Honeywell

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Honeywell

SERIES 60

LEVEL 68/DISTRIBUTED PROCESSING SYSTEM

POCKET GUIDE

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SERIES 60 (LEVEL 68/DPS)

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INTRODUCTION

Level 68/Distributed Processing System and the Multics operating system. . .

Proven.
Reliable.
State-of-the-art.
Available today.

Level 68/DPS with the Multics operating system has evolved into one of the most advanced general purpose data processing systems commercially available. Level 68/DPS addresses the functionality, reliability, availability, and system growth requirements of distributed processing users, exceeds most competitive offerings in configurability and ease of use, and embodies many features that may not be available on other systems for years.

The Multics operating system makes Level 68/DPS a truly unique large-scale system. Multics is interactive, conversational, service-oriented, and easy to use. Thus, the user benefits from powerful large-scale processing capabilities of Level 68/DPS without being restricted by the complexities of the system.

SERVICES OFFERED

Level 68/DPS offers processing features to help users with a variety of needs. These services are:

- Batch processing
- Remote job entry
- Transaction processing
- Time sharing
- Data base management
- Graphics
- Word processing
- Networking
- Conversational processing

USER INTERFACE

Level 68/DPS provides a single, consistent, uniform user interface for all processing modes. On most other computer systems, if programmers learn how to use batch processing they still have to learn how to use a separate and totally different interface for time sharing. Furthermore, in other systems, these incompatible interfaces impose severe restrictions on the transferability and accessibility of programs between environments or even between terminals.

Level 68/DPS sweeps away such restrictions and allows complete accessibility and uniformity among users of batch, time sharing, remote job entry, and transaction processing. A program written in an interactive environment will run in batch *without conversion or modification.* The same is true of batch jobs; they can run interactively without change. All features are accessible using a system-wide standard interface, and any terminal attached to the system can, unless specifically restricted, access any program or feature.

At a typical site, you might find 15 batch, 5 remote job entry, 3 transaction processing, and 40 time sharing users simultaneously using *a single copy* of the COBOL compiler. The same is true for the entire operating system, system libraries, and user programs and data.

The consistency of Level 68/DPS goes beyond total accessibility of functions. Implicit also is total compatibility. Programmers can develop applications with modules written in various languages, as suits their needs. Electing to use any Level 68/DPS feature doesn't prohibit a user from employing any other feature.

VIRTUAL MEMORY

The Level 68/DPS virtual memory implementation is invisible to users and user programs. Programmers

need not worry about the constraints of real main memory or other users' requirements. This flexibility allows the programmer to concentrate on the problem at hand rather than upon such questions as memory management and overlays. In addition, I/O is simplified, since the user need not be concerned with physical location of a file or other controlling attributes in order to access it.

One of the problems other virtual memory implementations have suffered is that of "thrashing" — excessive paging I/O caused by multiple users contending for main memory resources. Level 68/DPS has metering and tuning tools that prevent thrashing from impairing system throughput. This feature lets the user enjoy all of the productivity advantages of a comprehensive virtual memory environment without suffering many of the disadvantages inherent in other virtual memory systems.

SHARING

Level 68/DPS provides the user community with the ability to share not only the Multics operating system software and libraries, but all user code and data as well. In fact, all data that resides within the 68/DPS storage system can be shared, at the discretion of its owner. Since all its language processors generate only reentrant code, even application programs can be shared without any special programming. The result is significant economy in program development.

BATCH PROCESSING

In addition to interactive loads, Level 68/DPS supports batch processing in a variety of forms: local, remote, and GCOS mode (see "GCOS Encapsulation"). Interactive users can submit batch jobs for execution; batch jobs can also initiate other batch jobs. The status of a batch job may be ascertained from a terminal and its output can be directed to

various peripheral devices, such as printers, punches, tapes, terminals or files residing within the Multics storage system. A single, uniform interface allows jobs written for the batch environment to also be run interactively without change.

REMOTE JOB ENTRY DEVICES

Level 68/DPS supports several different remote job entry devices. These include Honeywell's Model G-115, the RNP 702, and several Level 6 minicomputer models as well as Mohawk Data Sciences 2400 and the DATA 100 Model 78.

