HVS 6 Plus is compatible at the application level with the DPS 6 operating system, GCOS 6 MOD 400. Applications written in higher level languages, such as Cobol, can be migrated to the HVS 6 Plus without modifications. Recompilations are necessary, however, if the application is to take advantage of the performance gains offered by the DPS 6 Plus architecture. Rewrites are required for the application program to capitalize on the HVS 6 Plus operating features.

HVS 6 Plus also maintains downward compatibility with GCOS 6 MOD 400. Applications can be developed under HVS 6 Plus to run on DPS 6 systems with little or no modification.

DATABASE MANAGEMENT SYSTEM: The HVS 6 Plus environment includes database management systems (DBMSs) for data storage and management in production and information processing environments.

Data Management 6 Integrated Data Store/II (DM6 I-D-S/II) is oriented toward production processing. It is based on a standard implementation of the recommendations and specifications of the Conference on Data Systems Languages (CODASYL). Because it implements a two-level network structure with owner/member relationships, DM6 I-D-S/II provides rapid access to complex relationships among data. Transactions—database record updates, deletions, modifications, queries, etc.—are processed in both interactive and batch modes. Integrity is ensured through journalization, automatic recovery and restart capabilities, system-maintained relationship pointers, and a concurrency control scheme. The software is also compatible with I-D-S/II implementations on Bull HN mainframes.

DM6 I-D-S includes a data definition language (DDL) for defining the database structure and application viewports; a device media control language (DMCL) to provide additional user control over mapping the database to the physical devices; an implementation of the Data Base Task Group (DBTG)-recommended data manipulation language (DML) for defining data manipulations within applications; a database administration control system to perform database utility functions; full CODASYL privacy and security facilities; and controls for "integrated" database organizations. In addition, a transaction processor, a query language, and a report writer are provided within DM6 I-D-S.

The Data Management 6 Transaction Processor (DM6 TP) is the high-volume transaction processor within DM6 I-D-S/II. It manages the terminal screens and the transaction processing and database update routines for the concurrent processing of diverse transactions. It also provides transaction deadlock resolution, transaction restart, and file restoration to ensure transaction integrity. A high-level, Cobol-like generation language is employed to describe transactions and the transaction processing environment.

The DM6 Distributed Transaction Processing (DM6 DTP) is a DM6 I-D-S-based, high-volume transaction processor for the network environment. It accommodates two-level transaction processing in Bull HN and mixed-vendor environments.

Data Management 6 AZ7 (DM6 AZ7) is a query and report writer for DM6 I-D-S/II. It enables end users to easily access the DM6 I-D-S/II database for ad hoc inquiry and quick report generation.

Bull HN's *Transaction Processing System 6 (TPS 6)* provides realtime transaction processing with data management facilities. TPS 6 system includes tools for validating transaction data at data entry, processing and outputting

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transaction data, updating files/records, and ensuring data and transaction integrity. It also provides TPS 6 Screenwrite and Transaction Control Language Facility (TCLF) for application programming within the transaction processing environment. Query processing and report writing are performed on the TPS 6 database via the TPS 6 Query/Report Writer (QR6), an ad hoc query and report writer that uses a query-by-forms interface. Performance monitoring tools assist the programmer to determine appropriate changes to programs and resource allocation in order to optimize TPS 6. The TPS 6 Distributed Processing Facility (DPF) provides for two-level transaction processing in a Bull HN environment.

Oracle supports information processing and decision support requirements. It is a widely installed relational database system from Oracle Corporation. Like all relational database systems, Oracle maintains data in the form of a series of relations or tables. It does not require explicit relationships between sets of data to be defined. Relationships are determined at the time the database update or query is performed. Users can redefine record sequences, subset records by select/omit criteria, and subset and concatenate fields to create new fields. Programs that use a logical view of the data are unaware of changes in the physical data. File access paths remain unchanged when a change to data occurs. Security features, data set locking, and data recovery facilities ensure data integrity within Oracle databases.

Oracle uses the de facto industry-standard SQL database language for creating and maintaining databases, performing queries, and writing reports. Furthermore, Oracle includes interactive application generators, report writers, an electronic spreadsheet, and graphics utilities. It also contains a data extraction facility to load data from ASCII-based files into Oracle databases. The interactive I-D-S/II Load Facility loads production data from information processing into the Oracle database.

The *ONEbase Departmental Information Base* is a set of layers of departmental and end-user services built around the de facto, industry-standard Oracle relational database management system. It enables departments and users to extract, format, and make queries upon data that originated in host Bull HN mainframes, other host mainframes, and remote systems, as well as process data that originates in the local environment. ONEbase is comprised of the following four components:

- ONEbase Data Base—provides the relational environment (an Oracle database) that houses the data and provides the utilities to manage the work space and create end-user views.
- ONEbase Extraction Toolkit—provides the tools that transfer data from other database environments to the ONEbase Data Base.
- ONEbase Data Translator—provides the tools to transform extracted data into specific formats.
- ONEbase View Building Toolkit—provides the tools to prepare customized queries and reports.

Total Central is a general-purpose database management system that offers shared data storage and management facilities for the concurrent processing of transaction processing and information system applications. It features a data dictionary, a transaction monitor, an interactive query language, and application development tools.

