

TO: Mail Stop 8 Director of the U.S. Patent & Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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In Compliance with 35 § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Northern District of California on the following Patents or Trademarks:

DOCKET NO. CV 14-04908 JSC	DATE FILED 11/4/2014	U.S. DISTRICT COURT 450 Golden Gate Avenue, P.O. Box 36060, San Francisco, CA 94102
PLAINTIFF FINJAN INC		DEFENDANT PALO ALTO NETWORKS INC
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	see Complaint	
2	6,804,780	
3	6,965,968	
4	7,058,822	
5	7,418,731	

In the above—entitled case, the following patent(s) have been included:

DATE INCLUDED	INCLUDED BY <input type="checkbox"/> Amendment <input type="checkbox"/> Answer <input type="checkbox"/> Cross Bill <input type="checkbox"/> Other Pleading		
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK	
1	7,613,918		
2	7,613,926		
3	7,647,633		
4	8,141,154		
5	8,225,408		
	8,677,494		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK Richard W. Wiekling	(BY) DEPUTY CLERK Sheila Rash	DATE November 5, 2014
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Copy 1—Upon initiation of action, mail this copy to Commissioner Copy 3—Upon termination of action, mail this copy to Commissioner
 Copy 2—Upon filing document adding patent(s), mail this copy to Commissioner Copy 4—Case file copy

AO 120 (Rev. 2/99)

TO: Mail Stop 8 Director of the U.S. Patent & Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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In Compliance with 35 § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Northern District California on the Patents or Trademarks:

DOCKET NO. CV 14-02998 RS	DATE FILED June 30, 2014	U.S. DISTRICT COURT 450 Golden Gate Avenue, 16 th Floor, San Francisco CA 94102
PLAINTIFF FINJAN INC		DEFENDANT SYMANTEC CORP
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 6,154,844		
2 7,613,926		
3 7,756,996		
4 7,757,289		
5 7,930,299		

In the above—entitled case, the following patent(s) have been included:

DATE INCLUDED	INCLUDED BY <input checked="" type="checkbox"/> Amendment <input type="checkbox"/> Answer <input type="checkbox"/> Cross Bill <input type="checkbox"/> Other Pleading		
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK	
1 8,015,182		***see Attach First Amended Complaint***	
2 8,141,154			
3 8,677,494			
4			
5			

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK Richard W. Wicking	(BY) DEPUTY CLERK Gina Augustine	DATE September 18, 2014
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Copy 1—Upon initiation of action, mail this copy to Commissioner Copy 3—Upon termination of action, mail this copy to Commissioner
 Copy 2—Upon filing document adding patent(s), mail this copy to Commissioner Copy 4—Case file copy

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 8,677,494 B2
APPLICATION NO. : 13/290708
DATED : March 18, 2014
INVENTOR(S) : Yigal Mordechai Edery et al.

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Title page, item (75) Inventors -

Change "Nimrod Itzhak Vered" to -- Nimrod Itzhak Vered --.

On Title Page 4, Column 2, Line 18, change
"printed Dec. 23, 2998, URL: <http://www.microsft.com/workshop/>"
to -- printed Dec. 23, 1998, URL: <http://www.microsoft.com/workshop/> --.

Signed and Sealed this
Ninth Day of September, 2014



Michelle K. Lee
Deputy Director of the United States Patent and Trademark Office

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Yigal Mordechai EDERY, et al.

Confirmation No.: 4120

Application No.: 13/290,708

Group Art Unit: 2431

Patent No.: 8,677,494

Examiner: Christopher A. Revak

Filed: November 7, 2011

Issued: March 18, 2014

Title: MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS

**REQUEST FOR ISSUANCE OF CERTIFICATE OF CORRECTION PURSUANT
TO 35 U.S.C. § 254 AND 37 C.F.R. § 1.322**

Certificate of Corrections Branch
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Upon review of U.S. Patent No. 8,677,494, Patentee notes errors in the patent which should be corrected as shown on the enclosed Form PTO/SB/44. One of the inventor's names is incorrect under the heading "(75) Inventors" on the face of the patent. There is also an error in the date of one of the references cited on page 4 of the patent.

The undersigned does not believe that a fee is required, as this was not an error caused by the Patentee.

Accordingly, Patentee respectfully solicits the issuance of the requested Certificate of Correction.

Respectfully submitted,

Date: July 10, 2014
Bey & Cotropia PLLC
213 Bayly Court
Richmond, VA 23229
(804) 441-8530

By: /Dawn-Marie Bey - 44,442/
Dawn-Marie Bey (Reg. No. 44,442)

**UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION**Page 1 of 1

PATENT NO. : 8,677,494

APPLICATION NO.: 13/290,708

ISSUE DATE : March 18, 2014

INVENTOR(S) : Yigal Mordechai EDERY, Nimrod Itzhak VERED, David R. KROLL, Shlomo TOUBOUL

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In Heading (75) Inventors -

Please change "Nirmrod Itzhak Vered" to -- Nimrod Itzhak Vered --.

On Page 4, Column 2, Line 18, please change "printed Dec. 23, 2998, URL: <http://www.microsft.com/workshop/>" to -- printed Dec. 23, 1998, URL: <http://www.microsoft.com/workshop/> --.

MAILING ADDRESS OF SENDER (Please do not use customer number below):

Dawn-Marie Bey, Bey & Cotropia PLLC
213 Bayly Court
Richmond, VA 23229

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1.0 hour to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: **Attention Certificate of Corrections Branch, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Acknowledgement Receipt

EFS ID:	19543572
Application Number:	13290708
International Application Number:	
Confirmation Number:	4120
Title of Invention:	MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS
First Named Inventor/Applicant Name:	Yigal Mordechai Edery
Customer Number:	115222
Filer:	Dawn-Marie Bey./Jeanne Paolella-Bald
Filer Authorized By:	Dawn-Marie Bey.
Attorney Docket Number:	FIN0001-CON1-CIP1-CON4
Receipt Date:	10-JUL-2014
Filing Date:	07-NOV-2011
Time Stamp:	14:27:47
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Certificate of Correction	fin0001con1cip1con4_executed_requestforcertificateofcorrection.pdf	89881 <small>56d3a202a1b9663d2bc8ba54d85d55eb6b59c0b</small>	no	1

Warnings:

Information:

2	Request for Certificate of Correction	fin0001con1cip1con4_certificat eofcorrection.pdf	150647 d8925af063a3d88c3aa0cbb215284950baa 47d51	no	1
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Warnings:

Information:

Total Files Size (in bytes):	240528
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P. O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/290,708	03/18/2014	8677494	FIN0001-CON1-CIP1-CON4	4120

115222 7590 02/26/2014
Bey & Cotropia PLLC (Finjan Inc.)
213 Bayly Court
Richmond, VA 23229

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Yigal Mordechai Edery, Pardesia, ISRAEL;
Nirmrod Itzhak Vered, Goosh Tel Mond, ISRAEL;
David R. Kroll, San Jose, CA;
Shlomo Touboul, Kefar-Haim, ISRAEL;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Receipt date: 05/07/2013	Application Number	13290708	13290708 - GAU: 2431
	Filing Date	2011-11-07		
	First Named Inventor	EDERY, Yigal		
	Art Unit	2431		
	Examiner Name	REVAK, Christopher A		
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4		

	24	Docket for Finjan Software Ltd. v. Aladdin Knowledge Systems, Inc., et al., U.S. District Court, District of Delaware (Wilmington), Civil Docket No.1 :08-cv-00300-GMS, 5 pp., retrieved on October 24, 2008 from https://lecf.ded.uscourts.gov/cgi-bin-DktRpt.pl?994267838982431-L 567 0-1	<input type="checkbox"/>
	25	Firewall Toolkit (FWTK) 2.0 Beta Release, 1996	<input type="checkbox"/>
	26	International Search Report for Application No. PCT/ILOSI0091S, 2 pp., dated March 3, 2006	<input type="checkbox"/>
	27	Written Opinion for Application No. PCT/ILOSI0091S, S pp., dated March 3,2006 (mailing date)	<input type="checkbox"/>
	28	International Search Report for Application No. PCT/IBO/01138, 3 pp., September 20, 2002 (mailing date)	<input type="checkbox"/>
	29	International Preliminary Examination Report for Application No. PCT/IBO/01138, 2 pp., dated December 19, 2002	<input type="checkbox"/>
	30	Gerzic, Amer, "Write Your Own Regular Expression Parser," November 17, 2003, 18 pp., Retrieved from the Internet: http://www.codeguru.com/Cpp/Cpp/cpp_mfc/parsing/article.php/c4093/	<input type="checkbox"/>
	31	Power, James, "Lexical Analysis," 4 pp., May 14,2006, Retrieved from the Internet: http://www.cs.may.ie/~jpower/Courses/compilers/notes/lexical.pdf	<input type="checkbox"/>
	32	Sitaker, Kragen, "Rapid Genetic Evolution of Regular Expressions" [online], The Mial Archive, April 24, 2004 (retrieved on December 7,2004), S pp., Retrieved from the Internet: http://www.mail-archive.com/kragen-tol@canonical.org/msg00097.html	<input type="checkbox"/>
Change(s) applied to document, /C.L./ 10/9/2013	33	"Lexical Analysis: DF A Minimization & Wrap Up" [online], Fall, 2004 [retrieved on March 2, 2008], 8 pp., Retrieved from the Internet: http://www.owl.net.rice.edu/~comp412/Lectures/L06LexWrapup4.pdf	<input type="checkbox"/>
	34	"Minimization of DFA" [online], [retrieved on December 7,2004], 7 pp., Retrieved from the Internet: http://www.cs.odu.edu/~toida/nerzic/390teched/regular/fa/min-fa.html	<input type="checkbox"/>

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13290708	13290708 - GAU: 2431
	Filing Date		2011-11-07	
	First Named Inventor	EDERY, Yigal		
	Art Unit	2431		
	Examiner Name	REVAK, Christopher A		
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4		

	86	7143444		2006-11-28	Porras, et al.	
	87	7210041		2007-04-24	Gryaznov, et al.	
	88	7308648		2007-12-11	Buchthal, et al.	
	89	7343604		2008-03-11	Grabamik, et al.	
	90	7418731		2008-08-26	Touboul	
	91	7613926		2009-11-03	Eder, et al.	
	92	7647633		2010-01-12	Eder, et al.	

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
Change(s) applied to document, /C.L./ 10/9/2013	1	20100195909		2010-08-05	Wasson Eder , et al.	
	2	20030014662		2003-01-16	Gupta, et al.	

Receipt date: 05/07/2013 INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13290708	13290708 - GAU: 2431
	Filing Date		2011-11-07	
	First Named Inventor	EDERY, Yigal		
	Art Unit	2431		
	Examiner Name	REVAK, Christopher A		
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4		

	31	5740248		1998-04-14	Fieres, et al.	
Change(s) applied to document, /C.L./ 10/9/2013	32	5740441		1998-04-14	Shao Yellin et al.	
	33	5761421		1998-06-02	Van Hoff, et al.	
	34	5765030		1998-06-09	Nachenberg, et al.	
	35	5765205		1 ⁶ 1998-08-09	Breslau, et al.	
	36	5784459		1998-07-21	Devarakonda, et al.	
	37	5796952		1998-08-18	Davis, et al.	
	38	5805829		1998-09-08	Cohen, et al.	
	39	5809230		1998-09-15	Pereira, J. L. A.	
	40	5825877		1998-10-20	Dan, et al.	
	41	5832208		1998-11-03	Chen, et al.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13290708	13290708 - GAU: 2431
	Filing Date		2011-11-07	
	First Named Inventor	EDERY, Yigal		
	Art Unit	2431		
	Examiner Name	REVAK, Christopher A		
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4		
	Receipt date: 05/07/2013			

	20	5606668		1997-02-25	Shwed	
	21	5621889		1997-04-15	Lermuzeaux, et al.	
	22	5623600		1997-04-22	Ji, et al.	
	23	5623601		1997-04-22	Vu	
	24	5638446		1997-06-10	Rubin	
	25	5675711		1997-10-07	Kephart, et al.	
Change(s) applied to document, /C.L./ 10/9/2013	26	5692047		¹¹ 1997- 12 -25	McManis	
	27	5692124		1997-11-25	Holden, et al.	
	28	5696822		1997-12-09	Nachenberg	
	29	5720033		1998-02-17	Deo	
	30	5724425		1998-03-03	Chang, et al.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13290708	13290708 - GAU: 2431
	Filing Date		2011-11-07	
	First Named Inventor	EDERY, Yigal		
	Art Unit	2431		
	Examiner Name	REVAK, Christopher A		
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4		

Change(s) applied to document, /C.L./ 10/9/2013	9	5361359	1992-08-31	Tajalli, et al.	November 1, 1994
	10	5398196	1995-03-14	Chambers	
	11	5412717	1995-05-02	Fischer	
	12	5414833	1995-05-09	Hershey, et al.	
	13	5440723	1995-08-08	Arnold, et al.	
	14	5452442	1995-09-19	Kephart	
	15	5483649	January 9, 1996 1996-06-09	Kuznetsov, et al.	
	16	5485409	1996-01-16	Gupta, et al.	
	17	5485575	1996-01-16	Chess, et al.	
	18	5524238	1996-06-04	Miller, et al.	
19	5579509	1996-11-26	Furtney, et al.		

Receipt date: 05/07/2013

13290708 - GAI: 2431

Doc code: IDS

Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Doc description: Information Disclosure Statement (IDS) Filed

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13290708	
	Filing Date		2011-11-07	
	First Named Inventor	EDERY, Yigal		
	Art Unit	2431		
	Examiner Name	REVAK, Christopher A		
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4		

U.S. PATENTS						
Examiner Initial	Cite (Change(s) applied to document, No)	Patent Number	Kind Code	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
/D.H.P./	1	8079086		2011-12-13	Edery, et al.	
Change(s) applied to document,	2	4562305		1985 1995-12-31	Gaffney, Jr. Ji, et al.	
/J.M.R./	3	5077677		1991-12-31	Murphy, et al.	
	4	5263147		1993-11-16	Francisco, et al.	
Change(s) applied to document,	5	5278901		1994-05-05	Shieh, et al.	January 11, 1994
/C.L./	6	5311591		1994-05-10	Fischer	
	7	5319776		1994-06-07	File , et al. Hile	
	8	5359659		1994-10-25	Rosenthal	



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/290,708	11/07/2011	Yigal Mordechai Edery	FIN0001-CON1-CIP1-CON4

CONFIRMATION NO. 4120

115222
Bey & Cotropia PLLC (Finjan Inc.)
213 Bayly Court
Richmond, VA 23229

**PUB REQUEST ACCEPTANCE
LETTER**



OC000000066494612

Date Mailed: 02/07/2014

NOTICE OF ACCEPTANCE OF PUBLICATION REQUEST

The request for voluntary publication, amended publication, early publication, redacted publication, republication, corrected publication or revised publication has been received for this application. The request, including payment of any necessary fee(s), is in compliance with 37 CFR 1.215, 1.217, 1.219 or 1.221.

The projected publication date is 05/15/2014.

/dterry/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

5. **Change in Entity Status** (from status indicated above)

Applicant certifying micro entity status. See 37 CFR 1.29

Applicant asserting small entity status. See 37 CFR 1.27

Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature /Dawn-Marie Bey/

Date January 13, 2014

Typed or printed name Dawn-Marie Bey

Registration No. 44,442

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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Electronic Acknowledgement Receipt

EFS ID:	18002591
Application Number:	13290708
International Application Number:	
Confirmation Number:	4120
Title of Invention:	MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS
First Named Inventor/Applicant Name:	Yigal Mordechai Edery
Customer Number:	115222
Filer:	Dawn-Marie Bey.
Filer Authorized By:	
Attorney Docket Number:	FIN0001-CON1-CIP1-CON4
Receipt Date:	23-JAN-2014
Filing Date:	07-NOV-2011
Time Stamp:	13:38:58
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	fin0001con1cip1con4_executed_requesttoapplypreviouslypaidissuefee.pdf	225049 <small>1273c7e4e4a6c118408c1b71d2e47d66702e70b</small>	no	3

Warnings:

Information:

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

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National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PART B - FEE(S) TRANSMITTAL

1/5m

Complete and send this form, together with applicable fee(s), to: **Mail** Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

115222 7590 10/25/2013
Bey & Cotropia PLLC (Finjan Inc.)
 213 Bayly Court
 Richmond, VA 23229



Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

_____ (Depositor's name)
_____ (Signature)
_____ (Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13290708	11/07/2011	Yigal Mordechai Edery	FIN0001-CON1-CIP1-CON4	4120

TITLE OF INVENTION: MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$0	\$0	\$1780	\$0	01/27/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
REVAK, CHRISTOPHER A	2431	726-024000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
 Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
 "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.

2. For printing on the patent front page, list
 (1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
 (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Bey & Cotropia PLLC
 2 _____
 3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)
 PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Finjan, Inc.
 (B) RESIDENCE: (CITY and STATE OR COUNTRY) Wilmington, DE

Please check the appropriate assignee category or categories (will not be printed on the patent):
 Individual Corporation or other private group entity Government

4a. The following fee(s) are submitted:
 Issue Fee
 Publication Fee (No small entity discount permitted)
 Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)
 A check is enclosed.
 Payment by credit card. Form PTO-2038 is attached.
 The Director is hereby authorized to charge the required fee(s); any deficiency, or credit any overpayment, to Deposit Account Number 50-6099 (enclose an extra copy of this form).

Adjustment date: 01/30/2014 EEKUBAY2
 09/20/2013 INTEFSW 00002867 13290708
 01 FC:1501 -1780.00 OP

01/30/2014 EEKUBAY2 00000002 13290708
 01 FC:1501 960.00 OP
 02 FC:1508 820.00 OP

5. Change in Entity Status (from status indicated above)

- Applicant certifying micro entity status. See 37 CFR 1.29
- Applicant asserting small entity status. See 37 CFR 1.27
- Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature /Dawn-Marie Bey/

Date January 13, 2014

Typed or printed name Dawn-Marie Bey

Registration No. 44,442

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

FIN0001-CON1-CIP1-CON4

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Yigal Mordechai EDERY, et al.



Group Art Unit: 2431

Serial No.: 13/290,708

Examiner: Christopher A. Revak

Filed: November 7, 2011

For: MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS

REQUEST TO APPLY PREVIOUSLY PAID ISSUE FEE PAYMENT

United States Patent and Trademark Office
Customer Service Window, Mail Stop Issue Fee
Randolph Building
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This document is being filed to request that the issue fee previously paid on September 19, 2013, be applied to the issue fee due by January 27, 2014. The Part B – Fee Transmittal was recently filed on January 13, 2014 (see attachment A).

On August 29, 2013, a Notice of Allowance was issued on the above application. On September 19, 2013, the Part B – Fee Transmittal was filed and the issue and publication fees were paid. The application was withdrawn from issue on October 1, 2013. On October 25, 2013, a second Notice of Allowance was issued. On January 13, 2014, the Part B – Fee Transmittal was filed.

The undersigned respectfully requests that the previously paid issue fee be applied to the current Notice of Allowance and the application proceed to issuance. In addition, if any additional fees are required in connection with this Request, the Commissioner is hereby authorized to charge the same to Deposit Account 50-6099.

Respectfully submitted,

Date: January 23, 2014

By: /Dawn-Marie Bey – 44,442/
Dawn-Marie Bey (Reg. No. 44,442)

Bey & Cotropia PLLC
213 Bayly Court
Richmond, VA 23229
(804) 441-8530



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

Table with columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO., EXAMINER, ART UNIT, PAPER NUMBER, NOTIFICATION DATE, DELIVERY MODE. Includes application details for 13/290,708 filed 11/07/2011 by Yigal Mordechai Edery.

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

dawnmarie@beycotropia.com
bey_cotropia_docketing@cardinal-ip.com



UNITED STATES DEPARTMENT OF COMMERCE
U.S. Patent and Trademark Office
 Address: COMMISSIONER FOR PATENTS
 P.O. Box 1450
 Alexandria, Virginia 22313-1450

APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
13/290,708	07 November, 2011	EDERY ET AL.	FIN0001-CON1-CIP1- CON4

Bey & Cotropia PLLC (Finjan Inc.) 213 Bayly Court Richmond, VA 23229	EXAMINER	
	CHRISTOPHER REVAK	
	ART UNIT	PAPER
	2431	20140111

DATE MAILED:

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner for Patents

PTO Form 1449 filed on January 8, 2014 complies with the requirement of the paper mailed December 30, 2013 requiring missing documentation of the IDS filed on 5/7/13. A copy of the corrected IDS filed on 1/8/14 in included with this correspondence.

/CHRISTOPHER REVAK/
 Primary Examiner, Art Unit 2431

Receipt date: 01/08/2014

13290708 - GAU: 2431

Form PTO-1449 (Rev. 2-32)		U.S. Department of Commerce Patent & Trademark Office		Atty. Docket No. FIN0001-CON1-CIP1-CON4		Serial No. 13/290,708	
INFORMATION DISCLOSURE STATEMENT							
<i>(Use several sheets if necessary)</i>				Applicant Yigal Mordechai EDERY, et al.			
				Filing Date November 7, 2011		Group 2431	
U.S. PATENT DOCUMENTS							
Examiner Initial		Document Number	Date	Name	Class	Sub-Class	Filing Date (if appropriate)
FOREIGN PATENT DOCUMENTS							
OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)							
		<p>"Internet Security Gets Less Costly and Easier to Manage: Integralis Announces MIMESweeper Compatible with Check Point FireWall-1 on Single NT Server; E-mail virus detection and content management can reside on Firewall server, saving money and supports costs" [online], The Free Library, September 16, 1996 [retrieved on March 20, 2012], 4 pp., Retrieved From the Internet: http://www.thefreelibrary.com/Internet+Security+gets+Less+Costly+and+Easier+to+Manage%3a+Integralis...-a018675791%22%3EInternet%20Security%20gets%20Less%20Costly%20and%20Easier%20to%20Manage:%20Integralis%20Announces%20MIMESweeper%20Compatible%20with%20Check%20Point%20FireWall-1%20on%20Single%20NT%20Server;%20E-mail%20virus%20detection%20and%20content%20management%20can%20reside%20on%20Firewall%20server,%20saving%20money%20and%20support%20costs (Current Link: http://www.thefreelibrary.com/Internet Security gets Less Costly and Easier to Manage: Integralis...-a018675791)</p>					
EXAMINER /Christopher Revak/				DATE CONSIDERED 01/11/2014			
<small>EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication.</small>							

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.R./

Receipt date: 01/08/2014

13290708 - GAU: 2431

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 07/31/2012. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13290708
	Filing Date	2011-11-07
	First Named Inventor	Yigal Mordechai EDERY, et al.
	Art Unit	2431
	Examiner Name	Christopher A. Revak
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4

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Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1					

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Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ² j	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1							<input type="checkbox"/>

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NON-PATENT LITERATURE DOCUMENTS		Remove
Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13290708	13290708 - GAU: 2431	
	Filing Date		2011-11-07		
	First Named Inventor		Yigal Mordechai EDERY, et al.		
	Art Unit		2431		
	Examiner Name		Christopher A. Revak		
	Attorney Docket Number		FIN0001-CON1-CIP1-CON4		

1		"Internet Security Gets Less Costly and Easier to Manage: Integralis Announces MIMESweeper Compatible with Check Point FireWall-1 on Single NT Server; E-mail virus detection and content management can reside on Firewall server, saving money and supports costs" [online]. The Free Library, September 16, 1996 [retrieved on March 20, 2012], 4 pp., Retrieved From the Internet: http://www.thefreelibrary.com/Internet+Security+gets+Less+Costly+and+Easier+to+Manage%3a+Integralis...+a018675791%22%3EInternet%20Security%20gets%20Less%20Costly%20and	<input type="checkbox"/>
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If you wish to add additional non-patent literature document citation information please click the Add button **Add**

EXAMINER SIGNATURE

Examiner Signature	/Christopher Revak/	Date Considered	01/11/2014
--------------------	---------------------	-----------------	------------

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13290708	13290708 - GAU: 2431
	Filing Date	2011-11-07	
	First Named Inventor	Yigal Mordechai EDERY, et al.	
	Art Unit	2431	
	Examiner Name	Christopher A. Revak	
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4	

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

- See attached certification statement.
- The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Dawn-Marie Bey/	Date (YYYY-MM-DD)	2014-01-08
Name/Print	Dawn-Marie Bey	Registration Number	44,442

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.R./

PART B - FEE(S) TRANSMITTAL

**Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE
 Commissioner for Patents
 P.O. Box 1450
 Alexandria, Virginia 22313-1450
 or Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

115222 7590 10/25/2013
Bey & Cotropia PLLC (Finjan Inc.)
 213 Bayly Court
 Richmond, VA 23229

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

_____ (Depositor's name)
_____ (Signature)
_____ (Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/290,708	11/07/2011	Yigal Mordechai Edery	FIN0001-CON1-CIP1-CON4	4120

TITLE OF INVENTION: MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$0	\$0	\$1780	\$0	01/27/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
REVAK, CHRISTOPHER A	2431	726-024000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
 Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
 "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
 (1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
 (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Bey & Cotropia PLLC
 2 _____
 3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Finjan, Inc.

Wilmington, DE

Please check the appropriate assignee category or categories (will not be printed on the patent): Individual Corporation or other private group entity Government

4a. The following fee(s) are submitted:

- Issue Fee
- Publication Fee (No small entity discount permitted)
- Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- A check is enclosed.
- Payment by credit card. Form PTO-2038 is attached.
- The Director is hereby authorized to charge the required fee(s); any deficiency, or credit any overpayment, to Deposit Account Number 50-6099 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

- Applicant certifying micro entity status. See 37 CFR 1.29
- Applicant asserting small entity status. See 37 CFR 1.27
- Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature /Dawn-Marie Bey/

Date January 13, 2014

Typed or printed name Dawn-Marie Bey

Registration No. 44,442

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Electronic Acknowledgement Receipt

EFS ID:	17902771
Application Number:	13290708
International Application Number:	
Confirmation Number:	4120
Title of Invention:	MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS
First Named Inventor/Applicant Name:	Yigal Mordechai Edery
Customer Number:	115222
Filer:	Dawn-Marie Bey./Jeanne Paolella-Bald
Filer Authorized By:	Dawn-Marie Bey.
Attorney Docket Number:	FIN0001-CON1-CIP1-CON4
Receipt Date:	13-JAN-2014
Filing Date:	07-NOV-2011
Time Stamp:	23:56:27
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	fin0001con1cip1con4_executed_partb_feespdpdf	260912 <small>7108fd5096aff6cdd1fa1a9159f16dc23a57856d</small>	no	2

Warnings:

Information:

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

Duo

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

115222 7590 10/25/2013
Bey & Cotropia PLLC (Finjan Inc.)
 213 Bayly Court
 Richmond, VA 23229



Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

_____ (Depositor's name)
_____ (Signature)
_____ (Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/290,708	11/07/2011	Yigal Mordechai Edery	FIN0001-CON1-CIP1-CON4	4120

TITLE OF INVENTION: MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$0	\$0	\$1780	\$0	01/27/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
REVAK, CHRISTOPHER A	2431	726-024000

<p>1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).</p> <p><input type="checkbox"/> Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.</p> <p><input type="checkbox"/> "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.</p>	<p>2. For printing on the patent front page, list</p> <p>(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,</p> <p>(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.</p> <p>1 <u>Bey & Cotropia PLLC</u></p> <p>2 _____</p> <p>3 _____</p>
--	--

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: **Finjan, Inc.**

(B) RESIDENCE: (CITY and STATE OR COUNTRY) **Wilmington, DE**

Please check the appropriate assignee category or categories (will not be printed on the patent): Individual Corporation or other private group entity Government

<p>4a. The following fee(s) are submitted:</p> <p><input type="checkbox"/> Issue Fee</p> <p><input type="checkbox"/> Publication Fee (No small entity discount permitted)</p> <p><input type="checkbox"/> Advance Order - # of Copies _____</p>	<p>4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)</p> <p><input type="checkbox"/> A check is enclosed.</p> <p><input type="checkbox"/> Payment by credit card. Form PTO-2038 is attached.</p> <p><input checked="" type="checkbox"/> The Director is hereby authorized to charge the required fee(s); any deficiency, or credit any overpayment, to Deposit Account Number <u>50-6099</u> (enclose an extra copy of this form).</p>
---	--

5. Change in Entity Status (from status indicated above)

- Applicant certifying micro entity status. See 37 CFR 1.29
- Applicant asserting small entity status. See 37 CFR 1.27
- Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature /Dawn-Marie Bey/

Date January 13, 2014

Typed or printed name Dawn-Marie Bey

Registration No. 44,442

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO.

13/290,708 11/07/2011 Yigal Mordechai Edery FIN0001-CON1-CIP1-CON4 4120

115222 7590 01/08/2014
Bey & Cotropia PLLC (Finjan Inc.)
213 Bayly Court
Richmond, VA 23229

Table with 1 column: EXAMINER

REVAK, CHRISTOPHER A

Table with 2 columns: ART UNIT, PAPER NUMBER

2431

Table with 2 columns: NOTIFICATION DATE, DELIVERY MODE

01/08/2014 ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

dawnmarie@beycotropia.com
bey_cotropia_docketing@cardinal-ip.com

Response to Rule 312 Communication	Application No. 13/290,708	Applicant(s) EDERY ET AL.
	Examiner CHRISTOPHER REVAK	Art Unit 2431

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

1. The amendment filed on 12/6/13 under 37 CFR 1.312 has been considered, and has been:
- a) entered.
 - b) entered as directed to matters of form not affecting the scope of the invention.
 - c) disapproved because the amendment was filed after the payment of the issue fee.
Any amendment filed after the date the issue fee is paid must be accompanied by a petition under 37 CFR 1.313(c)(1) and the required fee to withdraw the application from issue.
 - d) disapproved. See explanation below.
 - e) entered in part. See explanation below.

