WIL ALLSOPP

FOREWORD BY
HANS VAN DE LOOY

ADVANCED PENETRATION TESTING

HACKING THE WORLD'S MOST SECURE NETWORKS

WILEY

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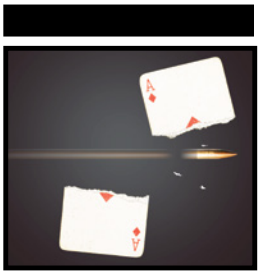

Advanced Penetration Testing

Hacking the World's Most Secure Networks

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Advanced Penetration Testing: Hacking the World's Most Secure Networks

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This work is dedicated to the memory of Sir Terry Pratchett, OBE (1948–2015), for teaching me comedy and satire and the wisdom to know the difference.

"Do you not know that a man is not dead while his name is still spoken?"

—Going Postal

About the Author

Wil Allsopp always liked taking things apart. Sometimes he was able to put them back together again. He wandered into penetration testing like some people wander into bars (another activity close to his heart). A chance encounter with a like-minded individual in the 't Stadscafe Zaltbommel in 1999 led to him resigning his IBM software development contract and forming his first company, called Tigerteam Security NV, which for reasons lost to time was incorporated in Curaçao. At least that's how he remembers it.

Nearly 20 years later, he's still breaking things, with the important difference that some of the most prestigious companies in the world are paying him to do so.

He lives in The Netherlands with his wife and a large menagerie of cats, dogs, chickens, and a toad named Malcolm.

"We work in the dark—we do what we can—we give what we have. Our doubt is our passion, and our passion is our task. The rest is the madness of art."

—Henry James

About the Technical Editor

Elias Bachaalany has been a computer programmer and a software reverse engineer for more than 14 years. Elias is also the co-author of two books published by Wiley, *Practical Reverse Engineering* and *The Antivirus Hacker's Handbook*, and the author of *Batchography: The Art of Batch Files Programming*. He worked with various technologies and programming languages such as web programming, database programming, and Windows device drivers programming (boot loaders and minimal operating systems), and wrote .NET and managed code, wrote scripts, assessed software protections, and wrote reverse engineering and desktop security tools.

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Also, thanks to every pen tester, hacker, and security evangelist I've toiled with over the years. You are this book.

Contents at a glance

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Foreword

Ever since I came first into contact with computers, the security (or insecurity if you want) of these very powerful systems has intrigued me. Living in The Netherlands, I was fortunate to be able to use a Philips P9200 system of the Technical University Eindhoven by dialing into it using a 300 baud modem when I attended high school to learn programming in ALGOL 60. Personal computers were virtually nonexistent at that time and computer systems like this cost a small fortune. Using a modem to connect to a system that you could program to solve lots of computational problems was already something magical, but gaining access to the machine itself became something of a quest. Since it was located on the university's campus, this was not that problematic. At that time, security was not really a big issue, and walking onto the premises as a young scholar asking for a tour of the facility was all it took.

There I learned that the P9200 was just a "small mini computer." The real deal was the Burroughs B7700 mainframe. It took some snooping around to find the dial-in number for that system, and a lot of persuading to get an account on that system, but eventually I succeeded. I did not hack the system at that time, but social engineering (being able to tell a persuading enough story to gain trust and/or information) proved to be a very valuable trait to have.

While I studied computing science, we eventually had to use Prime computers. Let me just state that computer security at that time was not considered important. The number of bugs in the operating system (PrimeOS) were numerous, and even fixes for security problems we uncovered would contain new security bugs. At that time, information security really caught my attention and it has not faded since. Just before graduating, I started working for a small company called Positronika, developing systems for the nuclear industry, ranging from a small pocket dosimeter (based on a 6502 processor) to large automated measurement

systems. They used PDP-11 systems for fuel rods after they were used in a nuclear reactor. I not only learned the importance of safety, but also learned how to write secure computer code. You just could not risk the various rod handling routines and drop some very highly radioactive material. It could be fatal.

In 1989, I came into contact with an underground and obscure publication called *Hack-Tic,* which was a so-called hacker magazine published irregularly. It opened up a whole new world to me. I suddenly noticed there were many more people interested in IT security and they published lots of other information as well. This included information on the phone system, which the Dutch telecom provider—at that time called PTT—was not too pleased with (they still did not understand that security through obscurity is a fundamentally bad idea!), as well as information about picking locks, to name but a few tricks. Discussing subjects like these with like-minded people eventually grew to monthly gatherings, random parties, and hacker events (in hotels and on campgrounds—always including high-speed Internet connectivity). Nowadays, there are even hacker spaces where people not only are building or breaking software, but are using all kinds of modern technology in new ways. So what once started as an underground movement is currently very well connected in modern society.

