SYNGRESS®



YOUR SOLUTIONS MEMBERSHIP



How to Cheat at

VoIP Security

The Perfect Reference for the Multitasked SysAdmin

- Discover Why "Measure Twice, Cut Once" Applies to Securing a VolP Infrastructure
- Learn How to Secure an Entire VolP Infrastructure and Defend Against Denialof-Service and Hijacking Attacks
- The Perfect Guide if VoIP Engineering is NOT Your Specialty

Thomas Porter Michael Gough



MICROSOFT CORP. EXHIBIT 1018 Syngress Publishing, Inc., the author(s), and any person or firm involved in the writing, editing, or production (collectively "Makers") of this book ("the Work") do not guarantee or warrant the results to be obtained from the Work.

There is no guarantee of any kind, expressed or implied, regarding the Work or its contents. The Work is sold AS IS and WITHOUT WARRANTY. You may have other legal rights, which vary from state to state.

In no event will Makers be liable to you for damages, including any loss of profits, lost savings, or other incidental or consequential damages arising out from the Work or its contents. Because some states do not allow the exclusion or limitation of liability for consequential or incidental damages, the above limitation may not apply to you.

You should always use reasonable care, including backup and other appropriate precautions, when working with computers, networks, data, and files.

Syngress Media®, Syngress®, "Career Advancement Through Skill Enhancement®," "Ask the Author UPDATE®," and "Hack Proofing®," are registered trademarks of Syngress Publishing, Inc. "Syngress: The Definition of a Serious Security Library" ™, "Mission Critical™," and "The Only Way to Stop a Hacker is to Think Like One™" are trademarks of Syngress Publishing, Inc. Brands and product names mentioned in this book are trademarks or service marks of their respective companies.

SERIAL NUMBER KEY 001 HJIRTCV764 002 PO9873D5FG 003 829KM8NJH2 004 VTY45Q9PLA 005 CVPLQ6WQ23 006 VBP965T5T5 007 HJJJ863WD3E 008 2987GVTWMK 009 629MP5SDJT 010 IMWQ295T6T

PUBLISHED BY Syngress Publishing, Inc. 800 Hingham Street Rockland, MA 02370

How to Cheat at VolP Security

Copyright © 2007 by Syngress Publishing, Inc. All rights reserved. Printed in the United States of America. Except as permitted under the Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of the publisher, with the exception that the program listings may be entered, stored, and executed in a computer system, but they may not be reproduced for publication.

Printed in the United States of America 1 2 3 4 5 6 7 8 9 0

ISBN 10: 1-59749-169-1 ISBN 13: 978-1-59749-169-3

Publisher: Amorette Pedersen Acquisitions Editor: Gary Byrne Technical Editor: Thomas Porter Cover Designer: Michael Kavish Page Layout and Art: Patricia Lupien Copy Editors: Adrienne Rebello, Mike McGee

Indexer: Nara Wood

Distributed by O'Reilly Media, Inc. in the United States and Canada. For information on rights, translations, and bulk sales, contact Matt Pedersen, Director of Sales and Rights, at Syngress Publishing; email matt@syngress.com or fax to 781-681-3585.



Contents

Chapter 1 Introduction to VolP Security
Introduction
The Switch Leaves the Basement
What Is VoIP?
VoIP Benefits
VoIP Protocols
VoIP Isn't Just Another Data Protocol
Security Issues in Converged Networks
VoIP Threats
A New Security Model
Summary
Chapter 2 The Hardware Infrastructure
Introduction
Traditional PBX Systems
PBX Lines
PBX Trunks
PBX Features
PBX Adjunct Servers
Voice Messaging
Interactive Voice Response Servers
Wireless PBX Solutions
Other PBX Solutions
PBX Alternatives
VoIP Telephony and Infrastructure
Interactive Media Service: Media Servers
Call or Resource Control: Media Servers
Media Gateways
Firewalls and Application-Layer Gateways34
Application Proxies
Endpoints (User Agents)
IP Switches and Routers
Wireless Infrastructure
Wireless Encryption: WEP
At Hotom They'l





Wireless Encryption: WPA2	30
Authentication: 802.1x	4(
Power-Supply Infrastructure	
Power-over-Ethernet (IEEE 802.3af)	11
UPS	12
Energy and Heat Budget Considerations	13
Summary	14
Chapter 3 Architectures	
Introduction	16
PSTN: What Is It, and How Does It Work?	16
PSTN: Outside Plant4	16
PSTN: Signal Transmission	19
T1 Transmission: Digital Time Division Multiplexing 4	19
PSTN: Switching and Signaling	5
The Intelligent Network (IN), Private	
Integrated Services, ISDN, and QSIG5	6
ITU-T Signaling System Number 7 (SS7)	7
PSTN: Operational and Regulatory Issues 6	1
PSTN Call Flow	1
PSTN Protocol Security	4
SS7 and Other ITU-T Signaling Security6	4
ISUP and QSIG Security	6
The H.323 Protocol Specification	7
The Primary H.323 VoIP-Related Protocols 6	8
H.225/Q.931 Call Signaling	1
H.245 Call Control Messages	5
Real-Time Transport Protocol	7
H.235 Security Mechanisms	8
Understanding SIP	2
Overview of SIP	3
RFC 2543 / RFC 3261	4
SIP and Mbone	5
OSI	5
SIP Functions and Features	7
User Location	3
User Availability	8
Lian Canabilities	_



xiii Contents SIP Architecture90 User Agents90 SIP Server91 SIP Requests and Responses94 Other Protocols Used by SIP99



DOCKET

Explore Litigation Insights



Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time** alerts and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.