TIME SHARING

Full time sharing capabilities are available on native mode, interactive Level 68/DPS. In addition, two systems are available to provide time sharing environments for BASIC and FORTRAN programming. These systems are limited in function, easy to learn, and require fewer resources to support each user. Among these three modes, the user is afforded a choice of interfaces with varying levels of sophistication and power.

TRANSACTION PROCESSING

The Multics operating system provides extremely powerful and flexible transaction processing capabilities. Since Multics itself is oriented directly toward serving the needs of a terminal user, there is no need for a special "executive" program to monitor terminal inputs and then attend to the user's requests in a batch mode. Application programs can be written in any Multics language and directly accessed from any number of terminals (or via batch or remote job entry) simultaneously in a shared mode. No copies of applications or data bases are required. System facilities are provided to allow

concurrent update, access control, journalization, and recovery and to allow interfaces to specialized data bases.

WORD PROCESSING

Level 68/DPS provides an advanced set of word processing facilities that include:

- Powerful text editors
- Document formatting capabilities
- Extensive error-detection tools
- SPEEDTYPE (a shorthand for typists)
- Online data dictionary capabilities
- Easy-to-use document maintenance tools
- A simplified data entry subsystem
- Macro tools for online artwork
- Electronic mail

All Honeywell Level 68/DPS and Multics technical documentation is developed online.

GRAPHICS

A user or application program can create, edit, store, display, and animate graphic material by means of a general purpose interface. The features of the 68/DPS Graphics System include:

- A high degree of terminal independence
- Definition of structured graphic objects for use in higher level objects
- Powerful editing facilities
- Permanent storage capabilities
- Shared subobjects and structures
- Dynamic animation
- Local editing
- Incremental picture update

DATA BASE MANAGEMENT

Level 68/DPS provides a comprehensive, and powerful data base management system, the Multics Data Base Manager. MDBM provides two interfaces: Multics Integrated Data Store (MIDS) and Multics Relational Data Store (MRDS). MIDS, a subset of Integrated Data Store/II (I-D-S/II), complies with the CODASYL DBTG standard. MRDS is a fully implemented relational data base. Both interfaces allow:

- Complex file organizations
- Easy record retrieval
- Interactive or batch usage simultaneously
- Usage from any 68/DPS language processor (COBOL, PL/I, FORTRAN, etc.)
- Independence of data structures and application programs
- Sharing and concurrent access

PROGRAM DEVELOPMENT

Level 68/DPS is an effective software development vehicle for a number of reasons:

- It supports multiple programming languages:
  - All of which can be executed interactively or from batch
  - All of which are shared
  - All of which generate reentrant code by default
  - All of which are compatible with each other
- It provides a number of interactive source-level debugging tools, subroutine tracers, and stack interrogation tools.

- It allows the option of prelinking or dynamic linking to subroutines.
- It provides an outstanding set of system commands and subroutines, including a highly flexible I/O system.
- It provides a virtual memory environment that is one of the industry's most comprehensive.

Additionally, since language processors are compatible, programmers can write applications in a modular fashion, choosing the best language to suit the needs of each module.

LANGUAGE PROCESSORS

A number of key language processors available with Level 68/DPS are listed below.

PL/I	COBOL-74	FORTRAN
BASIC	APL	ALM (Assembler)
JOVIAL	ALGOL	GMAP
LISP	COBOL-68	FORTRAN-Y

WORD PROCESSING

WORDPRO

- A subsystem that facilitates the online preparation and maintenance of documents. Includes text editors, formatters, and various other tools.

DATA MANAGEMENT

MDBM

- The Multics Data Base Manager, which includes two user interfaces to allow the establishment and maintenance of either network or relational data bases.

JANUS

- A relational data base manager developed as part of the Consistent System.

Consistent System
- A set of data base utility tools usable with JANUS to provide comprehensive end user facilities.

GRAPHICS Package
- A comprehensive graphics package.

FAST/DFAST
- Limited service subsystem designed to provide a simple, easy-to-use time sharing environment for users with limited needs. DFAST mimics the Dartmouth Time Sharing System (DTSS) while FAST more closely conforms to native Level 68/DPS itself.