LANGUAGES: HVS 6 Plus supports the Cobol, Fortran, Pascal, C, Ada, and Basic high-level programming languages. The Advanced Assembler provides for assembly-language programming or low-level programming.

COMMUNICATIONS: The DPS 6 Plus systems are fluent in several different data communications languages, thus enabling them to communicate with a variety of Bull HN and non-Bull HN computers.

The *Local Area Controller Subsystem Control Executive (LACS-CE)* and *Local Area Controller Subsystem Ethernet Driver (LACS-ED)* software programs provide IEEE 802.3 Ethernet link control and media access control functions and contain the transport and interface programs required to connect a DPS 6 Plus to a IEEE 802.3-recommended, coaxial cable-based, 10M bps Ethernet network. The high-level network applications for Ethernet networking are provided by the Distributed Systems Architecture DPS 6 and OSI/DSA 6 software systems.

Distributed Systems Architecture DPS 6 (DSA6) is a set of Bull HN Distributed Systems Architecture (DSA) networking products that enables the DPS 6 Plus computers to communicate among all levels of Bull HN systems, from microcomputers through mainframes. DSA6 consists of the following components:

- Transport Facility (DSA-TF)—provides communications protocols and basic network management tools.
- Network Terminal Manager (DSA-NTM)—enables a DPS 6 Plus to function as a terminal concentrator. DSA-NTM concentrates terminal traffic onto one communications line to access other DPS 6 Plus and DPS 6 systems, as well as DPS mainframe applications.
- Unified File Transfer (DSA-UFT)—moves program files and data files between DPS and Distributed Systems Architecture systems.
- Remote File Facility (DSA-RFF)—exchanges files with DPS mainframe computers.
- Remote Batch Facility (DSA-RBF)—permits a DPS 6 Plus node to be used for job submission and output delivery from a DPS 8 system via the network.
- Application Interface Facility (DSA-AIF)—provides an interface for program-to-program communications for Cobol programs on distributed systems.

The *Remote Network Processor DPS 6 (RNP6)* is a collection of networking facilities enabling a DPS 6 Plus system to communicate with other DPS 6 Plus superminicomputers, DPS 6 minisystems, and DPS mainframes. RNP6 capabilities include remote terminal concentration, remote batch, file transfer, application-to-application communications, and network management and administration. Such functions are provided with communications links to other RNP6 programs on DPS 6 Plus and DPS 6 computers and to the GRTS-II, NPS, or DNS programs on DPS mainframes. The communications/network applications run across dial-up or leased, full- or half-duplex lines that run at speeds up to 56K bps.

Polled VIP Emulation (PVE) allows the minicomputer to emulate a Bull HN synchronous VIP terminal. Facilities offered under PVE include file transfer, remote batch, and interactive access.

The following products enable the DPS 6 Plus computers to participate with remote systems in an International Organization for Standardization/Open Systems Interconnection (ISO/OSI) network:

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- OSI/DSA 6 Transport Services (TNS)—provides the communications protocols and basic network management facilities needed for communications in ISO/OSI networks.

- OSI/DSA 6 Application Services (APPS)—provides the communications protocols and network management facilities needed for establishing sessions between systems.

- OSI/DSA 6 Message Handling System (MHS)—provides for electronic messaging and mail services between U Series computers and other computers supporting the CCITT-recommended X.400 protocols and network management facilities for electronic messaging and mail systems.

- OSI/DSA 6 File Transfer, Access, and Management (FTAM)—provides for file transfers and file accesses between U Series computers and other computers supporting the ISO-recommended OSI network and ISO-recommended FTAM protocol and network application.

Systems Network Architecture DPS 6 (SNA6) is a set of software products that emulates most operations of standard IBM devices, permitting DPS 6 Plus systems to interface with Systems Network Architecture (SNA) distributed networks. SNA6 includes the following components:

- Transport Facility (SNA-TF)—provides the communications protocols and basic network management facilities to support the communications between a DPS 6 Plus and an SNA network.

- Interactive Terminal Facility (SNA-ITF)—enables the DPS 6 Plus to function as an IBM 3274 Control Unit with relevant display and print devices attached. DPS 6 Plus' interactive terminals appear as IBM 3270 interactive terminals and the printers appear as IBM 3270 printers to the host system.

- Remote Job Entry (SNA-RJE)—enables a DPS 6 Plus to perform remote job entry with an SNA-based IBM System/370-architecture mainframe.

- File Transfer Facility (SNA-FTF)—enables files to be transferred between a DPS 6 Plus and an IBM mainframe.

- Application Interface Facility (SNA-AIF)—enables DPS 6 Plus Cobol or Advanced Assembler-language programs to communicate with CICS or IMS system programs on the IBM mainframe.

- Remote Operator Facility (SNA-ROF)—enables an SNA-based operator to communicate with a DPS 6 Plus system to monitor and control activity.

Binary Synchronous Communications DPS 6 (BSC6) consists of a set of software products that enables the DPS 6 Plus to communicate with IBM mainframes using the BSC communication protocol. BSC6 includes the following components:

- BSC Transport Facility (BSC-TF)—transmits files between a DPS 6 Plus and IBM mainframe using the BSC protocol.

