EXHIBIT 6

(12) United States Patent

Edery et al.

(10) Patent No.:

US 8,677,494 B2

(45) **Date of Patent:**

*Mar. 18, 2014

(54) MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS

(75) Inventors: Yigal Mordechai Edery, Pardesia (IL);

Nirmrod Itzhak Vered, Goosh Tel-Mond (IL); David R. Kroll, San Jose, CA (US); Shlomo Touboul,

Kefar-Haim (IL)

(73) Assignee: Finjan, Inc., Wilmington, DE (US)

(*) Notice: Subject to any disclaimer, the term of this

patent is extended or adjusted under 35

U.S.C. 154(b) by 0 days.

This patent is subject to a terminal dis-

claimer.

(21) Appl. No.: 13/290,708

(22) Filed: Nov. 7, 2011

(65) Prior Publication Data

US 2012/0117651 A1 May 10, 2012

Related U.S. Application Data

(63) Continuation of application No. 12/471,942, filed on May 26, 2009, now Pat. No. 8,079,086, which is a

(Continued)

(51) Int. Cl. H04L 29/06 (2006.01) G06F 11/30 (2006.01) G06F 15/16 (2006.01)

(52) U.S. Cl.

(58) Field of Classification Search

None

See application file for complete search history.

(56) References Cited

U.S. PATENT DOCUMENTS

4,562,305 A 5,077,677 A 12/1985 Gaffney, Jr. 12/1991 Murphy et al. (Continued)

FOREIGN PATENT DOCUMENTS

EP 0636977 7/1994 EP 1021276 7/2000 (Continued) OTHER PUBLICATIONS

Zhong, et al., "Security in the Large: is Java's Sandbox Scalable?," Seventh IEEE Symposium on Reliable Distributed Systems, pp. 1-6, Oct. 1998

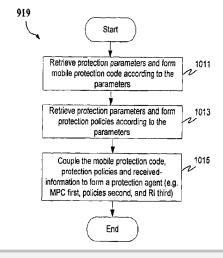
(Continued)

Primary Examiner — Christopher Revak (74) Attorney, Agent, or Firm — Bey & Cotropia PLLC

(57) ABSTRACT

Protection systems and methods provide for protecting one or more personal computers ("PCs") and/or other intermittently or persistently network accessible devices or processes from undesirable or otherwise malicious operations of Java TN applets, ActiveXTM controls, JavaScriptTM scripts, Visual Basic scripts, add-ins, downloaded/uploaded programs or other "Downloadables" or "mobile code" in whole or part. A protection engine embodiment provides for monitoring information received, determining whether received information does or is likely to include executable code, and if so, causes mobile protection code (MPC) to be transferred to and rendered operable within a destination device of the received information. An MPC embodiment further provides, within a Downloadable-destination, for initiating the Downloadable, enabling malicious Downloadable operation attempts to be received by the MPC, and causing (predetermined) corresponding operations to be executed in response to the attempts.

18 Claims, 10 Drawing Sheets





US 8,677,494 B2

Page 2

5,960,170 A

Related U.S. Application Data

continuation of application No. 11/370,114, filed on Mar. 7, 2006, now Pat. No. 7,613,926, which is a continuation of application No. 09/861,229, filed on May 17, 2001, now Pat. No. 7,058,822, which is a continuation-in-part of application No. 09/539,667, filed on Mar. 30, 2000, now Pat. No. 6,804,780, which is a continuation of application No. 08/964,388, filed on Nov. 6, 1997, now Pat. No. 6,092,194, said application No. 09/861,229 is a continuation-in-part of application No. 09/551,302, filed on Apr. 18, 2000, now Pat. No. 6,480, 962, and a continuation of application No. 08/790,097, filed on Jan. 29, 1997, now Pat. No. 6,167,520.

(60) Provisional application No. 60/205,591, filed on May 17, 2000, provisional application No. 60/030,639, filed on Nov. 8, 1996.

