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## (12) United States Patent

Rubin et al.

#### (54) METHOD AND SYSTEM FOR ADAPTIVE RULE-BASED CONTENT SCANNERS FOR DESKTOP COMPUTERS

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#### (56) References Cited

#### U.S. PATENT DOCUMENTS

5,077,677 A	12/1991	Murphy et al	706/62
5,359,659 A	10/1994	Rosenthal	726/24
5,361,359 A	11/1994	Tajalli et al	726/23
5,414,833 A	* 5/1995	Hershey et al	726/22
5,485,409 A	1/1996	Gupta et al	726/25
(Continued)			

#### FOREIGN PATENT DOCUMENTS

EP 1091276 4/2001 (Continued)

#### OTHER PUBLICATIONS

D Grune, et al.—Parsing Techniques: A Practical Guide, 2000—John Wiley & Sons, Inc. New York, NY, USA, p. 1-326.\*

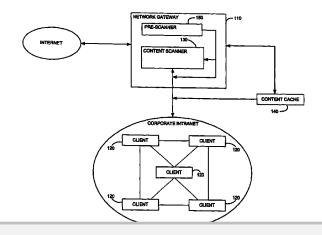
(Continued)

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#### (57) ABSTRACT

A security system for scanning content within a computer, including a network interface, housed within a computer, for receiving content from the Internet on its destination to an Internet application running on the computer, a database of rules corresponding to computer exploits, stored within the computer, a rule-based content scanner that communicates with said database of rules, for scanning content to recognize the presence of potential exploits therewithin, a network traffic probe, operatively coupled to the network interface and to the rule-based content scanner, for selectively diverting content from its intended destination to the rule-based content scanner, and a rule update manager that communicates with said database of rules, for updating said database of rules periodically to incorporate new rules that are made available. A method and a computer readable storage medium are also described and claimed.

#### 25 Claims, 14 Drawing Sheets





#### U.S. PATENT DOCUMENTS 5,485,575 A 5,572,643 A 5,579,509 A 11/1996 Furtney et al. ..... 703/27 5,606,668 A 2/1997 Shwed ...... 726/13 5,623,600 A 4/1997 Ji et al. ..... 726/24 5,638,446 A 6/1997 Rubin ..... 705/51 5,675,711 A 10/1997 Kephart et al. ..... 706/12 McManis ..... 713/167 5,692,047 A 11/1997 5.692.124 A 11/1997 Holden et al. ...... 726/2 5,720,033 A 2/1998 Deo ...... 726/2 5,724,425 A 3/1998 Chang et al. ..... 705/52 5,740,248 A 4/1998 Fieres et al. ...... 713/156 5,740,441 A 4/1998 Yellin et al. ..... 717/134 5,761,421 A 6/1998 van Hoff et al. ..... 709/223 5,765,205 A 6/1998 Breslau et al. ..... 711/203 5.784,459 A 7/1998 Devarakonda et al. ...... 713/165 5,796,952 A 8/1998 Davis et al. ..... 709/224 9/1998 5,805,829 A Cohen et al. ..... 709/202 5,832,208 A 11/1998 Chen et al. ..... 726/24 5,832,274 A 5,850,559 A 11/1998 Cutler et al. ..... 717/171 12/1998 Angelo et al. ..... 713/320 5,859,966 A 1/1999 Hayman et al. ..... 726/23 Boebert et al. ..... 709/249 5,864,683 A 1/1999 5,881,151 A 3/1999 5,884,033 A 3/1999 5,892,904 A 4/1999 Atkinson et al. ..... 726/22 5,951,698 A 9/1999 Chen et al. ..... 714/38 5,956,481 A 9/1999 5,963,742 A 10/1999 5,974,549 A 10/1999 Golan ...... 726/23 5,978,484 A 11/1999 Apperson et al. ..... 705/54 5,983,348 A 11/1999 $Ji \quad \dots \qquad 726/13$ Freund 726/4 Grecsek 726/1 Tso et al. 726/22 11/1999 5,987,611 A 6,088,801 A 7/2000 6,088,803 A 7/2000 6,092,194 A 7/2000 Touboul ...... 726/24 6,154,844 A 11/2000 Touboul et al. ..... 726/24 6,167,520 A 12/2000 Touboul ...... 726/23 6,339,829 B1 1/2002 Beadle et al. ..... 726/15 6,425,058 B1 7/2002 6,434,668 B1 8/2002 6,434,669 B1 8/2002 Arimilli et al. ..... 711/128 6,480,962 B1 11/2002 Touboul ...... 726/22 6,487,666 B1 11/2002 Shanklin et al. ..... 726/23 6,519,679 B2 2/2003 Devireddy et al. ..... 711/114 6,598,033 B2 \* 7/2003 Ross et al. ..... 706/46 6,732,179 B1 5/2004 Brown et al. ..... 709/229 6,804,780 B1 10/2004 Touboul ...... 713/181 6,917,953 B2 7/2005 Simon et al. ..... 707/204 7,058,822 B2 6/2006 Edery et al. ..... 726/22 7,143,444 B2 11/2006 7,210,041 B1\* 4/2007 7,308,648 B1 12/2007 Buchthal et al. ..... 715/234 7,343,604 B2 3/2008 Grabarnik et al. ..... 719/313 7,418,731 B2 8/2008 Touboul ...... 726/22 2002/0059157 A1\* 5/2002 2002/0066024 A1\* 5/2002 2002/0073330 A1\* 6/2002 Chandnani et al. ..... 713/200 2003/0014662 A1 1/2003 Gupta et al. ..... 726/23 2003/0101358 A1 5/2003 Porras et al. ...... 726/4 2004/0073811 A1\* 4/2004 Sanin ...... 713/201 2004/0088425 A1\* 5/2004 Rubinstein et al. ..... 709/230 2005/0050338 A1 3/2005 Liang et al. ..... 713/188 2005/0172338 A1 8/2005 Sandu et al. ..... 726/22 2006/0031207 A1 2/2006 2006/0048224 A1 3/2006 2008/0066160 A1 3/2008 Becker et al. ..... 726/4 2010/0195909 A1\* 8/2010 Wasson et al. ...... 382/176