- BSC 2780/3780 Workstation Facility (BSC-WF)—enables a DPS 6 Plus system to communicate with an IBM mainframe in a remote batch processing environment as an IBM 2780 or 3780 workstation.

- HASP Multileaving Facility (BSC-MF)—enables a DPS 6 Plus system to communicate with an IBM mainframe in a remote batch processing environment as a HASP multileaving workstation.

- BSC Programmable Facility/3271 (BSC-PF)—enables a DPS 6 Plus system to function as an IBM 3271 Control Unit with relevant display and print devices attached. DPS 6 Plus interactive terminals communicate interactively with an IBM mainframe over a communication link configured with the BSC protocol. It also allows the DPS 6 Plus printers to appear as 3271-based printers to the host system.

DSA/SNA Gateway 6 (GW6) connects Bull HN DSA and IBM SNA networks and provides internetworking capabilities for users in both environments. With DW6, the DPS 6 Plus acts as the internetwork bridge between the Bull HN network using DSA and the IBM network using SNA. From the DSA viewpoint, the DPS 6 Plus gateway node appears as a DSA system. From the SNA point of view, the DPS 6 Plus gateway node appears as a IBM 327X workstation cluster controller with the SDLC protocol.

GW6 facilities permit terminals within a DSA network to access applications on IBM System/370-architecture mainframes and terminals within an SNA network to access applications on DPS 6 Plus computers. GW6 performs all connection, routing, flow control, and terminal presentation mapping services to the target applications.

The *IBM 3270 Terminal Facility (3270TF)* software package allows the connection of a BSC-based IBM workstation cluster controller to a DPS 6 Plus computer. The 3270 or 3270-compatible terminals attached to the BSC-based cluster controller connect to either local DPS 6 Plus applications or, by using GW6, connect to applications on the DSA network or SNA network.

UTILITIES: As indicated previously, a comprehensive set of utility programs and system applications is packaged with the HVS 6 Plus to handle such functions as file management, program development, and system administration. For those installations needing additional application development and control functions, the System-80, Pro-IV, Info, and Data Entry Facility-II (DEF-II) software systems can be added.

System-80 generates complete Cobol programs. Batch and online screen programs, file updates, and reports are created using a hierarchy of menus, fill-in-the-blank attribute screens, prompts, data dictionary data descriptions, and explanation screens. The source code generated by the coding facilities is compiled and linked using standard operating system facilities.

PRO-IV is an application generator that employs fourth-generation application development technology. Developers build screens, menus, updates, and reports for applications by using a series of fill-in-the-blank screens. The entries from the screens do not generate source or object code, but create internal tables that are used during execution.

Info is an application generator that supports relational-like data structures. It features tools for data entry application, screen development, and query application development.

Data Entry Facility II (DEF-II) enhances the data entry effort. DEF-II allows programmers to define sophisticated data editing and validation features for data entry. It is used within forms-based applications and source applications.

Bull HN's *Graph6* adds graphics processing capabilities to the HVS 6 Plus environment. The Graph6 graphics software allows users to create graphs and charts to support

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business processing. Graph6 provides facilities for menu and command access. Graph6 allows MS-DOS microcomputers to run Graph6 applications and permits a variety of printers and plotters to serve as hard copy output devices.

OFFICE AUTOMATION: The Bull HN *Office Network Exchange Plus (ONE Plus)* is a multifunctional set of software programs encompassing office processing, data processing, user applications, interfaces, and communications and networking. Users may license just the individual modules required or obtain packaged systems.

ONE Plus software offerings include the following:

- *ONEmail*—an electronic mail system allowing users to send and receive documents, data processing files, and messages on the same system or throughout a network.
- *ONEtext Document Processing*—a document processing system that allows users to create, revise, and print documents; create abbreviation libraries for frequently used text, formats, and function key sequences; and index documents. It features a calculator, a spelling checker and corrector, a file access and data exchange facility, and optical character recognition (OCR) support facilities.
- *ONEtext Plus*—an advanced document processing facility that automatically generates tables of contents and indexes, and numbers paragraphs.
- *ONEdocument Compound Document*—a document processing system that allows textual and nontextual information (such as images, graphic designs, and presentation charts) to be integrated into a single document (a compound document).
- *ONEtime*—a time-management system providing planning and scheduling tools.
- *ONEcalc*—an electronic spreadsheet system providing three-dimensional calculation and forecasting capabilities.
- *ONElist*—an office-level database that stores and manipulates simple list records of frequently used information.
- *ONExchange Document Library*—a centralized document storage and retrieval facility that stores documents and data files created by DPS 6 Plus computers, other Bull HN computers, and MS-DOS microcomputers. Documents and files within the library can be searched, retrieved, printed, shared, and distributed. Documents and files are stored in their native formats. Translation services enable users to work with documents and files that would be otherwise incompatible.
- *ONElink DISOSS Services*—a software system that enables the DPS 6 Plus computer to exchange electronic messages, documents, spreadsheets, and data files with IBM and non-IBM systems connected to the IBM-based Distributed Office Support System (DISOSS) network. The DPS 6 Plus computer has complete access to the DISOSS document library and distribution service.
- *ONEdial Asynchronous Communications Information Retrieval Facility*—a tool that provides access to public data networks such as Tymnet and Telenet, and commercial databases such as The Source and Dow Jones. The information accessed via ONEdial can be automatically converted to ONEtext format and can be saved as a document for later editing, printing, or insertion into another document.

