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The protection of computer software – its technology and applications

Edited by Derrick Grover

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The Protection of Computer Software— its Technology and Applications

Second edition

Edited by

DERRICK GROVER

Chairman, BCS Technology of Software Protection Specialist Group

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THE BRITISH COMPUTER SOCIETY MONOGRAPHS IN INFORMATICS

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Biographies of the contributors

D. J. Grover
Chapter 1: Review of methods
Derrick Grover became intrigued by the possibilities for the non-legal protection of computer programs during his licensing activities with the National Research Development Corporation (NRDC), now a part of the British Technology Group. As a result he founded the BCS Technology of Software Protection Specialist Group in 1981 and became its chairman. Prior to working with the NRDC he was engaged for 15 years on the research, development and design of electronic and digital systems in industry both in the UK and the USA. He is now a senior executive responsible for the transfer of electronics and information technology between universities and industry. He is a member of the BCS Intellectual Property Rights Committee and is an advisory editor and contributor to a number of journals. He graduated at University College London, is a Fellow of the Institute of Physics and a Fellow of the BCS (C.Phys., C.Eng.).

R. Sather
Chapter 2: Disk protection
Robert Sather is Technical Director of Dark Star Systems, a software house for Apple computers. He devised the 'Snapshot' series of disk-copying products. He was educated at Amherst College (Massachusetts) and Berkeley, California, and spent many years programming mainframes for banks in America and Australia. He is an advocate of consumers' rights in the software protection controversy.

J. G. W. Phipps
Chapter 3: Physical protection devices
John Phipps holds a law degree from Trinity Hall, Cambridge and has been working in the computer industry since 1961. Initially he worked for

LEO computers, which later became English Electric, and later still became part of ICL. From 1970 to 1979 he worked for the Hoskyns Group, initially as a consultant and later as a senior manager for turnkey contracts and microprocessor systems. Since 1979 he has run his own business, acting as a software publisher and independent consultant specialising in arbitration and legal work concerning software protection as well as strategic studies and systems building.

D. W. Davies
Chapter 4: Cryptography
Donald Davies, CBE, FRS, Data Security Consultant, took part in the early development of computers (the ACE Pilot Model) at the National Physical Laboratory (NPL). He proposed the use of *packet switching* for computer networks and gave it that name. He was the Head of the Computer Science Division at NPL from 1966 to 1978. Since 1984 he has been an independent consultant on data security. He has received the BCS Award and the John von Neumann award of the von Neumann Society of Hungary.

G. I. Parkin and B. W. Wichmann
Chapter 5: Intelligent modules
Graeme Parkin graduated at Kings College London with honours in mathematics in 1974 and received his masters degree in 1975. He has worked for five years at NPL on data security aspects, mainly investigating the RSA public key encryption system. He has since worked on a system for the validation of PASCAL programs and is currently involved on the BSI committee for the standardisation of the specification language VDM.
Brian Wichmann, D.Phil, has been at NPL since 1964 where he has worked mainly on programming languages. He was a member of the design team for Ada, being responsible for the numerical support facilities. He founded the Ada-Europe group with support from the Commission of the European Communities. He is a member of the British Computer Society and on the Editorial Board of the *Computer Journal*.

D. J. Grover
Chapter 6: Program identification (*see above*)

M. Samociuk
Chapter 7: Hacking
Martin Samociuk is a director of Network Security Management Limited London, which specialises in the investigation and prevention of com-

puter related fraud. Following his graduation from Nottingham University he worked in Africa, holding various positions with responsibility for production, safety and security. He subsequently worked for Burroughs Machines and for a software house specialising in the products of Digital Equipment Company Limited. Since joining Network in 1981 he has been responsible for the company's computer research and telecommunication activities. He has uncovered many significant frauds, involving technical manipulation of computer systems and software. He is a lecturer and writer, covering the security of operating systems and software.

J. Hruska
Chapter 8: Computer viruses
Jan Hruska was born in Zagreb, Yugoslavia in 1957, the son of Professor Ivan Hruska. He came to England in 1974 when he attended King's School, Canterbury and then Downing College, Cambridge where he graduated in Engineering and Computer Sciences. He did further research in Medical Engineering at Magdalen College, Oxford where he obtained his D.Phil. He initially formed Sophos as a partnership, now a limited company where he is Technical Director. He has published several books in the field of computer security.

