

Exhibit 3



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Ederly et al.

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(54) **MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 917 days.

This patent is subject to a terminal disclaimer.

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Related U.S. Application Data

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(51) **Int. Cl.**

G06F 21/24 (2006.01)

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G06F 15/16 (2006.01)

(52) **U.S. Cl.** **726/22**

(58) **Field of Classification Search** None

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,077,677 A 12/1991 Murphy et al. 706/62

(Continued)

FOREIGN PATENT DOCUMENTS

EP 1091276 4/2001
EP 1132796 9/2001

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)

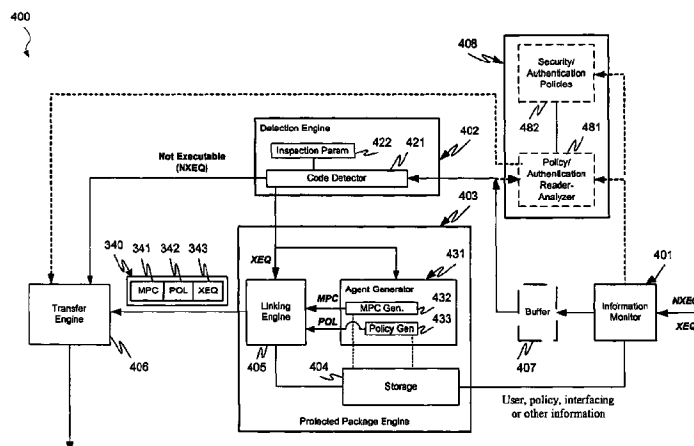
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(57) **ABSTRACT**

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™ applets, ActiveX™ controls, JavaScript™ scripts, Visual Basic scripts, add-ins, downloaded/uploaded programs or other "Downloadables" or "mobile code" in whole or part. A protection engine embodiment provides, within a server, firewall or other suitable "re-communicator," for monitoring information received by the communicator, 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, more suitably by forming a protection agent including the MPC, protection policies and a detected-Downloadable. 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, more suitably in conjunction with protection policies.

41 Claims, 10 Drawing Sheets



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U.S. PATENT DOCUMENTS

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
5,485,575	A	1/1996	Chess et al.	714/38
5,572,643	A	11/1996	Judson	709/218
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
5,692,047	A	11/1997	McManis	713/167
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
5,805,829	A	9/1998	Cohen et al.	709/202
5,832,208	A	11/1998	Chen et al.	726/24
5,832,274	A	11/1998	Cutler et al.	717/171
5,850,559	A	12/1998	Angelo et al.	713/320
5,859,966	A	1/1999	Hayman et al.	726/23
5,864,683	A	1/1999	Boebert et al.	709/249
5,881,151	A	3/1999	Yamamoto	726/24
5,884,033	A	3/1999	Duvall et al.	709/206
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	Walsh et al.	726/23
5,963,742	A	10/1999	Williams	717/143
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	726/13
5,987,611	A	11/1999	Freund	726/4
6,088,801	A	7/2000	Grecsek	726/1
6,088,803	A	7/2000	Tso et al.	726/22
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	Arimilli et al.	711/134
6,434,668	B1	8/2002	Arimilli et al.	711/128
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	Ederly et al.	726/22
7,210,041	B1	4/2007	Gryaznov et al.	713/188
7,343,604	B2	3/2008	Grabarnik et al.	719/313
7,418,731	B2	8/2008	Touboul	726/22
2004/0073811	A1	4/2004	Sanin	726/13
2004/0088425	A1	5/2004	Rubinstein et al.	709/230
2005/0172338	A1	8/2005	Sandu et al.	726/22
2006/0031207	A1	2/2006	Bjarnestam et al.	707/3

OTHER PUBLICATIONS

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).

International Search Report for Application No. PCT/IL05/00915, 4 pp., March 3, 2006.

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

International Search Report for Application No. PCT/IB01/01138, 44 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..

Power, James, "Lexical Analysis," 4 pp., May 14, 2006, Retrieved from the Internet.

Sitaker, Kragen "Rapid Genetic Evolution of Regular Expression" [online], *The Mial Archive*, Apr. 24, 2004 (retrieved on Dec. 7, 2004), 5 pp..

"Lexical Analysis: DFA Minimization & Wrap Up" [online], Fall, 2004 [retrieved on Mar. 2, 2005], 8 pp..

"Minimization of DFA" [online], [retrieved on Dec. 7, 2004], 7 pp., Retrieved from the Internet:

"Algorithm: NFS -> DFA" [online], Copyright 1999-2001 [retrieved on Dec. 7, 2004], 4 pp..

"CS 3813: Introduction to Formal Languages and Automata - State Minimization and Other Algorithms for Finite Automata," [retrieved on May 11, 2003], 38 pp.