	/CHRISTOPHER REVAK/ Primary Examiner, Art Unit 2431
--	--

Receipt date: 12/06/2013

13290708 - GAU: 2431

OK TO ENTER: /C.R./

FIN0001-CON1-CIP1-CON4

PATENT

01/03/2014

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Yigal Mordechai EDERY, et al.

Group Art Unit: 2431

Serial No.: 13/290,708

Examiner: Christopher A. Revak

Filed: November 7, 2011

For: MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND
METHOFDS

AMENDMENT TO THE SPECIFICATION UNDER 37 C.F.R. § 1.312

Commissioner for Patents
Mail Stop: **Issue Fee**
P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

In conjunction with the Request for Reconsideration of the Dismissed Renewed Petition to Accept Unintentionally Delayed Claim of Priority Under 35 U.S.C. §119(e) and § 120 for the Benefit of a Prior-Filed Application Filed Under 37 C.F.R. § 1.78(a)(3) entry of the following amendment to the specification and consideration of the remarks submitted herein is respectfully requested.

Amendments to the Specification begin on page 2 of this paper.

Remarks begin on page 4 of this paper.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13290708	
	Filing Date		2011-11-07	
	First Named Inventor	Yigal Mordechai EDERY, et al.		
	Art Unit	2431		
	Examiner Name	Christopher A. Revak		
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4		

U.S. PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
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Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
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If you wish to add additional U.S. Published Application citation information please click the Add button. Add

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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ² j	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1							<input type="checkbox"/>

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

NON-PATENT LITERATURE DOCUMENTS			Remove
Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13290708
	Filing Date	2011-11-07
	First Named Inventor	Yigal Mordechai EDERY, et al.
	Art Unit	2431
	Examiner Name	Christopher A. Revak
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4

1	"Internet Security Gets Less Costly and Easier to Manage: Integralis Announces MIMESweeper Compatible with Check Point FireWall-1 on Single NT Server; E-mail virus detection and content management can reside on Firewall server, saving money and supports costs" [online], The Free Library, September 16, 1996 [retrieved on March 20, 2012], 4 pp., Retrieved From the Internet: http://www.thefreelibrary.com/Internet+Security+gets+Less+Costly+and+Easier+to+Manage%3a+Integralis...-a018675791%22%3EInternet%20Security%20gets%20Less%20Costly%20and	<input type="checkbox"/>
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If you wish to add additional non-patent literature document citation information please click the Add button **Add**

EXAMINER SIGNATURE

Examiner Signature	Date Considered
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13290708
	Filing Date	2011-11-07
	First Named Inventor	Yigal Mordechai EDERY, et al.
	Art Unit	2431
	Examiner Name	Christopher A. Revak
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Dawn-Marie Bey/	Date (YYYY-MM-DD)	2014-01-08
Name/Print	Dawn-Marie Bey	Registration Number	44,442

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	17851112
Application Number:	13290708
International Application Number:	
Confirmation Number:	4120
Title of Invention:	MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS
First Named Inventor/Applicant Name:	Yigal Mordechai Edery
Customer Number:	115222
Filer:	Dawn-Marie Bey./Jeanne Paolella-Bald
Filer Authorized By:	Dawn-Marie Bey.
Attorney Docket Number:	FIN0001-CON1-CIP1-CON4
Receipt Date:	08-JAN-2014
Filing Date:	07-NOV-2011
Time Stamp:	12:48:33
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	fin0001con1cip1con4_executed_responsetomisellaneouscommunication.pdf	1349417 <small>84c06f2a7d8c174dd8698127327ea57f28461a29</small>	no	2

Warnings:

Information:

2	Information Disclosure Statement (IDS) Form (SB08)	fin0001con1cip1con4_sb08formisccomm.pdf	612454	no	4
			2f693082d7b85260da7a0f7b35a87eabc7d9b598		

Warnings:

Information:

A U.S. Patent Number Citation or a U.S. Publication Number Citation is required in the Information Disclosure Statement (IDS) form for autoloading of data into USPTO systems. You may remove the form to add the required data in order to correct the Informational Message if you are citing U.S. References. If you chose not to include U.S. References, the image of the form will be processed and be made available within the Image File Wrapper (IFW) system. However, no data will be extracted from this form. Any additional data such as Foreign Patent Documents or Non Patent Literature will be manually reviewed and keyed into USPTO systems.

3	Non Patent Literature	fin0001con1cip1con4_reference.pdf	205070	no	4
			3717539921aefef429cddb2029564eea117f4ae8		

Warnings:

Information:

Total Files Size (in bytes): 2166941

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Docket No. FIN0001-CON1-CIP1-CON4

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:

Yigal Mordechai EDERY, et al.

Serial No.: 13/290,708

Group Art Unit: 2431

Filed: November 7, 2011

Examiner: Christopher A. Revak

For: **MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS**

**RESPONSE TO MISCELLANEOUS COMMUNICATION TO APPLICANT
(DATED DECEMBER 30, 2013)**

U.S. Patent and Trademark Office
Customer Service Window, Mail Stop ISSUE FEE
Randolph Building
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This document is being filed in response to the Miscellaneous Communication To Applicant issued by the Examiner on December 30, 2013. The reference noted on the attached SB-08 form is hereby brought to the attention of the Examiner.

The undersigned received a call from the Examiner on December 19, 2013 regarding missing portions of a citation on the Information Disclosure Statement filed on May 7, 2013. The undersigned resubmits the original, complete citation, an updated citation for viewing the reference online, and a copy of the article. The Commissioner is hereby authorized to charge any additional fees under 37 C.F.R. 1.16 or 1.17 which may be required during the pendency of this application, or to credit any overpayment, to Deposit Account No. 50-6099.

The above information is presented so that the United States Patent and Trademark Office may, in the first instance, determine any materiality thereof to the claimed invention. See

Application Serial No. 13/290,708

Docket No. FIN0001-CON1-CIP1-CON4

37 C.F.R. §§ 1.104(a) conferring the PTO duty to consider and use any such information. It is respectfully requested that the information be expressly considered during the prosecution of this application, and that the references be made of record therein and appear among the “References Cited” on any patent to issue therefrom.

Respectfully submitted,

Date: January 8, 2014

By: /Dawn-Marie Bey – 44,442/
Dawn-Marie Bey (Reg. No. 44,442)

Bey & Cotropia PLLC
213 Bayly Court
Richmond, VA 23229
(804) 441-8530

Form PTO-1449 (Rev. 2-32)	U.S. Department of Commerce Patent & Trademark Office	Atty. Docket No. FIN0001-CON1-CIP1- CON4	Serial No. 13/290,708
INFORMATION DISCLOSURE STATEMENT			
<i>(Use several sheets if necessary)</i>		Applicant Yigal Mordechai EDERY, et al.	
		Filing Date November 7, 2011	Group 2431

U.S. PATENT DOCUMENTS

Examiner Initial		Document Number	Date	Name	Class	Sub-Class	Filing Date (if appropriate)

FOREIGN PATENT DOCUMENTS

--	--	--	--	--	--	--	--

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

		<p>"Internet Security Gets Less Costly and Easier to Manage: Integralis Announces MIMESweeper Compatible with Check Point FireWall-1 on Single NT Server; E-mail virus detection and content management can reside on Firewall server, saving money and supports costs" [online], The Free Library, September 16, 1996 [retrieved on March 20, 2012], 4 pp., Retrieved From the Internet: http://www.thefreelibrary.com/Internet+Security+gets+Less+Costly+and+Easier+to+Manage%3a+Integralis...-a018675791%22%3EInternet%20Security%20gets%20Less%20Costly%20and%20Easier%20to%20Manage:%20Integralis%20Announces%20MIMESweeper%20Compatible%20with%20Check%20Point%20FireWall-1%20on%20Single%20NT%20Server;%20E-mail%20virus%20detection%20and%20content%20management%20can%20reside%20on%20Firewall%20server,%20saving%20money%20and%20support%20costs (Current Link: http://www.thefreelibrary.com/Internet Security gets Less Costly and Easier to Manage: Integralis...-a018675791)</p>

EXAMINER	DATE CONSIDERED
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EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication.

Electronic Acknowledgement Receipt

EFS ID:	17851307
Application Number:	13290708
International Application Number:	
Confirmation Number:	4120
Title of Invention:	MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS
First Named Inventor/Applicant Name:	Yigal Mordechai Edery
Customer Number:	115222
Filer:	Dawn-Marie Bey./Jeanne Paolella-Bald
Filer Authorized By:	Dawn-Marie Bey.
Attorney Docket Number:	FIN0001-CON1-CIP1-CON4
Receipt Date:	08-JAN-2014
Filing Date:	07-NOV-2011
Time Stamp:	13:00:51
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
------------------------	----

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	fin0001con1cip1con4_1449_misccomm.pdf	102444 <small>9225aa1595f69fe27325b553acd15cd572531e66</small>	no	1

Warnings:

Information:

This is not an USPTO supplied IDS fillable form

Total Files Size (in bytes):

102444

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



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Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO.

13/290,708 11/07/2011 Yigal Mordechai Edery FIN0001-CON1-CIP1-CON4 4120

115222 7590 12/30/2013
Bey & Cotropia PLLC (Finjan Inc.)
213 Bayly Court
Richmond, VA 23229

Table with 1 column: EXAMINER

REVAK, CHRISTOPHER A

Table with 2 columns: ART UNIT, PAPER NUMBER

2431

Table with 2 columns: NOTIFICATION DATE, DELIVERY MODE

12/30/2013 ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

dawnmarie@beycotropia.com
bey_cotropia_docketing@cardinal-ip.com



UNITED STATES DEPARTMENT OF COMMERCE
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 Alexandria, Virginia 22313-1450

APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
13/290,708	07 November, 2011	EDERY ET AL.	FIN0001-CON1-CIP1-

CON4

Bey & Cotropia PLLC (Finjan Inc.) 213 Bayly Court Richmond, VA 23229	EXAMINER	
	CHRISTOPHER REVAK	
	ART UNIT	PAPER
	2431	20131223

DATE MAILED:

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner for Patents

The Examiner contacted the Attorney of record, Dawn-Marie Bey on Thursday December 19th in an attempt to resolve missing documentation from an IDS filed on 5/7/13. It was noted that item #7 titled "Internet Security Gets Less Costly and Easier to Manage....." was missing citation documentation cutoff by size limitations in the entry field. The Examiner indicated that the Applicant would be given a 30 day response period to submit the missing information. The 30 day response period is not extendable and failure to respond to this notice would result in the abandonment of the application.

/CHRISTOPHER REVAK/
 Primary Examiner, Art Unit 2431

PTO-90C (Rev.04-03)



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www.uspto.gov

Bey & Cotropia PLLC (Finjan Inc.)
213 Bayly Court
Richmond VA 23229

MAILED

DEC 24 2013

OFFICE OF PETITIONS

In re Application of	:	
Edery et al.	:	
Application No. 13/290,708	:	DECISION GRANTING PETITIONS
Filed: November 7, 2011	:	UNDER 37 CFR 1.78(a)(3) AND (a)(6)
Attorney Docket No. FIN0001-CON1-CIP1-CON4	:	

This is a decision on the renewed petition under 37 CFR §§ 1.78(a)(3) and 1.78(a)(6), filed December 6, 2013, to accept an unintentionally delayed claim under 35 U.S.C. §§ 120 and 119(e) for the benefit of priority to the prior-filed nonprovisional and provisional applications set forth in the concurrently filed amendment.

The petition is **GRANTED**

A petition for acceptance of a claim for late priority under 37 CFR §§ 1.78(a)(3) and 1.78(a)(6) is only applicable to those applications filed on or after November 29, 2000 and after the expiration of the period specified in 37 CFR §§ 1.78(a)(2)(ii) and 1.78(a)(5)(ii). In addition, the petition under 37 CFR §§ 1.78(a)(3) and 1.78(a)(6) must be accompanied by:

- (1) the reference required by 35 U.S.C. §§ 120 and 119(e) and 37 CFR §§ 1.78(a)(2)(i) and 1.78(a)(5)(i) of the prior-filed application, unless previously submitted;
- (2) the surcharge set forth in § 1.17(t); and
- (3) a statement that the entire delay between the date the claim was due under 37 CFR §§ 1.78(a)(2)(ii) and 1.78(a)(5)(ii) and the date the claim was filed was unintentional. The Director may require additional where there is a question whether the delay was unintentional.

Additionally, the instant nonprovisional application must be pending at the time of filing of the reference to the prior-filed provisional application as required by 37 CFR 1.78(a)(5)(ii). Further, a nonprovisional application in the priority chain claiming the benefit of the prior-filed provisional application must have been filed within twelve months of the filing date of the prior-filed provisional application.

All the above requirements having been satisfied, the late claim for benefit of priority under 35 U.S.C. §§ 120 and 119(e) is accepted as being unintentionally delayed.

The granting of the petition to accept the delayed benefit claim to the prior-filed applications under 37 CFR §§ 1.78(a)(3) and 1.78(a)(6) should not be construed as meaning that this application is entitled to the benefit of the filing date of the prior-filed applications. In order for this application to be entitled to the benefit of the prior-filed applications, all other requirements under 35 U.S.C. §§120 and 1.78(a)(1) and (a)(2) and under 35 U.S.C. §119(e) and 37 CFR 1.78(a)(4) and (a)(5) must be met. Similarly, the fact that the corrected Filing Receipt accompanying this decision on petition includes the prior-filed applications should not be construed as meaning that applicant is entitled to the claim for benefit of priority to the prior-filed applications noted thereon. Accordingly, the examiner will, in due course, consider this benefit claim and determine whether the application is entitled to the benefit of the earlier filing date.

A corrected Filing Receipt, which includes the priority claim to the prior-filed applications, accompanies this decision on petition.

Any questions concerning this matter may be directed to the undersigned at (571) 272-3230. All other inquiries concerning either the examination procedures or status of the application should be directed to the Technology Center.

This application is being forwarded to Technology Center Art Unit 2431 for consideration by the examiner of the claim under 35 U.S.C. § §120 and 119(e) of the prior-filed nonprovisional and provisional applications.



Shirene Willis Brantley
Attorney Advisor
Office of Petitions

ATTACHMENT : Corrected Filing Receipt



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Table with 7 columns: APPLICATION NUMBER, FILING or 371(c) DATE, GRP ART UNIT, FIL FEE REC'D, ATTY. DOCKET NO, TOT CLAIMS, IND CLAIMS. Row 1: 13/290,708, 11/07/2011, 2431, 1550, FIN0001-CONT-CIPI-CON4, 18, 2

CONFIRMATION NO. 4120

CORRECTED FILING RECEIPT

115222
Bey & Cotropia PLLC (Finjan Inc.)
213 Bayly Court
Richmond, VA 23229



Date Mailed: 12/23/2013

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application, must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections

Inventor(s)

Yigal Mordechai Edery, Pardesia, ISRAEL;
Nirmrod Itzhak Vered, Goosh Tel Mond, ISRAEL;
David R. Kroll, San Jose, CA;
Shlomo Touboul, Kefar-Haim, ISRAEL;

Applicant(s)

Yigal Mordechai Edery, Pardesia, ISRAEL;
Nirmrod Itzhak Vered, Goosh Tel Mond, ISRAEL;
David R. Kroll, San Jose, CA;
Shlomo Touboul, Kefar-Haim, ISRAEL;

Power of Attorney: The patent practitioners associated with Customer Number 74877

Domestic Priority data as claimed by applicant

This application is a CON of 12/471,942 05/26/2009 PAT 8079086
which is a CON of 11/370,114 03/07/2006 PAT 7613926
which is a CON of 09/861,229 05/17/2001 PAT 7058822
which claims benefit of 60/205,591 05/17/2000
and is a CIP of 09/539,667 03/30/2000 PAT 6804780
which is a CON of 08/964,388 11/06/1997 PAT 6092194
which claims benefit of 60/030,639 11/08/1996
and said 09/861,229 05/17/2001
is a CIP of 09/551,302 04/18/2000 PAT 6480962
which is a CON of 08/790,097 01/29/1997 PAT 6167520
which claims benefit of 60/030,639 11/08/1996

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

If Required, Foreign Filing License Granted: 11/17/2011

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/290,708**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No

Title

MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS

Preliminary Class

726

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications:

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative,

page 2 of 4

this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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Bib Data Sheet

CONFIRMATION NO. 4120

SERIAL NUMBER	FILING OR 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.	
13/290,708	11/07/2011	726	2431	FIN0001-CON1-CIP1-CON4	
AIA (First Inventor to File): NO					
INVENTORS Yigal Mordechai Edery, Pardesia, ISRAEL; Nirmrod Itzhak Vered, Goosh Tel Mond, ISRAEL; David R. Kroll, San Jose, CA; Shlomo Touboul, Kefar-Haim, ISRAEL;					
APPLICANTS Yigal Mordechai Edery, Pardesia, ISRAEL; Nirmrod Itzhak Vered, Goosh Tel Mond, ISRAEL; David R. Kroll, San Jose, CA; Shlomo Touboul, Kefar-Haim, ISRAEL;					
** CONTINUING DATA ***** This application is a CON of 12/471,942 05/26/2009 PAT 8079086 which is a CON of 11/370,114 03/07/2006 PAT 7613926 which is a CON of 09/861,229 05/17/2001 PAT 7058822 which claims benefit of 60/205,591 05/17/2000 and is a CIP of 09/539,667 03/30/2000 PAT 6804780 which is a CON of 08/964,388 11/06/1997 PAT 6092194 which claims benefit of 60/030,639 11/08/1996 and said 09/861,229 05/17/2001 is a CIP of 09/551,302 04/18/2000 PAT 6480962 which is a CON of 08/790,097 01/29/1997 PAT 6167520 which claims benefit of 60/030,639 11/08/1996					
** FOREIGN APPLICATIONS *****					
IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 11/17/2011					
Foreign Priority claimed 35 USC 119 (a-d) conditions met	<input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> Met after Allowance	STATE OR COUNTRY ISRAEL	SHEETS DRAWING 10	TOTAL CLAIMS 18	INDEPENDENT CLAIMS 2
Verified and Acknowledged Examiner's Signature _____ Initials _____					
ADDRESS					

115222

TITLE

MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS

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RECEIVED**
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- 1.17 Fees (Processing Ext. of time)
- 1.18 Fees (Issue)
- Other _____
- Credit



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CONFIRMATION NO. 4120

CORRECTED FILING RECEIPT

115222
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If Required, Foreign Filing License Granted: 11/17/2011

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/290,708**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No

Title

MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS

Preliminary Class

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Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

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This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop

technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.

FIN0001-CON1-CIP1-CON4

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Yigal Mordechai EDERY, et al.

Group Art Unit: 2431

Serial No.: 13/290,708

Examiner: Christopher A. Revak

Filed: November 7, 2011

For: MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS

**REQUEST FOR RECONSIDERATION OF THE DISMISSED RENEWED PETITION
TO ACCEPT UNINTENTIONALLY DELAYED CLAIM OF PRIORITY UNDER 35
U.S.C. §119(e) AND §120 FOR THE BENEFIT OF A PRIOR-FILED APPLICATION
FILED UNDER 37 CFR § 1.78(a)(3)**

Mail Stop PETITIONS

Commissioner for Patents

P. O. Box 1450

Alexandria, VA 22313-1450

Dear Sir:

In response to the December 3, 2013 dismissal of the Assignee's renewed petition for the acceptance of an unintentionally delayed claim of priority under 35 U.S.C. § 119(e) and §120 for the benefit of prior-filed applications in the above-referenced patent application, the Assignee respectfully requests reconsideration of the petition dismissal in view of the revised priority language submitted in conjunction herewith as an Amendment to the Specification pursuant to 37 CFR 1.312.

In accordance with the Patent Office's suggestion in the December 3rd dismissal, the following amendment to the specification of the present application which adds a reference to prior-filed U.S. Patent Application No. 08/790,097, filed January 28, 1997, now U.S. Patent No. 6,167,520 which claims benefit of U.S. Provisional Patent Application No. 60/030,639, is submitted in conjunction with this Petition:

[0001] This application is a continuation of assignee's pending U.S. patent application serial no. 12/471,942, filed May 26, 2009 by inventors Yigal Mordechai Edery, et al., now U.S. Patent No. 8,079,086, entitled "Malicious

Mobile Code Runtime Monitoring System and Methods," which is a continuation of assignee's U.S. patent application serial no. 11/370,114, filed March 7, 2006 by inventors Yigal Mordechai Edery, et al., now U.S. Patent No. 7,613,926, entitled "Method and System for Protecting a Computer and a Network from Hostile Downloadables," which is a continuation of assignee's U.S. patent application serial no. 09/861,229, filed on May 17, 2001 by inventors Yigal Mordechai Edery, et al., now U.S. Patent No. 7,058,822, entitled "Malicious Mobile Code Runtime Monitoring System And Methods," all of which are hereby incorporated by reference. U.S. patent application serial no. 09/861,229, now U.S. Patent No. 7,058,822, claims benefit of provisional U.S. patent application serial no. 60/205,591, entitled "Computer Network Malicious Code Run-Time Monitoring," filed on May 17, 2000 by inventors Nimrod Itzhak Vered, et al., which is hereby incorporated by reference. U.S. patent application serial no. 09/861,229, now U.S. Patent No. 7,058,822, is also a Continuation-In-Part of assignee's U.S. patent application serial no. 09/539,667, entitled "System and Method for Protecting a Computer and a Network From Hostile Downloadables," filed on March 30, 2000 by inventor Shlomo Touboul, now U.S. Patent No. 6,804,780, and hereby incorporated by reference, which is a continuation of assignee's U.S. patent application serial no. 08/964,388, filed on November 6, 1997 by inventor Shlomo Touboul, now U.S. Patent No. 6,092,194, also entitled "System and Method for Protecting a Computer and a Network from Hostile Downloadables" and hereby incorporated by reference, which application claims the benefit of provisional U.S. application serial no. 60/030,639, filed November 8, 1996 by inventors Shlomo Touboul, entitled "System and Method For Protecting a Computer From Hostile Downloadables." U.S. Serial No. 09/861,229, now U.S. Patent No. 7,058,822, is also a Continuation-In-Part of assignee's U.S. patent application serial no. 09/551,302, entitled "System and Method for Protecting a Client During Runtime From Hostile Downloadables," filed on April 18, 2000 by inventor Shlomo Touboul, now U.S. Patent No. 6,480,962, which is hereby incorporated by reference, which is a continuation of U.S. application serial no. 08/790,097, filed January 29, 1997 by inventor Shlomo Touboul, now U.S. Patent No.

6,167,520, entitled “System and Method For Protecting a Client From Hostile Downloadables” which claims the benefit of U.S. provisional application no. 60/030,639, filed on November 8, 1996 by inventor Shlomo Touboul, entitled “System and Method For Protecting a Computer From Hostile Downloadables.”

This amendment has been submitted separately as an Amendment to the Specification under 37 CFR 1.312 and includes no new matter. In accordance with 37 CFR §1.78(a)(2)(i), the amendment identifies the prior filed application by application number and indicates the relationship of the applications.

Assignee understands that a petition for acceptance of a claim for late priority under 37 CFR §1.78(a)(3) is only applicable to those applications filed on or after November 29, 2000 and after the expiration of the period specified in 37 CFR §1.78(a)(2)(ii). Assignee understands that the petition under 37 CFR §1.78(a)(3) must be accompanied by

- (1) the reference required by 35 U.S.C. §119(e), §120 and 37 CFR §1.78(a)(2)(i) of the prior-filed application, unless previously submitted;
- (2) the surcharge set forth in 37 CFR §1.17(t); and
- (3) a statement that the entire delay between the date the claim was due under 37 CFR §1.78(a)(2)(ii) and the date the claim was filed was unintentional.

The correction of the priority claim of the present application is made to complete the priority claim to include a specific reference to prior-filed U.S. Patent Application No. 08/790,097, filed January 28, 1997, now U.S. Patent No. 6,167,520 which also claims benefit of U.S. Provisional Patent Application No. 60/030,639, filed November 8, 1996. This request is made after the expiration of the period specified in 37 CFR §1.78(a)(2)(ii).

Assignee submits that the entire delay between the date the claim was due under 37 CFR §1.78(a)(2)(ii) and the date the claim was originally filed was unintentional.

Payment of \$1,410 fee as required under 37 CFR §1.17(t) was provided electronically via EFS-Web with the petition filed on October 23, 2012 and no additional fees are believed to be due. The Commissioner is authorized to charge any additional fees determined to be due to Deposit Account No. 50-6099.

Serial No. 13/290,708

Docket No. FIN0001-CON1-CIP1-CON4

Assignee submits that this request and the amendment to the specification are diligently made to correct the record of the present application. Granting of this renewed petition and entrance of the Amendment to the Specification are respectfully requested.

Respectfully submitted,

Date: December 6, 2013

By: /Dawn-Marie Bey - 44,442/
Dawn-Marie Bey
Reg. No. 44,442
Attorneys for Assignee
Finjan, Inc.

Bey & Cotropia PLLC
213 Bayly Court
Richmond, Virginia 23229
(w) 804-441-8530

FIN0001-CON1-CIP1-CON4

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Yigal Mordechai EDERY, et al.

Group Art Unit: 2431

Serial No.: 13/290,708

Examiner: Christopher A. Revak

Filed: November 7, 2011

For: MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND
METHOFDS

AMENDMENT TO THE SPECIFICATION UNDER 37 C.F.R. § 1.312

Commissioner for Patents
Mail Stop: **Issue Fee**
P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

In conjunction with the Request for Reconsideration of the Dismissed Renewed Petition to Accept Unintentionally Delayed Claim of Priority Under 35 U.S.C. §119(e) and § 120 for the Benefit of a Prior-Filed Application Filed Under 37 C.F.R. § 1.78(a)(3) entry of the following amendment to the specification and consideration of the remarks submitted herein is respectfully requested.

Amendments to the Specification begin on page 2 of this paper.

Remarks begin on page 4 of this paper.

Amendments to the Specification

Please replace Paragraph [0001] with the following amended paragraph:

[0001] This application is a continuation of assignee's pending U.S. patent application serial no. 12/471,942, filed May 26, 2009 by inventors Yigal Mordechai Edery, et al., now U.S. Patent No. 8,079,086, entitled "Malicious Mobile Code Runtime Monitoring System and Methods," which is a continuation of assignee's U.S. patent application serial no. 11/370,114, filed March 7, 2006 by inventors Yigal Mordechai Edery, et al., now U.S. Patent No. 7,613,926, entitled "Method and System for Protecting a Computer and a Network from Hostile Downloadables," which is a continuation of assignee's U.S. patent application serial no. 09/861,229, filed on May 17, 2001 by inventors Yigal Mordechai Edery, et al., now U.S. Patent No. 7,058,822, entitled "Malicious Mobile Code Runtime Monitoring System And Methods," all of which are hereby incorporated by reference. U.S. patent application serial no. 09/861,229, now U.S. Patent No. 7,058,822, claims benefit of provisional U.S. patent application serial no. 60/205,591, entitled "Computer Network Malicious Code Run-Time Monitoring," filed on May 17, 2000 by inventors Nimrod Itzhak Vered, et al., which is hereby incorporated by reference. U.S. patent application serial no. 09/861,229, now U.S. Patent No. 7,058,822, is also a Continuation-In-Part of assignee's U.S. patent application serial no. 09/539,667, entitled "System and Method for Protecting a Computer and a Network From Hostile Downloadables," filed on March 30, 2000 by inventor Shlomo Touboul, now U.S. Patent No. 6,804,780, and hereby incorporated by reference, which is a continuation of assignee's U.S. patent application serial no. 08/964,388, filed on November 6, 1997 by inventor Shlomo Touboul, now U.S. Patent No. 6,092,194, also entitled "System and Method for Protecting a Computer and a Network from Hostile Downloadables" and hereby incorporated by reference, which application claims the benefit of provisional U.S. application serial no. 60/030,639, filed November 8, 1996 by inventors Shlomo Touboul, entitled "System and Method For Protecting a Computer From Hostile Downloadables." U.S. Serial No. 09/861,229, now U.S. Patent No. 7,058,822, is also a Continuation-In-Part of assignee's U.S. patent application serial no. 09/551,302, entitled "System and Method for Protecting a Client During Runtime From Hostile Downloadables," filed on April 18, 2000 by inventor Shlomo Touboul, now U.S. Patent No. 6,480,962, which is hereby incorporated by reference, which is a

Serial No. 13/290,708

Docket No. FIN0001-CON1-CIP1-CON4

continuation of U.S. application serial no. 08/790,097, filed January 29, 1997 by inventor Shlomo Touboul, now U.S. Patent No. 6,167,520, entitled "System and Method For Protecting a Client From Hostile Downloadables" which claims the benefit of U.S. provisional application no. 60/030,639, filed on November 8, 1996 by inventor Shlomo Touboul, entitled "System and Method For Protecting a Computer From Hostile Downloadables."