J. R. Cartwright
Chapter 9: Licensing issues
Whilst he was taking a degree in science at Cambridge, the Royal Air Force decided that John Cartwright might become a good Technical Signals Officer. Having served in ground radar stations until after D-day, he found himself in the Middle East doing research, radar training and a spell in Forces Broadcasting. After leaving the RAF he joined the Patent Department of British Tabulating Machine Co., one of the forerunners of ICL. He stayed on through the various mergers, and was responsible for all intellectual property operations for 14 years. He was also particularly involved in software licensing and research contracts. Since late 1984 he has operated as an independent consultant.

R. J. Hart
Chapter 10: Copyright and patents
Robert Hart, Director of Intellectual Property International Ltd., Chartered Patent Agent, European Patent Attorney, Fellow of the British Computer Society, formerly Intellectual Property Development Manager for the Plessey Company plc. Inaugural Chairman of the BCS Intellectual Property Rights (formerly copyright) Committee. Member of the Chartered Institute of Patent Agents Software Protection Committee and

formerly a Representative of British Industry at UNICE. Represented IFIP at the WIPO Committee on the Legal Protection of Computer Software in Geneva, 1983, and the UK at the WIPO Working Group on Technical Questions Relating to the Legal Protection of Computer Software, Canberra, 1984. Consultant to WIPO on the legal protection of semiconductor products, representing UNICE at the WIPO Experts Meetings on the treaty on the Legal Protection of Topographies of Semiconductor Products. Representative of UNICE at Industry/EPO discussions on Patents for Software related inventions 1985. Consultant to DG III of the Commission of the European Communities on (i) the Directive and (ii) the Proposal for a Council Directive on the legal protection of computer programs.

Preface to the second edition

Publication of the first edition of this book occurred before the computer virus became the important issue it is today. Whereas reference was made to it in the previous edition it was not given the prominence that is now appropriate. Chapter 8 by Jan Hruska is therefore a necessary and welcome addition.

The computer virus has of course played two roles. On the one hand it has been a scourge for many users resulting in many hours of wasted effort. On the other hand it is probably the best antidote to casual piracy that has occurred. Its effect may have been overplayed by the media but its psychological impact has been undeniable.

There is the possibility that the reader may become confused as to the purpose of this book if it is seen to attend to the problems of the user in regard to hacking and viruses. These topics are included because of the importance of authenticated software to both user and software author. It is important to authors that their software behaves as intended both in regard to their reputations and the legal consequences of erroneous data. It has, for example, been known for a software house to be infected by a computer virus which caused infected software to be distributed. The potential use of computer viruses and hacking to undermine a nation's commercial and defence capabilities is, no doubt, receiving attention in several countries.

Copyright and patents, now Chapter 10, has been the subject of significant change and has been extensively updated by Bob Hart. The appendix has been rewritten to summarise the recent activity in surveys and legislation and there are smaller revisions to other chapters. There has not been much change in the technology, and the methods described previously are still candidates for consideration. As I noted in the previous edition, one aspect of protection is to use known methods which are

combined to produce unusual situations which would not be anticipated by the pirate or intruder. I hope that the variety of topics described in this book will give you food for thought.

D.J.G.
Haywards Heath

Preface to the first edition

The industry in computer software has been quoted, in 1987, at many billion dollars per annum world wide and increasing rapidly. Methods of safeguarding the investment are therefore important and have exercised the intellect of many in their efforts to protect computer programs and defeat the activities of those who seek to copy computer programs for their own benefit or for selling to others. The ingenuity applied to the task on both sides is considerable, encouraged in part by the intellectual challenge as well as financial considerations.

The illegal activities have eroded the financial return to the software developer which is necessary in order to produce and maintain good software. Consequently, the quantity and quality of new programs offered for sale have been less than might otherwise have been the case, and this has been especially noticeable in some markets.

This book is intended to create a general awareness of the aims and possibilities of software protection. It is assumed that the reader will have either a knowledge of computing or is working with people engaged in the production and protection of computer software. Some topics are inevitably more difficult than others, but in general the aim is to draw the attention of the reader to the possibilities for protecting software with an indication of how they would be incorporated by someone knowledgeable in systems and programming.