Watson, Bruce W., "Constructing Minimal Acyclic Deterministic Finite Automata," [retrieved on Mar. 20, 2005], 38 pp.

Chang, Chia-Hsiang, "From Regular Expression to DFA's Using Compressed NFA's," Oct., 1992, 243 pp.

"Products," Articles published on the Internet, "Revolutionary Security for a New Computing Paradigm" regarding SurfinGate™, 7 pp. no date provided.

"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™ and Downloadables, SurfinShield™" Article published on the Internet by Finjan Software Ltd., 2 pp. 1996.

Finjan Software Ltd., "Finjan Announces as Personal Java™ Firewall for Web Browsers - The SurfinShield™ 1.6 (formerly known as SurfinBoard)," Press Release of Finjan Releases SurfinShield 1.6, 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., 1p., 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.

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.

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

US 7,647,633 B2

Page 3

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.

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.

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.

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

* cited by examiner

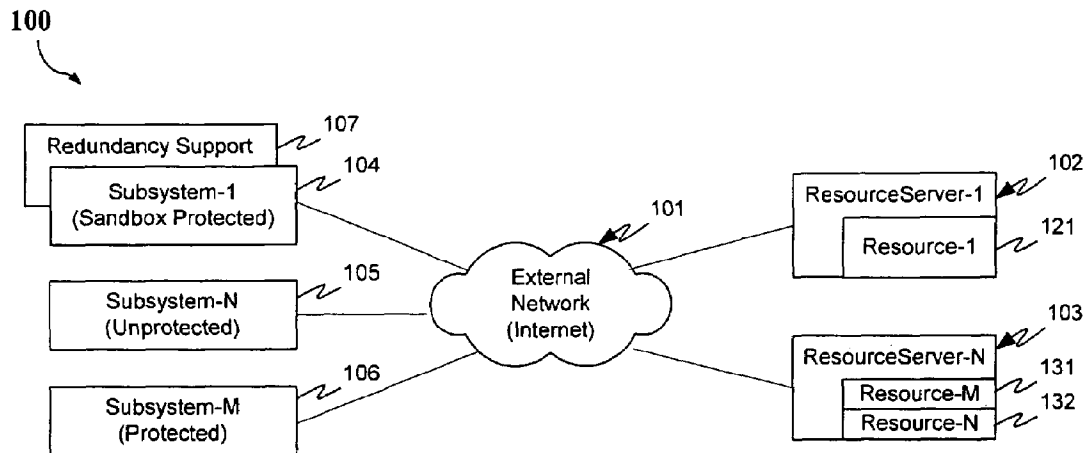


FIG. 1a

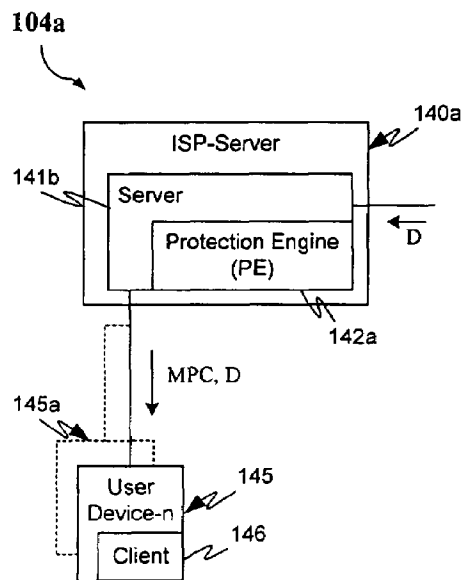


FIG. 1b

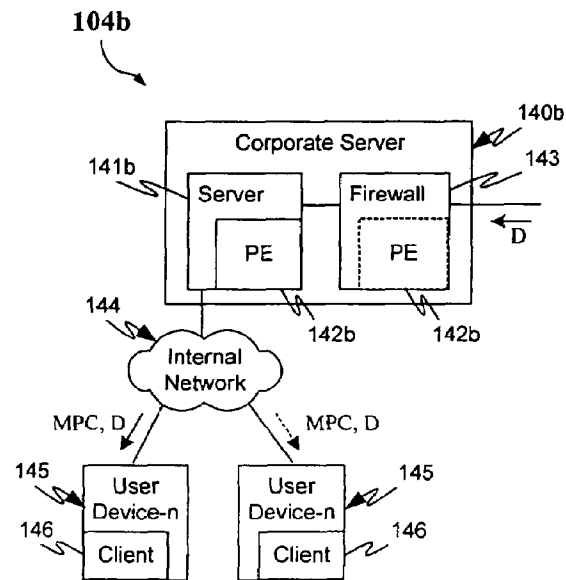


FIG. 1c

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