APPLICATIONS: Third parties provide packaged applications that cover management information system, operations control, transaction processing, and professional support requirements. Targeted industries include manufacturing; distribution; health care; banking and brokerages; telecommunications; education; and federal, state, and local governments. Descriptions of available applications can be found in Datapro Research's *Datapro Directory of Software.*

PRICING

POLICY: Bull HN offers the DPS 6 Plus computers on a purchase basis. Volume discounts for hardware equipment are available.

All software is offered on an annual license or initial license fee basis. Licenses are available for secondary sites with about a 25 percent cost savings. Primary site license fees include support. All support for secondary sites flows through the primary site.

SUPPORT: Hardware and software support are provided through Bull HN's TotalCare program. This is offered through Bull HN's Customer Service Division, which services the entire system.

The hardware support offerings include Installation Service, Scheduled Extended Maintenance Service, and Premium Services.

The *Installation Service* provides equipment installation services as part of the sale transaction at no additional charge to the customer. The installation service covers all major hardware equipment except for Bull HN personal computers and all other workstations designated as customer-installable units. Bull HN will install personal computers and equipment defined as customer-installable units for a fee.

Scheduled Extended Maintenance Service provides on-call remedial maintenance service to contracted customers for a basic monthly or annual charge. Service is provided during the principal period of maintenance. The principal period of maintenance is 10 hours per day from 8 a.m. to 6 p.m., Monday through Friday, excluding Bull HN's locally observed holidays. Customers may request maintenance service outside the principal period of maintenance on either an unscheduled or scheduled basis. The fee for unscheduled maintenance service is based on a per-hour charge. The fee for scheduled maintenance service outside the principal period of maintenance is based on a basic maintenance charge plus percentage of the applicable charge.

The *Premium Services* provides maintenance coverage up to 24 hours per day, 7 days per week. The agreement provides a guaranteed two-hour response for a service request, preventive maintenance service, equipment installation service, and equipment malfunction protection credits.

If a customer does not have a service contract with Bull HN, the company will nevertheless furnish maintenance service. Labor charges, travel charges, and parts and material charges apply, however.

The elementary software support offerings include Basic Software Support and Expanded Software Support.

The *Basic Software Support* offers telephone access to the National Response Center 24 hours a day, 7 days a week; telephone access to the Technical Assistance Center 5 days a week from 8 a.m. to 6 p.m., local customer time; and distribution of software product revisions and updates.

The *Expanded Software Support* provides a higher level of service that includes software configuration review, instal-

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lation consultation and assistance, update installation assistance, temporary fix development and delivery, emergency bypass development assistance, and on-site software support.

In addition to the software support services offered under the elementary software support offerings, Bull HN offers a comprehensive set of supplemental software services. Included within the supplemental programs are the following:

- *System Software Initial Installation Service*—installs system software and its facilities. Pre- and postinstallation services are offered, too.
- *System Software Update Installation Service*—updates system software on the primary system with the latest changes, corrections, and enhancements. It is offered on-site on a scheduled basis.
- *System Software Update Installation Service for Secondary Systems*—updates system software on the secondary system with the latest changes, corrections, and enhancements.
- *System Software Tuning Service*—analyzes in depth the customer's HVS 6 Plus and associated system software product performance and written suggestions for improvement.
- *System Software "Currency" Analysis Service*—analyzes the status of system software revisions and updates as related to current revisions and corrections.
- *DPS 6 Plus Start-Up Services*—provides on-site assistance in implementing and using HVS 6 Plus and system-level applications and subsystems.
- *System Software Migration Service*—provides planning, technical consultation, and implementation support to customers who want to migrate to the latest HVS 6 Plus software.

In addition to basic and supplemental product support programs, Bull HN DPS 6 Plus provides professional and consulting services for the DPS 6 Plus computers. Bull HN provides services that address the planning, development, and installation stages of computer system acquisition. Bull HN either executes jobs or consults and guides the customer through the various computer acquisition stages. The services cover first-time automation, distributed processing, and conversion and migration scenarios.

TRAINING: Bull HN offers users both on-site training and classroom instruction. Bull HN assists DPS 6 Plus users in structuring training programs that address their organizations' needs. Entry-level and operations training are offered, along with training in programming, transaction processing, database management, and networking.