The theme of the book has been influenced by the activities of the Technology of Software Protection Specialist (ToSPS) Group of the British Computer Society, which was founded in 1981 and has been organising meetings and seminars addressed to the problems of protecting software by technical means. A consideration in setting up the group was to provide a forum to update members on existing and new techniques to balance the number of seminars and conferences devoted to the legal

methods for protection of intellectual property by copyright, patents, trademarks, etc. It was apparent that a legal remedy must depend on the discovery of abuse and be subject to the availability of adequate proof.

With the above points of view in mind, an article was published in the British Computer Society *Computer Bulletin* in March, 1981, inviting interested members to a meeting to discuss the possibilities for protecting software. The group was formed and the first meeting was organised in July, 1981, when a half-day seminar considered the function of software locks. Since that date there have been some 25 meetings and seminars which have been addressed by speakers covering most areas of protection. On occasion the group has run a joint meeting with the Law Specialist Group where the overlap of interest warranted it.

In an activity of this kind there is the dilemma that such a forum will be of use to the computer criminal or pirate. It was, however, considered that the successful pirate is likely to be already well versed in methods of protection, and especially in ways of countering them of which the author of a program may be unaware. Accordingly, it was decided that general education in methods would be of a greater benefit to the author and the software house which is supplying program services.

The topics for consideration had been expected to cover all methods of non-legal protection, such as surveillance, identification, authorisation, cryptography, systems design, machine architecture, security modelling, management techniques, counters to intruder techniques, and non-technical precautions. It was seen that these topics would invade the area of data protection, itself an aspect of program protection, and indeed the two fields do complement each other to some extent. With the passing of time it has been found that there are some fundamental differences between computer security and software protection, although they can be supportive of each other.

The conventional methods used to safeguard computer security benefit from the cooperation of the legitimate user who probably has a vested interest in maintaining the security of the installation. In many cases the user does not have the same concern for safeguarding a program, and the interests of the author and user are often different. This difference in point of view may be reduced under the terms of contract by requiring the user to take all precautions to safeguard the program, but this may be difficult. It supposes that the licensee is able to maintain the confidentiality of a program under various conditions of use by the many people who may have access to the system.

The enactment of the Copyright (Computer Software) Amendment Act 1985 established the inclusion of computer programs as works

capable of copyright protection under UK copyright law. Together with the legislation overseas, it has created a more difficult environment for the software pirate, since, whereas a person with adequate resources by way of computer systems may check the code in order to bypass or erase protection methods, the use of such resources in a commercial environment implies a commercial return on their use and in consequence greater exposure to scrutiny by the copyright owner. The degree to which software may be disguised is the next consideration which is interesting both in regard to the techniques which may be used to disguise code and also in the methods which might be used to identify program modules which have been copied. The time and the resources required to crack the protection methods must be weighed against the greater certainty of legal retribution. The chance of being sued for infringement of copyright (or breach of contract) becomes more likely with the exposure accompanying the sale of programs in commercially viable quantities.

The review chapter (Chapter 1) aims to place the protection methods into different categories in order to show some association of ideas and modes of operation. Particular methods for disk protection and the use of special devices are discussed in the following chapters with consideration of their strengths and weaknesses. Cryptography is important in many of the techniques and makes an essential contribution to the more secure methods of protection. The intelligent module is an example where cryptography plays a vital role to provide possibly the most secure methods known.

In the event of failure of technical methods, or if reliance is placed entirely on legal remedies, then discovery and proof of copying is necessary both in regard to monitoring the distribution of copies of a program and also in order to provide evidence for litigation or arbitration.

The difficulties faced by the security manager are discussed in the chapter on hacking, which draws particular attention to the weaknesses in communications and networks, and provides an interesting insight into some of the methods that can be used to corrupt programs and data, and also provides food for thought in respect of other risks.

The scope of software protection overlaps both law and technology. An introduction to the protection of intellectual property by patents, copyright, trademarks, etc. is discussed. The summary of the law in different countries is important for a product which will be marketed internationally. The last chapter concludes with the topic of licensing in its many forms and considers the background against which a licence must be prepared.

The opinions of users have been canvassed on a number of occasions,

and a summary of their responses in the UK is given in the Appendix. Protection is of less value if a pirated version of a competitor's product is sold at a price which is below the commercially viable figure.

The glossary at the end of the book is taken from words used in the chapters.

I should like to acknowledge the support from the authors who gave constructive comments, and Joanna who typed about a quarter of the book.

D.J.G.
Haywards Heath

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