#### FOREIGN PATENT DOCUMENTS

EP 1132796 9/2001

#### OTHER PUBLICATIONS

International Search Report for Application No. PCT/IL05/00915, 4

Seventh IEEE Symposium on Reliable Distributed Systems, pp. 1-6, Oct. 1998.

Rubin, et al., "Mobile Code Security," *IEEE Internet*, pp. 30-34, Dec. 1998.

Schmid, et al. "Protecting Data From Malicious Software," *Proceeding of the 18th Annual Computer Security Applications Conference*, pp. 1-10, 2002.

Corradi, et al., "A Flexible Access Control Service for Java Mobile Code," *IEEE*, pp. 356-365, 2000.

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

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

International Search Report for Application No. PCT/IB01/01138, 4 pp., Sep. 20, 2002 (mailing date).

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

Gerzic, Amer, "Write Your Own Regular Expression Parser," Nov. 17, 2003, 18 pp., Retrieved from the Internet: http://www.codeguru.com/Cpp/Cpp\_mfc/parsing/article.php/c4093/.

Power, James, "Lexical Analysis," 4 pp., May 14, 2006, Retrieved from the Internet: http://www.cs.may.ie/~jpower/Courses/compilers/notes/lexical.pdf.

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, 243 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<sup>TM</sup>, 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 Java<sup>TM</sup> and Downloadables, Surfin Shield<sup>TM</sup>," Article published on the Internet by Finjan Software Ltd., 2 pp. 1996.

Finjan Sofrtware Ltd., "Finjan Announces a Personal Java<sup>TM</sup> Firewall for Web Browsers—the SurfinShield<sup>TM</sup> 1.6 (formerly known s 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 SurfinShield™ 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



"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.

Leach, Norvin, et al., "IE 3.0 Applets Will Earn Certification," *PC Week*, vol. 13, No. 29, 2 pp., Jul. 22, 1996.

Moritz, R., "Why We Shouldn't Fear Java," *Java Report*, pp. 51-56, Feb. 1997.

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, Oct. 1996, including Abstract, Contents, Introduction, and pp. 1-10.

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

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.

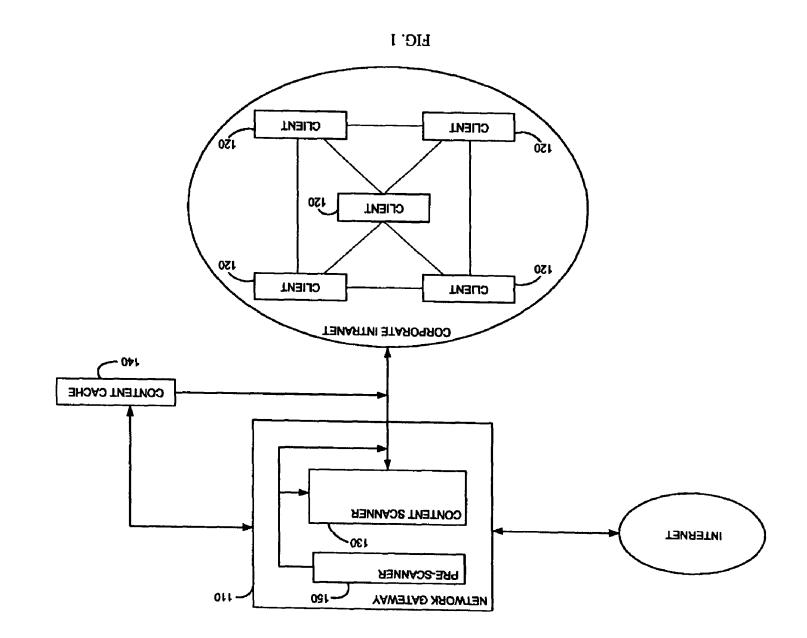
Omura, J. K., "Novel Applications of Cryptography in Digital Communications," *IEEE Communications Magazine*, pp. 21-29, May 1990.

Schmitt, D.A., ".EXE files, OS-2 style," *PC Tech Journal*, vol. 6, No. 11, p. 76(13), Nov. 1988.

Zhang, X. N., "Secure Code Distribution," *IEEE/IEE Electronic Library online, Computer*, vol. 30, Issue 6, pp. 76-79, Jun. 1997. Power, James, "Notes on Formal Language Theory and Parsing," National University of Ireland, pp. 1-40, 1999.

\* cited by examiner





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