EQUIPMENT PRICES

		Purchase Price ($)	Annual Maint. ($)
COMPUTER SYSTEMS			
—	DPS 6 Plus Series 210 with 32-bit CPU, CIM, and VMMU; 2MB memory; SMF; 650KB diskette drive; 37MB fixed disk; streaming tape drive; six asynchronous ports; and cabinet. Includes HVS 6 Plus operating system.	17,000	—
—	DPS 6 Plus Series 220 with 32-bit CPU, CIM, and VMMU; 4MB memory; SMF; 650KB diskette drive; fixed disk; streaming tape drive; six asynchronous ports; and cabinet. Includes HVS 6 Plus operating system.	25,000	—
CPX9900	DPS 6 Plus Model 400 with 32-bit CPU, cache, and VMMU; 2MB memory; SMF; Universal Peripheral Controller with 5¼" diskette adapter/device, MLX-16,and four RS-422-A ports; 8-slot cabinet. Includes HVS 6 Plus operating system.	33,000	2,400
CPX9910	DPS 6 Plus Series 410 with 32-bit CPU, cache, and VMMU; 4MB memory; SMF; Universal Peripheral Controller with 5¼" diskette adapter/device, MLX-16, and four RS-422-A ports; 16-slot cabinet. Includes HVS 6 Plus operating system	57,000	4,200
CPX9920	DPS 6 Plus Series 420 with 32-bit CPU, cache, and VMMU; 8MB memory; SMF; Universal Peripheral Controller with 5¼" diskette adapter/device, MLX-16, and four RS-422-A ports; 32-slot cabinet. Includes HVS 6 Plus operating system.	93,000	5,100
CABINET EXPANSIONS			
CAB9901	Expansion of 16-slot Model 410 to 32 slots (field installed)	26,000	100
CAB9903	Expansion of 16-slot Model 410 to 32 slots (factory installed)	24,000	100
CPK9911	Expansion of 8-slot Series 400 to 16 slots	20,000	850
PROCESSOR UPGRADES			
CPK9901	Mono-processor to dual-processor booster pac (factory installed)	25,000	1,100
CPK9902	Mono-processor to quad-processor booster pac (factory installed)	75,000	2,900
CPK9904	Mono-processor to dual-processor booster pac (field installed)	30,000	1,100
CPK9905	Mono-processor to quad-processor booster pac (field installed)	90,000	2,900
CPK9906	Dual-processor to quad-processor booster pac (field installed)	60,000	1,800
MEMORY UPGRADES			
CMM9901	4MB to 8MB for Model 410	14,000	800
CMM9902	8MB to 12MB or 12MB to 16MB memory expansion	14,000	800
CMM9903	8MB to 16MB memory expansion	25,600	1,600
CMM9904	12MB expansion from 4MB to 16MB for Model 410	38,400	2,400
CMC9907	8MB expansion (includes controllers) from 16MB to 24MB; 32MB to 40MB; 48MB to 56MB	25,600	1,600
CMM9908	8MB expansion from 24MB to 32MB; 40MB to 48MB; 56MB to 64MB	25,600	1,600
CMC9909	16MB expansion (includes controllers) from 16MB to 32MB; 32MB to 48MB; 48MB to 64MB	48,000	3,200