OLDES
- Online Data Entry System. A generalized data entry subsystem with formatted screen (frame) processing capabilities. Table-driven, it allows usage of site-selected terminals and site-specified forms.

ADMINISTRATIVE CONTROLS

One of the most significant strengths of Level 68/DPS is its ability to provide simultaneous service to a wide variety of users, each with diverse data processing needs. This is accomplished via a comprehensive set of administrative tools, including:

- A flexible, dynamic priority scheduler
- Guaranteed minimum CPU resources for each user group
- Interactive metering and tuning tools
- Dynamic system reconfigurability
- Project and user resource quotas
- User environment shaping facilities
- Flexible, interactive accounting and billing tools

EASE OF OPERATION

Level 68/DPS is designed to be run as a service. It provides the customer with a number of tools and

new approaches to operations which aid in the delivery of utility grade service. Some of the key operational features include:

- No system or library generation or edit
- Patch-free release software
- Source code for operating system (95% written in PL/I) delivered with object
- Online software updates (no shutdown)
- Unattended operation
- Dynamic reconfiguration
- Automatic reboot after failures
- Fail-safe configurability
- Online test and diagnostics
- Error Detection and Correction (EDAC) in main memory and disk subsystems
- Automatic file backup
- Online administration

DATA SECURITY

According to the conclusions of a 1975 United States Air Force Security study conducted by MITRE, the Multics operating system and the system's hardware architecture comprise the most secure data processing system commercially available. It is the only system where data security was a primary design consideration, and the only system where all security features are implemented in both software and hardware. Security features include:

- Passwords at user log-in
- Access permission lists for all program and data
- Ring protection mechanism (an extension of the master-slave, two-state machine concept to eight states of execution)
- Clearance/need-to-know controls
- User device access control

The real strengths of these security tools are that they are (1) uniformly applied to all users and system

functions and (2) usable (via a simple command interface) by programmers to provide comprehensive security for their own programs and data.

RELATION TO LEVEL 66/DPS GCOS

Honeywell's Level 68/DPS and Level 66/DPS share common hardware with the exception of the CPU itself. The Level 68/DPS CPU is a superset of the Level 66/DPS processor and has a switch that allows it to be run as a Level 66/DPS (GCOS) configuration. This provides added degrees of flexibility, compatibility, and backup to a site that has both GCOS and 68/DPS systems.

GCOS ENCAPSULATION

Honeywell provides a special subsystem called the GCOS Encapsulation that allows GCOS job decks or IMCVs (Input Media Conversions) to be run without change under the Multics operating system. Tools are provided to allow the transfer of GCOS files to 68/DPS (and vice versa) via GCOS standard tapes. In addition, this encapsulation allows the execution of certain GCOS language processors, including JOVIAL, ALGOL-68, COBOL-68, and FORTRAN-Y.

HARDWARE

Like all Honeywell systems, the Level 68/DPS hardware architecture provides the benefits of modularity: easy, stepwise growth with no need for swapouts to upgrade to higher performance. Hardware upgrades can be made without changes to the operating system, system libraries, or user code.

The Level 68/Distributed Processing System consists of a base system to which performance modules can be added in incremental steps. This easy expansion allows a user to configure the exact system needed and protect equipment investment.

SAMPLE CONFIGURATIONS

ENTRY-LEVEL CONFIGURATION

Level 68/DPS performance Level 1
1 System Control Unit with 512K words of memory
1 Input/Output Multiplexer (IOM)
1 Integrated Network Processor
4 MTU0500 Magnetic Tape Units

LARGE CONFIGURATION

Level 68/DPS with performance 4.3 times entry-level system
8 System Control Units with a total of 4 million words of memory
2 Input/Output Multiplexers
4 Integrated Network Processors
32 MSU0402/0451 or MSU0500 Mass Storage Units per subsystem
16 MTU0600 Magnetic Tape Units per subsystem

COMMUNICATIONS TERMINALS

Level 68/DPS supports a wide array of different terminal types. The tables used to determine the character set used by a terminal as well as its various physical characteristics (such as line length, delay timings) can be set by user programs; accordingly, any terminal obeying a standard line discipline can be used on 68/DPS. The following is a partial list of terminals that have been connected:

Honeywell VIP 7705 Keyboard Display Station
Teletype Models 33, 35, 37, 38, 40
IBM 3270[1] Information Display System
IBM 2741 Communications Terminal
(EBCDIC or Correspondence)
IBM 1050 Data Communications System
(EBCDIC or Correspondence)

[1] Additional 3270-compatible devices are also supported on Level 68/DPS using binary synchronous line control.