Fast forward to the year 2000. After several positions at various companies, eventually resulting in a lead role in a pentest group at one of the largest computer centers in The Netherlands, two friends and I decided we would start a business ourselves. The Internet bubble had just busted and we thought it a good idea to start a consultancy company focusing on information security. Luckily, we always had the credo, "If we do not succeed, we should at least be able to tell ourselves we had a blast." Little did we know.

The first assignment came when I was visiting Scandinavia and I had to draft a contract for this penetration test in a room of a hotel I walked by while talking to the prospect and used their fax machine to send it out. We did not even have a name for this venture of ours.

Even though the bubble busted and various Internet companies were forced to close shop, we continued, eventually choosing the name Madison Gurkha since we could not find any domain name containing something that came close to the service we tried to provide. The advantages of this exotic name were numerous, ranging from the fact you had to spell it at least three times (so it would really be burned into the brains of those who had to deal with us), to the assumption people made (and still make) that we were an international conglomerate with an HQ somewhere outside of The Netherlands.

At that time we had no need for a sales and marketing department. Our personal network was expanding and there were not many businesses providing our services, so verbal recommendations brought the opportunities to our door. At that time we basically only did vulnerability assessments of web

applications and ICT infrastructures, and some pentesting when our customers were really interested in the impact of real-live attacks on their ICT environments. Since there were hardly any tools available, we had to create our own exploits and scripts to make our lives easier. Exploits were sometimes also published on the Internet (mostly in newsgroups), but you had to compile them yourself and they always contained some flaw so that script kiddies who just compiled the thing, but did not understand the actual problem, could not use the code (you had to make some minor modifications to be able to use it). At the time of this writing, tools like Metasploit and Nessus are widely available and popular TV shows like *Mr. Robot* show these tools at work.

But IT security advances. It always has been, and will probably always be, a precarious balance between attacks and defenses. The available tools will be enhanced and become more powerful and more advanced tools will become available. But only in the hands of a well-educated specialist will they add real value. That person not only understands the benefits of the tools but also knows their limitations and how to interpret the results.

Wil Allsopp is one such specialist. I have been fortunate to work with Wil when he joined Madison Gurkha in 2006. At that time we were a couple of years old and expanding from the three-person start-up to the well-established dedicated IT security consultancy firm we are today. Wil helped us push the bounds of the security testing envelope even further and has done so ever since. He has always looked for new vulnerabilities and wants corporations and institutions to be aware of the latest threats. This book contains various valuable examples of those advanced threats.

When your organization not only is looking for a positive score on the "in control" checklist, but really wants to know if it is capable of withstanding the kind of very advanced attacks that currently take place on a global scale, you should read this book. Ensure that the company you hire to perform IT security assessments can actually execute attacks like these. Once again, Wil shows that a real IT security specialist not only does know how to use available tools, but is also able to think outside of the box and develop additional and advanced attacks when needed. Regular vulnerability scans are helpful to keep your infrastructure on par; actual penetration testing using advanced techniques like those described in this book will provide your organization with the needed insight on whether you are actually in control of your IT security or have been shutting your eyes to the real dangers out there while adding ticks to your checklists.

Amsterdam, October 5, 2016
Hans Van de Looy
Founder of Madison Gurkha BV

Introduction

There is an old yet erroneous belief that fortune favors the brave. Fortune has and always will favor the prepared. When your organization experiences a serious security incident (and it will), it's your level of preparedness based on the understanding of the inevitability of such an event that will guide a successful recovery. It doesn't matter if you're responsible for the security of a local community college or if you're the CISO of an international bank—this fact will always remain true.

To quote Howard Ruff, "It wasn't raining when Noah built the ark."

The first step to being prepared is being aware.

Coming Full Circle

There has always been the impression that you have to patch your systems and secure your networks because hackers are scanning vast address ranges looking for victims who haven't done these things and they'll take whatever vulnerable systems they can get. In a sense that's true—there have always been those who are satisfied with low hanging fruit. It was true back in the 80s as well—war dialing on the PSTN and such attacks are usually trivial to guard against if you know what you're up against. However, if you are specifically targeted by someone with time and resources, you have a problem of an altogether different magnitude. Put simply, gaining access to corporate systems by patiently targeting the users was usually the best way to go in the 80s and it's usually the best way now. However, the security industry, like any other, is constantly looking to sell "new" products and services with different names and to do that, a buzzword is required. The one that stuck was *advanced persistent threat*.