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PERIPHERAL CONTROLLERS/ADAPTERS			
MSC9901	MXC-32F Controller with four ports for fixed disks (132, 413, and 295 megabytes	5,000	250
MSC9903	MXC-32R Controller with four ports for SMD/CMD	7,000	300
MSC9904	MXC-16F Controller with two ports for 142MB disks	3,000	150
UPC9901	Universal Peripheral Controller with four positions	2,000	150
MTM9901	GCR/PE ½" Magnetic Tape Adapter for UPC with four ports (uses two UPC positions)	2,000	150
MTM9902	¼" Cartridge Tape Adapter for UPC with one port	700	70
PRM9901	300- or 600-lpm Printer Adapter for UPC with one port	550	70
PRM9902	900- or 1,200-lpm Printer Adapter for UPC with one port (uses two UPC positions)	1,000	140
MASS STORAGE			
MSU9901	132MB Fixed Disk in cabinet	14,500	600
MSU9902	Second or third 132MB Fixed Disk (no cabinet)	12,000	600
MSU9911	413MB Fixed Disk in cabinet	21,000	1,000
MSU9912	Second or third 413MB Fixed Disk (no cabinet)	18,500	1,000
MSU9931	295MB Fixed Disk in cabinet	13,000	750
MSU9932	Second, third, or fourth 295MB Fixed Disk (no cabinet)	11,000	750
MSU9941	142MB Fixed Disk in cabinet	8,500	550
MSU9942	Second and fourth 142MB Fixed Disk	7,000	550
MSU9943	Third 142MB Fixed Disk	7,000	550
MAGNETIC TAPE EQUIPMENT			
MTU9901	¼" 64MB Integrated Cartridge Tape Unit	2,700	300
MTU9921	GCR/PE, 6250, 25/75 ips, 1600 bpi Tape Unit (primary unit)	17,900	1,350
MTU9922	GCR/PE, 6250, 25/75 ips, 1600 bpi Tape Unit (add-on unit)	17,900	1,350
PRINTERS			
PRU7070	Model 10, 80 col., 100 cps	995	222
PRU7075	Model 30, 132 col., 100 cps	1,495	278
PRU7170	Model 32, 132 col., 150 cps	1,795	335
PRU7175	Model 34, 132 col., 200/45 cps	2,450	375
PRU7270	Model 38, 132 col., 400 cps	3,095	450
PRU7200	Model 25, 96 character set, 13.2-inch print line, 55 cps	3,350	450
PRU7210	Model 24, 130 character set, 13.2-inch print line, 50 cps	3,350	450
PRU7220	Model 26, 130 character set, 19.6-inch print line, 50 cps	4,550	550
PRU7230	Model 27, 96 character set, 13.2-inch print line, 80 cps	4,550	550
PRU9901	300-lpm, 132-col., 64-character Band Printer	11,500	1,280
PRU9902	600-lpm, 132-col., 64-character Band Printer	14,450	1,890
PRU9903	900-lpm, 136-col., 64-character Belt Printer	26,000	2,150
PRU9904	1,200-lpm, 136-col., 64-character Belt Printer	33,000	2,900
PRK9905	900-to-1,200 lpm field upgrade for PRU9903	8,600	750
PRU7262	Model 80 Laser Printer	3,600	650
DISPLAY TERMINALS AND KEYBOARDS			
HDS7302	Display Station Model 2/HDS 2—includes VDC 7302 control unit, VKU0002 standard keyboard unit, VMU0002 monitor unit—green phosphor RS-232-C/RS-422-A interface (communications cable not included)	1,295	110
HDS7304	Display Station Model 2/HDS 2—includes VDC 7302 control unit, VKU0002 standard keyboard unit, VMU0004 monitor unit, amber phosphor RS-232-C/ RS-422-A interface (communications cable not included)	1,295	110
VIP7201	Asynchronous, multipurpose Keyboard Display Terminal	795	200
VIP7813	Asynchronous, 12" Keyboard Display Terminal with Low Profile Multifunctional keyboard, 72-line scroll feature, buffered printer adapter, 25-foot RS-232-C cable	2,350	250
VIP7814	Synchronous/asynchronous, High Profile Keyboard, 12" CRT, 1,920-character display positions, keyboard with 25-foot RS-232-C communications cable	2,700	250
VIP7815	Synchronous/asynchronous, High Profile Keyboard, Display Terminal with 15" CRT green phosphor, 72-line scroll feature, and buffered printer adapter	3,095	295
VIP7816	Synchronous/asynchronous Multiple Mode Terminal with 12" CRT green phosphor, High Profile Keyboard, 25-foot RS-232-C cable	2,800	250
VIP7817	Synchronous/asynchronous Multiple Mode Terminal with 15" CRT green phosphor, High Profile Keyboard	3,350	295
VIP7823	Asynchronous Keyboard Display Terminal with 12" Monitor and Low Profile Multifunctional Keyboard, includes a 72-line scroll feature and buffered print adapter	2,350	250
VIP7824	Synchronous/asynchronous, Low Profile Multifunctional Keyboard, 12" CRT, 1,920-character display positions	2,700	250
VIP7825	Synchronous/asynchronous, Low Profile Multifunctional Keyboard, 15" CRT green phosphor, 72-line scroll feature, and buffered printer adapters	3,095	295
VIP7826	Synchronous/asynchronous Multiple Mode Terminal with 12" CRT green phosphor, Low Profile Multifunctional Keyboard	2,800	250
VIP7826	Synchronous/asynchronous Multiple Mode Terminal with 15" CRT green phosphor, Low Profile Multifunctional Keyboard	3,350	295

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		Purchase Price ($)	Annual Maint. ($)
COMMUNICATIONS			
MLC9901	MLX-16 Communications Processor with four positions	2,700	145
DCM9901	Integrated RS-422-A MLX-16 Adapter with four ports	1,500	130
DCM9902	Integrated RS-232-C MLX-16 Adapter with four ports	1,500	130
DCM9303	Integrated HDLC medium-speed (to 19.2K bps), RS-232-C, MLX-16 Adapter with two ports	3,000	200
DCM9909	HDLC/SDLC/synchronous Adapter	2,200	145
DCM9910	Synchronous/asynchronous MLX-16 Adapter with four ports	1,000	70
DCC9920	Adapter with 1 HDLC/SDLC port, RS-232-C up to 19.2K bps, with cable	2,200	161
DCC9921	Adapter with 1 HDLC/SDLC port, RS-422-A up to 19.2K bps, with cable	2,200	161
DCC9922	Adapter—broadband, SDLC/HDLC, Mil-188C, up to 100K bps, with cable	2,375	161
DCC9923	Adapter—broadband, synchronous, Mil-188C, up to 100K bps, with cable	2,375	161
DCC9924	Adapter—broadband, synchronous, V.35 (DDS), up to 100K bps, with cable	2,375	161
DCC9925	Adapter—broadband, SDLC/HDLC, V.35 (DDS), up to 100K bps, with cable	2,375	161
DCC9926	Adapter—broadband, synchronous, 301/303, up to 100K bps, with cable	2,375	161
DCC9927	Adapter—broadband, SDLC/HDLC 301/303, up to 100K bps, with cable	2,375	161
DCC9928	Adapter—RS-422-A broadband LIU, up to 100K bps, with cable	2,375	161
DCC9929	Adapter—HDLC RS-422-A broadband LIU, up to 100K bps, with cable	2,375	161
DCC9930	Adapter—HDLC X.21 LIU, 100K bps, with cable	2,375	161