REMARKS

Assignee respectfully requests entry of the amendment to the specification of U.S. Patent Application No. 13/290,708 in conjunction with the Request for Reconsideration of the Dismissed Renewed Petition to Accept Unintentionally Delayed Claim of Priority Under 35 U.S.C. § 119(e) and § 120 for the Benefit of a Prior-Filed Application Filed Under 37 C.F.R. § 1.78(a)(3) filed herewith. The amendment introduces no new matter and corrects the priority claim of the application. Assignee notes that U.S. Patent Application Nos. 08/790,097, 60/030,639 and the present invention share the inventor Shlomo Touboul.

This submission is filed prior to payment of the issue fee and not fee is believed to be due. However, in the event additional fees are due, the Commissioner is authorized to charge any underpayment of fees, or to credit any overpayment, to Deposit Account No. 50-6099.

Respectfully submitted,

Date: December 6, 2013

By: /Dawn-Marie Bey - 44,442/
Dawn-Marie Bey
Reg. No. 44,442
Attorneys for Assignee
Finjan, Inc.

Bey & Cotropia PLLC
213 Bayly Court
Richmond, Virginia 23229
(w) 804-441-8530

Electronic Acknowledgement Receipt

EFS ID:	17586129
Application Number:	13290708
International Application Number:	
Confirmation Number:	4120
Title of Invention:	MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS
First Named Inventor/Applicant Name:	Yigal Mordechai Edery
Customer Number:	115222
Filer:	Dawn-Marie Bey./Jeanne Paoella_Bald
Filer Authorized By:	Dawn-Marie Bey.
Attorney Docket Number:	FIN0001-CON1-CIP1-CON4
Receipt Date:	06-DEC-2013
Filing Date:	07-NOV-2011
Time Stamp:	11:48:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition for review by the Office of Petitions.	fin0001con1cip1con4_RENEWEDpetitionunintentionallydelayedClaim.pdf	119394 <small>bf7c3e361486983d8350d7a5d15625cc00163124</small>	no	4

Warnings:

Information:

2	Amendment after Notice of Allowance (Rule 312)	fin0001con1cip1con4_Rule312 AmntSpecPriority.pdf	117009	no	4
			114ff0d2640c4d041d83233532acdbd5469 8f1ed		

Warnings:

Information:

Total Files Size (in bytes):	236403
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

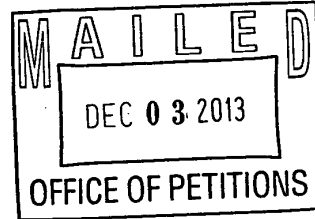
New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov



Bey & Cotropia PLLC (Finjan Inc.)
213 Bayly Court
Richmond VA 23229

In re Application of :
Edery et al. :
Application No. 13/290,708 : DECISION DISMISSING PETITIONS
Filed: November 7, 2011 : UNDER 37 CFR 1.78(a)(3) AND (a)(6)
Attorney Docket No. FIN0001-CON1-CIP1- :
CON4 :

This is a decision on the renewed petition under 37 CFR §§ 1.78(a)(3) and 1.78(a)(6), filed October 1, 2013, to accept an unintentionally delayed claim under 35 U.S.C. §§ 120 and 119(e) for the benefit of priority to the prior-filed nonprovisional and provisional applications set forth in the concurrently filed amendment.

The petition is **DISMISSED**

A petition for acceptance of a claim for late priority under 37 CFR §§ 1.78(a)(3) and 1.78(a)(6) is only applicable to those applications filed on or after November 29, 2000 and after the expiration of the period specified in 37 CFR §§ 1.78(a)(2)(ii) and 1.78(a)(5)(ii). In addition, the petition under 37 CFR §§ 1.78(a)(3) and 1.78(a)(6) must be accompanied by:

- (1) the reference required by 35 U.S.C. §§ 120 and 119(e) and 37 CFR §§ 1.78(a)(2)(i) and 1.78(a)(5)(i) of the prior-filed application, unless previously submitted;
- (2) the surcharge set forth in § 1.17(t); and
- (3) a statement that the entire delay between the date the claim was due under 37 CFR §§ 1.78(a)(2)(ii) and 1.78(a)(5)(ii) and the date the claim was filed was unintentional. The Director may require additional where there is a question whether the delay was unintentional.

The petition does not comply with item (1).

The amendment is not acceptable as drafted.

The amendment asserts Application No. 09/551,203 is a continuation of Application No. 08/790,097 **and further** claims benefit of Application No. 60/030,639 (emphasis added).

Application No. 09/551,302, filed April 18, 2000, cannot directly claim benefit of Application No. 60/030,639, filed November 8, 1996 because it was filed more than 12 months after the filing date of the provisional application.

Application No. 08/790,097, filed January 29, 1997, claims benefit of Application No. 60/030,639, filed November 8, 1996.

Please submit another amendment that corrects the priority chain. Specifically, eliminate the phrase -"and further"- from the third line of the second page of the amendment and substitute the word "which".

Before the petition under 37 CFR §§ 1.78(a)(3) and 1.78(a)(6) can be granted, a renewed petition and either an Application Data Sheet or a substitute amendment (complying with the provisions of 37 CFR 1.121 and 37 CFR 1.76(b)(5)) to correct the above matters are required.

Further correspondence with respect to this matter should be addressed as follows:

By mail: Mail Stop PETITIONS
 Commissioner for Patents
 Post Office Box 1450
 Alexandria, VA 22313-1450

By hand: Customer Service Window
 Mail Stop Petitions
 Randolph Building
 401 Dulany Street
 Alexandria, VA 22314

By fax: (571) 273-8300
 ATTN: Office of Petitions

By internet: EFS-Web
 www.uspto.gov/ebs/efs_help.html
 (for help using EFS-Web call the
 Patent Electronic Business Center
 at (866) 217-9197)

Any questions concerning this matter may be directed to the undersigned at (571) 272-3230.

Shirene Willis Brantley

Shirene Willis Brantley

Attorney Advisor

Office of Petitions



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

115222 7590 10/25/2013
Bey & Cotropia PLLC (Finjan Inc.)
213 Bayly Court
Richmond, VA 23229

EXAMINER

REVAK, CHRISTOPHER A

ART UNIT PAPER NUMBER

2431

DATE MAILED: 10/25/2013

Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO.

13/290,708 11/07/2011 Yigal Mordechai Edery FIN0001-CON1-CIP1-CON4 4120

TITLE OF INVENTION: MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS

Table with 7 columns: APPLN. TYPE, ENTITY STATUS, ISSUE FEE DUE, PUBLICATION FEE DUE, PREV. PAID ISSUE FEE, TOTAL FEE(S) DUE, DATE DUE

nonprovisional UNDISCOUNTED \$0 \$0 \$1780 \$0 01/27/2014

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

**Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE
 Commissioner for Patents
 P.O. Box 1450
 Alexandria, Virginia 22313-1450
 or Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

115222 7590 10/25/2013
 Bey & Cotropia PLLC (Finjan Inc.)
 213 Bayly Court
 Richmond, VA 23229

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

_____ (Depositor's name)
_____ (Signature)
_____ (Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/290,708	11/07/2011	Yigal Mordechai Ederly	FIN0001-CON1-CIP1-CON4	4120

TITLE OF INVENTION: MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$0	\$0	\$1780	\$0	01/27/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
REVAK, CHRISTOPHER A	2431	726-024000

<p>1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).</p> <p><input type="checkbox"/> Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.</p> <p><input type="checkbox"/> "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.</p>	<p>2. For printing on the patent front page, list</p> <p>(1) the names of up to 3 registered patent attorneys or agents OR, alternatively, _____ 1</p> <p>(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. _____ 2</p> <p>_____ 3</p>
---	---

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE _____ (B) RESIDENCE: (CITY and STATE OR COUNTRY) _____

Please check the appropriate assignee category or categories (will not be printed on the patent): Individual Corporation or other private group entity Government

<p>4a. The following fee(s) are submitted:</p> <p><input type="checkbox"/> Issue Fee</p> <p><input type="checkbox"/> Publication Fee (No small entity discount permitted)</p> <p><input type="checkbox"/> Advance Order - # of Copies _____</p>	<p>4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)</p> <p><input type="checkbox"/> A check is enclosed.</p> <p><input type="checkbox"/> Payment by credit card. Form PTO-2038 is attached.</p> <p><input type="checkbox"/> The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).</p>
---	--

5. **Change in Entity Status** (from status indicated above)

Applicant certifying micro entity status. See 37 CFR 1.29

Applicant asserting small entity status. See 37 CFR 1.27

Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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Address: COMMISSIONER FOR PATENTS
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Alexandria, Virginia 22313-1450
www.uspto.gov

Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO.

115222 7590 10/25/2013
Bey & Cotropia PLLC (Finjan Inc.)
213 Bayly Court
Richmond, VA 23229

EXAMINER

REVAK, CHRISTOPHER A

ART UNIT PAPER NUMBER

2431

DATE MAILED: 10/25/2013

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 0 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 0 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

**Notices of Allowance and Fee(s) Due mailed between October 1, 2013 and
December 31, 2013**

(Addendum to PTOL-85)

If the "Notice of Allowance and Fee(s) Due" has a mailing date on or after October 1, 2013 and before January 1, 2014, the following information is applicable to this application.

If the issue fee is being timely paid on or after January 1, 2014, the amount due is the issue fee and publication fee in effect January 1, 2014. On January 1, 2014, the issue fees set forth in 37 CFR 1.18 decrease significantly and the publication fee set forth in 37 CFR 1.18(d)(1) decreases to \$0.

If an issue fee or publication fee has been previously paid in this application, applicant is not entitled to a refund of the difference between the amount paid and the amount in effect on January 1, 2014.

Notice of Allowability	Application No. 13/290,708	Applicant(s) EDERY ET AL.	
	Examiner CHRISTOPHER REVAK	Art Unit 2431	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. This communication is responsive to the petition decision on 10/3/13.
 A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.
2. An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. The allowed claim(s) is/are 1-18. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

- a) All b) Some *c) None of the:
1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|--|---|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892) | 5. <input type="checkbox"/> Examiner's Amendment/Comment |
| 2. <input type="checkbox"/> Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____ | 6. <input type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| 3. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 7. <input type="checkbox"/> Other _____. |
| 4. <input type="checkbox"/> Interview Summary (PTO-413),
Paper No./Mail Date _____. | |

/Christopher A. Revak/
Primary Examiner, Art Unit 2431

? show files

File 2:INSPEC 1898-2013/Oct W1
(c) 2013 The IET

File 6:NTIS 1964-2013/Oct W1
(c) 2013 NTIS, Intl Cpyrghrt All Rights Res

File 8:EI Compendex(R) 1884-2013/Oct W2
(c) 2013 Elsevier Eng. Info. Inc.

File 34:SciSearch(R) Cited Ref Sci 1990-2013/Oct W2
(c) 2013 The Thomson Corp

File 35:Dissertation Abs Online 1861-2013/Jul
(c) 2013 ProQuest Info&Learning

File 56:Computer and Information Systems Abstracts 1966-2013/Sep
(c) 2013 CSA.

File 60:ANTE: Abstracts in New Tech & Engineer 1966-2013/Oct
(c) 2013 CSA.

File 65:Inside Conferences 1993-2013/Oct 17
(c) 2013 BLDSO all rts. reserv.

File 92:IHS Intl.Stds.& Specs. 1999/Nov
(c) 1999 Information Handling Services

File 95:TEMA-TECHNOLOGY & MANAGEMENT 1989-2010/OCTW3
(c) 2012 WTI-FRANKFURT

File 99:Wilson Appl. Sci & Tech Abs 1983-2011/Nov
(c) 2012 The HW Wilson Co.

File 103:Energy SciTec 1974-2013/Sep E2
(c) 2013 Contains copyrighted material

File 144:Pascal 1973-2013/Oct W2
(c) 2013 INIST/CNRS

File 275:Gale Group Computer DB(TM) 1983-2013/Oct 17
(c) 2013 Gale/Cengage

File 434:SciSearch(R) Cited Ref Sci 1974-1989/Dec
(c) 2006 The Thomson Corp

File 647:UBM Computer Fulltext 1988-2013/Oct W1
(c) 2013 UBM, LLC

File 674:Computer News Fulltext 1989-2006/Sep W1
(c) 2006 IDG Communications

File 9:Business & Industry(R) Jul/1994-2013/Oct 16
(c) 2013 Gale/Cengage

File 15:ABI/Inform(R) 1971-2013/Oct 16
(c) 2013 ProQuest Info&Learning

File 16:Gale Group PROMT(R) 1990-2013/Oct 17
(c) 2013 Gale/Cengage

File 18:Gale Group F&S Index(R) 1988-2013/Oct 17
(c) 2013 Gale/Cengage

File 20:Dialog Global Reporter 1997-2013/Oct 17
(c) 2013 Dialog

File 36:MetalBase 1965-20131017
(c) 2013 The Thomson Corporation

File 80:TGG Aerospace/Def.Mkts(R) 1982-2013/Oct 17
(c) 2013 Gale/Cengage

File 148:Gale Group Trade & Industry DB 1976-2013/Oct 17
(c) 2013 Gale/Cengage

File 160:Gale Group PROMT(R) 1972-1989
(c) 1999 The Gale Group

File 583:Gale Group Globalbase(TM) 1986-2002/Dec 13
(c) 2002 Gale/Cengage

File 621:Gale Group New Prod.Annou.(R) 1985-2013/Oct 17
(c) 2013 Gale/Cengage


File 624:McGraw-Hill Publications 1985-2013/Feb 28
(c) 2013 McGraw-Hill Co. Inc

File 635:Business Dateline(R) 1985-2013/Oct 17
(c) 2013 ProQuest Info&Learning

File 636:Gale Group Newsletter DB(TM) 1987-2013/Oct 17
(c) 2013 Gale/Cengage

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Set	Items	Description
S1	596246	(CODE OR EXECUTABLE OR DOWNLOAD????? OR APPLETT OR JAVA OR JAVASCRIPT OR ACTIVEX) (16N) (DETERMIN????? OR ASCERTAIN??? OR MONITOR??? OR ANALY????? OR INSPECT??? OR EXAMIN?????)
S2	45209	S1(16N) (OPERATION OR ACTION OR COMMAND OR INSTRUCTION OR STATE OR STATUS OR CONDITION OR CALL OR PROMPT)
S3	1052	S2(16N) (MALICIOUS OR SUSPICIOUS OR MALWARE OR ATTACK??? OR VIRUS OR VIRAL OR TROJAN OR WORM)
S4	104	S3(16N) (REPORT??? OR INSTRUMENT????? OR PROFILE OR LIST??? OR ITEMIZ?????)

Search Notes 	Application/Control No. 13290708	Applicant(s)/Patent Under Reexamination EDERY ET AL.
	Examiner CHRISTOPHER REVAK	Art Unit 2431

CPC- SEARCHED		
Symbol	Date	Examiner


CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
none	none	7/13/12	CR

SEARCH NOTES		
Search Notes	Date	Examiner
PALM Inventor Name Search	7/14/12	CR
BRS Text Search: USPAT, US PGPUB, USOCR, DERWENT, FPRS, IBM TDB, EPO, JPO (see attached search strategy)	7/14/12; 8/24/13; 10/17/13	CR
BRS Subclass Text Search: USPAT, US PGPUB (see attached search strategy)	7/14/12	CR
DIALOG Text Search: COMPSCI, ELECTRON, SOFTWARE (see attached search strategy)	8/24/13; 10/17/13	CR
Interference Search (see attached search strategy)	8/24/13; 10/17/13	CR

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
726	22-25	8/24/13; 10/17/13	CR
713	168,175,176,179-181	8/24/13; 10/17/13	CR


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Issue Classification 	Application/Control No. 13290708	Applicant(s)/Patent Under Reexamination EDERY ET AL.
	Examiner CHRISTOPHER REVAK	Art Unit 2431

CPC		
Symbol	Type	Version


CPC Combination Sets				
Symbol	Type	Set	Ranking	Version

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	18	
/CHRISTOPHER REVAK/ Primary Examiner. Art Unit 2431	10/17/2013	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	10B

Issue Classification 	Application/Control No. 13290708	Applicant(s)/Patent Under Reexamination EDERY ET AL.
	Examiner CHRISTOPHER REVAK	Art Unit 2431

US ORIGINAL CLASSIFICATION						INTERNATIONAL CLASSIFICATION																	
CLASS		SUBCLASS				CLAIMED					NON-CLAIMED												
726		24				H	0	4	L	29 / 06 (2006.01.01)					H	0	4	L	29 / 06 (2006.01.01)				
CROSS REFERENCE(S)						G	0	6	F	11 / 30 (2006.01.01)					G	0	6	F	11 / 30 (2006.01.01)				
						G	0	6	F	15 / 16 (2006.01.01)					G	0	6	F	15 / 16 (2006.01.01)				
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)																						
713	175																						

NONE		Total Claims Allowed:	
		18	
(Assistant Examiner)	(Date)		
/CHRISTOPHER REVAK/ Primary Examiner. Art Unit 2431	10/17/2013	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	10B

Issue Classification 	Application/Control No. 13290708	Applicant(s)/Patent Under Reexamination EDERY ET AL.
	Examiner CHRISTOPHER REVAK	Art Unit 2431

<input checked="" type="checkbox"/> Claims renumbered in the same order as presented by applicant <input type="checkbox"/> CPA <input checked="" type="checkbox"/> T.D. <input type="checkbox"/> R.1.47															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
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	16														

NONE		Total Claims Allowed:	
		18	
(Assistant Examiner)	(Date)	O.G. Print Claim(s)	O.G. Print Figure
/CHRISTOPHER REVAK/ Primary Examiner. Art Unit 2431	10/17/2013	1	10B
(Primary Examiner)	(Date)		

EAST Search History

EAST Search History (Prior Art)

<This search history is empty>

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	22766	(726/22-25 or 713/168,175,176,179-181).ccls.	US-PGPUB; USPAT; UPAD	OR	ON	2013/10/17 14:52
L2	6	(downloadable with profile).clm. and 1	US-PGPUB; USPAT; UPAD	OR	ON	2013/10/17 14:52

10/ 17/ 2013 2:52:39 PM

EAST Search History**EAST Search History (Prior Art)**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	515698	(code or executable or download\$5 or applet or java or script or javascript or activex)with(determin\$5 or ascertain\$3 or monitor\$3 or analy\$4 or inspect\$3 or examin\$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/10/17 13:19
L2	171571	1 with(operation or action or command or instruction or state or status or condition or call or prompt)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/10/17 13:20
L3	1869	2 with(malicious or suspicious or malware or attack\$3 or virus or viral or trojan or worm)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/10/17 13:20
L4	200	3 with(report\$3 or instrument\$5 or profile or list\$3 or itemiz\$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/10/17 13:21
L5	9	4 with(append\$3 or attach\$4 or add or addon or addition)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/10/17 13:21
L6	531258	(report\$3 or instrument\$3 or profile or list\$3 or itemiz\$5)with(append\$3 or attach\$4 or add or addon or addition)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/10/17 13:23
L7	15	4 same 6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/10/17 13:23
L8	99	4 and 6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/10/17 13:23

EAST Search History (Interference)

EAST Search History

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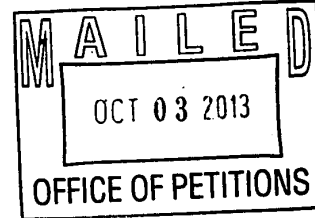
10/ 17/ 2013 1:23:55 PM



UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Bey & Cotropia PLLC (Finjan Inc.)
213 Bayly Court
Richmond VA 23229



In re Application of :
Yigal Mordechai Edery, et al. :
Application No. 13/290,708 : DECISION GRANTING PETITION
Filed: November 7, 2011 : UNDER 37 CFR 1.313(c)(2)
Attorney Docket No. FIN0001-CON1-CIP1- :
CON4 :

This is a decision on the petition under 37 CFR 1.313(c)(2), filed, October 1, 2013 to withdraw the above-identified application from issue after payment of the issue fee.

The petition is **GRANTED**.

The above-identified application is withdrawn from issue for consideration of a submission under 37 CFR 1.114 (request for continued examination). See 37 CFR 1.313(c)(2).

Petitioner is advised that the issue fee paid on September 19, 2013 cannot be refunded. If, however, this application is again allowed, petitioner may request that it be applied towards the issue fee required by the new Notice of Allowance.¹

Telephone inquiries should be directed to Terri Johnson at (571) 272-2991.

This application is being referred to Technology Center AU 2431 for processing of the request for continued examination under 37 CFR 1.114 and for consideration of the concurrently filed renewed petition to accept unintentionally delayed claim of priority.

/Terri Johnson/
Terri Johnson
Paralegal Specialist
Office of Petitions

¹ The request to apply the issue fee to the new Notice may be satisfied by completing and returning the new Part B – Fee(s) Transmittal Form (along with any balance due at the time of submission). *Petitioner is advised that the Issue Fee Transmittal Form must be completed and timely submitted to avoid abandonment of the application.*

FIN0001-CON1-CIP1-CON4

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Yigal Mordechai EDERY, et al.

Group Art Unit: 2431

Serial No.: 13/290,708

Examiner: Christopher A. Revak

Filed: November 7, 2011

For: MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS

**RENEWED PETITION TO ACCEPT UNINTENTIONALLY DELAYED CLAIM OF
PRIORITY UNDER 35 U.S.C. §119(e) AND §120 FOR THE BENEFIT OF A PRIOR-
FILED APPLICATION FILED UNDER 37 CFR § 1.78(a)(3)**

Mail Stop PETITIONS

Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Assignee respectfully submits this renewed petition for the acceptance of an unintentionally delayed claim of priority under 35 U.S.C. § 119(e) and §120 for the benefit of prior-filed applications in the above-referenced patent application. In conjunction with this Petition, Assignee re-submits an Amendment to the Specification, and provides for payment of the additional \$10 for required fees over the originally paid \$1410 under 37 CFR 1.17(t) (which is now \$1420). The original petition was dismissed by the Patent Office on November 27, 2012. In the petition filed October 23, 2013, the undersigned submits that although the language recited in the petition document was missing a reference to the intervening U.S. Application No. 08/790,097 as pointed out by the Patent Office, that the amendment to the priority paragraph of the Specification that was submitted therewith did include the proper reference. *See Amendment to Specification* Filed October 23, 2013. Indeed the *de facto* same amendments to the priority paragraph of the Specification that are being re-submitted along with this renewed petition were included in the October 23, 2012 amendments to paragraph [0001] of the Specification.

Assignee understands that a petition for acceptance of a claim for late priority under 37 CFR §1.78(a)(3) is only applicable to those applications filed on or after November 29, 2000 and

after the expiration of the period specified in 37 CFR §1.78(a)(2)(ii). Assignee understands that the petition under 37 CFR §1.78(a)(3) must be accompanied by

- (1) the reference required by 35 U.S.C. §119(e), §120 and 37 CFR §1.78(a)(2)(i) of the prior-filed application, unless previously submitted;
- (2) the surcharge set forth in 37 CFR §1.17(t); and
- (3) a statement that the entire delay between the date the claim was due under 37 CFR §1.78(a)(2)(ii) and the date the claim was filed was unintentional.

The correction of the priority claim of the present application is made to complete the priority claim to include a specific reference to benefit of priority to U.S. Provisional Patent Application No. 60/030,639, filed November 8, 1996 (benefit directly claimed by prior-filed U.S. Patent Application No. 08/964,388, filed November 6, 1997, now U.S. Patent No. 6,092,194) and to separately include reference to prior-filed U.S. Patent Application No. 08/790,097, filed January 28, 1997, now U.S. Patent No. 6,167,520 which also claims benefit of U.S. Provisional Patent Application No. 60/030,639, filed November 8, 1996. This request is made after the expiration of the period specified in 37 CFR §1.78(a)(2)(ii).

In accordance with 35 U.S.C. §119(e), §120, and 37 CFR §1.78(a)(2)(i), the following amendment to the specification of the present application which adds a reference to the benefit of priority to U.S. Provisional Patent Application No. 60/030,639 and to prior-filed U.S. Patent Application No. 08/790,097, filed January 28, 1997, now U.S. Patent No. 6,167,520 which claims benefit of U.S. Provisional Patent Application No. 60/030,639, is submitted in conjunction with this Petition:

[0001] This application is a continuation of assignee's pending U.S. patent application serial no. 12/471,942, filed May 26, 2009 by inventors Yigal Mordechai Edery, et al., now U.S. Patent No. 8,079,086, entitled "Malicious Mobile Code Runtime Monitoring System and Methods," which is a continuation of assignee's U.S. patent application serial no. 11/370,114, filed March 7, 2006 by inventors Yigal Mordechai Edery, et al., now U.S. Patent No. 7,613,926, entitled "Method and System for Protecting a Computer and a Network from Hostile Downloadables," which is a continuation of assignee's U.S. patent application serial no. 09/861,229, filed on May 17, 2001 by inventors Yigal Mordechai Edery, et al., now U.S. Patent No. 7,058,822, entitled "Malicious Mobile Code

Runtime Monitoring System And Methods," all of which are hereby incorporated by reference. U.S. patent application serial no. 09/861,229, now U.S. Patent No. 7,058,822, claims benefit of provisional U.S. patent application serial no. 60/205,591, entitled "Computer Network Malicious Code Run-Time Monitoring," filed on May 17, 2000 by inventors Nimrod Itzhak Vered, et al., which is hereby incorporated by reference. U.S. patent application serial no. 09/861,229, now U.S. Patent No. 7,058,822, is also a Continuation-In-Part of assignee's U.S. patent application serial no. 09/539,667, entitled "System and Method for Protecting a Computer and a Network From Hostile Downloadables," filed on March 30, 2000 by inventor Shlomo Touboul, now U.S. Patent No. 6,804,780, and hereby incorporated by reference, which is a continuation of assignee's U.S. patent application serial no. 08/964,388, filed on November 6, 1997 by inventor Shlomo Touboul, now U.S. Patent No. 6,092,194, also entitled "System and Method for Protecting a Computer and a Network from Hostile Downloadables" and hereby incorporated by reference, which application claims the benefit of provisional U.S. application serial no. 60/030,639, filed November 8, 1996 by inventors Shlomo Touboul, entitled "System and Method For Protecting a Computer From Hostile Downloadables." U.S. Serial No. 09/861,229, now U.S. Patent No. 7,058,822, is also a Continuation-In-Part of assignee's U.S. patent application serial no. 09/551,302, entitled "System and Method for Protecting a Client During Runtime From Hostile Downloadables," filed on April 18, 2000 by inventor Shlomo Touboul, now U.S. Patent No. 6,480,962, which is hereby incorporated by reference, which is a continuation of U.S. application serial no. 08/790,097, filed January 29, 1997 by inventor Shlomo Touboul, now U.S. Patent No. 6,167,520, entitled "System and Method For Protecting a Client From Hostile Downloadables" and further claims the benefit of U.S. provisional application no. 60/030,639, filed on November 8, 1996 by inventor Shlomo Touboul, entitled "System and Method For Protecting a Computer From Hostile Downloadables."

Serial No. 13/290,708

Docket No. FIN0001-CON1-CIP1-CON4

This amendment has been submitted separately as an Amendment to the Specification and includes no new matter. In accordance with 37 CFR §1.78(a)(2)(i), the amendment identifies the prior filed application by application number and indicates the relationship of the applications.

Assignee submits that the entire delay between the date the claim was due under 37 CFR §1.78(a)(2)(ii) and the date the claim was originally filed was unintentional.

Payment of \$1,410 fee as required under 37 CFR §1.17(t) was provided electronically via EFS-Web with the petition filed on October 23, 2012. It is believe that the only additional fee due is \$10. The Commissioner is authorized to charge the additional \$10 due to Deposit Account No. 50-6099.

Assignee submits that this request and the amendment to the specification are diligently made to correct the record of the present application. Granting of this renewed petition is respectfully requested.

Respectfully submitted,

Date: October 1, 2013

By: /Dawn-Marie Bey - 44,442/
Dawn-Marie Bey
Reg. No. 44,442
Attorneys for Assignee
Finjan, Inc.

Bey & Cotropia PLLC
213 Bayly Court
Richmond, Virginia 23229
(w) 804-441-8530

FIN0001-CON1-CIP1-CON4

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Yigal Mordechai EDERY, et al.

Group Art Unit: 2431

Serial No.: 13/290,708

Examiner: Christopher A. Revak

Filed: November 7, 2011

For: MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND
METHOFDS

**SUBMISSION WITH REQUEST FOR CONTINUED EXAMINATION: AMENDMENT
TO THE SPECIFICATION**

Commissioner for Patents
Mail Stop: **RCE**
P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

In conjunction with a Petition to Withdraw Application from Issue Under 37 C.F.R. § 1.313, Petition to Accept Unintentionally Delayed Claim of Priority Under 35 U.S.C. §119(e) and § 120 for the Benefit of a Prior-Filed Application Filed Under 37 C.F.R. § 1.78(a)(3) and the accompanying Request for Continued Examination, entry of the amendments and consideration of the remarks submitted herein is respectfully requested.

Amendments to the Specification begin on page 2 of this paper.

Remarks begin on page 4 of this paper.