(56)References Cited

U.S. PATENT DOCUMENTS

5 3 C 2 1 477 A	11/1002	Formation of all	6,73
5,263,147 A		Francisco et al. Shieh et al.	6,80
5,278,901 A 5,311,591 A			6,91
		Fischer Hile et al.	7,05
- , ,			7,14
5,359,659 A		Rosenthal	7,21
5,361,359 A		Tajalli et al.	7,30
5,398,196 A		Chambers Fischer	7,34
5,412,717 A 5,414,833 A			7,41
- , ,		Hershey et al.	7,61
5,440,723 A		Arnold et al.	7,64
5,452,442 A 5,483,649 A		Kephart	8,07
5,483,649 A 5,485,409 A		Kuznetsov et al. Gupta et al.	2003/00
5,485,575 A		Chess et al.	2003/00
5,524,238 A		Miller et al.	2003/01
			2004/00
5,572,643 A 5,579,509 A		Judson 709/218	2004/00
5,606,668 A		Furtney et al. Shwed	2005/00
			2005/01
5,621,889 A 5,623,600 A		Lermuzeaux et al. Ji et al.	2006/00
		Vu	2006/00
5,623,601 A 5,638,446 A		Rubin	2008/00
5,675,711 A		Kephart et al.	2010/01
5,692,047 A		McManis	
5,692,047 A		Holden et al.	
5,696,822 A		Nachenberg	
5,720,033 A		Deo Deo	EP
5,720,033 A		Chang et al.	EP
5,740,248 A		Fieres et al.	JP
5,740,246 A		Yellin et al.	WO
5,740,441 A		Van Hoff et al.	WO
5,765,030 A		Nachenberg et al.	WO
5,765,205 A		Breslau et al.	WO
5,784,459 A		Devarakonda et al.	wo '
5,796,952 A		Davis et al.	., .
5,805,829 A		Cohen et al.	
5,809,230 A		Pereira	
5,809,230 A		Dan et al.	Rubin, et a
5,832,208 A		Chen et al.	1998.
5,832,208 A		Cutler et al.	Schmid, e
5,850,559 A		Angelo et al.	ing of the
5,854,916 A		Nachenberg	
5,859,966 A		Hayman et al.	pp. 1-10,
5,864,683 A		Boebert et al.	Corradi, e
5,867,651 A		Dan et al.	Code," <i>IE</i>
5,878,258 A		Pizi et al.	Internatio
		Yamamoto	pp., May
5,881,151 A 5,884,033 A		Duvall et al.	Internatio
_ 5,00 4 ,∪33 A	3/1999	Duvan et al.	1 4 1

