THIRD EDITION

SECURITY ENGINEERING

A GUIDE TO BUILDING DEPENDABLE DISTRIBUTED SYSTEMS

ROSS ANDERSON

WILEY

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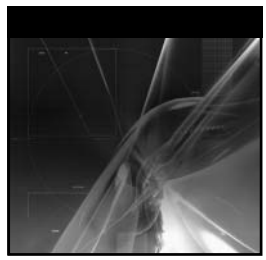
Third Edition



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For Shireen, Bavani, Nav, Ivan, Lily-Rani, Veddie and Bella

About the Author

I've worked with systems for over forty years. I graduated in mathematics and natural science from Cambridge in the 1970s, and got a qualification in computer engineering; my first proper job was in avionics; and after getting interested in cryptology and computer security, I worked in the banking industry in the 1980s. I then started working for companies who designed equipment for banks, and then on related applications such as prepayment electricity meters.

I moved to academia in 1992 but continued to consult to industry on security technology. During the 1990s, the number of applications that used cryptology rose rapidly: burglar alarms, car door locks, road toll tags and satellite TV systems all made their appearance. The first legal disputes about these systems came along, and I was lucky enough to be an expert witness in some of the important cases. The research team I lead had the good fortune to be in the right place at the right time when technologies such as peer-to-peer systems, tamper-resistance and digital watermarking became hot topics.

After I'd taught security and cryptology to students for a few years, it became clear to me that the existing textbooks were too narrow and theoretical: the security textbooks focused on the access control mechanisms in operating systems, while the cryptology books developed the theory behind cryptographic algorithms and protocols. These topics are interesting, and important. But they're only part of the story. Most working engineers are not overly concerned with crypto or operating system internals, but with getting good tools and learning how to use them effectively. The inappropriate use of protection mechanisms is one of the main causes of security failure. I was encouraged by the positive reception of a number of articles I wrote on security engineering (starting with 'Why Cryptosystems Fail' in 1993).

Finally, in 1999, I got round to rewriting my class lecture notes and a number of real-world case studies into a book for a general technical audience.

The first edition of the book, which appeared in 2001, helped me consolidate my thinking on the economics of information security, as I found that when I pulled my experiences about some field together into a narrative, the backbone of the story was often the incentives that the various players had faced. As the first edition of this book established itself as the standard textbook in the field, I worked on establishing security economics as a discipline. In 2002, we started the Workshop on the Economics of Information Security to bring researchers and practitioners together.

By the time the second edition came out in 2008, it was clear we'd not paid enough attention to the psychology of security either. Although we'd worked on security usability from the 1990s, there's much more to it than that. We need to understand everything from the arts of deception to how people's perception of risk is manipulated. So in 2008 we started the Workshop on Security and Human Behaviour to get security engineers talking to psychologists, anthropologists, philosophers and even magicians.

A sabbatical in 2011, which I spent partly at Google and partly at Carnegie Mellon University, persuaded me to broaden our research group to hire psychologists and criminologists. Eventually in 2015 we set up the Cambridge Cybercrime Centre to collect lots of data on the bad things that happen online and make them available to over a hundred researchers worldwide. This hasn't stopped us doing research on technical security; in fact it's helped us pick more relevant technical research topics.

A medic needs to understand a whole series of subjects including anatomy, physiology, biochemistry, pharmacy and psychology, and then temper this knowledge with experience of working on hundreds of cases with experienced colleagues. So also a security engineer needs to understand technical subjects like crypto, access controls, protocols and side channels; but this knowledge also needs to be honed by studying real cases. My goal in my academic career has been to pull all this together. The result you now hold in your hands.

I have learned a lot in the process; writing down what you think you know is a good way of finding out what you don't. I have also had a lot of fun. I hope you have as much fun reading it!

Ross Anderson
Cambridge, November 2020

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