SOFTWARE PRICES

		Annual License Fee		Annual Support Fee	
		Primary ($)	Secondary ($)	Primary ($)	Secondary ($)
SOFTWARE					
SHS2052M-100	HVS 6 Plus Operating System	NSC	NSC	2,860	3,640
SHE1022M-20T	ONE Plus Integrated Office System, includes ONExchange, ONEmail (DSA), ONEtime, ONEtext	4,665	3,500	NSC	2,555
SHE1032M-200	ONE Plus Office Exchange System, includes ONExchange, ONEmail (DSA)	1,715	1,285	NSC	770
SHH1332M-20T	ONEtext Document Processing	2,850	2,140	NSC	1,095
SHH1342M-200	ONEtext Plus Advanced Document Processing	605	455	NSC	230
SHH1382M-200	ONEcalc Electronic Spreadsheet	1,100	825	NSC	420
SHH1372M-200	ONEdocument Compound Document	530	400	NSC	205
SHD1412M-200	ONElist List Processing	980	735	NSC	375
SHH1322M-200	ONEtime Time Management	1,805	1,355	NSC	690
SHH1312M-200	ONExchange Document Library Facility	1,310	980	NSC	500
SHD1452M-200	ONEbase Departmental Information Base, includes ONEbase Extraction Toolkit, ONEbase View Building Toolkit, ONEbase Data Translator	3,135	2,355	NSC	1,600
SHD1422M-200	ONEbase Data Extraction Toolkit	2,350	1,765	NSC	900
SHD1432M-200	ONEbase View Building Toolkit	1,570	1,180	NSC	600
SHD1442M-200	ONEbase Data Translator	265	200	NSC	100
SHC3052M-200	ONEdial Asynchronous Communications	1,310	985	NSC	500
SHU1882M-900	ONEmail Electronic Mail for DSA	710	535	NSC	270
SHU1932M-200	ONElink DISOSS Services	3,395	2,550	NSC	1,440
SHU1902M-200	ONEmail Electronic Mail for RNP network	710	535	NSC	270
SHU1922M-200	Document Transfer Facility	265	200	NSC	100
SHH9502M-10T	Graph6 Executive	575	430	70	115
SHH9512M-10T	Graph6 Interactive Facility	865	650	105	175
SHH9522M-10T	Graph6 Application Development Facility	2,170	1,630	260	435
SHL1332M-200	Advanced Cobol	3,895	2,920	NSC	480
SHL1652M-200	Multiuser Cobol	3,895	2,920	NSC	480
SHL1272M-200	Advanced Fortran	2,635	1,980	NSC	480
SHL1312M-200	Basic Interpreter/Compiler	1,380	1,035	NSC	530
SHL1412M-200	Advanced Assembler	1,025	770	NSC	700
SHL9502M-200	Pascal	6,380	4,785	770	700
SHL9622M-200	C Compiler	2,500	1,875	300	500
SHL1612M-10T	Portable C Compiler	4,000	3,000	480	800
SHL9632M-10T	Ada Compiler System	24,500	18,375	2,940	1,200
SHC1492M-200	Data Entry Facility II (DEF-II)	1,210	910	NSC	465
STS1902M-200	TPS 6 Transaction Processing System	4,230	3,175	NSC	1,620
STS1912M-200	TPS 6 Screenwrite	1,565	1,175	NSC	600
STS1922M-200	TPS 6 Cobol Run-time Library	380	285	NSC	145
STS1942M-200	TPS 6 Query/Report Writer	2,320	1,740	NSC	890
SHC2112M-200	TPS 6 Distributed Processing Facility	290	220	NSC	110

NA—Not applicable.
NSC—No separate charge.