Amendments to the Specification

Please replace Paragraph [0001] with the following amended paragraph:

[0001] This application is a continuation of assignee's pending U.S. patent application serial no. 12/471,942, filed May 26, 2009 by inventors Yigal Mordechai Edery, et al., now U.S. Patent No. 8,079,086, entitled "Malicious Mobile Code Runtime Monitoring System and Methods," which is a continuation of assignee's U.S. patent application serial no. 11/370,114, filed March 7, 2006 by inventors Yigal Mordechai Edery, et al., now U.S. Patent No. 7,613,926, entitled "Method and System for Protecting a Computer and a Network from Hostile Downloadables," which is a continuation of assignee's U.S. patent application serial no. 09/861,229, filed on May 17, 2001 by inventors Yigal Mordechai Edery, et al., now U.S. Patent No. 7,058,822, entitled "Malicious Mobile Code Runtime Monitoring System And Methods," all of which are hereby incorporated by reference. U.S. patent application serial no. 09/861,229, now U.S. Patent No. 7,058,822, claims benefit of provisional U.S. patent application serial no. 60/205,591, entitled "Computer Network Malicious Code Run-Time Monitoring," filed on May 17, 2000 by inventors Nimrod Itzhak Vered, et al., which is hereby incorporated by reference. U.S. patent application serial no. 09/861,229, now U.S. Patent No. 7,058,822, is also a Continuation-In-Part of assignee's U.S. patent application serial no. 09/539,667, entitled "System and Method for Protecting a Computer and a Network From Hostile Downloadables," filed on March 30, 2000 by inventor Shlomo Touboul, now U.S. Patent No. 6,804,780, and hereby incorporated by reference, which is a continuation of assignee's U.S. patent application serial no. 08/964,388, filed on November 6, 1997 by inventor Shlomo Touboul, now U.S. Patent No. 6,092,194, also entitled "System and Method for Protecting a Computer and a Network from Hostile Downloadables" and hereby incorporated by reference, which application claims the benefit of provisional U.S. application serial no. 60/030,639, filed November 8, 1996 by inventors Shlomo Touboul, entitled "System and Method For Protecting a Computer From Hostile Downloadables." U.S. Serial No. 09/861,229, now U.S. Patent No. 7,058,822, is also a Continuation-In-Part of assignee's U.S. patent application serial no. 09/551,302, entitled "System and Method for Protecting a Client During Runtime From Hostile Downloadables," filed on April 18, 2000 by inventor Shlomo Touboul, now U.S. Patent No. 6,480,962, which is hereby incorporated by reference, which is a

Serial No. 13/290,708

Docket No. FIN0001-CON1-CIP1-CON4

continuation of U.S. application serial no. 08/790,097, filed January 29, 1997 by inventor Shlomo Touboul, now U.S. Patent No. 6,167,520, entitled "System and Method For Protecting a Client From Hostile Downloadables" and further claims the benefit of U.S. provisional application no. 60/030,639, filed on November 8, 1996 by inventor Shlomo Touboul, entitled "System and Method For Protecting a Computer From Hostile Downloadables."

REMARKS

Assignee respectfully requests entry of the amendment to the specification of U.S. Patent Application No. 13/290,708 in conjunction with the Petition to Withdraw Application from Issue Under 37 C.F.R. § 1.313 and Petition to Accept Unintentionally Delayed Claim of Priority Under 35 U.S.C. § 119(e) and § 120 for the Benefit of a Prior-Filed Application Filed Under 37 C.F.R. § 1.78(a)(3) filed herewith. The amendment introduces no new matter and corrects the priority claim of the application. Assignee notes that U.S. Patent Application Nos. 08/790,097, and 60/030,639 and the present invention share the inventor Shlomo Touboul.

This submission is filed with a Request for Continuation Examination, including the appropriate fee. However, in the event additional fees are due, the Commissioner is authorized to charge any underpayment of fees, or to credit any overpayment, to Deposit Account No. 50-6099.

Respectfully submitted,

Date: October 1, 2013

By: /Dawn-Marie Bey - 44,442/
Dawn-Marie Bey
Reg. No. 44,442
Attorneys for Assignee
Finjan, Inc.

Bey & Cotropia PLLC
213 Bayly Court
Richmond, Virginia 23229
(w) 804-441-8530

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Request for Continued Examination (RCE) Transmittal Address to: Mail Stop RCE Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450	Application Number	13/290,708
	Filing Date	November 7, 2011
	First Named Inventor	Yigal Mordechai EDERY, et al.
	Art Unit	2431
	Examiner Name	Christopher A. Revak
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
 Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. See Instruction Sheet for RCEs (not to be submitted to the USPTO) on page 2.

1. **Submission required under 37 CFR 1.114** Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

a. Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

i. Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

ii. Other _____

b. Enclosed

i. Amendment/Reply

ii. Affidavit(s)/ Declaration(s)

iii. Information Disclosure Statement (IDS)

iv. Other Submission with Request for Continued Examination: Amendment to Specification; Renewed Petition to Accept Unintentionally Delayed Claim of Priority Under 35 U.S.C. 119(e) and 120 For the Benefit of a Prior-Filed Application Filed Under 37 CFR 1.78(a)(3)

2. **Miscellaneous**

a. Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of _____ months. (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(f) required)

b. Other _____

3. **Fees** The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

The Director is hereby authorized to charge the following fees, any underpayment of fees, or credit any overpayments, to

a. Deposit Account No. _____

i. RCE fee required under 37 CFR 1.17(e)

ii. Extension of time fee (37 CFR 1.136 and 1.17)

iii. Other _____

b. Check in the amount of \$ 1,700 enclosed

c. Payment by credit card (Form PTO-2038 enclosed)

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED			
Signature	/Dawn-Marie Bey/	Date	October 1, 2013
Name (Print/Type)	Dawn-Marie Bey	Registration No.	44,442

CERTIFICATE OF MAILING OR TRANSMISSION			
I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop RCE, Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450 or facsimile transmitted to the U.S. Patent and Trademark Office on the date shown below.			
Signature			
Name (Print/Type)		Date	

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.
 If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Patent Application Fee Transmittal

Application Number:	13290708				
Filing Date:	07-Nov-2011				
Title of Invention:	MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS				
First Named Inventor/Applicant Name:	Yigal Mordechai Edery				
Filer:	Dawn-Marie Bey./Jeanne Paoella-Bald				
Attorney Docket Number:	FIN0001-CON1-CIP1-CON4				
Filed as Large Entity					
Utility under 35 USC 111(a) Filing Fees					
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)	
Basic Filing:					
Pages:					
Claims:					
Miscellaneous-Filing:					
Petition:					
Petition fee- 37 CFR 1.17(h) (Group III)	1464	1	140	140	
Patent-Appeals-and-Interference:					
Post-Allowance-and-Post-Issuance:					
Extension-of-Time:					

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
RCE - 2nd and Subsequent Request	1820	1	1700	1700
Total in USD (\$)				1840

Electronic Acknowledgement Receipt

EFS ID:	17004348
Application Number:	13290708
International Application Number:	
Confirmation Number:	4120
Title of Invention:	MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS
First Named Inventor/Applicant Name:	Yigal Mordechai Edery
Customer Number:	115222
Filer:	Dawn-Marie Bey./Jeanne Paolella-Bald
Filer Authorized By:	Dawn-Marie Bey.
Attorney Docket Number:	FIN0001-CON1-CIP1-CON4
Receipt Date:	01-OCT-2013
Filing Date:	07-NOV-2011
Time Stamp:	11:32:49
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	\$1840
RAM confirmation Number	16637
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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1	Petition to Withdraw from Issue	fin0001con1cip1con4_petforwi thdrawalfromissue.pdf	123927 d0a91cc6294f2254f398b1d90ad571cc6414 3c28	no	1
Warnings:					
Information:					
2	Petition for review by the Office of Petitions.	fin0001con1cip1con4_renewe dpet_clmofpriority.pdf	136551 51b09035185ba41637487d6f647f8b74c7e 9bc3	no	4
Warnings:					
Information:					
3	Amendment Submitted/Entered with Filing of CPA/RCE	fin0001con1cip1con4_subwrce .pdf	129998 ae49fa492646ff8ac18074f220501eeb840a3 d14	no	4
Warnings:					
Information:					
4	Request for Continued Examination (RCE)	fin0001con1cip1con4_rcetrans. pdf	1645534 98394286115002c3697a5018d2a33cde928 1147e	no	1
Warnings:					
This is not a USPTO supplied RCE SB30 form.					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	32460 9e948cf0ce29635c5fe92ef153d2d4204e91f fe2	no	2
Warnings:					
Information:					
Total Files Size (in bytes):				2068470	
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:

Yigal Mordechai EDERY, et al.

Serial No.: 13/290,708

Group Art Unit: 2431

Filed: November 7, 2011

Examiner: Christopher A. Revak

For: MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND
METHODS

U.S. Patent and Trademark Office

Mail Stop **PETITIONS**

Randolph Building

401 Dulany Street

Alexandria, VA 22314

PETITION UNDER 37 C.F.R. § 1.313(c) FOR WITHDRAWAL FROM ISSUE

Dear Sir:

The undersigned requests withdrawal of the above application from issue, under 37 C.F.R. § 1.313(c)(2), so as to file a Request for Continued Examination along with a renewed Petition to Accept Unintentionally Delayed Claim of Priority and Amendment to the Specification.

The petition fee of \$140 set forth in 37 C.F.R. § 1.17(h) is submitted herewith. In addition, if any additional fees are required in connection with the filing of this Petition, the Commissioner is hereby authorized to charge the same to Deposit Account 50-6099.

Respectfully submitted,

Date: October 1, 2013

By: /Dawn-Marie Bey - 44,442/
Dawn-Marie Bey (Reg. No. 44,442)
Attorneys for Assignee
Finjan, Inc.**Bey & Cotropia PLLC**
213 Bayly Court
Richmond, VA 23229
(804) 441-8530

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875			Application or Docket Number 13/290,708	Filing Date 11/07/2011	<input type="checkbox"/> To be Mailed
ENTITY: <input checked="" type="checkbox"/> LARGE <input type="checkbox"/> SMALL <input type="checkbox"/> MICRO					
APPLICATION AS FILED – PART I					
(Column 1)		(Column 2)			
FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)	
<input type="checkbox"/> BASIC FEE <small>(37 CFR 1.16(a), (b), or (c))</small>	N/A	N/A	N/A		
<input type="checkbox"/> SEARCH FEE <small>(37 CFR 1.16(k), (l), or (m))</small>	N/A	N/A	N/A		
<input type="checkbox"/> EXAMINATION FEE <small>(37 CFR 1.16(o), (p), or (q))</small>	N/A	N/A	N/A		
TOTAL CLAIMS <small>(37 CFR 1.16(j))</small>	minus 20 =	*	X \$ =		
INDEPENDENT CLAIMS <small>(37 CFR 1.16(h))</small>	minus 3 =	*	X \$ =		
<input type="checkbox"/> APPLICATION SIZE FEE <small>(37 CFR 1.16(s))</small>	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT <small>(37 CFR 1.16(j))</small>					
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL		

APPLICATION AS AMENDED – PART II							
(Column 1)		(Column 2)		(Column 3)			
AMENDMENT	10/01/2013	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	* 18	Minus	** 20	= 0	X \$80 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X \$420 =	0
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))						
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

(Column 1)		(Column 2)		(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X \$ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X \$ =	
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))						
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.						LIE /PARTHENIA D. MERRILL/	
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".							
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".							
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.							

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
 If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
 or **Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; *and/or* (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

115222 7390 08/29/2013
Bey & Cotropia PLLC (Finjan Inc.)
 213 Bayly Court
 Richmond, VA 23229

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

_____ (Depositor's name)
_____ (Signature)
_____ (Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/290,708	11/07/2011	Yigal Mordchai Eldery	FIN0001-CON1-CPI1-CON4	4120

TITLE OF INVENTION: MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS

APPL. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEES DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1780	\$300	\$0	\$2080	11/29/2013

EXAMINER	ART UNIT	CLASS/SUBCLASS
REVAK, CHRISTOPHER A	2431	726-024000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- Change of correspondence address (for Change of Correspondence Address Form PTO/SB/122) attached.
 "Fee Address" indication (or "Fee Address" Indication Form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
 (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1. Bey & Cotropia PLLC
 2. _____
 3. _____

3. ASSIGNEE'S NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Finjan, Inc.

New York, New York

Please check the appropriate assignee category or categories (will not be printed on the patent): Individual Corporation or other private group entity Government

4a. The following fee(s) are submitted:

- Issue Fee
 Publication Fee (No small entity discount permitted)
 Advance Order - # of Copies _____

4b. Payment of Fee(s). (Please first reapply any previously paid issue fee shown above)

- A check is enclosed.
 Payment by credit card. Form PTO-2038 is attached.
 The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- Applicant certifying micro entity status. See 37 CFR 1.29
- Applicant asserting small entity status. See 37 CFR 1.27
- Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant, a registered attorney or agent, or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature /Dawn-Marie Bey/ Date September 19, 2013
Typed or printed name Dawn-Marie Bey Registration No. 44,442

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 422 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Electronic Patent Application Fee Transmittal

Application Number:	13290708			
Filing Date:	07-Nov-2011			
Title of Invention:	MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS			
First Named Inventor/Applicant Name:	Yigal Mordechai Edery			
Filer:	Dawn-Marie Bey./Jeanne Paolella-Bald			
Attorney Docket Number:	FIN0001-CON1-CIP1-CON4			
Filed as Large Entity				
Utility under 35 USC 111(a) Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl Issue Fee	1501	1	1780	1780
Publ. Fee- Early, Voluntary, or Normal	1504	1	300	300

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				2080

Electronic Acknowledgement Receipt

EFS ID:	16902795
Application Number:	13290708
International Application Number:	
Confirmation Number:	4120
Title of Invention:	MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS
First Named Inventor/Applicant Name:	Yigal Mordechai Edery
Customer Number:	115222
Filer:	Dawn-Marie Bey./Jeanne Paolella-Bald
Filer Authorized By:	Dawn-Marie Bey.
Attorney Docket Number:	FIN0001-CON1-CIP1-CON4
Receipt Date:	19-SEP-2013
Filing Date:	07-NOV-2011
Time Stamp:	15:56:21
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	\$2080
RAM confirmation Number	2867
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
-----------------	----------------------	-----------	----------------------------------	------------------	------------------

1	Issue Fee Payment (PTO-85B)	fin0001con1cip1con4_execute dpartb.pdf	1882708 d1451bad472566b3da1b6e5a4239023754 4d6911	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	32225 1ea891eb41a9a17e6c466df23db3c0709d b19e	no	2
Warnings:					
Information:					
Total Files Size (in bytes):				1914933	
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					



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NOTICE OF ALLOWANCE AND FEE(S) DUE

115222 7590 08/29/2013
Bey & Cotropia PLLC (Finjan Inc.)
213 Bayly Court
Richmond, VA 23229

EXAMINER

REVAK, CHRISTOPHER A

ART UNIT PAPER NUMBER

2431

DATE MAILED: 08/29/2013

Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO.

13/290,708 11/07/2011 Yigal Mordechai Edery FIN0001-CON1-CIP1-CON4 4120

TITLE OF INVENTION: MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS

Table with 7 columns: APPLN. TYPE, ENTITY STATUS, ISSUE FEE DUE, PUBLICATION FEE DUE, PREV. PAID ISSUE FEE, TOTAL FEE(S) DUE, DATE DUE

nonprovisional UNDISCOUNTED \$1780 \$300 \$0 \$2080 11/29/2013

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

**Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE
 Commissioner for Patents
 P.O. Box 1450
 Alexandria, Virginia 22313-1450
 or Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

115222 7590 08/29/2013
 Bey & Cotropia PLLC (Finjan Inc.)
 213 Bayly Court
 Richmond, VA 23229

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

_____ (Depositor's name)
_____ (Signature)
_____ (Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/290,708	11/07/2011	Yigal Mordechai Ederly	FIN0001-CON1-CIP1-CON4	4120

TITLE OF INVENTION: MALICIOUS MOBILE CODE RUNTIME MONITORING SYSTEM AND METHODS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1780	\$300	\$0	\$2080	11/29/2013

EXAMINER	ART UNIT	CLASS-SUBCLASS
REVAK, CHRISTOPHER A	2431	726-024000

<p>1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).</p> <p><input type="checkbox"/> Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.</p> <p><input type="checkbox"/> "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.</p>	<p>2. For printing on the patent front page, list</p> <p>(1) the names of up to 3 registered patent attorneys or agents OR, alternatively, _____ 1</p> <p>(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. _____ 2</p> <p>_____ 3</p>
---	---

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE _____ (B) RESIDENCE: (CITY and STATE OR COUNTRY) _____

Please check the appropriate assignee category or categories (will not be printed on the patent): Individual Corporation or other private group entity Government

<p>4a. The following fee(s) are submitted:</p> <p><input type="checkbox"/> Issue Fee</p> <p><input type="checkbox"/> Publication Fee (No small entity discount permitted)</p> <p><input type="checkbox"/> Advance Order - # of Copies _____</p>	<p>4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)</p> <p><input type="checkbox"/> A check is enclosed.</p> <p><input type="checkbox"/> Payment by credit card. Form PTO-2038 is attached.</p> <p><input type="checkbox"/> The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).</p>
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5. **Change in Entity Status** (from status indicated above)

Applicant certifying micro entity status. See 37 CFR 1.29

Applicant asserting small entity status. See 37 CFR 1.27

Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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Bey & Cotropia PLLC (Finjan Inc.)
213 Bayly Court
Richmond, VA 23229

EXAMINER

REVAK, CHRISTOPHER A

ART UNIT PAPER NUMBER

2431

DATE MAILED: 08/29/2013

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 0 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 0 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 13/290,708	Applicant(s) EDERY ET AL.	
	Examiner CHRISTOPHER REVAK	Art Unit 2431	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. This communication is responsive to the response filed on 5/7/13.
 A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.
2. An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. The allowed claim(s) is/are 1-18. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

- a) All b) Some *c) None of the:
1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. <input type="checkbox"/> Notice of References Cited (PTO-892) 2. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date <u>See Continuation Sheet</u> 3. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit of Biological Material 4. <input type="checkbox"/> Interview Summary (PTO-413), Paper No./Mail Date _____. | <ol style="list-style-type: none"> 5. <input type="checkbox"/> Examiner's Amendment/Comment 6. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance 7. <input checked="" type="checkbox"/> Other <u>Examiner's Comments.</u> |
|---|--|

/Christopher A. Revak/
Primary Examiner, Art Unit 2431

Continuation of Attachment(s) 2. Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date: 5/7/13;5/7/13;5/7/13;5/7/13;5/7/13.

NOTICE OF ALLOWANCE

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 7, 2013 has been entered.

Response to Arguments

2. The Declaration filed on May 7, 2013 under 37 CFR 1.131(a) is sufficient to overcome the Ji, U.S. Patent 5,983,348 reference wherein the submitted Exhibit A Surfingate™ product press release titled "Gateway Level Corporate Security for the New World of Java™ and Downloadables" shows a publication date of October 31, 1996 which is prior to September 10, 1997. The rejection is hereby withdrawn and the claims are in conditions for allowance.

Information Disclosure Statement

3. The information disclosure statements (IDS) submitted are in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Allowable Subject Matter

4. Claims 1-18 are allowed.
5. The following is an examiner's statement of reasons for allowance:

It was not found to be taught in the prior art of receiving an incoming Downloadable; deriving security profile data for the Downloadable, including a list of suspicious computer operations that may be attempted by the Downloadable, and storing the Downloadable security profile data in a database.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHRISTOPHER REVAK whose telephone number is (571)272-3794. The examiner can normally be reached on Monday-Thursday, 9:00am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on 517-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Christopher A. Revak/
Primary Examiner, Art Unit 2431

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File 6:NTIS 1964-2013/Aug W2
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File 34:SciSearch(R) Cited Ref Sci 1990-2013/Aug W3
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(c) 2012 WTI-FRANKFURT

File 99:Wilson Appl. Sci & Tech Abs 1983-2011/Nov
(c) 2012 The HW Wilson Co.

File 103:Energy SciTec 1974-2013/Aug B1
(c) 2013 Contains copyrighted material

File 144:Pascal 1973-2013/Aug W3
(c) 2013 INIST/CNRS

File 275:Gale Group Computer DB(TM) 1983-2013/Aug 23
(c) 2013 Gale/Cengage

File 434:SciSearch(R) Cited Ref Sci 1974-1989/Dec
(c) 2006 The Thomson Corp

File 647:UBM Computer Fulltext 1988-2013/Aug W3
(c) 2013 UBM, LLC

File 674:Computer News Fulltext 1989-2006/Sep W1
(c) 2006 IDG Communications

File 9:Business & Industry(R) Jul/1994-2013/Aug 23
(c) 2013 Gale/Cengage

File 15:ABI/Inform(R) 1971-2013/Aug 23
(c) 2013 ProQuest Info&Learning

File 16:Gale Group PROMT(R) 1990-2013/Aug 23
(c) 2013 Gale/Cengage

File 18:Gale Group F&S Index(R) 1988-2013/Aug 23
(c) 2013 Gale/Cengage

File 20:Dialog Global Reporter 1997-2013/Aug 24
(c) 2013 Dialog

File 36:MetalBase 1965-20130823
(c) 2013 The Thomson Corporation

File 80:TGG Aerospace/Def.Mkts(R) 1982-2013/Aug 23
(c) 2013 Gale/Cengage

File 148:Gale Group Trade & Industry DB 1976-2013/Aug 23
(c) 2013 Gale/Cengage

File 160:Gale Group PROMT(R) 1972-1989
(c) 1999 The Gale Group

File 583:Gale Group Globalbase(TM) 1986-2002/Dec 13
(c) 2002 Gale/Cengage

File 621:Gale Group New Prod.Annou.(R) 1985-2013/Aug 23
(c) 2013 Gale/Cengage

File 624:McGraw-Hill Publications 1985-2013/Feb 28
(c) 2013 McGraw-Hill Co. Inc

File 635:Business Dateline(R) 1985-2013/Aug 24
(c) 2013 ProQuest Info&Learning

File 636:Gale Group Newsletter DB(TM) 1987-2013/Aug 23
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Set	Items	Description
S1	588653	(CODE OR EXECUTABLE OR DOWNLOAD????? OR APPLETT OR JAVA OR - JAVASCRIPT OR ACTIVEX)(16N) (DETERMIN????? OR ASCERTAIN??? OR - MONITOR??? OR ANALY????? OR INSPECT??? OR EXAMIN?????)
S2	44659	S1(16N) (OPERATION OR ACTION OR COMMAND OR INSTRUCTION OR S- TATE OR STATUS OR CONDITION OR CALL OR PROMPT)
S3	1010	S2(16N) (MALICIOUS OR SUSPICIOUS OR MALWARE OR ATTACK??? OR - VIRUS OR VIRAL OR TROJAN OR WORM)
S4	65	S3(16N) (REPORT OR INSTRUMENT????? OR PROFILE OR LIST??? OR ITEMIZ?????)

EAST Search History**EAST Search History (Prior Art)**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	506715	(code or executable or download\$5 or applet or java or script or javascript oractivex)with(determin\$5 or ascertain\$3 or monitor\$3 or analy\$4 or inspect\$3 or examin\$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/08/24 10:47
L2	167946	1 with(operation or action or command or instruction or state or status or condition or call or prompt)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/08/24 10:48
L3	1802	2 with(malicious or suspicious or malware or attack\$3 or virus or viral or trojan or worm)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/08/24 10:49
L4	197	3 with(report\$3 or instrument\$5 or profile or list\$3 or itemiz\$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/08/24 10:50
L5	8	4 with(append\$3 or attach\$4 or add or addon or addition)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/08/24 10:50
L6	531306	(append\$3 or attach\$4 or add or addon or addition)with(report\$3 or instrument\$5 or profile or list\$3 or itemiz\$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/08/24 10:51
L7	14	4 same 6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/08/24 10:51
L8	97	4 and 6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/08/24 10:51

EAST Search History (Interference)

EAST Search History

<This search history is empty>

8/ 24/ 2013 10:51:48 AM

Receipt date: 05/07/2013

13290708 - GAI: 2431

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		13290708	
	Filing Date		2011-11-07	
	First Named Inventor	EDERY, Yigal		
	Art Unit	2431		
	Examiner Name	REVAK, Christopher A		
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4		

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	Attorney Docket Number	FIN0001-CON1-CIP1-CON4	

1	ThunderByte Antivirus for Windows	no date provided	<input type="checkbox"/>
2	InterScan VirusWall from Trend Micro		<input type="checkbox"/>
3	VirusSafe from Eliashim		<input type="checkbox"/>
4	Intel LANProtect from Intel		<input type="checkbox"/>
5	The Java Security Manager from Sun Microsystems		<input type="checkbox"/>
6	McAfee Web Shield		<input type="checkbox"/>
7	McAfee WebScan		<input type="checkbox"/>
8	McAfee VirusScan		<input type="checkbox"/>
9	McAfee NetShield		<input type="checkbox"/>
10	Dr. Solomon's Antivirus Toolkit for Windows 95		<input type="checkbox"/>
11	Dr. Solomon's Antivirus Toolkit for Windows NT		<input type="checkbox"/>

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12	Dr. Solomon's WinGuard	no date provided	<input type="checkbox"/>
13	Dr. Solomon's Virus Guard		<input type="checkbox"/>
14	Dr. Solomon's Virus Shield		<input type="checkbox"/>
15	Dr. Solomon's Virex		<input type="checkbox"/>
16	Dr. Solomon's "Merlin" Anti-Virus Engine		<input type="checkbox"/>
17	Dr. Solomon's McAfee "Olympus" Anti-Virus Engine		<input type="checkbox"/>
18	ActiveX Web Tutorial		<input type="checkbox"/>
19	Java FAQ (1995-1998)		<input type="checkbox"/>
20	Norton AntiVirus TUfor Windows@95 User's Guide. Published by Symantec in 1995. (179 pages)		<input type="checkbox"/>
21	JAEGER, at al., "Building Systems that Flexibly Control Downloadable Executable Content," Proceedings of the Sixth USENIX UNIX Security Symposium, July 1996. (19 pages)		<input type="checkbox"/>
22	RASMUSSEN, Andreas and JANSSON, Sverker, "Personal Security Assistance for Secure Internet Commerce," Sept. 16, 1996. (12 pages)		<input type="checkbox"/>



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23	BHARAT et al. "Migratory Applications" November 15,1995. (10 pages)	<input type="checkbox"/>
24	DEAN, Drew, et al., "Java Security: From HotJava to Netscape and Beyond," 1996 IEEE Symposium on Security and Privacy, May 6,1996. (11 pages)	<input type="checkbox"/>
25	STERBENZ, Andreas, "An Evaluation of the Java Security Model," IEEE, December 1996. (13 pages)	<input type="checkbox"/>
26	FRITZINGER, J. Steven, et al., "Java Security," Sun Microsystems, December 1996 (7 pages)	<input type="checkbox"/>
27	BANK Joseph A. "Java Security," December 8 1995. (14 pages)	<input type="checkbox"/>
28	CLAUNCH, "Java Blocking," http://groups.google.com/group/muc.lists.firewalls/msg/2a5ec02e00a37071 . September 25 1996. Accessed date: May 10 2011. (2 pages).	<input type="checkbox"/>
29	CHAPPELL, "Understanding ActiveX and OLE: A Guide for Developers and Managers (Strategic Technology)," September 1,1996, Microsoft Press. (91 pages)	<input type="checkbox"/>
30	CROSBIE, et al., "Active Defense of a Computer System Using Autonomous Agents". February 15, 1995. (14 pages)	<input type="checkbox"/>

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- See attached certification statement.
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- A certification statement is not submitted herewith.