5,000,710		10/1000	117:11:				
5,963,742	A	10/1999	Williams				
5,964,889	A	10/1999	Nachenberg				
5,974,549	A	10/1999	Golan				
5,978,484	A	11/1999	Apperson et al.				
5,983,348	A	11/1999	Ji				
5,987,611	A	11/1999	Freund				
6,070,239	Α	5/2000	McManis				
6,088,801	A	7/2000	Grecsek				
6,088,803	A	7/2000	Tso et al.				
6,092,194	A	7/2000	Touboul				
6,125,390	A	9/2000	Touboul				
6,154,844	A	11/2000	Touboul et al.				
6,167,520	A	12/2000	Touboul				
6,263,442	В1	7/2001	Mueller et al.				
6,339,829	В1	1/2002	Beadle et al.				
6,351,816	B1	2/2002	Mueller et al.				
6,425,058	B1	7/2002	Arimilli et al.				
6,434,668	B1	8/2002	Arimilli et al.				
6,434,669	B1	8/2002	Arimilli et al.				
6,480,962	B1	11/2002	Touboul				
6,487,666	B1	11/2002	Shanklin et al.				
6,519,679	B2	2/2003	Devireddy et al.				
6,571,338	B1	5/2003	Shaio et al.				
6,598,033	B2	7/2003	Ross et al.				
6,643,696	B2	11/2003	Davis et al.				
6,732,179	B1	5/2004	Brown et al.				
6,804,780	B1	10/2004	Touboul				
6,917,953	B2	7/2005	Simon et al.				
7,058,822	$\overline{\mathrm{B2}}$	6/2006	Edery et al.				
7,143,444	B2	11/2006	Porras et al.				
7,210,041	$\overline{\mathrm{B1}}$	4/2007	Gryaznov et al.				
7,308,648	Bi	12/2007	Buchthal et al.				
7,343,604	B2	3/2008	Grabarnik et al.				
7,418,731	B2	8/2008	Touboul				
7,613,926	B2	11/2009	Edery et al.				
7,647,633	B2	1/2010	Edery et al.				
8,079,086	B1*	12/2011	Edery et al 726/24				
03/0014662	Al	1/2003	Gupta et al.				
03/0074190	Al	4/2003	Allison				
03/0101358	Al	5/2003	Porras et al.				
04/0073811	Al	4/2004	Sanin				
04/0088425	Al	5/2004	Rubinstein et al.				
05/0050338	Al	3/2005	Liang et al.				
05/0172338	Al	8/2005	Sandu et al.				
06/0031207	Al	2/2006	Bjarnestam et al.				
06/0048224	Al	3/2006	Duncan et al.				
08/0066160	Al	3/2008	Becker et al.				
10/0195909	Al	8/2010	Wasson et al.				
10/0173707	731	3/2010	masson et al.				
FOREIGN PATENT DOCUMENTS							

9/1999 Chen et al.

EP	1091276	4/2001	G06F 1/00
EP	1132796	9/2001	
JP	08-263447	10/1996	
WO	95/27249	10/1995	
WO	95/33237	12/1995	
WO	98/21683	5/1998	
WO	2004/063948	7/2004	
WO	WO 2004/063948	7/2004	G06F 17/30

OTHER PUBLICATIONS

al., "Mobile Code Security," IEEE Internet, pp. 30-34, Dec.

et al. "Protecting Data From Malicious Software," Proceede 18th Annual Computer Security Applications Conference, 2002.

et al., "A Flexible Access Control Service for Java Mobile EEE, pp. 356-365, 2000.

onal Search Report for Application No. PCT/IB97/01626, 3 14, 1998 (mailing date).

onal Search Report for Application No. PCT/IL05/00915, 4 pp., dated Mar. 3, 2006.

Written Opinion for Application No. PCT/IL05/00915, 5 pp., dated Mar. 3, 2006 (mailing date).



5.889.943 A

5.892,904 A

3/1999 Ji et al.

4/1999 Atkinson et al.

9/1999 Chen et al.

US 8,677,494 B2

Page 3

(56) References Cited

OTHER PUBLICATIONS

International Preliminary Examination Report for Application No. PCT/IB01/01138, 2 pp., dated Dec. 19, 2002.

Sitaker, Kragen, "Rapid Genetic Evolution of Regular Expressions" [online], *The Mial Archive*, Apr. 24, 2004 (retrieved on Dec. 7, 2004), 5 pp., Retrieved from the Internet: http://www.mail-archive.com/kragen-tol@canonical.org/msg00097.html.

"Lexical Analysis: DFA Minimization & Wrap Up" [online], Fall, 2004 [retrieved on Mar. 2, 2005], 8 pp., Retrieved from the Internet: http://www.owlnet.rice.edu/~comp412/Lectures/L06LexWrapup4. pdf.

"Minimization of DFA" [online], [retrieved on Dec. 7, 2004], 7 pp., Retrieved from the Internet: http://www.cs.odu.edu/~toida/nerzic/390teched/regular/fa/min-fa.html.

"Algorithm: NFS -> DFA" [online], Copyright 1999-2001 [retrieved on Dec. 7, 2004], 4 pp., Retrieved from the Internet: http://rw4.cs. uni-sb.de/~ganimal/GANIFA/page16_e.htm.