Bull HN Information Systems, Inc.
DPS 6 Plus

		Annual License Fee		Annual Support Fee	
		Primary ($)	Secondary ($)	Primary ($)	Secondary ($)
SOFTWARE (Continued)					
SHS1202M-200	Transaction Control Language Facility	310	230	NSC	120
SHD1142M-200	Data Management 6 Transaction Processor	3,975	2,980	NSC	1,525
SHD1152M-200	DM6 TP Run-time Service	2,500	1,875	NSC	960
SHD1162M-200	DM6 I-D-S/II (includes Run-time Service)	6,035	4,525	NSC	2,310
SHD1172M-200	DM6 I-D-S/II Run-time Service	3,260	2,445	NSC	1,250
SHD1242M-200	DM6 Distributed Transaction Processing Facility	380	285	NSC	145
SHD9812M-10T	DM6 AZ7 Query/Report Writer	7,000	5,250	840	1,400
SHD9292M-10T	Oracle	21,025	15,770	2,525	4,205
SHD9282M-10T	Oracle Program Development Facility	9,800	7,350	1,180	1,960
SHD9302M-100	Oracle I-D-S/II Load Facility	2,175	1,635	265	435
SHD9312M-10T	Total Central	15,000	NA	1,800	3,000
SHD9322M-10T	Total Central Upgrade from Total 6	3,000	NA	1,800	3,000
SHD9212M-10T	Info Release 9.2	12,500	9,375	1,500	2,500
SHD9222M-10T	Info Upgrade from Info 6	7,500	5,625	1,500	2,500
SHP9802M-10T	System-80 Cobol Program Generator	9,500	7,125	1,140	1,900
SHD9372M-10T	Pro-IV Development System	16,000	12,000	1,920	3,200
SHD9382M-10T	Pro-IV Execution System	2,175	1,635	265	435
SHC2542M-200	DSA6 (includes DSA-TF, DSA-NTM, DSA-UFT, DSA-RFF, DSA-RBF, DSA-AIF)	3,015	2,260	NSC	1,710
SHC2462M-200	DSA Transport Facility (DSA-TF)	1,290	965	NSC	495
SHC2472M-200	DSA Network Terminal Manager (DSA-NTM)	380	285	NSC	145
SHC2482M-200	DSA Unified File Transfer Facility (DSA-UFT)	760	570	NSC	290
SHC2492M-200	DSA Remote File Facility (DSA-RFF)	760	570	NSC	290
SHC2312M-200	DSA Remote Batch Facility (DSA-RBF)	760	570	NSC	290
SHC2332M-200	DSA Application Interface Facility (DSA-AIF)	525	395	NSC	200
SHC2512M-200	DSA/6 Entry (DSA/E) (includes DSA-TF without X.25, DSA-NTM, DSA-RFF, DSA-RBF, DSA-AIF)	1,895	1,420	NSC	875
SHC2532M-200	DSA/6 Upgrade to DSA/6	1,125	845	NSC	1,710
SHC2502M-200	DSA Network Administrator Facility (DSA-NAF)	380	285	NSC	145
SHC3022M-200	DSA Network Control Facility (DSA-NCF)	1,780	1,335	NSC	680
SHF1142M-200	Remote File Access—DSA	95	75	NSC	40
SHC2342M-200	Terminal Presentation Facility	575	430	NSC	220
SHC3062M-200	LACS Control Executive (LACS-CE)	370	280	NSC	140
SHC3072M-200	LACS Ethernet Driver (LACS-ED)	165	125	NSC	60
SHC1112M-200	Bull HN COMM/FTF	520	390	NSC	200
SHC1282M-200	Remote Batch Facility (Level 64)	1,040	780	NSC	400
SHC2932M-200	PVE Communications Upgrade to DSA6/E	1,100	825	NSC	875
SHC2602M-200	RNP6 (includes LHDLC, RFF, RBF II, RCF, ATI)	3,730	2,800	NSC	1,795
SHC2612M-200	LHDLC Basic Software	1,040	780	NSC	400
SHC2622M-200	Remote File Facility (RFF)	910	680	NSC	350
SHC2632M-200	Remote Batch Facility II (RBF II)	1,125	850	NSC	430
SHC2642M-200	Remote Concentration Facility (RCF)	910	680	NSC	350
SHC2652M-200	Application Transport Interface (ATI)	695	520	NSC	265
SHC1012M-200	BSC6 (includes BSC-TF, BSC-WF, BSC-MF, BSC-PF)	1,840	1,380	NSC	705
SHC1092M-200	BSC Transport Facility (BSC-TF)	550	410	NSC	210
SHC1222M-200	2780/3780 Workstation Facility (BSC-WF)	880	660	NSC	340
SHC1262M-200	Hasp Multileaving Facility (BSC-MF)	880	660	NSC	340
SHC1242M-200	Programmable Facility/3271 (BSC-PF)	1,025	770	NSC	395
SHC2832M-200	IBM 3270 Terminal Facility	230	170	NSC	90
SHC2252M-200	SNA6 (includes SNA-TF, SNA-ITF, SNA-RBF, SNA-FTF-6, SNA-AIF, SNA-ROF-6)	2,845	2,135	NSC	1,595
SHC1922M-200	SNA Transport Facility (SNA-TF)	810	605	NSC	310
SHC1942M-200	SNA Interactive Terminal Facility (SNA-ITF)	1,025	770	NSC	395
SHC1962M-200	SNA Remote Job Entry (SNA-RJE)	1,065	800	NSC	410
SHC2822M-200	SNA Application Interface Facility (SNA-AIF)	525	395	NSC	200
SHC2942M-200	SNA Remote Operator Facility-6 (SNA-ROF-6)	210	160	NSC	80
SHC2262M-200	SNA File Transmission Facility-6 (SNA-FTF-6)	525	395	NSC	200
SHC2912M-200	SNA Host Package (includes SNA-FTF-H, SNA-ROF)	3,240	NA	NSC	1,200
SHC1902M-200	SNA File Transmission Facility Host (SNA-FTF-H)	2,460	NA	NSC	915
SHC2922M-200	SNA Remote Operator Facility (SNA-ROF)	1,355	NA	NSC	505
SHC2842M-200	Gateway 6 (GW6) (includes GW-PSF, GWIF-DSA, GWIF-SNA)	2,615	1,960	NSC	1,435
SHC2852M-200	Gateway Presentation Service Facility (GW-PSF)	660	195	NSC	255
SHC2862M-200	Gateway Interface Facility—DSA (GWIF-DSA)	1,180	885	NSC	455
SHC2952M-200	Gateway Interface Facility—SNA (GWIF-SNA)	1,895	1,420	NSC	725
SNC2182M-200	SNA/DSA Gateway Interface Facility—Host (GWIF-HOST)	1,515	NA	NSC	580

NA—Not applicable.
NSC—No separate charge. ■