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Signature	/Dawn-Marie Bey/	Date (YYYY-MM-DD)	2013-05-07
Name/Print	Dawn-Marie Bey	Registration Number	44,442

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1	"Trend Micro's Virus Protection Added to Sun Microsystems Netra Internet Servers," Business Wire, October 1, 1996, available at http://www.cs.indiana.edu/~kinzler/pubs/viruswall.html	<input type="checkbox"/>
2	"Symantec Announces Norton Antivirus 2.0 for Windows NT," Symantec Corporation press release, September 16, 1996, available at http://www.symantec.com/about/news/release/article.jsp?prid=19960916_01	<input type="checkbox"/>
3	"Dark Avenger Mutation Engine No Threat to Protected PCs," McAfee, Inc. press release, May 11, 1992, available at http://securitydigest.org/virus/mirror/www.phreak.orgvirus1/1992/vinl05.191	<input type="checkbox"/>
4	"Dark Avenger Mutation Engine No Threat to Protected PCs," McAfee, Inc. press release, May 11, 1992, available at http://securitydigest.org/virus/mirror/www.phreak.orgvirus1/1992/vinl05.191	<input type="checkbox"/>
5	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	<input type="checkbox"/>
6	"Symantec Announces Norton Internet Email Gateway at Internet World - Booth # 369 on December 11, 12, and 13," Symantec Corporation press release, December 11, 1996, available at http://www.symantec.com/about/news/release/article.jsp?prid=19961211_03	<input type="checkbox"/>
7	"Internet Security Gets Less Costly and Easier to Manage: Integralis Announces MIMEsweeper Compatible with Check Point Firewall-Ion Single NT Server; E-mail Virus Detection and Content Management Can Reside on Firewall Server, Saving Money and Support Costs," Business Wire, September 16, 1996, available at http://www.thefreelibrary.com/Internet+Security+Gets+Less+Costly+and	<input type="checkbox"/>
8	"Presenting Java," by John December (1995)	<input type="checkbox"/>
9	"The Java Language Specification" by Gosling, et al. (1996)	<input type="checkbox"/>
10	"The Java Programming Language," by Ken Arnold and James Gosling (1996)	<input type="checkbox"/>
11	"The Java Virtual Machine Specification," by Tim Lindholm and Frank Yellin (1997)	<input type="checkbox"/>

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12	"Computer Viruses and Artificial Intelligence," by David Stang (September, 1995)	<input type="checkbox"/>
13	"Java Security and a Firewall Extension for Authenticity Control of Java Applets," by Magnus Johansson (January 29, 1997)	<input type="checkbox"/>
14	"Static Analysis of Programs With Application to Malicious Code Detection," by Raymond Lo (1992)	<input type="checkbox"/>
15	File History for U.S. Patent No. 6,804,780	<input type="checkbox"/>
16	"Virus Detection Alternatives," by Patrick Min (July, 1992)	<input type="checkbox"/>
17	"Dynamic Detection and Classification of Computer Viruses Using General Behaviour Patterns," by LeCharlier, et al. (September, 1995)	<input type="checkbox"/>
18	The Giant Black Book of Computer Viruses by Mark Ludwig (1995)	<input type="checkbox"/>
19	HotJava: The Security Story	no date provided <input type="checkbox"/>
20	The Java Filter	no date provided <input type="checkbox"/>
21	"A Java Filter," by Balfanz, et al.	no date provided <input type="checkbox"/>
22	"Improved JavaScript and Java Screening Function," by Claunch (May 4, 1996)	<input type="checkbox"/>

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23	"New Version of Java, JavaScript, ActiveX Screening," by Claunch (July 3, 1996)	<input type="checkbox"/>
24	"A Toolkit and Methods for Internet Firewalls," by Ranum, et al. no date provided	<input type="checkbox"/>
25	"Identifying and Controlling Undesirable Program Behaviors," by Maria King no date provided	<input type="checkbox"/>
26	"PACL's: An Access Control List Approach to Anti-Viral Security," by Wichers, et al. no date provided	<input type="checkbox"/>
27	ENDRIJONAS, Janet, Rx PC The Anti-Virus Handbook. Published in the U.S. in 1993 by TAB Books, a division of McGraw-Hill, Inc. (201 paQes)	<input type="checkbox"/>
28	"Secure Code Distribution," by X. Nick Zhang (June, 1997)	<input type="checkbox"/>
29	IBM AntiVirus User's Guide (November 15, 1995)	<input type="checkbox"/>
30	"Breadth of Runtime Environments and Security Make Java a Good Choice for the Internet" (1996)	<input type="checkbox"/>
31	Omura, Jim K., "Novel Applications of Cryptography in Digital Communications," IEEE Communications Magazine, pp. 21-29, May, 1990	<input type="checkbox"/>
32	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, July 19,1990, Abstract and pages 1169-1170, URL: http://iel.ihs.com:80/cgibin/iel_cgi?se ... 2ehts%26ViewTemplate%3ddocview%5fb%2ehts	<input type="checkbox"/>
33	IBM AntiVirus User's Guide Version 2.4, International Business Machines Corporation, pp. 6-7, November 15, 1995	<input type="checkbox"/>

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34	Leach, Norvin, et al., "IE 3.0 Applets Will Earn Certification," PC Week, Vol. 13, No. 29,2 pp., July 22, 1996	<input type="checkbox"/>
35	"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., July 29, 1996	<input type="checkbox"/>
36	"Powerful PC Security for the New World of JAVATM and Downloadables, Surfin Shield™," Article published on the Internet by Finjan Software Ltd., 2 pp. 1996	<input type="checkbox"/>
37	Microsoft® Authenticode Technology, "Ensuring Accountability and Authenticity for Software Components on the Internet," Microsoft Corporation, including Abstract, Contents, Introduction, and pp. 1-10, October, 1996	<input type="checkbox"/>
38	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., October 21, 1996	<input type="checkbox"/>
39	Company Profile, "Finjan-Safe Surfing. The Java Security Solutions Provider," Article published on the Internet by Finjan Software Ltd., 3 pp., October 31,1996	<input type="checkbox"/>
40	"Finjan Announces Major Power Boost and New Features for SurfinShield™ 2.0," Las Vegas Convention Center/Pavilion 5 P5551, 3 pp., November 18, 1996	<input type="checkbox"/>
41	"Java Security: Issues & Solutions," Article published on the Internet by Finjan Software Ltd., 8 pp., 1996	<input type="checkbox"/>
42	"Products," Article published on the Internet, 7 pp. no date provided	<input type="checkbox"/>
43	Mark LaDue, "Online Business Consultant: Java Security: Whose Business Is It?," Article published on the Internet, Home Page Press, Inc., 4 pp., 1996	<input type="checkbox"/>
44	Web Page Article, "Frequently Asked Questions About Authenticode," Microsoft Corporation, last updated February 17, 1997, printed December 23, 1998, URL: http://www.microsoft.com/workshop/security/authcodee/signfaq.asp#9 , pp. 1-13	<input type="checkbox"/>

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45	Zhang, X.N., "Secure Code Distribution," IEEE/IEE Electronic Library online, Computer Vol. 30, Issue 6, pp. 76-79, June, 1997		<input type="checkbox"/>
46	Binstock, Andrew, "Multithreading, Hyper-Threading, Multiprocessing: Now, What's the Difference?," http://hlv.viv-intel.com/cd/ids/dcvdoQcr!asmo-na/enfl/20456.htm , Pacific Data Works, LLC, downloaded 7/7/2008, 7 pp.		<input type="checkbox"/>
47	VirexPC Version 2.0 or later from Microcom	no date provided	<input type="checkbox"/>
48	AntiVirus Kit From 1 stAide Software	no date provided	<input type="checkbox"/>
49	FluShot+ Series of Products by Ross Greenberg	no date provided	<input type="checkbox"/>
50	Symantec Antivirus of the Mac version 3.0 or later	no date provided	<input type="checkbox"/>

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5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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Receipt date: 05/07/2013

13290708 - GAI: 2431

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

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	Filing Date		2011-11-07	
	First Named Inventor	EDERY, Yigal		
	Art Unit	2431		
	Examiner Name	REVAK, Christopher A		
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4		

U.S.PATENTS

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1	"Synthesizing Fast Intrusion Prevention/Detection Systems From High-Level Specifications," by Sekar, et al. (1999)	<input type="checkbox"/>
2	Art of Computer Virus Research and Defense b Peter Szor (February, 2005)	<input type="checkbox"/>
3	"Process Execution Controls as a Mechanism to Ensure Consistency," by Eugen Bacic (1990)	<input type="checkbox"/>
4	"Process Execution Controls: Revisited," by Bacic (1990)	<input type="checkbox"/>
5	"A Flexible Access Control Service for Java Mobile Code," by Corradi, et al. (2000)	<input type="checkbox"/>
6	"Java Security: Issues & Solutions" (1996)	<input type="checkbox"/>
7	"Microsoft Authenticode analyzed," by Rohit Khare (July 22, 1996)	<input type="checkbox"/>
8	"Java Security: Whose Business Is It?" by Mark LaDue (1996)	<input type="checkbox"/>
9	Microsoft Authenticode Technology (October, 1996)	<input type="checkbox"/>
10	"Mobile Code Security," by Rubin, et al.	no date provided <input type="checkbox"/>
11	"Protecting Data From Malicious Software," by Schmid, et al.	no date provided <input type="checkbox"/>

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12	"Security in the Large: Is Java's Sandbox Scalable?" by Zhong, et al. (April, 1998)	<input type="checkbox"/>
13	"A Domain and type Enforcement UNIX Prototype," by Badger, et al. (June, 1995)	<input type="checkbox"/>
14	"Heuristic Anti-Virus Technology," by Frans Veldman no date provided	<input type="checkbox"/>
15	"Standards for Security in Open Systems," by Warwick Ford (1989)	<input type="checkbox"/>
16	"Secure File Transfer Over TCP/IP," by Brown, et al. (November, 1992)	<input type="checkbox"/>
17	"Standards in Commercial Security," by Nick Pope no date provided	<input type="checkbox"/>
18	"X.400 Security Features," by Tony Whyman no date provided	<input type="checkbox"/>
19	"Using CASE Tools to Improve the Security of Applications Systems," by Hosmer, et al. (1988)	<input type="checkbox"/>
20	"Miro: Visual Specification of Security," by Heydon, et al. (October, 1990)	<input type="checkbox"/>
21	"An Evaluation of Object-Based Programming with Visual Basic," by Dukovic, et al. (1995)	<input type="checkbox"/>
22	"Visual Basic 5.0 Significantly Improved," by W. Dennis Swift (June, 1997)	<input type="checkbox"/>

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23	"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)	<input type="checkbox"/>
24	"Detecting Unusual Program Behavior Using the Statistical Component of the Nextgeneration Intrusion Detection Expert System (NIDES), by Anderson, et al. (May, 1995)	<input type="checkbox"/>
25	"A Generic Virus Scanner in C++," by Kumar, et al. (September 17, 1992)	<input type="checkbox"/>
26	"A Model For Detecting the Existence of Software Corruption in Real Time," by Voas, et al. (1993)	<input type="checkbox"/>
27	"Protection Against Trojan Horses by Source Code Analysis," by Saito, et al. (March, 1993)	<input type="checkbox"/>
28	"Information Agents for Automated Browsing," by Dharap, et al. (1996)	<input type="checkbox"/>
29	"Static Analysis Virus Detection Tools for Unix Systems," by Kerchen, et al. (1990)	<input type="checkbox"/>
30	"Managing Trust in an Information-Labeling System," by Blaze, et al. (November 4, 1996)	<input type="checkbox"/>
31	List of Secure Internet Programming Publications from www.cs.princeton.edu	no date provided <input type="checkbox"/>
32	"A Guide to the Selection of Anti-Virus Tools and Techniques," by Polk, et al. (December 2, 1992)	<input type="checkbox"/>
33	"An Integrated Toolkit for Operating System Security," by Rabin, et al. (August, 1988)	<input type="checkbox"/>

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34	"A Web Navigator With Applets in Caml," by Francois Ronaix (May, 1996)	<input type="checkbox"/>	
35	"Intel Launches Virus Counterattack," by Charles Bruno (August, 1992)	<input type="checkbox"/>	
36	Intel LANProtect Software User's Guide (1992)	<input type="checkbox"/>	
37	"Parents Can Get PC Cruise Control," by George Mannes (July, 1996)	<input type="checkbox"/>	
38	"A New Techniques for Detecting Polymorphic Computer Viruses," by Carey Nachenberg (1995)	<input type="checkbox"/>	
39	"Heuristic Scanners: Artificial Intelligence," by Righard Zwienenberg (September, 1995)	<input type="checkbox"/>	
40	Intel LANProtect, 30-Day Test Drive Version User's Manual	no date provided	<input type="checkbox"/>
41	Slade, Robert, "Guide to Computer Viruses: How to A void Them, How to Get Rid of Them, and How to Get Help" (April, 1996)	<input type="checkbox"/>	
42	A Pathology of Computer Viruses by David Ferbranche (November, 1994)	<input type="checkbox"/>	
43	Earl Boebert's post to the greatcircle firewalls mailing list. Taken from http://www.greatcircle.com/lists/firewalls/archive/firewalls.199410 (October, 16, 1994)	<input type="checkbox"/>	
44	CSL Bulletin: Connecting to the Internet: Security Considerations. Taken from http://csrc.nist.gov/publications/nistbul/cs193-07.txt (July 1993)	<input type="checkbox"/>	

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45	FAQ: Interscan Viruswall Taken from http://\veb.archive.org/web/19970605050331/www..antivirus.com/faq/finterscanfaq.html (last updated August 8, 1996)	<input type="checkbox"/>
46	Network Security and SunScreen SPF-IOO: Technical White Paper, Sun Microsystems, 1995	<input type="checkbox"/>
47	"Why Do We Need Heuristics?" by Frans Veldman (September, 1995)	<input type="checkbox"/>
48	"Leading Content Security Vendors Announce Support for Check Point Firewall- 1.3.0; New Partners for Anti-Virus Protection, URL Screening and Java Security," Business Wire, October 7, 1996, available at http://www.allbusiness.com/technology/computer-networks-computer-networksecurity17274315-1.html#ixzz1gkbKf4g1	<input type="checkbox"/>
49	"McAfee Introduces Web shield; Industry's First Secure Anti-Virus Solution for Network Firewalls; Border Network Technologies and Secure Computing to Enter into Web Shield OEM Agreements," Business Wire, May 14, 1996, available at http://findarticles.com/p/articles/mi_mOEINlis_1996_May_14/ai_182834561	<input type="checkbox"/>
50	"Trend Micro Announces Virus and Security Protection For Microsoft Proxy Server; Also Blocks Java Applets, ActiveX," Business Wire, October 29, 1996, available at http://www.thefreelibrary.com/Trend+Micro+announces+virus+and+security+protection+for+MicrosoftL.-aO18810512	<input type="checkbox"/>

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Examiner Signature	/Christopher Revak/	Date Considered	08/21/2013
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CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

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The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

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SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Dawn-Marie Bey/	Date (YYYY-MM-DD)	2013-05-07
Name/Print	Dawn-Marie Bey	Registration Number	44,442

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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1	Finjan's Opposition to Websense's Renewed Motion For Judgment as a Matter of Law, dated December 21,2012, filed in Finjan, Inc. v. Symantec Corp., Sophos, Inc., and Websense, Inc., CA. No. 10-cv-593 (OMS)	<input type="checkbox"/>
2	Declaration of Paul Batchter Re Websense, Inc.s' Proffer of Evidence Re Laches, dated December 19,2012, filed in Finjan, Inc. v. Symantec Corp., Sophos, Inc., and Websense, Inc., CA. No. 10-cv-593 (OMS) (Redacted 12/26/12)	<input type="checkbox"/>
3	Opposition to Symantec's Motion For JMOL, dated December 17, 2012, filed in Finjan, Inc. v. Symantec Corp., Sophos, Inc., and Websense, Inc., CA. No. 10-cv-593 (OMS) (Redacted 12/27/12)	<input type="checkbox"/>
4	Omura, Jim K., "Novel Applications of Cryptography in Digital Communications," IEEE Communications Magazine, pp. 21-29, May, 1990	<input type="checkbox"/>
5	Okamoto, E., et al., "ID-Based Authentication System For Computer Virus Detection," IEEE Electronic Library online, Electronics Letters, Vol. 26, Issue 15, ISSN 0013-5194, July 19,1990, Abstract and pages 1169-1170, URL: http://iel.ihs.com:80/cgi-bin/iel.cgi?se...2ehts%26ViewTemplate%3ddocview%5fb%2ehts	<input type="checkbox"/>
6	IBM AntiVirus User's Ouide Version 2.4, International Business Machines Corporation, pp. 6-7, November 15,1995	<input type="checkbox"/>
7	Leach, Norvin, et al., "IE 3.0 Applets Will Earn Certification," PC Week, Vol. 13, No. 29, 2 pp., July 22, 1996	<input type="checkbox"/>
8	"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., July 29, 1996	<input type="checkbox"/>
9	"Powerful PC Security for the New World of JAVATM and Downloadables, Surfin Shield™," Article published on the Internet by Finjan Software Ltd., 2 pp. 1996	<input type="checkbox"/>
10	Microsoft® Authenticode Technology, "Ensuring Accountability and Authenticity for Software Components on the Internet," Microsoft Corporation, including Abstract, Contents, Introduction, and pp. 1-10, October, 1996	<input type="checkbox"/>
11	Finjan Announces a Personal Java™ Firewall for Web Browsers - the SurfinShield™ 1.6 (fonnerly known as SurfinBoard)," Press Release of Finjan Releases SurfinShield 1.6,2 pp., October 21, 1996	<input type="checkbox"/>

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12	Company Profile, "Finjan-Safe Surfing. The Java Security Solutions Provider," Article published on the Internet by Finjan Software Ltd., 3 pp., October 31, 1996	<input type="checkbox"/>
13	"Finjan Announces Major Power Boost and New Features for SurfinShield™ 2.0," Las Vegas Convention Center/Pavilion 5 P5551, 3 pp., November 18, 1996	<input type="checkbox"/>
14	"Java Security: Issues & Solutions," Article published on the Internet by Finjan Software Ltd., 8 pp., 1996	<input type="checkbox"/>
15	"Products," Article published on the Internet, 7 pp. no date provided	<input type="checkbox"/>
16	Mark LaDue, "Online Business Consultant: Java Security: Whose Business Is It?," Article published on the Internet, Home Page Press, Inc., 4 pp., 1996	<input type="checkbox"/>
17	Web Page Article, "Frequently Asked Questions About Authenticode," Microsoft Corporation, last updated February 17, 1997, printed December 23, 1998, URL: http://www.microsoft.com/workshop/security/authcode/signfaq.asp#9 , pp. 1-13	<input type="checkbox"/>
18	Zhang, X.N., "Secure Code Distribution," IEEE/IEE Electronic Library online, Computer Vol. 30, Issue 6, pp. 76-79, June, 1997	<input type="checkbox"/>
19	Binstock, Andrew, "Multithreading, Hyper-Threading, Multiprocessing: Now, What's the Difference?," http://www.intel.com/cd/ids/developer/asmo-na/eng/20456.htm , Pacific Data Works, LLC, downloaded 7/7/2008, 7 pp.	<input type="checkbox"/>
20	"Frequently Asked Questions About Authenticode," Microsoft Corporation, updated February 17, 1997	<input type="checkbox"/>
21	"WWWProxyto Cut Off Java," by Carl Claunch (April 12, 1996)	<input type="checkbox"/>
22	"Combating Viruses Heuristically," by Frans Veldman (September, 1993)	<input type="checkbox"/>

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24	Anti-Virus Tools and Techniques for Computer Systems by Polk, et al. (1995)	<input type="checkbox"/>
25	"Dynamic Detection and Classification of Computer Viruses Using General Behaviour Patterns," by LeCharlier, et al. (July 2, 1995)	<input type="checkbox"/>
26	"Towards a Testbed for Malicious Code Detection," by Lo, et al. (1991)	<input type="checkbox"/>
27	"Blocking Java Applets at the Firewall," by Martin, et al. no date provided	<input type="checkbox"/>
28	Virus Detection and Elimination by Rune Skardhamar (1996)	<input type="checkbox"/>
29	Computer Viruses and Anti-Virus Warfare by Jan Hruska (1992)	<input type="checkbox"/>
30	"Active Content Security," by Brady, et al. (December 13, 1999)	<input type="checkbox"/>
31	"Low Level Security in Java," by Frank Yellin no date provided	<input type="checkbox"/>
32	"Email With a Mind ofIts Own: The Safe-Tcl Language for Enabled Mail," by Nathaniel Borenstein no date provided	<input type="checkbox"/>
33	"Mobile Agents: Are They a Good Idea?" by Chess, et al. (December 21, 1994)	<input type="checkbox"/>

Receipt date: 05/07/2013 INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13290708	13290708 - GAU: 2431
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	Art Unit	2431	
	Examiner Name	REVAK, Christopher A	
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4	

34	"Remote Evaluation," by Stamos, et al. (October, 1990)	<input type="checkbox"/>
35	"Active Message Processing: Messages as Messengers," by John Vittal (1981)	<input type="checkbox"/>
36	"Programming Languages for Distributed Computing Systems," by Bal, et al. (September, 1989)	<input type="checkbox"/>
37	"Scripts and Agents: The New Software High Ground," by John Ousterhout (October 20, 1995)	<input type="checkbox"/>
38	"The HotJava Browser: A White Paper" no date provided	<input type="checkbox"/>
39	The Java Virtual Machine Specification, Sun Microsystems (August 21, 1995)	<input type="checkbox"/>
40	"Security of Web Browser Scripting Languages: Vulnerabilities, Attacks and Remedies," by Anupam, et al. (January, 1998)	<input type="checkbox"/>
41	"ActiveX and Java: The Next Virus Carriers?" no date provided	<input type="checkbox"/>
42	"Gateway Level Corporate Security for the New World of Java and Downloadables" (1996)	<input type="checkbox"/>
43	"Practical Domain and Type Enforcement for UNIX," by Badger, et al. (1995)	<input type="checkbox"/>
44	"A Sense of Self for Unix Processes," by Forrest, et al. (1996)	<input type="checkbox"/>

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45	"Antivirus Scanner Analysis 1995," by Marko Helenius (1995)	<input type="checkbox"/>
46	"State Transition Analysis: A Rule-Based Intrusion Detection Approach," by Ilgun, et al. (March, 1995)	<input type="checkbox"/>
47	"Automated Detection of Vulnerabilities in Privileged Programs by Execution Monitoring," by Ko, et al. (1994)	<input type="checkbox"/>
48	"Execution Monitoring of Security-Critical Programs in Distributed Systems: A Specification-Based Approach," by Ko, et al. (1997)	<input type="checkbox"/>
49	"Classification and Detection of Computer Intrusions," by Sandeep Kumar (August, 1995)	<input type="checkbox"/>
50	ThunderBYTE Anti-Virus Utilities User Manual (1995)	<input type="checkbox"/>

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Examiner Signature	/Christopher Revak/	Date Considered	08/21/2013
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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

- See attached certification statement.
- The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Dawn-Marie Bey/	Date (YYYY-MM-DD)	2013-05-07
Name/Print	Dawn-Marie Bey	Registration Number	44,442

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Receipt date: 05/07/2013

13290708 - GAI: 2431

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	Art Unit	2431		
	Examiner Name	REVAK, Christopher A		
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4		

U.S.PATENTS						
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	8079086		2011-12-13	Edery, et al.	
	2	4562305		1995-12-31	Ji, et al.	
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	6	5311591		1994-05-10	Fischer	
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	8	5359659		1994-10-25	Rosenthal	

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9	5361359		1992-08-31	Tajalli, et al.	
10	5398196		1995-03-14	Chambers	
11	5412717		1995-05-02	Fischer	
12	5414833		1995-05-09	Hershey, et al.	
13	5440723		1995-08-08	Arnold, et al.	
14	5452442		1995-09-19	Kephart	
15	5483649		1996-06-09	Kuznetsov, et al.	
16	5485409		1996-01-16	Gupta, et al.	
17	5485575		1996-01-16	Chess, et al.	
18	5524238		1996-06-04	Miller, et al.	
19	5579509		1996-11-26	Furtney, et al.	

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	20	5606668		1997-02-25	Shwed	
	21	5621889		1997-04-15	Lermuzeaux, et al.	
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	25	5675711		1997-10-07	Kephart, et al.	
	26	5692047		1997-12-25	McManis	
	27	5692124		1997-11-25	Holden, et al.	
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	29	5720033		1998-02-17	Deo	
	30	5724425		1998-03-03	Chang, et al.	

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	31	5740248		1998-04-14	Fieres, et al.	
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	33	5761421		1998-06-02	Van Hoff, et al.	
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	35	5765205		1998-08-09	Breslau, et al.	
	36	5784459		1998-07-21	Devarakonda, et al.	
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	38	5805829		1998-09-08	Cohen, et al.	
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	40	5825877		1998-10-20	Dan, et al.	
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	42	5832274		1998-11-03	Cutler, et al.	
	43	5850559		1998-12-15	Angelo, et al.	
	44	5854916		1998-12-29	Nachenberg	
	45	5859966		1999-01-12	Hayman, et al.	
	46	5864683		1999-01-26	Boebert, et al.	
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	48	5878258		1999-03-02	Pizi, et al.	
	49	5881151		1999-03-09	Yamamoto	
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	60	5978484		1999-11-02	Apperson, et al.	
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	64	6088801		2000-07-11	Grecsek	
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U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20100195909		2010-08-05	Eder, et al.	
	2	20030014662		2003-01-16	Gupta, et al.	

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	3	20030074190		2003-04-17	Allison	
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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
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	Attorney Docket Number		FIN0001-CON1-CIP1-CON4		

	1	1021276	EP		2000-07-26	Frank Marusiak		<input type="checkbox"/>
	2	1132796	EP		2001-09-12	University of Louvain		<input type="checkbox"/>
	3	0636977	EP		1994-07-27	Chambers		<input type="checkbox"/>
	4	04/063948	WO		2004-07-29	Vihana, Inc.		<input type="checkbox"/>
	5	08-263447	JP		1996-10-11	Sun Microsyst., Inc.		<input type="checkbox"/>
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	7	95/27249	WO		1995-10-12	Intel Corporation		<input type="checkbox"/>
	8	98/21683	WO		1998-05-22	Touboul		<input type="checkbox"/>

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NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T5
	1	Doyle, et al., "Microsoft Press Computer Dictionary," Microsoft Press, 2nd Edition, pp. 137-138,1993	<input type="checkbox"/>

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2	Schmitt, D.A., ".EXE files, OS-2 style," PC Tech Journal, Vol. 6, No. 11, p. 76(13), November, 1988	<input type="checkbox"/>
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4	Supplementary European Search Report for Application No. EP 97 950351, dated November 17, 2004, 2 pp.	<input type="checkbox"/>
5	File History for Canadian Application No. 2,275,771, 84 pp. no date provided	<input type="checkbox"/>
6	File History for European Application No. 97950351.3, 58 pp. no date provided	<input type="checkbox"/>
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10	Plaintiff Finjan Software, Ltd. 's Opening Claim Construction Brief, 38 pp., September 7, 2007	<input type="checkbox"/>
11	Defendant Secure Computing Corporation's Opening Claim Construction Brief, 46 pp., September 7, 2007	<input type="checkbox"/>
12	Plaintiff Finjan Software, Ltd. 's Answering Claim Construction Brief (Public Version), 45 pp., September 28, 2007	<input type="checkbox"/>

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13	Defendant Secure Computing Corporation's Responsive Claim Construction Brief (Public Version), 37 pp., September 28,2007	<input type="checkbox"/>
14	Secure Computing Corporation's Disclosure of Prior Art Pursuant to 35 U.S.c. § 282, 6 pp., February 1,2008	<input type="checkbox"/>
15	Stang, David J., "Computer Viruses and Artificial Intelligence," Virus Bulletin Conference, pp. 235-257, September, 1995	<input type="checkbox"/>
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17	Joint Appendix of Intrinsic and Extrinsic Evidence Regarding Claim Construction Briefing, Volume 1, October 4, 2007	<input type="checkbox"/>
18	Joint Appendix of Intrinsic and Extrinsic Evidence Regarding Claim Construction Briefing, Volume 2, October 4, 2007	<input type="checkbox"/>
19	Final Joint Claim Construction Chart, August 24,2007	<input type="checkbox"/>
20	Joint Post-Hearing Claim Construction Chart, October 30, 2007	<input type="checkbox"/>
21	Plaintiffs Trial Brief (Public Version), January 14,2008	<input type="checkbox"/>
22	Marcionek, David, "A Complete ActiveX Web Control Tutorial," Available at http://www.codeproject.com/KB/COM/CompleteActiveX.aspx (2006)	<input type="checkbox"/>
23	Docket for Finjan Software Ltd. v. Secure Computing Corporation, et al., U.S. District Court, District of Delaware (Wilmington), Civil Docket No.1 :06-cv-00369-GMS, 52 pp., retrieved on October 24, 2008 from https://lecf.ded.uscourts.gov/cgibinIDktRpt.pl?6532182820 13655-L 567 0-1	<input type="checkbox"/>

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Receipt date: 05/07/2013	Application Number	13290708	13290708 - GAU: 2431
	Filing Date	2011-11-07		
	First Named Inventor	EDERY, Yigal		
	Art Unit	2431		
	Examiner Name	REVAK, Christopher A		
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4		

24	Docket for Finjan Software Ltd. v. Aladdin Knowledge Systems, Inc., et al., U.S. District Court, District of Delaware (Wilmington), Civil Docket No.1 :08-cv-00300-GMS, 5 pp., retrieved on October 24, 2008 from https://lecf.ded.uscourts.gov/cgi-bin-DktRpt.pl?994267838982431-L 567 0-1	<input type="checkbox"/>
25	Firewall Toolkit (FWTK) 2.0 Beta Release, 1996	<input type="checkbox"/>
26	International Search Report for Application No. PCT/ILOSI0091S, 2 pp., dated March 3, 2006	<input type="checkbox"/>
27	Written Opinion for Application No. PCT/ILOSI0091S, S pp., dated March 3,2006 (mailing date)	<input type="checkbox"/>
28	International Search Report for Application No. PCT/IBO/01138, 3 pp., September 20, 2002 (mailing date)	<input type="checkbox"/>
29	International Preliminary Examination Report for Application No. PCT/IBO/01138, 2 pp., dated December 19, 2002	<input type="checkbox"/>
30	Gerzic, Amer, "Write Your Own Regular Expression Parser," November 17, 2003, 18 pp., Retrieved from the Internet: http://www.codeguru.com/Cpp/Cpp/cpp_mfc/parsing/article.php/c4093/	<input type="checkbox"/>
31	Power, James, "Lexical Analysis," 4 pp., May 14,2006, Retrieved from the Internet: http://www.cs.may.ie/~jpower/Courses/compilers/notes/lexical.pdf	<input type="checkbox"/>
32	Sitaker, Kragen, "Rapid Genetic Evolution of Regular Expressions" [online], The Mial Archive, April 24, 2004 (retrieved on December 7,2004), S pp., Retrieved from the Internet: http://www.mail-archive.com/kragen-tol@canonical.org/msg00097.html	<input type="checkbox"/>
33	"Lexical Analysis: DF A Minimization & Wrap Up" [online], Fall, 2004 [retrieved on March 2, 200S], 8 pp., Retrieved from the Internet: http://www.owl.net.rice.edu/~comp412/Lectures/L06LexWrapup4.pdf	<input type="checkbox"/>
34	"Minimization of DFA" [online], [retrieved on December 7,2004], 7 pp., Retrieved from the Internet: http://www.cs.odu.edu/~toida/nerzic/390teched/regular/fa/min-fa.html	<input type="checkbox"/>

