Introduction

COHERENT is a professional operating system designed for use on machines that can run MS-DOS. It has many of the features and functionality of the UNIX operating system, but is the creation of Mark Williams Company. COHERENT gives your computer multi-tasking, multi-user capabilities without the tremendous overhead, both in hardware and money, required by current editions of UNIX. COHERENT is what UNIX used to be: a well-designed system with selected tools and well-designed utilities that bring out the best in modest computer systems.

The COHERENT system consists of the following:

- A fully multi-tasking, multi-user kernel.
- Choice of Bourne or Korn shells.
- The Mark Williams C compiler, linker, assembler, archiver, and other tools.
- A suite of commands, including editors, languages, tools, and utilities.
- Drivers for peripheral devices, including terminals; ASCII, PostScript, and PCL printers; dumb serial cards; and tape backup.
- Libraries, including the standard C library, the mathematics library, and libraries for **curses** and socket emulation.
- Numerous tools, utilities, and games.

For a list of some third-party programs that you can run under COHERENT, see the release notes that accompany this manual. New programs are released regularly, so consult the Mark Williams Bulletin Board for the latest information.

What Is COHERENT?

COHERENT is a multiuser, multitasking operating system. *Multiuser* means that with COHERENT, more than one person can use your computer at any given time. *Multitasking* means that with COHERENT, any user can run more than one program at any given time. The design of COHERENT employs a few elegant concepts to give you a powerful and flexible system that is easy to use.

What is an Operating System?

An *operating system* is the master program that controls the operation of all other programs. It loads programs into memory, controls their execution, and controls a program's access to peripheral devices, such as printers, modems, and terminals.

Some operating systems (e.g., MS-DOS) permit only one user to use the computer at a time; and that user can run only one program at a time. However, you may well want your computer to support more than one user at a time, and run more than one program simultaneously. Sharing not only yields many economies (such as allowing a group of users to share one printer), but also allows the users to communicate with each other and so work together more efficiently.

Any multitasking operating system must be able to do the following tasks efficiently:

- Schedule computer time
- Control mass-storage devices (disks and tape drives)
- Organize disk-storage space
- Protect programs from conflict
- Protect stored information from destruction
- Ease cooperation among users

Today's operating systems also provide *tools*. These are programs that are bundled with the operating system, and that are designed to help you do your work more efficiently. For example, you need editors, compilers, debuggers, and assemblers to develop and test programs. Text formatters and spelling checkers help you write memoranda, manuals, or books. Command processors (also called *shells*) help you run the computer easily. Status checkers tell you what programs are being run, who is using the system, and how much space is left on your disk.

The combination of operating system and its tools transforms a boxful of wires and circuits into a useful machine.

Design Philosophy

A computer system is not an end in itself; rather, it is a “bench” for constructing tools to solve specific problems. If the operating system is too specialized or limited, the range of problems it can help you solve will be narrow. On the other hand, if the operating system is too detailed, then it becomes complex, idiosyncratic, and potentially unreliable.

The following quotation from John Conway summarizes well the philosophy that underlies the design of the COHERENT system:

> *The engineer who wants a machine for some specific purpose will normally approve the simplest machine that does the job. He will not usually prefer a multiplicity of parts with the same effect, nor will he countenance the insertion of components with no function.*

The COHERENT system follows this approach throughout. In brief, COHERENT is what UNIX used to be: an efficient system of selected tools and well-designed utilities, that brings out the best in your computer system.

Installation

The release notes that come with COHERENT describe how to install COHERENT. The release notes also list hardware that is known to work with COHERENT, and hardware that is known *not* to work with COHERENT. Before you begin to install COHERENT on your system, be sure to check those lists and make sure that your system is compatible with COHERENT.

Please note that Mark Williams Company tries to keep these lists up to date, but it is not possible to keep pace with the continual introduction of new machines and new models. If you do not find your machine on either list, the odds are that COHERENT will work correctly with it.

User Registration and Reaction Report

Before you continue, fill out the User Registration Card that came with your copy of COHERENT. When you return this card, you become eligible for direct telephone support from the Mark Williams Company technical staff, and you will automatically receive information about all new releases and updates.

If you have comments or reactions to the COHERENT software or documentation, please fill out and mail the User Reaction Report included at the end of the manual. We especially wish to know if you found errors in this manual. Mark Williams Company needs your comments to continue to improve COHERENT.

Technical Support

Mark Williams Company provides free technical support to all registered users of COHERENT. If you are experiencing difficulties with COHERENT, outside the area of programming errors, feel free to contact the Mark Williams Technical Support Staff. You can telephone, send electronic mail, or write. Please note that this support is available *only* if you have returned your User Registration Card for COHERENT.

Before you contact Mark Williams Technical Support with your problem, *please check this manual first.* If you do not find an article in the Lexicon that addresses your problem, be sure to check the index at the back of the manual. Often, the information that you want is kept in an article that you didn’t consider, and the index will point you to it.