"CS 3813: Introduction to Formal Languages and Automata—State Minimization and Other Algorithms for Finite Automata," 3 pp., May 11, 2003, Retrieved from the Internet: http://www.cs.msstate.edu/~hansen/classes/3813fall01/slides/06Minimize.pdf.

Watson, Bruce W., "Constructing Minimal Acyclic Deterministic Finite Automata," [retrieved on Mar. 20, 2005], 38 pp., Retrieved from the Internet: http://www.win.tue.nl/~watson/2R870/downloads/madfa_algs.pdf.

Chang, Chia-Hsiang, "From Regular Expressions to DFA's Using Compressed NFA's," Oct. 1992, 112 pp., http://www.cs.nyu.edu/web/Research/Theses/chang_chia-hsiang.pdf.

"Products," Articles published on the Internet, "Revolutionary Security for a New Computing Paradigm" regarding SurfinGate™, 7 pp. "Release Notes for the Microsoft ActiveX Development Kit," Aug. 13, 1996, activex.adsp.or.jp/inetsdk/readme.txt, pp. 1-10.

Doyle, et al., "Microsoft Press Computer Dictionary," Microsoft Press, 2d Edition, pp. 137-138, 1993.

Finjan Software Ltd., "Powerful PC Security for the New World of JavaTM and Downloadables, Surfin ShieldTM," Article published on the Internet by Finjan Software Ltd., 2 pp. 1996.

Finjan Sofrtware Ltd., "Finjan Announces a Personal Java™ Firewall for Web Browsers—the SurfinShield™ 1.6 (formerly known as SurfinBoard)," Press Release of Finjan Releases SurfinShield 1.6, 2 pp., Oct. 21, 1996.

Finjan Software Ltd., "Finjan Announces Major Power Boost and New Features for SurfinShieldTM 2.0," Las Vegas Convention Center/ Pavillion 5 P5551, 3 pp., Nov. 18, 1996.

Finjan Software Ltd., "Finjan Software Releases SurfinBoard, Industry's First JAVA Security Product for the World Wide Web," Article published on the Internet by Finjan Software Ltd., 1 p., Jul. 29, 1996. Finjan Software Ltd., "Java Security: Issues & Solutions," Article published on the Internet by Finjan Software Ltd., 8 pp. 1996.

Finjan Software Ltd., Company Profile, "Finjan—Safe Surfing, The Java Security Solutions Provider," Article published on the Internet by Finjan Software Ltd., 3 pp., Oct. 31, 1996.

"IBM AntiVirus User's Guide, Version 2.4,", International Business Machines Corporation, pp. 6-7, Nov. 15, 1995.

Khare, R., "Microsoft Authenticode Analyzed" [online], Jul. 22, 1996 [retrieved on Jun. 25, 2003], 2 pp., Retrieved from the Internet: http://www.xent.com/FoRK-archive/smmer96/0338.html.

LaDue, M., Online Business Consultant: Java Security: Whose Business is It?, Article published on the Internet, Home Page Press, Inc., 4 pp., 1996.

Microsoft, "Microsoft ActiveX Software Development Kit" [online], Aug. 12, 1996 [retrieved on Jun. 25, 2003], pp. 1-6, Retrieved from the Internet: activex.adsp.or.jp/inetsdk/help/overview.htm.

Microsoft® Authenticode Technology, "Ensuring Accountability and Authenticity for Software Components on the Internet,"

Microsoft Corporation, Web Page Article "Frequently Asked Questions About Authenticode," last updated Feb. 17, 1997, printed Dec. 23, 1998, URL: http://www.microsoft.com/workshop/security/authcode/signfaq.asp#9, pp. 1-13.

Okamoto, E., et al., "ID-Based Authentication System for Computer Virus Detection," *IEEE/IEE Electronic Library online, Electronics Letters*, vol. 26, Issue 15, ISSN 0013-5194, Jul. 19, 1990, Abstract and pp. 1169-1170, URL: http://iel.ihs.com:80/cgi-bin/iel_cgi?se... 2ehts%26ViewTemplate%3ddocview%5fb%2ehts.