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Receipt date: 05/07/2013	Application Number	13290708	13290708 - GAU: 2431
	Filing Date	2011-11-07		
	First Named Inventor	EDERY, Yigal		
	Art Unit	2431		
	Examiner Name	REVAK, Christopher A		
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4		

35	"Algorithm: NFS -> DFA" [online], Copyright 1999-2001 [retrieved on December 7, 2004],4 pp., Retrieved from the Internet: http://rw4.cs.uni-sb.de/~ganimal/GANIFA/page16_e.htm	<input type="checkbox"/>
36	"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/~hansenclasses/3813fall01/slides/06Minimize.pdf	<input type="checkbox"/>
37	Watson, Bruce W., "Constructing Minimal Acyclic Deterministic Finite Automata," [retrieved on March 20,2005],38 pp., Retrieved from the Internet: http://www.win.tue.nl/~watson/2R870/downloads/madfa_algs.pdf	<input type="checkbox"/>
38	Chang, Chia-Hsiang, "From Regular Expressions to DFA's Using Compressed NF A's," October, 1992, 112 pp., http://www.cs.nyu.edu/web/Research/Theses/chang_chi-hsiang.pdf	<input type="checkbox"/>
39	Khare, R., "Microsoft Authenticode Analyzed" [online], July 22, 1996 [retrieved on June 25,2003],2 pp., Retrieved from the Internet: http://www.xent.com/ForKarchive/smmer96/0338.html	<input type="checkbox"/>
40	Moritz, R., "Why We Shouldn't Fear Java," Java Report, pp. 51-56, February, 1997	<input type="checkbox"/>
41	Microsoft, "Microsoft ActiveX Software Development Kit" [online], August 12, 1996 [retrieved on June 25,2003], pp. 1-6, Retrieved from the Internet: http://activex.adsp.or.jp/inetsdklhelp/overview.htm	<input type="checkbox"/>
42	D. Grune, et al., "Parsing Techniques: A Practical Guide," John Wiley & Sons, Inc., New York, New York, USA, pp. 1-326,2000	<input type="checkbox"/>
43	Power, James, "Notes on Formal Language Theory and Parsing," National University of Ireland, pp. 1-40, 1999	<input type="checkbox"/>
44	Scott, et al., "Abstracting Application-Level Web Security," ACM, pp. 396-407,2002	<input type="checkbox"/>
45	Non-Final Office Action, dated July 23,2012, for Application Serial No. 13/290,708, 10 pp.	<input type="checkbox"/>

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Receipt date: 05/07/2013	Application Number	13290708	13290708 - GAU: 2431
	Filing Date	2011-11-07		
	First Named Inventor	EDERY, Yigal		
	Art Unit	2431		
	Examiner Name	REVAK, Christopher A		
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4		

46	Amendment and Response to Office Action (Dated July 23,2012) Under 37 C.F.R. 1.111 filed October 23,2012 for Application Serial No. 13/290,708,9 pp.	<input type="checkbox"/>
47	Final Office Action, dated January 7,2013, for Application Serial No. 13/290,708, 7 pp.	<input type="checkbox"/>
48	Judgment, dated December 21,2012, filed in Finjan, Inc. v. Symantec Corp., Sophos, Inc., and Websense, Inc., C.A. No. 10-cv-593 (GMS)	<input type="checkbox"/>
49	Finjan's Opposition to Sophos' Renewed Motion For Judgment as a Matter of Law, dated December 21,2012, filed in Finjan, Inc. v. Symantec Corp., Sophos, Inc., and Websense, Inc., C.A. No. 10-cv-593 (GMS)	<input type="checkbox"/>
50	Finjan's Opposition to Symantec's Motion For Judgment as a Matter of Law at the Close of Evidence, dated December 21,2012, filed in Finjan, Inc. v. Symantec Corp., Sophos, Inc., and Websense, Inc., CA. No. 10-cv-593 (OMS)	<input type="checkbox"/>

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/Christopher Revak/	Date Considered	08/21/2013
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13290708	13290708 - GAU: 2431
	Filing Date	2011-11-07	
	First Named Inventor	EDERY, Yigal	
	Art Unit	2431	
	Examiner Name	REVAK, Christopher A	
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4	

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

- See attached certification statement.
- The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Dawn-Marie Bey/	Date (YYYY-MM-DD)	2013-05-07
Name/Print	Dawn-Marie Bey	Registration Number	44,442

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**


Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.R./

Search Notes 	Application/Control No. 13290708	Applicant(s)/Patent Under Reexamination EDERY ET AL.
	Examiner CHRISTOPHER REVAK	Art Unit 2431

CPC- SEARCHED		
Symbol	Date	Examiner


CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
none	none	7/13/12	CR

SEARCH NOTES		
Search Notes	Date	Examiner
PALM Inventor Name Search	7/14/12	CR
BRS Text Search: USPAT, US PGPUB, USOCR, DERWENT, FPRS, IBM TDB, EPO, JPO (see attached search strategy)	7/14/12; 8/24/13	CR
BRS Subclass Text Search: USPAT, US PGPUB (see attached search strategy)	7/14/12	CR
DIALOG Text Search: COMPSCI, ELECTRON, SOFTWARE (see attached search strategy)	8/24/13	CR
Interference Search (see attached search strategy)	8/24/13	CR

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
726	22-25	8/24/13	CR
713	168,175,176,179-181	8/24/13	CR


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Issue Classification 	Application/Control No. 13290708	Applicant(s)/Patent Under Reexamination EDERY ET AL.
	Examiner CHRISTOPHER REVAK	Art Unit 2431

CPC		
Symbol	Type	Version


CPC Combination Sets				
Symbol	Type	Set	Ranking	Version

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	18	
/CHRISTOPHER REVAK/ Primary Examiner. Art Unit 2431	08/24/2013	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	10B

Issue Classification 	Application/Control No. 13290708	Applicant(s)/Patent Under Reexamination EDERY ET AL.
	Examiner CHRISTOPHER REVAK	Art Unit 2431

US ORIGINAL CLASSIFICATION				INTERNATIONAL CLASSIFICATION							
CLASS		SUBCLASS		CLAIMED				NON-CLAIMED			
726		24		H	0	4	L	29 / 06 (2006.01.01)			
CROSS REFERENCE(S)				G	0	6	F	11 / 30 (2006.01.01)			
				G	0	6	F	15 / 16 (2006.01.01)			
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)										
713	175										

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	18	
/CHRISTOPHER REVAK/ Primary Examiner. Art Unit 2431	08/24/2013	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	10B

Issue Classification 	Application/Control No. 13290708	Applicant(s)/Patent Under Reexamination EDERY ET AL.
	Examiner CHRISTOPHER REVAK	Art Unit 2431

<input checked="" type="checkbox"/> Claims renumbered in the same order as presented by applicant <input type="checkbox"/> CPA <input checked="" type="checkbox"/> T.D. <input type="checkbox"/> R.1.47															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
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	16														

NONE		Total Claims Allowed:	
		18	
(Assistant Examiner)	(Date)	O.G. Print Claim(s)	O.G. Print Figure
/CHRISTOPHER REVAK/ Primary Examiner. Art Unit 2431	08/24/2013	1	10B
(Primary Examiner)	(Date)		

EAST Search History

EAST Search History (Prior Art)

<This search history is empty>

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	22121	(726/22-25 or 713/168,175,176,179-181).ccls.	US-PGPUB; USPAT; UPAD	OR	ON	2013/08/24: 13:18
L2	6	(downloadable with profile).clm. and 1	US-PGPUB; USPAT; UPAD	OR	ON	2013/08/24: 13:18

8/ 24/ 2013 1:19:08 PM



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APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	FILE WRAPPER LOCATION
13/290,708		2431	



Correspondence Address/Fee Address Change

The following fields have been set to Customer Number 115222 on 05/20/2013

- Correspondence Address
- Maintenance Fee Address

The address of record for Customer Number 115222 is:

115222
Bey & Cotropia PLLC
213 Bayly Court
Richmond, VA 23229

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Patent Application of:)	
)	Examiner: Christopher A. Revak
Yigal Mordechai Edery)	
Nimrod Itzhak Vered)	Art Unit: 2431
David R. Kroll)	
Shlomo Touboul)	
)	
Application No: 13/290,708)	
)	
Filed: November 7, 2011)	
)	
For: METHOD AND SYSTEM FOR)	
PROTECTING A COMPUTER)	
AND A NETWORK FROM)	
HOSTILE DOWNLOADABLES)	
)	

Mail Stop AMENDMENT
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT AND RESPONSE TO OFFICE ACTION
UNDER 37 C.F.R. §1.114

In response to the final office action dated January 7, 2013 (the "Office Action") and pursuant to 37 C.F.R. §1.114, applicant respectfully requests that the above-identified application be amended as follows. A Request for Continued Examination (RCE) is being filed herewith, and the requisite fee for the RCE and for a one-month extension of time is being paid herewith.

IN THE CLAIMS:

Please substitute the following claims for the pending claims with the same number:

- 1. (original)** A computer-based method, comprising the steps of:
 receiving an incoming Downloadable;
 deriving security profile data for the Downloadable, including a list of suspicious computer operations that may be attempted by the Downloadable; and
 storing the Downloadable security profile data in a database.
- 2. (original)** The computer-based method of claim **1** further comprising storing a date & time when the Downloadable security profile data was derived, in the database.
- 3. (original)** The computer-based method of claim **1** wherein the Downloadable includes an applet.
- 4. (original)** The computer-based method of claim **1** wherein the Downloadable includes an active control.
- 5. (original)** The computer-based method of claim **1** wherein the Downloadable includes program script.
- 6. (original)** The computer-based method of claim **1** wherein suspicious computer operations include calls made to an operating system, a file system, a network system, and to memory.

7. (original) The computer-based method of claim **1** wherein the Downloadable security profile data includes a URL from where the Downloadable originated.

8. (original) The computer-based method of claim **1** wherein the Downloadable security profile data includes a digital certificate.

9. (original) The computer-based method of claim **1** wherein said deriving Downloadable security profile data comprises disassembling the incoming Downloadable.

10. (original) A system for managing Downloadables, comprising:
a receiver for receiving an incoming Downloadable;
a Downloadable scanner coupled with said receiver, for deriving security profile data for the Downloadable, including a list of suspicious computer operations that may be attempted by the Downloadable; and
a database manager coupled with said Downloadable scanner, for storing the Downloadable security profile data in a database.

11. (currently amended)The system of claim **[[86]] 10** wherein said database manager also stores a date & time when the Downloadable security profile data was derived by said Downloadable scanner, in the database.

12. (currently amended)The system of claim **[[86]] 10** wherein the Downloadable includes an applet.

13. (currently amended)The system of claim **[[86]] 10** wherein the Downloadable includes an active control.

14. (currently amended)The system of claim **[[86]] 10** wherein the Downloadable includes program script.

15. (currently amended)The system of claim **[[86]] 10** wherein suspicious computer operations include calls made to an operating system, a file system, a network system, and to memory.

16. (currently amended)The system of claim **[[86]] 10** wherein the Downloadable security profile data includes a URL from where the Downloadable originated.

17. (currently amended)The system of claim **[[86]] 10** wherein the Downloadable security profile data includes a digital certificate.

18. (currently amended)The system of claim **[[86]] 10** wherein said Downloadable scanner comprises a disassembler for disassembling the incoming Downloadable.

REMARKS

Applicant has amended claims **11 - 18**. Claims **1 - 18** are presented for examination.

In paragraphs 4 and 5, the Office Action has rejected claims **1 - 18** under 35 U.S.C. 102(e) as being anticipated by Ji, U.S. Patent No. 5,983,348 ("Ji").

Applicants are submitting herewith a declaration pursuant to 37 C.F.R. §131 establishing invention of the subject matter prior to the effective date of Ji; namely, September 10, 1997. Hence, Ji is not prior art, and the rejection fails to establish a prima facie case for anticipation.

In applicants' response filed on October 23, 2012, applicants established support for claims **1, 3, 4, 6, 9, 10, 12, 13, 15** and **18** in the disclosure of US Provisional Patent Application No. 60/030,639 ("Touboul").

Applicants wish to address the remaining claims **2, 5, 7, 8, 11, 14, 16** and **17** in this supplemental response. Before addressing the individual claims specifically, applicants wish to point out that fundamentally, Ji does not store security profile data in a database altogether. Instead, Ji instruments suspicious functions by altering them to include a pre-filter and post-filter function, as described in the pseudo-code provided at Ji, col. 5, line 46 – col. 6, line 37.

In rejecting claims **2** and **11**, the Office Action cites Ji, col. 3, lines 32 – 44, as disclosing storing a date & time when the Downloadable security profile data was derived, in the database. Applicants respectfully submit that Ji fails to show or suggest this feature. Instead, the cited location describes monitoring instructions of an applet code that is executing, and applying security checks.

Claims **5** and **14** are supported in Touboul at least by page 2, lines 4 – 7: *"Examples of Downloadables include applets designed for use in the Java™ distributing environment produced by Sun Microsystems or for use in the Active X distributing environment produced by Microsoft Corporation"*

In rejecting claims **7** and **16**, the Office Action cites Ji, col. 4, lines 55 – 65, as disclosing wherein the Downloadable security profile data includes a URL from where the Downloadable originated. Applicants respectfully submit that Ji fails to show or suggest this feature. Instead, the cited location simply mentions that the Internet is shown generally at element 10 of FIG. 1.

In rejecting claims **8** and **17**, the Office Action cites Ji, col. 8, lines 6 – 15, as disclosing wherein the Downloadable security profile data includes a digital certificate. Applicants respectfully submit that Ji fails to show or suggest this feature. Instead, the cited location describes an applet that includes a digital certificate. See also Ji, col. 5, lines 4 – 8; col. 7, lines 1 – 4; and claims 14 and 29.

For the foregoing reasons, applicants respectfully submit that the applicable objections and rejections have been overcome and that the claims are in condition for allowance.

Respectfully submitted,

Date: May 6, 13
Bey & Cotropia PLLC
Richmond, VA 23229
(804) 441-8530

By: Dawn-Marie Bey – 44,442
Dawn-Marie Bey
Reg. No.: 44,442

Attorney's Docket No.: FIN0001-CON1-CIP1-CON4 *PATENT*

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Patent Application of:)	
)	Examiner: Christopher A. Revak
Yigal Mordechai Edery)	
Nimrod Itzhak Vered)	Art Unit: 2431
David R. Kroll)	
Shlomo Touboul)	
)	
Application No: 13/290,708)	
)	
Filed: November 7, 2011)	
)	
For: METHOD AND SYSTEM FOR)	
PROTECTING A COMPUTER)	
AND A NETWORK FROM)	
HOSTILE DOWNLOADABLES)	
)	

Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

**DECLARATION OF PRIOR INVENTION IN THE UNITED STATES TO
OVERCOME CITED PATENT OR PUBLICATION (37 C.F.R. §131)**

Sir:

My name is Shlomo Touboul. I was employed by Finjan Software, Ltd. of Netanya, Israel.

I am an inventor of the above identified patent application which is assigned to Finjan, Inc. I have reviewed the application including the claims of the application.

The declaration made herein is to establish that I had the ideas described in the patent application, and first developed a working system that is described in the patent application and in claims 1, 3, 4-6, 9, 10, 12-15 and 18 pending as of the signing of this declaration

Atty. Docket No. FIN0001-CON1-CIP1-CON4 -1-

(hereafter sole invention) prior to September 10, 1997, which is the filing date of U.S. Patent No. 5,983,348 to Ji ("the '348 patent"). I hereby declare that my sole invention was in my mind and developed by at least November 18, 1996. The remaining pending dependent claims were co-invented by or with one or more of the other listed inventors.

Below stated are activities of myself and Finjan Software, Ltd. regarding the date on which I developed my sole invention.

My sole invention was embodied in a Finjan Software, Ltd. computer software product entitled SURFINGATE™, which was released to the public before September 10, 1997 (but less than one year before the filing date of the parent application, US Serial No. 08/964,388). SURFINGATE™ contained a fully functional implementation of the technology described and claimed in the above identified patent application.

Exhibit A attached herewith includes a press release and product marketing materials explicitly establishing that SURFINGATE™ performed my sole invention. All of the functionality shown in the documents of Exhibit A was available in SURFINGATE™'s product which was released before September 10, 1997. Hence, my sole claimed invention was developed and released to the public before September 10, 1997 by its incorporation into this product.

Additionally, the '348 patent explicitly references the SURFINGATE™ product and various claimed functionality thereof in Column 2 as follows:

SufinGate is a server solution that is installed on an HTTP proxy server.... . If it detects that one or more insecure functions might be called during the execution of the applet, it blocks the applet. ... , SurfinGate maintains an applet profile database. Each applet is given an ID which is its URL. Once an

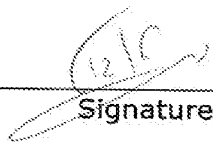
applet is scanned, an entry is added to the database with its applet ID and the insecure functions it might try to access. When this applet is downloaded again, the security profile is taken from the database to determine the behavior of the applet. No analysis is redone.

Accordingly, since the '348 Patent references the Surfingate product - which embodies my sole invention - this is further evidence that the Surfingate product existed at the time the '348 Patent was filed and that the sole invention was clearly developed and released to the public prior to September 10, 1997, which is the filing date of the '348 Patent (Ji).

As the below-signed inventor, I, Shlomo Touboul, hereby declare that all statements herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made knowing that willful false statements and the like are punishable by fine or imprisonment, or both under 1001 of Title 18 of United States Code, and such willful or false statements may jeopardize the validity of the application or any patent issuing therefrom.

Very truly yours,

Dated: APR-17-2013



Signature

Full Legal Name: Shlomo Touboul

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	13290708
	Filing Date	2011-11-07
	First Named Inventor	EDERY, Yigal
	Art Unit	2431
	Examiner Name	REVAK, Christopher A
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4

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	Examiner Name	REVAK, Christopher A
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4

1	ThunderByte Antivirus for Windows	<input type="checkbox"/>
2	InterScan VirusWall from Trend Micro	<input type="checkbox"/>
3	VirusSafe from Eliashim	<input type="checkbox"/>
4	Intel LANProtect from Intel	<input type="checkbox"/>
5	The Java Security Manager from Sun Microsystems	<input type="checkbox"/>
6	McAfee Web Shield	<input type="checkbox"/>
7	McAfee WebScan	<input type="checkbox"/>
8	McAfee VirusScan	<input type="checkbox"/>
9	McAfee NetShield	<input type="checkbox"/>
10	Dr. Solomon's Antivirus Toolkit for Windows 95	<input type="checkbox"/>
11	Dr. Solomon's Antivirus Toolkit for Windows NT	<input type="checkbox"/>

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	Attorney Docket Number	FIN0001-CON1-CIP1-CON4

12	Dr. Solomon's WinGuard	<input type="checkbox"/>
13	Dr. Solomon's Virus Guard	<input type="checkbox"/>
14	Dr. Solomon's Virus Shield	<input type="checkbox"/>
15	Dr. Solomon's Virex	<input type="checkbox"/>
16	Dr. Solomon's "Merlin" Anti-Virus Engine	<input type="checkbox"/>
17	Dr. Solomon's McAfee "Olympus" Anti-Virus Engine	<input type="checkbox"/>
18	ActiveX Web Tutorial	<input type="checkbox"/>
19	Java FAQ (1995-1998)	<input type="checkbox"/>
20	Norton AntiVirus TUfor Windows@95 User's Guide. Published by Symantec in 1995. (179 pages)	<input type="checkbox"/>
21	JAEGER, at al., "Building Systems that Flexibly Control Downloadable Executable Content," Proceedings of the Sixth USENIX UNIX Security Symposium, July 1996. (19 pages)	<input type="checkbox"/>
22	RASMUSSEN, Andreas and JANSSON, Sverker, "Personal Security Assistance for Secure Internet Commerce," Sept. 16, 1996. (12 pages)	<input type="checkbox"/>

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	Examiner Name	REVAK, Christopher A
	Attorney Docket Number	FIN0001-CON1-CIP1-CON4

23	BHARAT et al. "Migratory Applications" November 15, 1995. (10 pages)	<input type="checkbox"/>
24	DEAN, Drew, et al., "Java Security: From HotJava to Netscape and Beyond," 1996 IEEE Symposium on Security and Privacy, May 6, 1996. (11 pages)	<input type="checkbox"/>
25	STERBENZ, Andreas, "An Evaluation of the Java Security Model," IEEE, December 1996. (13 pages)	<input type="checkbox"/>
26	FRITZINGER, J. Steven, et al., "Java Security," Sun Microsystems, December 1996 (7 pages)	<input type="checkbox"/>
27	BANK Joseph A. "Java Security," December 8 1995. (14 pages)	<input type="checkbox"/>
28	CLAUNCH, "Java Blocking," http://groups.google.com/group/muc.lists.firewalls/msg/2a5ec02e00a37071. September 25 1996. Accessed date: May 10 2011. (2 pages).	<input type="checkbox"/>
29	CHAPPELL, "Understanding ActiveX and OLE: A Guide for Developers and Managers (Strategic Technology)," September 1, 1996, Microsoft Press. (91 pages)	<input type="checkbox"/>
30	CROSBIE, et al., "Active Defense of a Computer System Using Autonomous Agents". February 15, 1995. (14 pages)	<input type="checkbox"/>

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EXAMINER SIGNATURE

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CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Dawn-Marie Bey/	Date (YYYY-MM-DD)	2013-05-07
Name/Print	Dawn-Marie Bey	Registration Number	44,442

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(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication: **11.04.2001 Bulletin 2001/15** (51) Int. Cl.⁷: **G06F 1/00, H04L 29/06**

(21) Application number: **99440269.1**

(22) Date of filing: **06.10.1999**

<p>(84) Designated Contracting States: AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE Designated Extension States: AL LT LV MK RO SI</p>	<p>(72) Inventor: Brette, Marc 67408 Illkirch Cedex (FR)</p>
<p>(71) Applicant: ALCATEL 75008 Paris (FR)</p>	<p>(74) Representative: Menzietti, Domenico, Dipl.-Ing et al Alcatel Intellectual Property Department, Stuttgart 70430 Stuttgart (DE)</p>

(54) **Authentication of hypertext kind of resources through signature handling protocol**

(57) Method of receiving a resource out of an application stored by a service provider on a site at a client terminal, both being interconnected. The method is advantageously implemented into the browser of the client. It comprises the steps of:

- requesting the resource within the application on the site from the client terminal;
- receiving a signed archive file containing the requested resource by the client terminal;
- authenticating the received signed archive file;
- retrieving the requested resource out of the received archive file if that was undoubtedly authenticated.

EP 1 091 276 A1

Description

[0001] This invention relates to a method of receiving a resource as set forth in the preamble of claim 1, to a computer readable medium having a program recorded thereon and to a trustable disposal of a resource as set forth in the preamble of claim 10.

[0002] In the last ten years, networks of computerized terminals are more and more interconnected over the world. The set of those networks are called internet. They allow a transfer of data from one terminal to another almost everywhere as long as the terminals are connected to the same internet. The popularity of such "communication" was boosted by the introduction in the middle of the ninetieth of the so called World Wide Web (the "Web"). It is a decentralized, electronic database service offering an ensemble (universe) of dynamically connected information on the internet which win through and is called the Internet. Such information can be in any of various media and is relatively easily found by and made accessible to individuals exploring ("surfing") that universe ("Webspace"). More specifically, the Web is a distributed, hypertext system comprising hypermedia documents, Web servers and Web clients.

[0003] Web clients include software programs commonly known as browsers. Browsers typically reside on an individual's electronic terminal (e.g. personal computer, laptop and in the near future even phone terminal) and, among other things, provide for exploring the Web so as to find and access Web documents.

[0004] Web servers are server processes running at a Web site i.e. a terminal connected to the Internet. The Web servers support various features, including being compatible with one or more standard protocols, e.g., the HyperText Transfert Protocol ("HTTP"), the well-known, native protocol of the Web generally unifying its information. With that programs hypermedia documents are put on the Web and resources associated with applications stored by the server on the site are let available to clients. The Web servers do not only make documents and resources accessible to clients, but also direct specific documents to clients and complete transactions responsive to each client's request which were activated through their browsers.

[0005] Web documents ("pages") are constructed in conformity with one of various accepted formats or languages, e.g., HyperText Markup Language ("HTML"). The formats support, among other things, the Web's hypermedia and hypertext characteristic. As to the hypermedia characteristic, Web documents can, and generally do, combine content from one or more of the various media including text, graphics, audio and video. As to the hypertext characteristic, Web documents can, and generally do, contain electronic links to related Web documents. Selecting the link causes the browser to (i) connect to a server associated with that link, (ii) request the linked document and (iii) if the client satisfies the server's security requirements, receive and

display the document.

[0006] The security of information and transaction transferred under that way has been identified as a significant problem. At the center of the problem are so-called crackers: individuals who seek to access computers, such as sites (servers), so as to conduct pranks, vandalism, espionage or other illegitimate activities. A way to respond to these activities, among other things is to strive to maintain the confidentiality and integrity of information, both as resident on servers and as communicated in Web transaction. Increasing the vulnerability to crackers is that the Web is an open system available to anyone in possession of readily available, affordable technology.

[0007] One important Web security issue is authentication. An example of an authentication on the Web is given by the SSL (Secure Sockets Layer) Handshake Protocol which was developed by Netscape Communications Corporation. The protocol supports server and client authentication. The SSL protocol is application independent, allowing protocols like HTTP, FTP (File Transfer Protocol), and Telnet to be layered on top of it transparently. The SSL protocol is able to negotiate encryption keys as well as authenticate the server before data is exchanged by the higher-level application. But the SSL protocol maintains the security and integrity only of the transmission channel. It uses encryption, authentication and message authentication codes only to authenticate the sites of the Web server as well as the Web client. The trust is then granted on a site by site basis.

[0008] That protocol does not authenticate the whole data itself which will be exchanged through the Internet and thus does not work against software virus like "Trojan horses". The later denominates some code put somewhere but mainly at the end of a data by an illegitimate one. Once the data is downloaded, the Trojan horse can be activated by the client unintentionally. Some special and very feared cases of Trojan horses are the so called "mockingbirds". They permit to intercept communication (especially login transactions) between the client and the server. When activated, the code will provide system-like responses to the client while saving their responses (especially account IDs, passwords and PINs).

[0009] An object of the invention is to ensure that any transaction between a trusted site and a client both interconnected is free of any kind of software virus, and to provide methods to implement such measures without losing the comfort of a service like the Web.

[0010] These objects are attained by a method of receiving a resource as claimed in claim 1, a computer readable medium as claimed in claim 9 and a trustable disposal of resources as claimed in claim 10.

[0011] It is extremely hard to ensure that platforms like Web servers are visited only by trusted clients. A site manager, the one responsible for the maintenance of a site, can never be completely sure that none imper-

sonator will achieve to penetrate a protected Web server. It is also difficult to protect a single application (Web page) with all the resources embedded in it. This explains the interest to protect the whole content of the resources which may be downloaded during a critical transaction e.g. like a banking transaction or an electronic commerce application.

[0012] The basic idea of the invention consists of assembling resources which shall be downloaded together with their respective application into a single file, "an archive file". To sign these files in their entire content ensures then that nowhere in the data's of one resource is hidden some virus. These signed files are stored on a site and let to the disposal of some potential clients able to authenticate the signature.

[0013] When a client surfing on the Web will come across one of such a resource, he may be interested to open it. This will necessarily means that before being activated on its terminal, it must be downloaded. Using its browser on its terminal on which advantageously a protocol according to the invention is running, he will request the chosen resource. This will start the protocol which will look after the corresponding archive file of that resource onto the site where the resource was found. After a download of the entire signed archive file onto the client terminal, the protocol will have to authenticate the signature of that file. Only in the positive case that it was entirely authenticated, the protocol will retrieve the requested resource out of the archive file, to active it on client terminal.

[0014] With that protocol, the client can trust not only the site itself, like it would be the case if its browser would use only a SSL protocol, but will be sure that the activation of that resource on its own terminal will not activate a virus hidden somewhere into the data's of that resource. The solution obtained with that invention permits to combine the flexibility of a service like the Web with a communication between client terminal and sites free of any transfer of virus specially of the feared mockingbirds.

[0015] Further advantageous features of the invention are defined in the dependent claims and will become apparent from the following description and the drawing.

[0016] One embodiment of the invention will now be explained in more detail with reference to the accompanying drawing, in which:

Fig.1 is a flow chart showing steps associated with the method of receiving a resource of a resource according to the invention.

[0017] The present invention concerns a trustable activation of some resources downloaded out of some site and methods therefore. A service provider who wants to let on a site resources all trustfully free of any virus to the disposal of some clients, will have to apply the following procedure. The codes of these resources

must be assembled in an archive file. Some times, it is of advantage to include also the codes of the corresponding application into the archive file. To build that archive file, already existing archive formats like tar, zip or jar can be used. The later is applied specifically for an ensemble of files written in an objected oriented syntax like "java", the one used for most of the resources of applications on the Web.

[0018] In some header of the archive file may be stored the information of their content. Afterwards, the archive file must be protected from the illegitimate implementation of subsidiary codes like the one of a mockingbird. This is achieved by signing the entire content of the archive file.