Another good way to find a topic in the manual is to use the command **apropos**, which is part of the COHERENT system. **apropos** finds every article in the Lexicon that mentions a given term or phrase. For details on how to use this command, see its entry in the Lexicon.

If the manual does not solve your problem — or if you find it to be misleading or difficult to understand — then Mark Williams Technical Support is available to help you. You can reach Technical Support via any number of routes:

Electronic Mail
: If you have access to the Internet, send mail to **support@mwc.com**. This is the preferred means of communication. Be sure to include your surface address and telephone number as well as your e-mail address, so we can contact you even if return electronic mail fails.

FAX Send your technical FAXes to 1-708-291-6750.

Surface Mail
Write to Technical Support, Mark Williams Company, 60 Revere Drive, Northbrook, IL 60062.

Telephone
To contact Technical Support via telephone, call 1-708-291-6700, between 9 AM and 5 PM, Central Time. Please have at hand your manual for COHERENT, as well as your serial number and version number. Please collect as much information as you can concerning your difficulty before you call. If possible, call while you are at your machine, so the technical support person can walk you through your problem.

Help Us Help You

Mark Williams Technical Support wants to help you fix your problem as quickly as possible, so you can enjoy your COHERENT system. You can help us to help you by doing the following:

Before you contact Technical Support, *write down* as carefully as possible what you did that triggered the problem. Copy down exactly any error messages that appeared on the screen.

If the problem is triggered by a script or program, try to edit the script or program to the chunk of code that triggers the problem. The smaller the chunk of code, the better.

In your message, please include the following information:

- The make of your computer, and the type and clock speed of its microprocessor.
- The amount of RAM that you have.
- The size and make of your hard disk, and the make of its controller.
- If the problem affects the video display, include the make of your display (i.e., tube) and controller card.

If you have found an error in the manual, please mention the page on which the error occurs.

This information will help us to to clear up your problem as quickly as possible.

How To Use This Manual

COHERENT encompasses an entire world of computing. Before you learn the signposts of this world, you may find it difficult to perform even simple tasks; and you may feel confusion and frustration.

COHERENT, however, more than anything else, consists of tools; and this manual is one of the most useful tools that your COHERENT system has. It is designed to guide you through the COHERENT system, to answer your questions, and to lead you into areas of the system that may never have explored on your own. If you can learn to use it effectively, you will both lower the amount of frustration you will have to endure, and increase your productivity.

Beginners, in particular, should look over this manual carefully. The following sub-sections describe the steps a beginner should take when she begins to work with this manual.

Elementary Tutorials

The following tutorials teach the essentials of COHERENT: they teach both essential information and essential skills. Every beginner should work through these tutorials:

- First, read the tutorial *Using the COHERENT System*. This tutorial will introduce the COHERENT system and its tools. It also teaches you such important tasks as how to shut the system down properly (hint — *never* just shutting the machine off!) and how to boot it again.
- Then look at the subsequent tutorial, *Introducing sh, the Bourne Shell*. The shell is the program through which you give commands to your COHERENT system; and it incorporates a powerful programming language of its own. Some of this information will seem obscure to you; but the as with any language, the more you use the shell's programming language the more quickly will you acquire fluency.
- You should then look into learning how to use a text editor under COHERENT. You will need to use a text editor in order to write scripts, programs, and documents, which is the heart of using any information-processing tool like COHERENT.

  COHERENT offers two screen-oriented text editors: MicroEMACS, and **vi**. The manual has a tutorial on MicroEMACS. You will find it to be fairly easy to learn how to perform simple text editing with MicroEMACS.

Advanced Tutorials

The above tutorials will teach you the rudiments of how to use COHERENT. The next set of tutorials introduce some of COHERENT's tools and languages. These tutorials are rather specialized. A beginner should look only at the ones that interest her:

Introduction to the ed Line Editor
: **ed** is an editor from the early days of UNIX. It is line oriented, which means that you edit text by typing commands rather than by moving a cursor around the screen. **ed** is powerful and useful tool, but is of limited appeal to most beginners.

Introduction to the sed Stream Editor
: **sed** is another line-oriented editor. However, it differs from **ed** in that it works non-interactively: you write a program in the **sed** language, then filter one or more files through the program. **sed** is very useful if you wish to process large amounts of text quickly and in an automated manner, but is of limited appear to most beginners.

The C Language
: This is a primer on the C language, for persons who have never programmed before. C is the native language of COHERENT and UNIX. If you are interested in learning something about C, you should look at this tutorial.

Introduction to the awk Language
: **awk** is a general-purpose for processing text. With **awk**, you can process both ordinary text and tables; thus, you can quickly implement simple data-base programs and other useful tools. If you are at all interested in processing text or data under COHERENT, you should look at this tutorial.

Introduction to lex, the Lexicon Analyzer
: **lex** is a tool with which you can generate programs to analyze text lexically. You write a set of rules for **lex**, and it generates a program that you can compile and run. **lex** is a very useful tool for programmers who have to perform sophisticated analysis of text. For many beginners, however, it is of limited appeal.

