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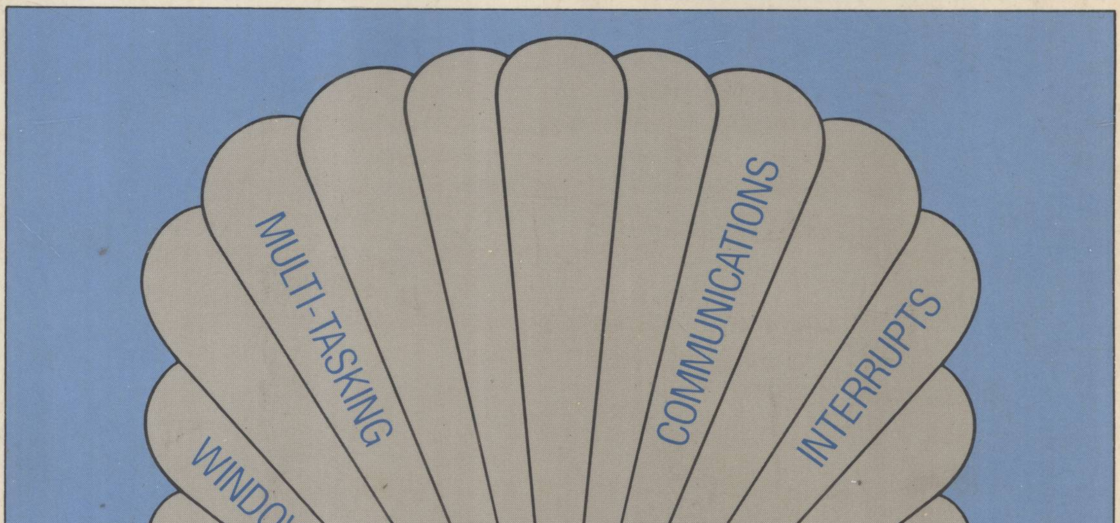

Ted J. Biggerstaff

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Ted J. Biggerstaff

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To my parents, *Harold and Dorothy,*
and my wife, *Christina*.

Preface

The structure of this book is predicated upon several ideas. First, it is easier for people to learn concepts when simultaneously presented with a basic principle and one or more specific examples of that principle. Consider the English student trying to decide whether to use "which" or "that" to introduce a clause modifying a noun. Referring to his dictionary, he finds that "which" is used for nonrestrictive clauses and that "that" is largely confined to restrictive clauses. Now, exactly what does that mean? The dictionary provides examples that clarify the contrast. "A computer language that does not allow pointers is a clumsy language." "The FORTRAN language, which is considered by many to be the first high-level language, was developed at IBM." Ah, yes, now I see. The clause introduced by "that" is necessary to identify the specific computer languages referred to by the subject of the first example sentence. In contrast, the clause introduced by "which" in the second example sentence could be eliminated and the reader would still know exactly what the subject noun phrase is referring to.

Examples provide the student with a structure he can use to derive, test, and adjust his understanding of basic principles. Examples also provide a rich set of implications—albeit quite specific—that are either not derivable from the general principle or are derivable only with great labor. In this book, I will present both the basic principles, and working examples that illustrate the basic principles.

The second idea behind this book is that people learn best by doing. There is a popular aphorism that recognizes the value of doing:

I hear, I forget; I see, I remember; I do, I understand.

But one must perform a fair amount of preparatory work in order to start exper-

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imenting (i.e., "doing") with systems software. If a person is studying simple, standalone algorithms it is easy enough to start from scratch and develop working variations on the algorithms. If, on the other hand, the person is studying systems, there are few small, standalone parts of systems that can be extracted for experimentation. To experiment with systems software, one usually has to implement a fairly large piece of the system before much of anything starts to work in an interesting way. Thus, it is useful to have a starting framework that relieves the experimenter of the rather large task of setting up a structure in which to perform an implementation experiment. Providing such a framework is the second objective of this book. The system software described herein is intended to serve as a starting framework for:

1. Student lab assignments in an operating systems course
2. Ambitious student projects, such as quarter, senior and masters projects
3. Hobby computing projects
4. Serious software engineering developments

It is not a complete system with all of the facilities that one would find in a production system. It is a minimal, working system intended as a base to be modified and extended.

The third idea behind this book is that most current operating systems texts do a good job of presenting the general principles but are less successful at presenting the student with examples that are rich enough to have interesting internal interactions among their parts; that actually run on some real machine and, therefore, can be experimented with; that, in addition to dealing with those systems issues for which simple, elegant theories exist, deal with those scruffy, homely systems issues for which there are no simple, elegant theories; and that, because of the richness of the examples, raise a plethora of design issues and problems that most students do not encounter until they get their first job assignment to develop a complex systems design. This book is targeted to fill this gap and serve as a teaching supplement or lab book for systems courses that require hands-on development of system software, or that would benefit from the study of reasonably rich working examples with documentation.

It also is intended as a case book for the working software practitioner. In that role, it can serve as a source for ideas and software algorithms that are the starting point for real developments, or it can serve as a self-study guide for the software practitioner delving into new systems areas.

The fourth idea behind this book is that it should be complete and stand alone in the knowledge that it presents. That is, it is intended to provide at least the rudiments of the various kinds of knowledge required to develop and understand the examples. This goal requires that it present a broad array of information areas, including the C programming language, operating systems concepts, windowing concepts, communications concepts, the 8086/88 and associated hardware, and the PC-DOS operating system. It presents these various information areas not with the intent of providing a thorough, in-depth treatment, but with the intent of providing sufficient information for the student to be able to understand, modify, and extend the examples presented.

I would like to thank several people who have helped to bring this book about. First, Brian Kernighan caught several bugs and many instances of ugly constructions. Not all ugly constructions managed to get removed, but most of those you don't see are due to Brian! In addition, a number of organizational improvements were due to Brian's suggestions. Second, Jim Fegen provided enthusiasm, encouragement, and suggestions that helped to shape the book. Third, Lisa Schulz and other anonymous copyeditors put some spit and polish on my prose. Finally, my wife tolerated my absence for the long time that these programs and this book required.

Ted J. Biggerstaff

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