[0019] There exists several possibilities to perform a signature of a file. One way which would be quite advantageous in the context of this invention is the use of an encryption scheme. A particular popular one due to the ease of its utilization, is the so called public-key encryption.

[0020] This encryption scheme is based on a pair of "keys". One of them is called a public key and the other one a private key. The public key is published, while the private key is kept secret. The need for the signer (e.g. some service provider like e.g. the some credit card company) and the receiver (e.g. the browser of some client) to share secret information is eliminated; all communications involve only public keys, and no private key is ever transmitted or shared. In this system, it is no longer necessary to trust the security of some means of communications. The only requirement is that public keys be associated with their users in a trusted (authenticated) manner (for instance, in a trusted directory).

[0021] For the purpose of the invention, the archive files are encrypted using the private key of the service provider. If for example, a company wants to let to the disposal of its clients some information trustfully free of viruses on the Internet, they must be signed using the private key of that company. For that, the archive file containing the code containing this information (e.g. a resource of some application) will be encrypted. The signer don't need to care who will read this information or even visit the site where it is let to the disposal since its signature can't be imitated. This will ensure the one (e.g. some client) who will decrypt that signed archive file using a public key, of the absence of any fake code. No third-party could have modified the signed archive file without destroying the whole file.

[0022] To optimize the downloading i.e. avoiding any delay or unnecessary checking procedure, it is of great advantage for the client to install a protocol according to the method of the invention onto its browser e.g. in an URL syntax (Universal Resource Locator) as below:

(URL: signed.protocol://host/path?resource).

Where protocol is the underlying protocol used to

retrieve the archive file. It may be for example http, https, ftp or file. Host is the name of the server where the jar file is located (it may be empty for local file). Path is the location of the jar file on the host for the given protocol. Resource is the actual name of the resource inside the jar file.

Example:

signed.http://www.alcatel.com/applets/smart-card.jar?index.html

[0023] On Fig. 1, is shown a flow chart that depicts an example of the downloading method according to the present invention. As already said above, it can be implemented on the browser of client's terminal. The method starts 10 by an action of the client onto its terminal like choosing an Internet address out of an address book e.g. stored by its browser.

[0024] In step 11, the client requests access of a Web server site by sending the Web location (Internet address) he choose when starting. Such location may be in the form of a URL. In this step, a secure communication channel may be established between the client terminal and the site. For example, if SSL is employed, the secure communication channel is established during the SSL handshake, including by, among other things, (i) negotiating an encryption algorithm between the site and the terminal and (ii) authenticating the site to the client terminal. But the building of a secure communication channel is no more of priority since the resources are anyway protected according to the invention.

[0025] In step 12, the client requests a specific resource within an application to be activated on its terminal. This will bring the browser of the client to look after the corresponding archive file 13. After finding it, the transfer 14 of that file will occur through the communication channel.

[0026] When the archive file is downloaded onto the client terminal, the authentication procedure 15 of its signature will start. The browser will apply some decryption scheme in accordance to the one used to encrypt it.

[0027] Dependent on the result of that procedure 15, will depend if the resource is taken out of the archive file or not. In the negative case, that the signature was not entirely recognized, it will mean that either the client is not allowed to download the requested resource or some codes in the archive file were illegitimately modified or added, then the archive file will be deleted 16 from the client terminal. Optionally, the protocol will contain the step 17 to send a message to the client to warn him about the result of the authentication and/or to send to the site a message 18 informing the signer of that resource and/or site manager that someone tried unsuccessfully to download some resources.

[0028] Alternatively, if the downloaded archive file was decrypted successfully, then the browser will look 19 for the requested resource into the downloaded

archive file. It will then activate the resource onto the client terminal 20. The protocol will then end its procedure 21.

[0029] The steps described above can be configured to support various options, without departing from the principles of the invention to assemble all resources of sensible applications into a single archive file protected by a signature and ready to be downloaded.

[0030] The fact to implement the protocol onto the client browser, enable to perform the procedure in an almost transparent way. The client will not necessarily notice the take place of the authentication of the requested resource. He will even not know that the resource is somewhere archived on some signed file. It is the browser which will apply the protocol after the invention by first authenticate the signed archive file. If it succeeded, it will then retrieve the requested resource out of the archive file and activate it. All the steps may take a fraction of time mainly dependent on the transfer rate on the communication channel between the site of the Web server and the client terminal.

[0031] It is therefore particularly adapted for Web pages (applications on some site) which often contain a certain number of applets (resources made of java codes). They are some times part of the application user interface and are usually downloaded and dynamically generated. Applying the procedure according to the invention ensure that the whole application user interface does not contain any fake codes put there by some impostor. It is an ideal procedure for any application but some highly secure applications such as electronic commerce applications (electronic banking service or smart card facilities). The method according to the invention can be used also if the corresponding signed archive file is downloaded out of some untrustworthy site, since the entire content of the resource is itself protected. The author of the resource has the assurance that every reader of its resource will really read the information he put there himself.

Claims

1. Method of receiving a resource out of an application stored by a service provider on a site at a client terminal, both being interconnected, the method comprising the step of
 - requesting the resource within the application on the site from the client terminal; and
 - characterized by the additional steps:
 - receiving a signed archive file containing the requested resource by the client terminal;
 - authenticating the received signed archive file;
 - retrieving the requested resource out of the received archive file if that was undoubtedly authenticated.

- 2. Method of receiving a resource as claimed in claim 1, characterized in that the entire requested resource is signed.

- 3. Method of receiving a resource as claimed in claim 1, characterized in that the signature of the archive file is authenticated using a decryption scheme. 5

- 4. Method of receiving a resource as claimed in claim 1, characterized in that the service provider is part of a decentralized, electronic database service offering an ensemble of dynamically connected information like the Web. 10

- 5. Method of receiving a resource as claimed in claim 1, characterized in that it works transparently for the client. 15

- 6. Method of receiving a resource as claimed in claim 1, characterized in that the requested resources are object oriented resources like java applets. 20

- 7. A computer readable medium having a program recorded thereon, said computer readable medium comprising computer program code means adapted to perform all the steps of claim 1 when said program is run on the client terminal. 25

- 8. A computer readable medium as claimed in claim 7, characterized in that the program code is built with an Universal Resource Locator syntax. 30

- 9. A computer readable medium as claimed in claim 7, characterized in that the program code is implemented into a browser on the client terminal. 35

- 10. Trustable disposal of a resource from an application on a site to some client having a terminal interconnected with the site characterized in that the resource is stored in a signed archive file on the site. 40

- 11. Trustable disposal of a resource as claimed in claim 10, characterized in that the archive file is signed using an encryption scheme. 45

50

55

5

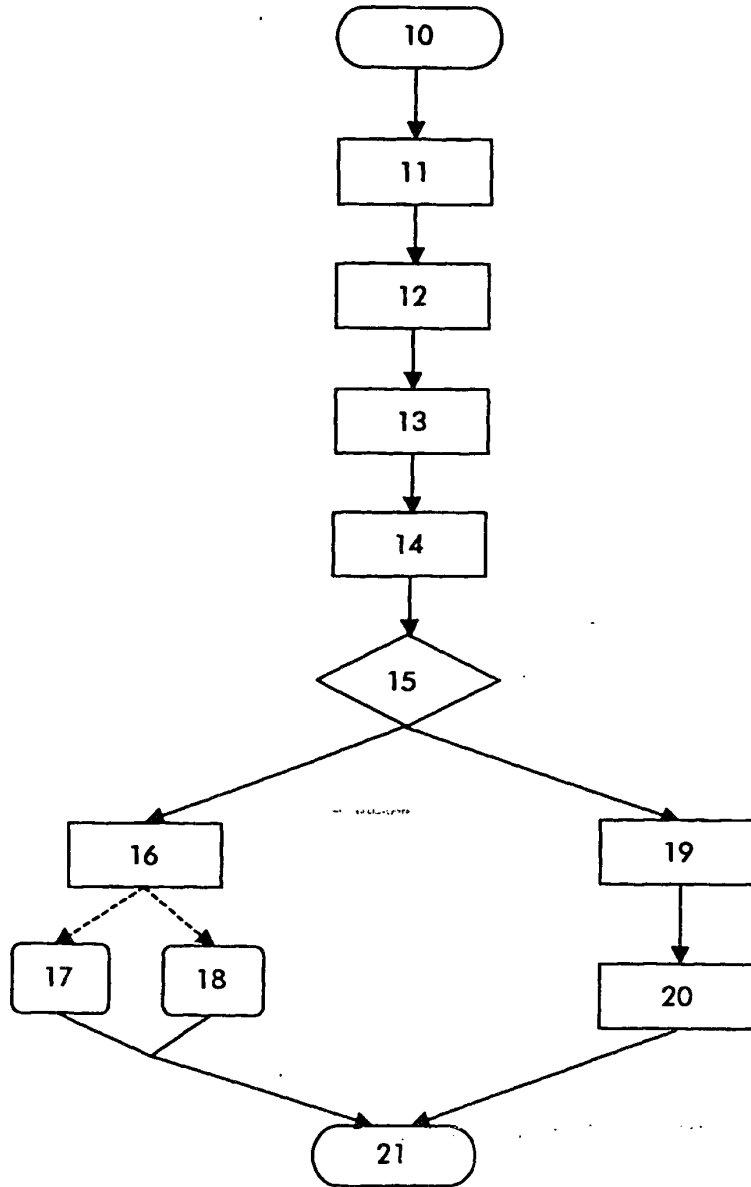


Fig.1



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EUROPEAN SEARCH REPORT

Application Number
EP 99 44 0269

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 5 892 904 A (ATKINSON ROBERT G ET AL) 6 April 1999 (1999-04-06) * abstract * * figures 2A,3,4,5,6 * * column 1, line 35 - column 3, line 36 * * column 5, line 14 - column 6, line 43 * * column 7, line 11 - column 7, line 30 * * column 11, line 9 - column 11, line 36 * * column 26, line 38-54 *	1-11	G06F1/00 H04L29/06
X	WO 98 44402 A (BRAMHILL IAN DUNCAN ;SIMS MATTHEW ROBERT CHARLES (GB); BRITISH TEL) 8 October 1998 (1998-10-08) * abstract * * figures 3,5 * * page 2, line 12 - page 4, line 29 * * page 6, line 16-22 * * page 9, line 15 - page 14, line 9 *	1,3-5	
A	EP 0 913 769 A (SUN MICROSYSTEMS, INC.) 6 May 1999 (1999-05-06) * abstract * * figures 1,2 * * page 2, line 21-29 * * page 4, line 20-27 * * page 4, column 42-43 * * page 7, line 42 - page 8, line 1 * * page 8, column 47-48 *	1,4-6	TECHNICAL FIELDS SEARCHED (Int.Cl.7) G06F H04L
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 27 January 2000	Examiner Sigolo, A
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons S : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

EPO FORM 1503 03 82 (PAG01)

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 44 0269

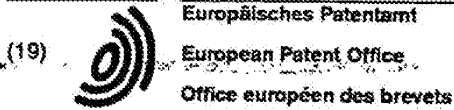
This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

27-01-2000

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EPO FORM P048

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(11) EP 1 132 796 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication: 12.09.2001 Bulletin 2001/37

(51) Int Cl.: G06F 1/00

(21) Application number: 00104966.7

(22) Date of filing: 08.03.2000

(84) Designated Contracting States: AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE Designated Extension States: AL LT LV MK RO SI

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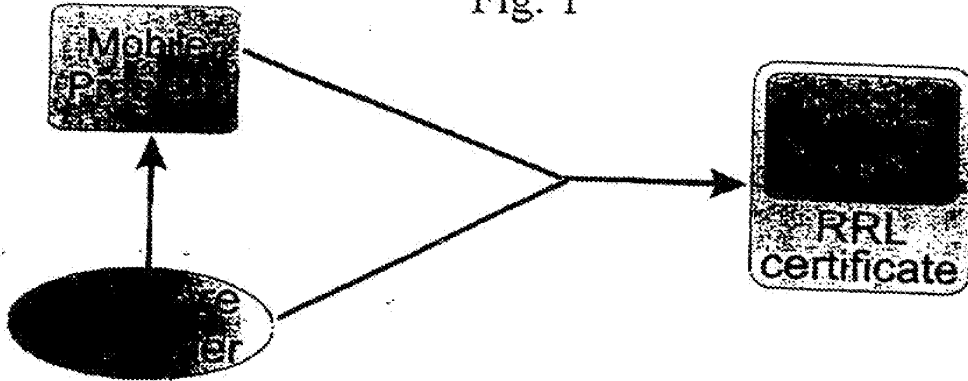
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(54) Mobile code and method for resource management for mobile code

(57) A mobile code linked to a certificate including at least a resource requirements list (RRL) including those resources needed by the mobile code to be properly executable plus those resources that are known a priori to be accessed when executing the mobile code. The unique certificate contains additionally an issuer of the certificate information identifying the entity issuing the certificate, a subject information identifying the mo-

bile code to which the certificate is referred, and a validity period information stating the period of time within which the certificate is valid. When downloading or uploading a mobile code the RRL is transferred to the user informing the user of the resource requirements of the mobile code. An execution environment is provided in an execution peer of the user, the execution environment defining at least the resource access policy that will be applied to the mobile code on execution.

Fig: 1



EP 1 132 796 A1

Description

[0001] This invention relates to a mobile code and method for resource management for mobile code.

[0002] Nowadays, with the recent explosive growth of the Internet, the number of computer interconnected in a global communications network grows exponentially. Many view the Internet as a universal communications medium that can replace telephone, television and radio. The potential is there, but progress has been hampered by the open design of the network itself. It is still too easy to intercept, monitor and forge messages on the Internet, and people are reluctant to use the network for financially or legally sensitive data.

[0003] Computer networks are evolving at a very fast pace, and this evolution proceeds along several aspects. Network links are constantly improved, and technological developments lead to increased computational power in network nodes. With increase in size and performance of computer networks, network connectivity has become a basic feature of computers and many products in the consumer electronics industry. On the other hand, users can exploit network connectivity independently of their physical location. In this new scenario, mobile users can move together with their hosts across different locations and still find their working environment.

[0004] The problems faced by users of the Internet fall into two main categories: privacy and authentication. Privacy involves transmitting messages that cannot be altered or read en route, while authentication allows each party to a communication to be sure of the identity of the other. Cryptography holds the promise of a solution to these problems.

[0005] These developments lead to a widespread diffusion of services and applications, making it necessary to increase the customizability of services. Thereby, different classes of users are then enabled to tailor the functionality and interface to a service according to their specific configuration, needs and preferences. Finally, the dynamic nature of both the underlying network infrastructure and market requirements demand higher levels of extensibility and flexibility.

[0006] There exist already a number of patent publications related to security aspects and authorizations for mobile programs. The systems described in these patent publications have, however some serious drawbacks. First, whenever certification is used, the systems require the existence of a hierarchic certification infrastructure in place. Second, all the systems deal with authorization. And finally, these patent publications all talk about low-level resource access such as file permissions, program execution, and network access. Some examples of these patent publications are discussed below.

[0007] The US 5,412,717 A relates to a computer system security method and apparatus having program authorization information data structures. The authoriza-

tion information is about low level resource access at operating system level. The only external resources available are the possibility to call another executable. Furthermore, the system needs to be implemented at an operating system level. The invention states that if all authorizations defined in the "Program Authorization Information" are not granted, the program can not be executed.

[0008] The US 5,892,904 A relates to a code certification for network transmission. A system is described to support the distribution of software over networks or off-line along with an Access Control List (ACL) for the program itself and a certificate that 'makes' the program secure for execution. In this case, the code production system submits the program and the ACL for the program to a certification authority, which sends back a certificate on the code and another one on the ACL for the program. At distribution time, the code is sent along with the ACL, the certificate on the code (which in fact is more a signature than a certificate) and another certificate on the ACL (again, this is more a signature by a CA over the ACL than a certificate). The contents of the ACL define the rights and authorizations a program has. In case not all of these authorizations are granted by the executing system or user, the program cannot run.

[0009] The US 5,892,904 A shows a system for certifying executable objects. The patent deals exclusively with program certification for network transmission. This certification guarantees program integrity, gives descriptive information on the program itself and information on the entity that certifies the program. This patent does not deal with any kind of authorization nor resource access.

[0010] The US 5,919,247 A relates to a method for the distribution of code and data updates over any network. Applications are seen as channels that can be subscribed to and updated. Whenever a user subscribes to a channel, the associated application is downloaded to the local disk and can be executed any number of times. On the other hand, there is the possibility to define an updating rate in which applications will be updated if necessary. This method basically deals with software downloading and updating and lacks, however, some important aspects on software downloading such as security and payment/licensing.

[0011] The US 5,978,484 A describes a system in which code to be sent through the network is associated with a "privilege request code", i.e. a set of rights the code may exercise, and digitally signed by a certification authority. A run-time system prevents the code from exercising unauthorized accesses. A certification hierarchy needs to be in place so that the user or executing system can verify the certificate attached to the program. The first drawback of the system is that it assumes the existence of a certification hierarchy in such a way that any user on the network can verify the validity of a given certificate. Such an infrastructure is not in place nowadays and will most likely never exist. On the other

hand, it makes the distributing authority dependent on a certification authority, which is a strong requirement.

[0012] There are also a number of scientific publications dealing mobile code handling. Examples are: D. Balfanz and L. Gong. "Experience with Secure Multi-Processing in Java". Technical Report, Princeton University, September 1997; and G. Back and W. Hsieh. "Drawing the Red Line in Java". In Proceedings of the 7th Workshop on Hot Topics in Operating Systems, March 1999. IEEE Computer Society; and G. Back, P. Trullmann, L. Stoller, W.C. Hsieh and J. Lepreau. "Java Operating Systems: Design and Implementation". Technical Report UUCS-98-015, University of Utah, August 1999; and G. Czajkowski and T. von Eicken. "JRes: A Resource Accounting Interface for Java". In Proceedings of the 1998 ACL OOPSLA Conference, Vancouver, BC, October 1998; and L. Gong, M. Mueller, H. Prafulchandra and R. Schemers. "Going Beyond the Sandbox: An Overview of the New Security Architecture in the Java Development Kit 1.2". In Proceedings of the USENIX Symposium on Internet Technologies and Systems, Monterey, CA, December 1997; and T. Tock, D. Sturman and R. Campbell. "Security, Delegation, and Extensibility". Technical Report, University of Illinois, November 1994; and T. von Eiken, C. Chang, G. Czajkowski, C. Hawblitzel, D. Hu and D. Spoonhower. "J-Kernel: a Capability-Based Operating System for Java". To appear in Secure Internet Programming: Security Issues for Distributed and Mobile Objects, Springer-Verlag Lecture Notes in Computer Science, 1999; and D. S. Wallach, D. Balfanz, D. Dean and E.W. Felten. "Extensible Security Architectures for Java". In Proceedings of the 16th Symposium on Operating Systems Principles, October 1997, Saint-Malo, France.

[0013] A few years ago, Java, developed by Sun Microsystems, triggered most of the attention and expectations on code mobility. Being able to run on any platform, Java has become a preferred research and development language for code mobility. Since then, most code mobility research literature refers to Java even if the paradigms, methodologies or concepts exposed are general and independent of any language. The Java 1.2 approach to the security of mobile code is focused exclusively on control access to resources on the machine onto which the application is executed. Classes are grouped in domains defined on the basis of the origin of the code. The address of the server providing the code or the public key associated with the signature over the code define such domains. A user can then associate to each domain an access control list containing the resources made available to classes within a domain. The Java runtime maintains a mapping from objects to their protection domains and then to their permissions. Each resource manages the permissions by itself. Nevertheless, it has some important drawbacks. Precisely, privileges are assigned to code based on their origin and totally independent of the application it implements. There is no support for resource accounting, monitoring

or reclamation, which are required from a system point of view. Furthermore, mobile code usually requires awareness of the location it is executed, and the resources and its state available to it.

[0014] Another totally different approach to resource management comes from research carried out in the past in the field of operating systems applied to type-safe languages such as Java. Type-safe languages provide the same functionality as a MMU (memory management unit) in classical operating systems, but within a single address space. The MMU is in charge of isolating address-spaces of different processes running on the same machine, and user and kernel execution modes.

[0015] Operating systems implemented with type-safe languages have several advantages over traditional operating systems with hardware-based MMU. One of the most time expensive operations on computers is context switching between user and kernel mode.

These switches occur every time a user-space application makes a system call. Any operations on the file system, network access or keyboard read causes produces a context switch. Type-safe languages prevent from accessing variables or objects in an illegal way, opposed to the possibility in other languages like C/C++, in which one can access and modify the processes' memory. This feature makes unnecessary the use of MMU and boosts the performance of the system by avoiding context switching.

[0016] However, the concept of operating system limits the possibilities of such systems. The different prototypes deal exclusively with fair allocation of resources to different processes running on a machine, and provide applications with different ways to manage these resources. They lack, nevertheless, the possibility to externally define the resources available to an application.

[0017] Code mobility is exploited on an Internet scale, conceived to operate in large-scale settings with heterogeneous hosts connected by links at different bandwidths. This conception is opposed to distributed systems providing object migration that have been designed having in mind small-scale networks with high bandwidths. Mobile code is location and environment-aware and it takes actions based on such knowledge.

Nevertheless, mobile code has some non-negligible risks regarding its security. A program going from computer to computer with the same privileges for the provider and the user is a non-acceptable risk for system administrators and users. Unless some precautions are taken, mobile code could read files, delete them, access the network impersonating the user or abuse of any of the resources the user has access to.

[0018] In view of the above, it is an object of the invention to provide a secured and scalable resource management at user level when using the code.

[0019] For achieving the above object, a mobile code comprises a resource usage needs section containing at least a resource requirements list (RRL) including

those resources needed by the mobile code to be properly executable plus those resources that are known a priori to be accessed when executing the mobile code. The invention provides a secure resource management for mobile code on the receiving and executing peer. A programmer or software provider/distributor attaches a RRL containing a description of the resources required by the application in order to correctly run. This information is a list of the different resources the mobile code will eventually access. The semantics of this Resource Requirements List is "the programmer of this mobile code states that the application needs to access the resources in the RRL". The goal of the RRL is not to transfer authorization but to provide a basis for the resource management.

[0020] According to a preferred aspect of the invention, the resource usage needs section of the mobile code is a certificate which is unique for each different mobile code. Out of security reasons, it is preferred to include the RRL in a certificate linked to the mobile code. For example the "most important" certificate is the certificate which is attached, for example, via a soft link by means of a hash function on the mobile code. The RRL can be contained in this certificate.

[0021] According to a preferred aspect of the invention, the resource usage needs section of the mobile code contains, in addition to the resource requirements list, any of the following information: a) issuer of the certificate information identifying the entity issuing the certificate, b) subject information identifying the mobile code to which the certificate is referred, and c) validity period information stating the period of time within which the certificate is valid. Any of this information subjects serve to further improve the ability of the system to manage resources.

[0022] According to a further preferred aspect of the invention, the information as to the issuer of the certificate is a digest of the public key of the entity having produced the mobile code. By using a digest of the public key of the entity having produced the mobile code, the safety of this information is further improved as it is made more difficult to forge the identity of this entity.

[0023] According to a further preferred aspect of the invention, the information as to the issuer of the certificate is a public key of the entity having produced the mobile code. Using the public key as an identification of the entity having produced the mobile code along with the signature on the certificate, identifies and authenticates the producer and gives a high level of security to this identification information.

[0024] According to a further preferred aspect of the invention, the subject information is a hash of the mobile code. To use a hash of the mobile code as subject information ensures again a high level of security in relation to this information. As security is an important aspect in the handling of mobile code, the importance of the last mentioned aspects of the invention is substantial.

[0025] According to a further preferred aspect of the invention, the resource requirements' list contains any of the following information: a) name of the resource information specifying the type of resource, b) action on the resource specifying as to how the resource should be used, c) upper quantitative limit information stating the maximum usage of the resource from a quantitative point of view, and d) upper qualitative limit information stating the maximum usage of the resource from a qualitative point of view.

[0026] The more information is given about the resource requirements, the better is the basis for deriving a successful and tailored management. Therefore, if anyone or several or all of this information is provided, the results management is correspondingly improved.

[0027] According to a further preferred aspect of the invention, the mobile code and the certificate are logically linked by means of the code hash. This ensures that the mobile code and the certificate containing the information necessary for performing a good resource management are not separated in any stage of their co-existence so that the mobile code can, at any time, rely on the resource management based on the logically linked certificate.

[0028] According to a further preferred aspect of the invention, certificate or a sequence of certificates is linked to the mobile code and the RRL list, the certificate or certificates transferring trust from a principal trusted by the software consumer to the RRL certificate issuer. The certificate or the sequence of the certificate contains one or several certificates transferring authorization from a executing peer to the principal who signed the certificate containing RRL. If the certificate or the certificate sequences is/are valid, the run-time execution environment will define the resource location policy. This system contributes very much to the success of the transfer and usage of the mobile code.

[0029] Furthermore, a certificate containing the RRL contains a digest of the mobile code that is used to verify its integrity which is another security feature.

[0030] According to a further preferred aspect of the invention, the mobile code comprises Java programs and applications. As mentioned before, Java provides programs and applications which are not restricted to special platforms which means that also the resource management will be platform independent.

[0031] According to a further preferred aspect of the invention, the format of the certificate or certificates is SPKI. As stated below, the SPKI is a preferred format when putting the invention to practice as SPKI provides all the features which are desirable for the invention in an efficient and elegant way.

[0032] According to a further preferred aspect of the invention, an execution program is provided in an execution environment of the user, the execution program defining at least the resource access policy that will be applied to the mobile code on execution. Such execution program will be the most suitable tool to define the re-

source access policy which also has the advantage that the implementation of the resource access policy will be done by a program which is adapted to the RRL transmitted with the mobile code.

[0033] For achieving the above object a method for resource management for mobile code using a mobile code as discussed above comprises, in the case of downloading upon request a mobile code from a principal (software provider or distributor) to a user, in a the negotiation phase in the beginning of the downloading process, a RRL list is transferred from the principle to the user informing the user of the resource requirements of the mobile code. Whenever a peer requests to download mobile code, the RRL information is used in the negotiation protocol the goal of which is to ensure that the receiving peer has all resources required for the execution of the mobile code. Exactly this information is provided by this method in a most advantageous way. Whenever a peer requests to download or upload mobile code, the RRL information can be used in a negotiation protocol. The goal of this negotiation protocol is for the sender peer to ensure that the receiving peer has all resources the mobile application requires to execute.

[0034] According to a further preferred aspect of the invention, in the negotiation phase, the downloading process further includes user and/or platform authentication, specifying restrictions imposed by the mobile code distributor as to the user and/or platform involved, and/or payment/licensing evaluation, comprising the financial aspects of the mobile code transfer. The platform authentication offers some guarantees for the software producer/distributor that is a contribution to the deal is acknowledged and the mobile code is used in the proper way.

[0035] According to a further preferred aspect of the invention, after the negotiation phase, the mobile code is downloaded. This ensures that the mobile code is downloaded and only then downloaded if all the basic requirements for its execution have already been checked and verified as being available.

[0036] According to a further preferred aspect of the invention, the mobile code or upgrades thereof are distributed from a service provider to a plurality of users, and wherein, in the case of upgrading, additional information is transmitted specifying which files need to be deleted, replaced or added. The mobile code and methods described so far can not only be used in a negotiation between two entities but also for distributing mobile code from a service provider to a plurality of users. It is advantageous that, for this application of invention, only a minimum of additional information is required which can be put into the resource usage needs section or the certificate containing the RRL.

[0037] For achieving the above object a method for resource management for mobile code using a mobile code as discussed above comprises, in the case of uploading upon request a mobile code from a resource owner to a user using a mobile code, in a the negotiation

phase in the beginning of the uploading process, a RRL list is transferred from the resource owner to the user informing the user of the resource requirements of the mobile code. Here again, the same advantages are achieved as with the downloading process.

[0038] According to a further preferred aspect of the invention, in the negotiation phase, the uploading process further includes user and/or platform authentication information specifying restrictions imposed by the resource owner as to the user and/or platform involved, and/or payment/licensing evaluation information comprising the financial aspects of the mobile code transfer. Also in the uploading process, such information is valuable to conclude an acceptable deal and to optimize the resource management.

[0039] According to a further preferred aspect of the invention, after the negotiation phase, the mobile code is uploaded. This is again to make sure that the actual transfer of the mobile code is effected only after all the security and resource management information checks have been made.

[0040] For achieving the above object, in a method for transferring mobile code through an active network for resource management for mobile code using a mobile code of as discussed above, the network comprising a plurality of active network nodes, the active flow is composed of the following information: a) a mobile code that needs to be executed in a node which is crossed by the active flow, b) a RRL list issued by the entity that sends the mobile code to the network, c) a certificate or a sequence of certificates whose first entry is a certificate from the network operator to the starting entity, and d) the data themselves. This method ensures in a most advantageous way that the mobile code with the resource usage needs section can also be used and transferred in an environment of active networks playing an ever increasing role in the global program and data transfer.

[0041] According to a further preferred aspect of the invention, when the active flow crosses a network operator boundary from an operator X to an operator Y, the exit node of the operator X adds a certificate to the sequence issued by network operator Y authorizing operator X to send active flows through its network. This is a simple and, therefore, advantageous way to ensure a safe transfer of the mobile code with the resource usage needs section within the active networks.