Omura, J. K., "Novel Applications of Cryptography in Digital Communications," *IEEE Communications Magazine*, pp. 21-29, May 1990.

Zhang, X. N., "Secure Code Distribution," *IEEE/IEE Electronic Library online, Computer*, vol. 30, Issue 6, pp. 76-79, Jun. 1997.

D. Grune, et al., "Parsing Techniques: A Practical Guide," John Wiley & Sons, Inc., New York, New York, USA, pp. 1-326, 2000.

Scott, et al., "Abstracting Application-Level Web Security," *ACM*, pp. 396-407, 2002.

ThunderByte Antivirus for Windows.

InterScan VirusWall from Trend Micro.

ViruSafe from Eliashim.

Intel LANProtect from Intel.

The Java Security Manager from Sun Microsystems.

McAfee Web Shield.

McAfee WebScan.

McAfee VirusScan.

McAfee N etShield.

Dr. Solomon's Antivirus Toolkit for Windows 95.

Dr. Solomon's Antivirus Toolkit for Windows NT.

Dr. Solomon's WinGuard.

Dr. Solomon's Virus Guard.

Dr. Solomon's Virus Shield.

Dr. Solomon's Virex

Dr. Solomon's "Merlin" Anti-Virus Engine.

Dr. Solomon's IMcAfee "Olympus" Anti-Virus Engine.

ActiveX Web Tutorial.

Java FAQ (1995-1998)

Norton AntiVirus TUfor Windows@95 User's Guide. Published by Symantec in 1995. (179 pages).

Jaeger, at al., "Building Systems that Flexibly Control Downloadable Executable Content," ProceedinQs of the Sixth USENIX UNIX Security Symposium, Jul. 1996. (19 paQes).

Rasmusson, Andreas and Jansson, Sverker, "Personal Security Assistance for Secure Internet Commerce," Sep. 16, 1996. (12 pages).

Bharat et al. Migratory Applications Nov. 15, 1995. (10 oaoes).

Dean, Drew, et al., "Java Security: From HotJava to Netscape and Beyond," 1996 IEEE Symposium on Security and Privacy, May 6, 1996. (11 pages).

Sterbenz, Andreas, An Evaluation of the Java Security Model, • IEEE, Dec. 1996. f13pages).

Fritzinger, J. Steven, et al., Java Security, Sun Microsystems, Dec. 1996 (7 paQes).

Bank Joseoh A. "Java Security," Dec. 8, 1995. (14 paoes).

Claunch, "Java Blocking," http://groups.google.com/group/muc. lists.firewalls/msg/2a5ec02eOOa37071. Sep. 25, 1996. Accessed date: May 10, 2011. (2 paces).

Chappell, *Understanding ActiveX and OLE: A Guide for Developers and Managers (Strategic Technology), Sep. 1, 1996, Microsoft Press. (91 pages).

Crosbie, et al., "Active Defense of a Computer System Using Autonomous Agents". Feb. 15, 1995. (14 pages).

"Trend Micro's Virus Protection Added to Sun Microsystems Netra Internet Servers," Business Wire, Oct. 1, 1996, available at http://www.cs.indiana.edu/~kinzler/pubs/viruswall.html.

"Symantec Announces Norton Antivirus 2.0 for Windows NT," Symantec Corporation press release, Sep. 16, 1996, available at http://www.symantec.com/about/news/release/article.jsp?prid=19960916_01.