Trendata Models 1000 and 4000
Datel 30
Dura 1021
GE TermiNet 300 and 1200 printers
Execuport 310
Texas Instruments Silent 700 Series
Adage Inc. Advanced Remote Display Station
IMLAC PDS-1D Graphic Display Computer
Tektronix Models 4002, 4012, 3013, 4014, 4015, 4023, etc.
DIGI-Log Telecomputer 109
Data Products Porta Com
Computer Devices Inc. Teleterm 1030 and Miniterm Series
Teleray 3700
DEC GT40 Display Processor, DECwriter II, DECwriter LA36 (ASCII)
DEC Graphics Models 12, 15
Hazeltine 2000 (ASCII)
Delta Data Systems
Xerox 1700 (Diablo printer with plotting capability)
Data 100 Model 78 (Honeywell Model G-115 or IBM 2780 Emulation Mode)
Anderson-Jacobsen Model AJ841 Selectronic Terminal (IBM 2741-line) and Model AJ630 (ASCII)
Gen Com Systems GSI-300 Universal Data Terminal (ASCII)
Lear Siegler ADM-2 Display Terminal
ADDS Consul Model 980
DTC300 Series
Bedford 575 (SelecTerm)
Infoton Vistar/II
BeeHive Super Bee

LEVEL 6 RELATIONSHIP

The operating system and system libraries for the Honeywell Level 6 minicomputers are developed online on Level 68/DPS via a "software factory" environment. In addition to these Level 6 software

tools, 68/DPS can communicate with the Level 6 in a concentration or remote job entry mode. This natural software relationship makes Level 6 to Level 68/DPS networks much easier to implement. Customers can utilize the software development capabilities of Level 68/DPS to program their Level 6 systems and then use Multics as a centralized resource in a distributed network.

DISTRIBUTED NETWORKS

Level 68/DPS can also be used to establish a network of distributed mainframe systems. Using off-the-shelf hardware and software, Honeywell can interconnect 68/DPS to other existing vendor machines. This allows users of one machine to transmit files, programs, and data to any other on the network. In addition, the user of one machine can access the unique capabilities of any other machine via the same network. For example, a programmer can log into an IBM System/370-158, have the network transmit some data from a CDC-7600 to a 68/DPS system, and then interactively process that data using 68/DPS facilities.

Interfaces currently exist for a wide array of different machines and operating systems within many vendors' lines including:

IBM System/360, System/370 Series
Burroughs 4700, 6700 Series
CDC Cyber Series
DEC PDP-8, 9, 10, 11 Series
UNIVAC 1100, 90 Series

A complete list is available from Honeywell's Large Systems Product Marketing.

CUSTOMER CROSS SECTION

The following are some selected examples of how Level 68/DPS is being used today.

ACADEMIC

A large university uses 68/DPS for all administrative and academic processing.

SERVICE BUREAU

A dedicated transaction processing service uses Level 68/DPS for scheduling advertising slots for various companies involved with mass communications.

MANUFACTURING

A multinational transportation manufacturer uses Level 68/DPS for corporate-wide financial data services and as a data processing service for R&D groups.

GOVERNMENT

Federal Agency — Technical personnel of a large civil agency uses 68/DPS as a computing tool for administrative and financial work performed in time sharing, transaction processing, and batch modes.

Department of Defense — A service bureau in the Pentagon for the Joint Chiefs of Staff. The 68/DPS system provides a vehicle for strategic studies, as well as for budget work for Congress and the Executive Branch.

MORE INFORMATION

For more information about Level 68/DPS, contact your local Honeywell Marketing Representative or write or call:

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