Introduction to yacc
: **yacc** is another tool that with which you can generate programs. It is often used with **lex** to build sophisticated tools, such as compilers. If you are interested in building such tools, or if the problem of parsing text interests you, you will find this tutorial to be helpful.

bc Desk Calculator Language
: **bc** is a language in which you can write programs to perform calculations. The numbers you calculate can be of infinite size and precision (or as infinite as your system's memory allows). You can perform calculations "on the fly," as with a desk calculator; or you can write programs that you store on disk and run repeatedly. If number-crunching interests you, you should find this tutorial helpful.

Introduction to the m4 Macro Processor
: **m4** is a macro processor. A *macro* is a sign or symbol whose interpretation can be deferred until needed. For example, a writer may embed a macro in a letter in place of the name of the person to whom the letter is addressed, and replace the macro with the name only when the letter is printed. This permits her to use the same letter over and over again, with the computer replacing the macro with a different name. Most COHERENT tools can process macros to a limited extent. **m4**, however, will teach you about macro processing, and let you write your own macro-process programs.

The make Programming Discipline
: **make** is a utility that builds things out of other things. This tool is absolutely essential to anyone who writes programs or generates reports.

nroff, The Text-Formatting Language
: **nroff** is a text-formatting language. With it (and its related program **troff**), you can format letters, documents, or even entire books. For example, this manual was formatted with COHERENT **troff**.

UUCP, Remote Communications Utility
: One of the most attractive features of COHERENT or UNIX is its ability to communicate with other computers without needing the assistance of a human operator. UUCP is a set of programs with which you can exchange electronic mail and files with other COHERENT and UNIX systems. With UUCP (and some help from other computer systems) you can even tie into the Internet, and participate in the global computer network that is being expanded every day. This tutorial will introduce you to UUCP, and help you get UUCP up and running on your system.

The Lexicon

The bulk of this manual consists of the Lexicon. This is a set of more than 1,000 articles, arranged in alphabetical order. Each article discusses one aspect of the COHERENT system: a command; a library function; a system file; or a general discussion of a technical topic, such as how to hook up a terminal to your system.

At first glance, the Lexicon looks like a rag-bag of material that is in no particular order. However, this is not true: it actually has a carefully designed internal structure. Once you learn this structure, you can use it both to help you look up a specific item of information quickly, or take a guided tour through some aspect of the COHERENT system that you otherwise might never have explored.

Internally, the Lexicon has a *tree structure*. Just as the roots and branches of a tree grow from a central trunk, dividing and subdividing as they progress, so too the articles of the Lexicon grow from one central article, and divide into ever more detailed discussions as they go along.

The central article is the one called **COHERENT**. It gives an overview of the COHERENT system — its design philosophy, how it relates to other operating systems, and its internal structure. This article introduces (or "branches into") the following three "overview" articles:

Running COHERENT
: This article introduces other articles that describe things you can do with COHERENT: the commands and tools that an ordinary user would use in the course of her daily work.

Programming COHERENT
: This articles introduces other articles that describe how to write programs for COHERENT. These articles describe, among other things, the COHERENT C compiler, and the the libraries and header files included with COHERENT.

Administering COHERENT
: This article introduces articles of interest to perons who administer a COHERENT system. These articles cover such topics as how to set up mail and UUCP on your system; the "magic" files that COHERENT uses to manage itself; and the COHERENT kernel and its device drivers.

For example, consider that you are a programmer who wants to learn if COHERENT has a library function that compares two strings. You would turn first to the article called **COHERENT**, which would point you to the overview article called **Programming COHERENT**. Looking in there, you see a reference to an article on **libraries**. This, in turn, points to the article on **libc**, which is the standard C library. Turning to this article, you find a section on string functions, which has brief summaries of the functions **memcmp()**, **strcmp()**, and **strncmp()**. Each of these, in turn, is described in detail in its own Lexicon entry, which By reading each entry, you can quickly find which function suits your purposes.

As you can see, the overview article briefly summarized the articles that are available on a given topic. If you want details, you can turn to the articles themselves — which you can find easily because all of the articles printed in alphabetical order.

Another approach is to look directly for an article on the subject that interests you. For example, suppose you wanted to learn about COHERENT's mail system. You could open the Lexicon and look for an article called **mail**; and just as you supposed, there it is.

If you're looking for a discussion of a specialized topic that does not have its own article in the Lexicon, look in the Index, which is at the back of the manual. Often, you will find an entry that points to the information you want.

Finally, many users just like to open the Lexicon and leaf through it at random. Often, they discover nooks and crannies within the COHERENT system that they never would have encountered otherwise.

Where To Go From Here

The next step is to install COHERENT if you have not yet done so. Fill out the user registration card at the back of this manual and mail it to Mark Williams Company, so you will become eligible for technical support. If you are new to UNIX or COHERENT, turn to the tutorial *Using the COHERENT System*; otherwise, you may wish to study a specialized tutorial or begin to explore the Lexicon.

We hope that you enjoy using your COHERENT system!