"Dark Avenger Mutation Engine No Threat to Protected PCs," McAfee, Inc. press elease, May 11, 1992, available at http://



US 8,677,494 B2

Page 4

(56)References Cited

OTHER PUBLICATIONS

"Dark Avenger Mutation Engine No Threat to Protected PCs," McAfee, Inc. press elease, May 11, 1992, available at http:// securitydigest.org/virus/mirror/www.phreak.orgvirus1/1992/

Gryaznov, D.O., "Scanners of the Year 2000: Heuristics," Proceedings of the Fifth International Virus Bulletin Conference, pp. 225-234 (1995), available at http://vxheavens.com/lib/adgOO.html

"Symantec Announces Norton Internet Email Gateway at Internet World—Booth # 369 on Dec. 11, 12, and 13," Symantec Corporation press release, Dec. 11, 1996, available at http:// Iwww.symantec .comlabout/news/release/article.jsp?prid= 19961211_03.

"Presenting Java," by John Dec. (1995).

"The Java Language Specification" by Gosling, et al. (1996).

"The Java Programming Language," by Ken Arnold and James Gosling (1996).

"The Java Virtual Machine Specification," by Tim Lindholm and Frank Yellin (1997).

"Computer Viruses and Artificial Intelligence," by David Stang (Sep.

"Java Security and a Firewall Extension for Authenticity Control of Java Applets," by Magnus Johansson (Jan. 29, 1997)

"Static Analysis of Programs With Application to Malicious Code Detection," by Raymond Lo (1992).

File History for U.S. Patent No. 6,804,780.

"Virus Detection Alternatives," by Patrick Min (Jul. 1992).

"Dynamic Detection and Classification of Computer Viruses Using General Behaviour Patterns," by LeCharlier, et al. (Sep. 1995).

The Giant Black Book of Computer Viruses by Mark Ludwig (1995). HotJava: The Security Story.

The Java Filter.

"A Java Filter," by Balfanz, et al.

"Improved JavaScript and Java Screening Function," by Claunch (May 4, 1996).

"New Version of Java, JavaScript, ActiveX Screening," by Claunch (Jul. 3, 1996).

"A Toolkit and Methods for Internet Firewalls," by Ranum, et al. "Identifying and Controlling Undesirable Program Behaviors," by Maria King.

"PACL1's: An Access Control List Approach to Anti-Viral Security," by Wichers, et al.

Endrijonas, Janet, Rx PC The Anti-Virus Handbook. Published in the U.S. in 1993 by TAB Books, a division of McGraw-Hili, Inc. (201 paQes).

"Secure Code Distribution," by X. Nick Zhang (Jun. 1997).

IBM AntiVirus User's Guide (Nov. 15, 1995).

"Breadth of Runtime Environments and Security Make Java a Good Choice for the Internet" (1996)

Omura, Jim K., "Novel Applications of Cryptography in Digital Communications," IEEE Communications Magazine, pp. 21-29, May 1990.

Okamoto, E., et al., "ID-Based Authentication System for Computer Virus Detection," IEEE/IEE Electronic Library online, Electronics Letters, vol. 26, Issue 15, ISSN 0013-5194, Jul. 19, 1990, Abstract and pp. 1169-1170, URL: http://iel.ihs.com:80/cgibinliel_cgi?se ... 2ehts%26ViewTemplate%3ddocview%5fb%2ehts.

IBM AntiVirus User's Guide Version 2.4, International Business Machines Corporation, pp. 6-7, Nov. 15, 1995. Leach, Norvin, et al., "IE 3.0 Applets Will Earn Certification," PC

Week, vol. 13, No. 29,2 pp., Jul. 22, 1996.

"Finjan Software Releases SurfinBoard, Industry's First JAVA Security product for the World Wide Web," Article published on the Internet by Finjan Software Ltd., 1 p., Jul. 29, 1996.

"Powerful PC Security for the New World of JAVATM and Downloadables, Surfin ShieldTM," Article published on the Internet by Finjan Software Ltd., 2 pp. 1996.

Microsoft® Authenticode Technology, "Ensuring Accountability and Authenticity for Software Components on the Internet,'

Finjan Announces a Personal Java™ Firewall for Web Browsers the SurfinShieldTM 1.6 (formerly known as SurfinBoard), Press Release of Finjan Releases SurfinShield 1.6, 2 pp., Oct. 21, 1996.

Company Profile, "Finjan-Safe Surfing. The Java Security Solutions Provider," Article published on the Internet by Finjan Software Ltd., 3 pp., Oct. 31, 1996.

"Finjan Announces Major Power Boost and New Features for SurfinShield™ 2.0," Las Vegas Convention Center/Pavilion 5 P5551, 3 pp., Nov. 18, 1996.

"Java Security: Issues & Solutions," Article published on the Internet by Finjan Software Ltd., 8 pp., 1996.

"Products," Article published on the Internet, 7 pp.

Mark LaDue, "Online Business Consultant: Java Security: Whose Business Is It?," Article published on the Internet, Home Page Press, Inc., 4 pp., 1996.

Web Page Article, "Frequently Asked Questions About Authenticode," Microsoft Corporation, last updated Feb. 17, 1997, printed Dec. 23, 2998, URL: http://www.microsoft.com/workshop/ security/authcodee/signfaq.asp#9, pp. 1-13.

Zhang, X.N., "Secure Code Distribution," IEEE/IEE Electronic Library online, Computer vol. 30, Issue 6, pp. 76-79, Jun. 1997.

Binstock, Andrew, "Multithreading, Hyper-Threading, Multiprocessing: Now, What's the Difference?," httn:!hlv'\v\v-inteLcom!cd/ ids!dcvdoQcr!asmo-na/enfl/20456.htm, Pacific Data Works, LLC, downloaded Jul. 7, 2008, 7 pp.

VirexPC Version 2.0 or later from Microcom.

AntiVirus Kit From 1 stAide Software.

FluShot+ Series of Products by Ross Greenberg.

Symantec Antivirus of the Mac version 3.0 or later.

"Synthesizing Fast Intrusion Prevention/Detection Systems From High-Level Specifications," by Sekar, et al. (1999).

Art of Computer Virus Research and Defense b Peter Szor (Feb. 2005).

"Process Execution Controls as a Mechanism to Ensure Consistency," by Eugen Bacic (1990).

"Process Execution Controls: Revisited," by Bacic (1990).

"A Flexible Access Control Service for Java Mobile Code," by Corradi, et al. (2000).

"Java Security: Issues & Solutions" (1996).

"Microsoft Authenticode analyzed," by Rohit Khare (Jul. 22, 1996).

"Java Security: Whose Business Is It?" by Mark LaDue (1996).

Microsoft Authenticode Technology (Oct. 1996).

"Mobile Code Security," by Rubin, et al.

"Protecting Data From Malicious Software," by Schmid, et al.

"Security in the Large: Is Java's Sandbox Scalable?" by Zhong, et al. (Apr. 1998).

"A Domain and type Enforcement UNIX Prototype," by Badger, et al.

"Heuristic Anti-Virus Technology," by Frans Veldman.

"Standards for Security in Open Systems," by Warwick Ford (1989).

"Secure File Transfer Over TCP/IP," by Brown, et al. (Nov. 1992).

"Standards in Commercial Security," by Nick Pope.

"X.400 Security Features," by Tony Whyman.

"Using CASE Tools to Improve the Security of Applications Systems," by Hosmer, et al. (1988).

"Miro: Visual Specification of Security," by Heydon, et al. (Oct. 1990).

"An Evaluation of Object-Based Programming with Visual Basic," by Dukovic, et al. (1995).

"Visual Basic 5.0 Significantly Improved," by W. Dennis Swift (Jun.

"Development of an Object Oriented Framework for Design and Implementation of Database Powered Distributed Web Applications With the DEMETER Project as a Real-Life Example," by Goschka, et al. (1997)

Detecting Unusual Program Behavior Using the Statistical Component of the Nextgeneration Intrusion Detection Expert System (NIDES), by Anderson, et al. (May 1995).

"A Generic Virus Scanner in C++," by Kumar, et al. (Sep. 17, 1992). "A Model for Detecting the Existence of Software Corruption in Real Time," by Voas, et al. (1993).



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.