[0042] According to a further preferred aspect of the invention, an execution program is provided in an execution environment of the user, the execution program defining at least the resource access policy that will be applied to the mobile code on execution. As the certificate sequence with resource usage information is attached to the mobile code, this information can be used by the receiving peer to define the resource management policy on the mobile code at run-time.

[0043] According to a further preferred aspect of the invention, the execution program is transmitted together with the mobile code. Also the execution program could

also be provided separately or on other storage media to the user, the transfer of the execution program together with the mobile code is an advantageous way of handling this matter.

[0044] According to a further preferred aspect of the invention, the method comprises any of the following steps: a) verifying that the mobile code integrity has not been compromised, b) reducing the certificate chain associated with the mobile code to verify trust transfer from the execution environment to the supplier, and c) create a process-like structure for the mobile code which isolates the mobile code from other programs running on the same execution environment.

[0045] Before executing the mobile code, the receiving peer reduces the certificate sequence that comes along with the mobile code. If the certificate or sequence of certificates is valid, the run-time execution environment will define the resource allocation policy based on the RRL along with the type of access to the resource and an upper limit on its usage. Any or all of these steps contribute to a smooth execution of the mobile code. Furthermore, the mobile programs are isolated one from each other. Also the access to resources is done through the execution environment avoiding influence or interference of mobile code and programs among each other.

[0046] According to a further preferred aspect of the invention, the resource allocation policy is defined by an intersection between the sequence of certificates, one of which contains the RRL, and the ACL local to the executing peer. In other words, authorization to access resources at run-time will be defined on the executing peer based on the RRL and the ACL of each peer and/or user. If the certificate or the certificate sequence of the certificates is valid, the run-time execution environment will define the resource location policy based on the RRL and the ACL. The ACL contains a list of principals known to the executing peer along with a maximum resource usage list per principal. Unknown principals can have a default maximum resource usage list too.

[0047] According to a further preferred aspect of the invention, the mobile code or the execution program or its reduced program is configured to discover that a given resource is available through the execution environment and to request access to it, and thus to dynamically request access to other resources, and wherein the execution environment will decide on run time whether to grant or to deny such access. One advantageous feature of the mobile code is its ability to discover the resources and other applications present or running on the target machine to be able to communicate or work with them. This gives rise to new security concerns for both the calling and the called code. Each one of them might impose its own access control based on an authenticated message exchange system, which helps to run the mobile code in a safe way. Another functionality of the execution environment is the dynamic allocation of resources not listed in the RRL. More specifically, the mo-

mobile code can dynamically discover resources on the executing peer. Therefore, the resource usage policy can be made dynamically updateable.

[0048] According to a further preferred aspect of the invention, for resources not listed in the RRL, if the resource is a build-in resource in the execution environment, the execution program will check its "run-time resource access policy" and determine, whether to grant access or not to the resource. This method takes advantage of the presence of the built-in resource and the general ability thereof.

[0049] According to a further preferred aspect of the invention, if the resource is another mobile code, this can define its own access policy stating to whom access should be granted, the advantage being that any resources which are available to anyone are integrated in the process in the execution environment almost automatically.

[0050] According to a further preferred aspect of the invention, wherein the execution program monitors and/or accounts for and/or reclaims the resources whenever its usage limit is exceeded depending on the level of trust the user has on the source of the mobile code, the resources made available to the application can be trusted to never exceed the allocated amount.

[0051] In the invention, resource needs are described and it is up to the executing environment to decide which ones are granted and which ones are not, based on their ACL and the trust path between themselves and the certifying programmer. This reflects a more generalized vision of resource as "anything a program can interact with" which is a much broader concept than the once present in the state of art. A main advantage of the invention is that it provides secure fine-grained access to resources, both quantitative and qualitative, for mobile code and that it is not restricted to provide an all or nothing access control to resources. Furthermore, in the invention, there is no need for a certificate infrastructure in order to validate the certificates or certificate sequences.

[0052] The invention also differs from the state of art specifically in that the mobile code comes along with a non-exhaustive list of required resources. The list is nevertheless only intended for execution environment information. The mobile programs could run with fewer/greater resources granted or discover new resources on the fly.

[0053] The execution environment embodying the invention allows, apart from controlling and managing access to resources, for collaboration between different programs running on this execution environment.

[0054] Embodiments of the invention are now described with reference to the attached drawings in which:

Figure 1 is a block diagram view of the software producer system depicting the phases involved in the production of a mobile pro-

- gram,
- Figure 2 shows a download upon request case in which a software consumer requests to download a mobile program from a software distributor;
- Figure 3 shows an upload upon request case in which a resource requester contacts a resource owner and asks to upload a mobile program that will act as personalized interface with the resource;
- Figure 4 shows a broadcast / multicast of mobile programs or upgrades case in which a service provider broadcasts mobile programs to offer new services to its clients or upgrades/patches;
- Figure 5 shows an active flow crossing the active network between two execution environments.
- Figure 6 shows an execution environment for mobile code.

[0055] A software producer is the entity responsible for producing a mobile code or program. This principal can be a programmer, a department within a company, an organization, etc. The mobile code is any code or application that can be sent/received through the net and is, thus, susceptible of attacking the executing peer. The mobile code can also be a local code that has arrived at the peer through a network or applications on CDROM and distributed to the users.

[0056] The first step in the process is to attach a certificate to the mobile code stating which are the resource usage needs for the given program: the software producer writes a mobile program that wants to diffuse over the Internet. To do so it needs to attach to the mobile program a certificate detailing the resource usage needs of the mobile program. This certificate is unique for each different mobile application and contains the following information:

a) Issuer of the certificate:

This is a unique identifier for the software producer. This needs not to represent a whole organization: it can be a programmer within a company, a research group or an open software group. Practically, it will be a digest (or hash) of the public key of the software producer, or the key itself.

b) Subject:

A value that uniquely identifies the mobile program to which the certificate is referred. In cryptographic words, this will be a hash of the mobile program.

c) Validity period:

This states from when to when the given certificate and thus the information contained in it is valid. This field allows for producing demo software with short validity periods, or release software with long ones.

d) Resource Requirements List (RRL):

This list should contain those resources needed by

the mobile program without which it is unable to execute, plus those resources that the software producer knows a priori that will be accessed. For each entry of the list there should be the following information which describes precisely the access to the resource:

d1) Name of the resource:

This name can be general specifying the type of resource, or more detailed, for example the resource manufacturer. The name can have constructor like 'any', or 'prefix'. For example, C:\Temp\ stands for any file in the temporary directory.

d2) Action of the resource:

A statement as to how the resource should be used. For example, if accessing a webcam, actions supported could be read (the images), zoom, on, off, focus and move.

d3) Upper quantitative limit:

This statement relates to the maximum usage of the resource from a quantitative point of view, for example writing 150Mbytes to disk or allocating 30Mbytes of memory.

d4) Upper qualitative limit:

This statement relates to the maximum usage of the resource from a qualitative point of view, for example a network connection with 10Mbits/sec, or a 4Mbits/sec video decoder.

[0057] With all the previous information, the software producer creates a certificate and attaches it to the mobile program. Here, "attach" should not be understood as a physical link, but a logical one. Precisely, a characteristic of cryptographic hashing functions is that for two different inputs, the result will be different. Moreover, it is computationally impossible, given an input, to find another one that generates the same output. Thus, mobile program and certificate are logically linked.

[0058] The certificate fields described above are those required. However, a certificate can contain some optional information such as the certification authority (entity capable of generating certificates) of the issuer, an address with detailed information on the mobile application, etc.

[0059] It should be noted that the RRL certificate is only a requirements list issued by the programmer of the mobile program. As can be seen in the following section, this certificate alone provides no security at all. Upon software distribution, the mobile program and the RRL certificate will be accompanied by a sequence of certificates transferring trust from a principal trusted by the software consumer to the RRL certificate issuer.

[0060] The distribution of mobile applications and programs can follow different patterns. In this section, different scenarios of mobile software distribution are presented. It should be noted that this section does not deal with classical software download from the Internet (ftp,

http, etc), but only with mobile applications that take advantage of the invention.

[0061] Figure 2 shows the interactions between a software distributor and a software consumer in the 'download upon request' case. A user or device contacts a software distributor and requests to download a specific piece of software. When the software distributor receives such a request, it starts a negotiation phase previous to the downloading of the mobile program. This negotiation comprehends several sub-phases:

a) User and/or platform authentication:

A software distributor may, and probably will, impose restrictions as to whom or where the software is being downloaded. Software producers or distributors may require software to be downloaded onto secure platforms that provide some guarantees as of there will not be any interference on program execution.

b) Resource requirements:

In this phase, the software distributor informs the consumer of the resource requirements on the mobile program. The objective of this phase is to avoid the downloading of software that will not be able to execute due to lack of resources. Note that the RRL is not exhaustive, since, by definition, mobile code should be able to discover resources present on the executing platform. The software consumer answers back to the distributor with a list of principals it trusts and to whom it will grant access to the resources. It is the distributor's responsibility to provide a sequence of certificates transferring trust from one of these principals to the principal that issued the RRL, along with the RRL certificate and the mobile program.

c) Payment / licensing / evaluation:

Since not all software is free of charge, this phase deals with the financial aspects of software distribution. Here, software distributor and consumer reach an agreement, possibly with proof of payment or license, before the downloading of the mobile program. Note that the consumer may be requesting an evaluation software. In this case, the only difference will be that the RRL certificate will have a short validity period, and platform authentication as described in the previous phase becomes mandatory in order to avoid illegal usage of the software.

[0062] The last step in the process is the actual download of the mobile program, the RRL certificate and a sequence of certificates that transfer trust from the software consumer down to the principal that issued the RRL certificate. Along with these data, the software distributor will most likely send a description of the mobile code with information such as name, version, etc. Software integrity is assured by the subject field in the RRL certificate which contains for example the result of a hash function on the mobile program file. If privacy is

needed, any protocol cryptographic protocol may be used.

[0063] Figure 3 shows a case in which a computer or device wants to access a resource residing on a remote computer. A resource requester contacts a resource owner and asks to upload a mobile program that will act as personalized interface with the resource. Examples of this are analyzing images of an electronic microscope or convert data from a compressed format to postscript before printing which means an application wanting to get some specific information from an electronic microscope or printing a compressed image. However, the requester may not want to access directly the resource, but use a specific interface providing the desired functionality. This is done by sending a mobile application to the resource owner system which, in the first case, extracts locally the information from the microscope images and sends it back to the application or, in the second case, converts from a compressed image format to postscript before sending to the printer, increases the performance of the application.

[0064] The protocols between peers are basically the same as in previous case of the communication between a software distributor and a consumer, with the exception that here there is a request to upload mobile code instead of downloading. As for the negotiation phase, user and platform authentication will be used here by the resource owner, since it can have its own policy as of who can upload software to the system. On the other hand, the payment/licensing phase can be used here whenever the resource requester should pay to access the resource. An example would be sending a mobile program that queries a remote database for which a subscription is required.

[0065] Figure 4 shows the case of a service provider with several subscribers broadcast or multicasts mobile programs to all or some of its clients. This mobile code can be whether a new mobile program that the service provider wishes to install on all its client platforms, or an upgrade/patch to already existing applications of the subscribers' systems.

[0066] Given the nature of the broadcast scenario, in this case there is not the possibility of an interactive protocol between service provider and consumers. Therefore, when the service provider broadcasts the mobile program along with some extra information:

a) Installation / upgrade information:

The installation information is basically the same information about the mobile program sent in the earlier cases. In the case of upgrading, the service provider needs to specify which files need to be deleted, replaced or added.

b) Certificate sequence:

If, in this scenario, the receiving systems are subscribed to a service and thus there is already a trust relationship, the service provider needs only to provide the sequence of certificates transferring trust

from itself to the programmer. The service provider itself may be also a software producer, in which case the certificate sequence will be empty.

c) RRL certificates and mobile program as in previous cases.

[0067] The case in which a service provider or software distributor sends a mobile program to a single receiver is a special case of the one presented above.

[0068] Active networks are a hot topic of research nowadays. The idea behind active networks is the possibility to configure each node of the network as a data flow traverses it. The active flow carries the data along with code that is executed by each active node and that does any processing on the flow. This processing can be from deciding which link the flow should follow up to reducing the quality of a video flow depending on the capacity of the link.

[0069] Figure 5 shows a scenario in which a flow between two execution environments, i.e. computers, crosses several active nodes or routers from different network operators. Any negotiation between active nodes belonging to the same or different network operators are not possible in this case. An active flow is composed of the following information:

a) The mobile code that needs to be executed in every node the flow crosses.

b) RRL certificate issued by the originating execution environment, the entity that sends the mobile code to the network.

c) A sequence of certificates whose first entry is a certificate from the network operator X to the execution environment. This certificate allows the flow to cross all active nodes belonging to operator X. When the flow crosses an operator boundary, the exit node of operator X adds a certificate to the sequence issued by network operator Y authorizing operator X to send flows through its network.

d) The data itself.

[0070] The certificates between network operators reflect real-world deals between network operators. An operator Y may authorize operator X to cross its network, but imposing some limits to the resources available to mobile code sent. In this case, there is a particular need for the active node to control the resources made available to "foreign" mobile programs.

[0071] The last phase involved in the present invention is mobile code security during execution and secured resource management. The mobile program has gotten to the executing system, or it is already present on the system. The execution environment, that is the software in charge of executing a mobile program, needs to meet some requirements so that the security of the system is not compromised (see Fig. 6). When a mobile program is launched, the execution environment performs the following steps:

a) Verify that the mobile program integrity has not been compromised. This is done by computing the hash function on the mobile program and verifying that the result is the same as in the RRL certificate.

b) Reduce the certificate chain associated with the mobile program to verify that trust is passed from the executing environment to the programmer or the issuer of the RRL certificate. To do this, the execution environment needs to access its own access control list (ACL) or the ACL of the user.

c) Define the resource access policy that will be applied to the mobile program on execution. This resource access policy is the intersection between the RRL and the ACL plus certificate sequence reduction. Note that this resource access policy refers only to those resources specified in the RRL and the ACL. Mobile programs can dynamically request access to other resources: the execution environment will decide on run-time whether to grant or deny such access.

d) Create a process-like structure for the mobile program, which isolates the program from other programs running on the same execution environment. The process abstraction also enforces the program to go through the execution environment in order to access any resource.

[0072] Whenever a mobile program requests access or tries to access a resource, the execution environment checks in the resource access policy of the process whether it has access to the resource or not. If it does, it will provide a capability that will monitor, account for and reclaim the resource whenever its usage limit is exceeded. There are, nevertheless, exception to this: low level resources, that is CPU time and memory, cannot be managed through capabilities; the execution environment manages them directly.

[0073] As stated above, the mobile code has the ability to discover the system on which it is being executed and take advantage of the resources available. This means that a program can discover that a given resource is available through the execution environment and request access to it. This resource can be a built-in resource in the execution environment or a software-based resource, i.e. any other mobile program that allows being called.

[0074] If the resource is a built-in one in the system, the execution environment will check its "run-time resource access policy" and determine whether to grant access or not to the resource. If, on the other hand, the resource is another mobile program (a video decoder or a decryption service for example) that gives access to anyone (it has not defined a its own resource access policy), access is granted too.

[0075] In case the software-based resource defines its own access policy, the execution environment will query the resource itself as to whether access is granted or not. This means that mobile programs available as

resources of a system have the ability to manage and define who (that is which mobile programs) can access them.

[0076] As stated above, security and privacy is a major concern with the handling of mobile code to cope with these requirements, one relies on cryptography. There are many different ways to implement cryptographic features in a program or on data. However, one particular format, the Simple Public Key Infrastructure or SPKI-format is particularly adapted for the purposes of the invention as will be described below.

[0077] Cryptography provides a means whereby two people can communicate openly in such a way that a third party is unable to determine or alter what is being said. By assuring privacy, cryptography indirectly provides authentication because only the communicating parties know how to encrypt and decipher each other's messages. A form of cryptography known as public-key cryptography appears to be best suited to fulfilling the requirements of the Internet. Each user of a public-key cryptosystem holds a pair of related keys. Anything encoded with one key can only be decoded by its counterpart. Each user keeps one key secret and makes the other publicly available. Thus, other people can employ the user's public key to send messages that only the user can read, or the user can "sign" a message with her private key to authenticate it - other people can apply the user's public key to verify that the message came from the user. Crucial to the operation of a global public-key cryptosystem on the Internet is a practical and reliable means of having access to the public keys, called a Public Key Infrastructure or PKI.

[0078] Much recent work has focused on moving away from identity-based PKIs to a more general system based on attributes or credentials. SPKI and SDSI (Simple Distributed Security Infrastructure) are two of such efforts. These two initiatives merged later into SPKI, given that their approach to security infrastructures and certificates were almost identical. SPKI is designed to "facilitate the construction of secure systems" and "provides simple, clear terminology for defining access-control lists and security policies". It is also an attempt to move away from identity-based certification and towards a system based on roles and credentials.

[0079] SPKI calls its entities "principals" and defines them to be digital signature verification keys. Thus, SPKI principals are public keys that can make declarations by issuing verifiable signed statements. Those signed statements come mainly in the form of certificates. SPKI provides for so called SPKI authorization certificates as a basic form of certificates which transfer some specific authorization or permission from one principal to another. Because a certificate merely transfers authorizations, rather than creating them, it is required to inject authorizations into a chain of certificates. This is done by means of ACL-entries (ACL = Access Control List). An ACL-entry lives on the machine of the verifier, leading to the observation that all authorization flow is in a

circuit from the verifying machine's ACL, possibly through certificates and then back to the verifying machine. Alternatively, one might say that the only root of an authorization certificate chain is the verifier.

[0080] SPKI allows its principals to define groups, or sets, of principals by means of name certificates. Each group has a name and a set of members. The name is local to some principal, which is the "owner" of the group. Only a group's owner may change its definition.

A group can be an explicit list of the group's members (either as a list of principals and/or names of principals), or it can be defined in terms of other groups. Any principal can define his own groups and export them via his servers in much the same way as name bindings. The servers can issue membership certificates based on the groups' definitions.

[0081] If, from a practical point of view, mobile applications are programmed in the Java language, and programs and applications can be distributed using a specific file format that packages all files that compose the application. Moreover, this format fits the requirements of code certification, since a single file can easily be hashed to create a certificate.

[0082] As for the certificate format, SPKI certificates fit the above expressed requirements. Moreover, the fact that there is no need for an infrastructure of certification authorities in place will make the present invention easy to deploy.

Claims

1. Mobile code comprising a resource usage needs section containing at least a resource requirements list including those resources needed by the mobile code to be properly executable plus those resources that are known a priori to be accessed when executing the mobile code.
2. Mobile code according to claim 1, wherein the resource usage needs section of the mobile code is a certificate which is unique for each different mobile code.
3. Mobile code according to claim 1 or 2, wherein the resource usage needs section of the mobile code or the certificate contains, in addition to the resource requirements list, any of the following information:
 - a) issuer of the certificate information identifying the entity issuing the certificate,
 - b) subject information identifying the mobile code to which the certificate is referred, and
 - c) validity period information stating the period of time within which the certificate is valid.
4. Mobile code according to claim 3, wherein the re-

resource requirements list contains any of the following information:

- a) name of the resource information specifying the type of resource, 5
 - b) action on the resource specifying as to how the resource should be used,
 - c) upper quantitative limit information stating the maximum usage of the resource from a quantitative point of view, and 10
 - d) upper qualitative limit information stating the maximum usage of the resource from a qualitative point of view.
5. Mobile code according to any of the preceding claims, wherein an execution program is provided in an execution environment of the user, the execution program defining at least the resource access policy that will be applied to the mobile code on execution. 15
6. Method for resource management for mobile code using a mobile code of any of the claims 1 to 5, wherein: 20
- (a) in the case of downloading upon request a mobile code from a principal to a user, in a the negotiation phase in the beginning of the downloading process, a RRL list is transferred from the principal to the user informing the user of the resource requirements of the mobile code, and 30
 - (b) in the case of uploading upon request a mobile code from a resource owner to a user, in a the negotiation phase in the beginning of the uploading process, a RRL list is transferred from the resource owner to the user informing the user of the resource requirements of the mobile code. 35
7. Method according to claim 6, wherein, in the negotiation phase, the downloading process further includes user and/or platform authentication, specifying restrictions imposed by the mobile code distributor as to the user and/or platform involved, and/or payment/licensing evaluation, comprising the financial aspects of the mobile code transfer; and wherein, in the negotiation phase, the uploading process further includes user and/or platform authentication information specifying restrictions imposed by the resource owner as to the user and/or platform involved, and/or payment/licensing evaluation information comprising the financial aspects of the mobile code transfer. 40
8. A method for transferring mobile code through an active network for resource management for mobile code using a mobile code of any of the claims 1 to 45
- 50
- 55

5, the network comprising a plurality of active network nodes, wherein the active flow is composed of the following information:

- a) a mobile code that needs to be executed in a node which is crossed by the active flow,
 - b) a RRL-list issued by the entity that sends the mobile code to the network,
 - c) a certificate or a sequence of certificates whose first entry is a certificate from the network operator to the starting entity, and
 - e) the data themselves.
9. Method according to claim 8, further comprising any of the following steps: 15
- a) verifying that the mobile code integrity has not been compromised,
 - b) reducing the certificate chain associated with the mobile code to verify trust transfer from the execution environment to the supplier, and
 - c) create a process-like structure for the mobile code which isolates the mobile code from other programs running on the same execution environment. 20
10. Method according to claim 8 or 9, wherein the mobile code or the execution program or its reduced program is configured to discover that a given resource is available through the execution environment and to request access to it thus to dynamically request access to other resources, and wherein the execution environment will decide on run time whether to grant or to deny such access. 25
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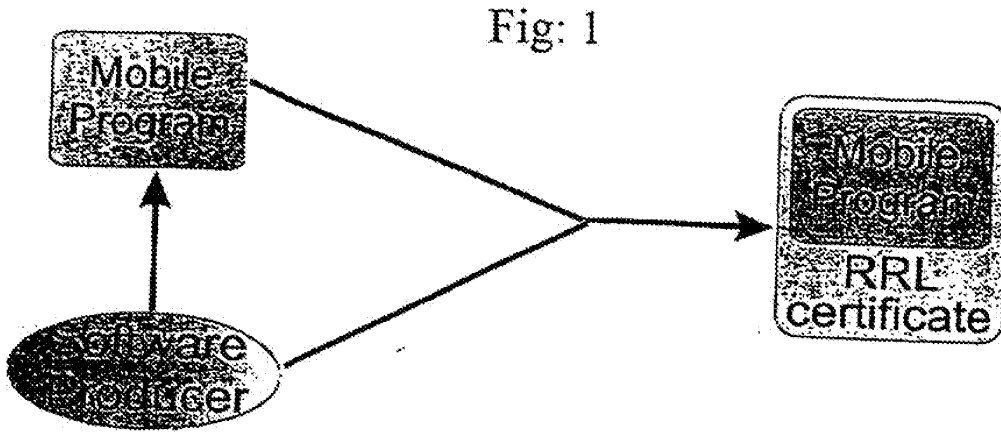
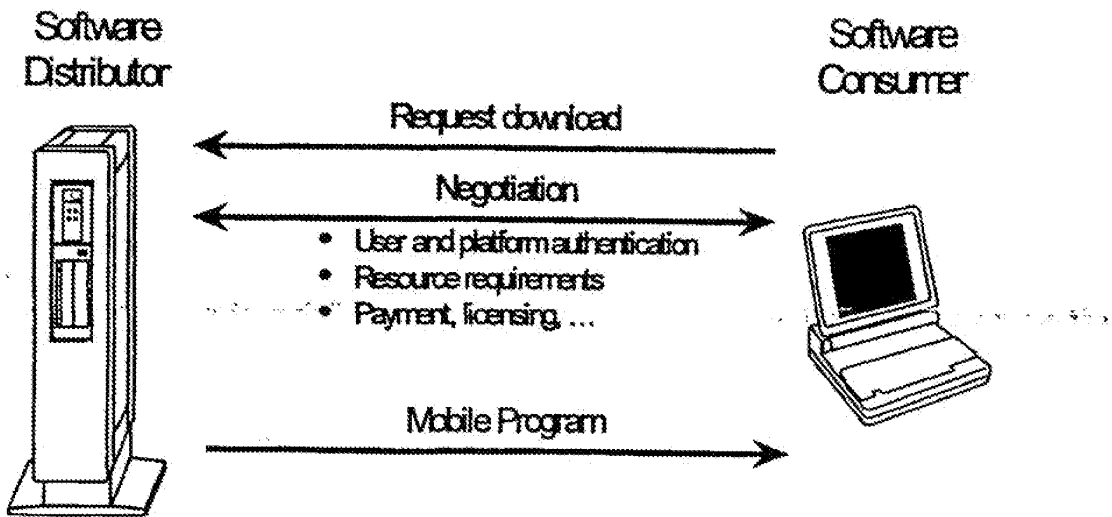


Fig: 2



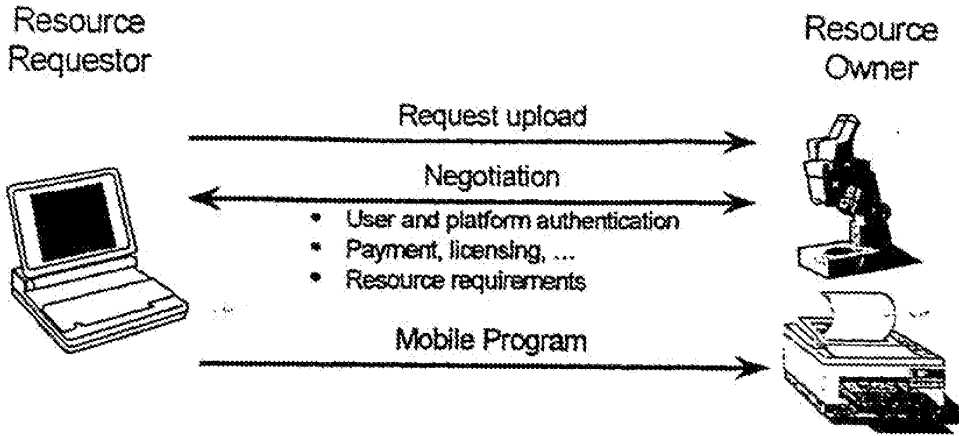


Fig: 3

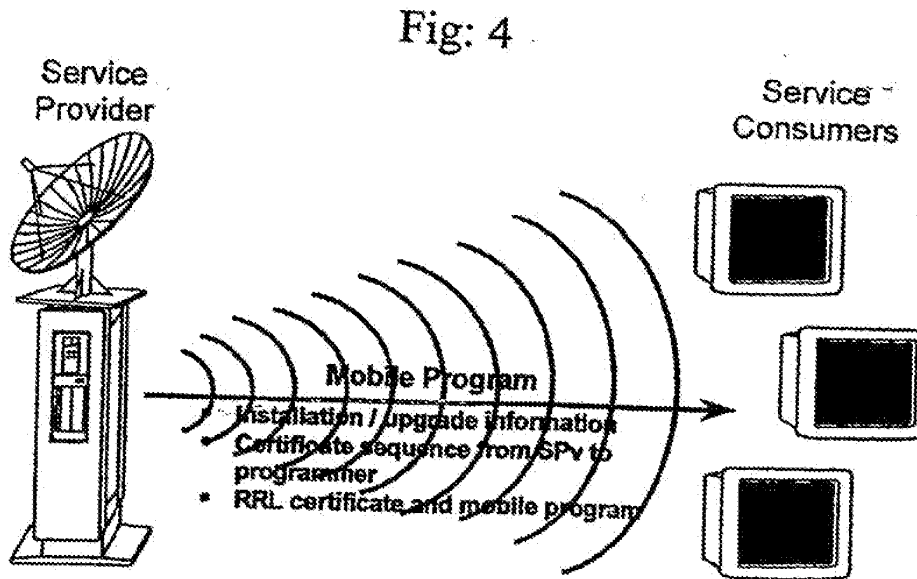


Fig: 4

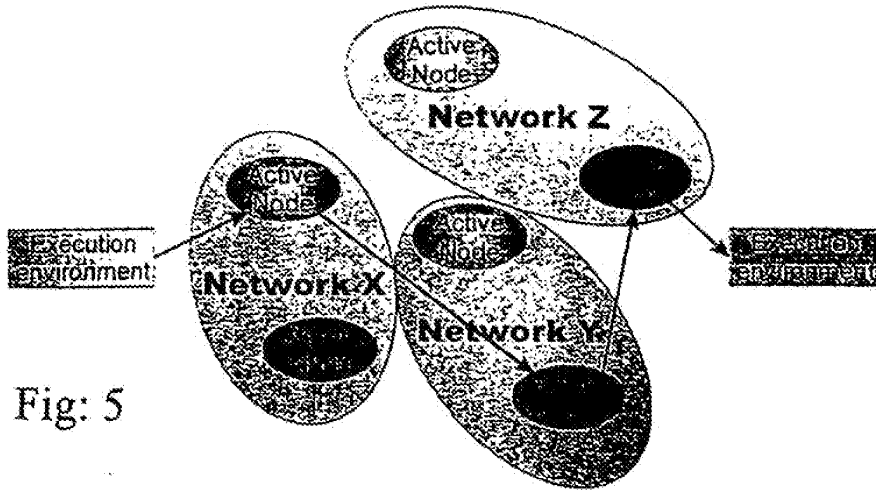


Fig: 5

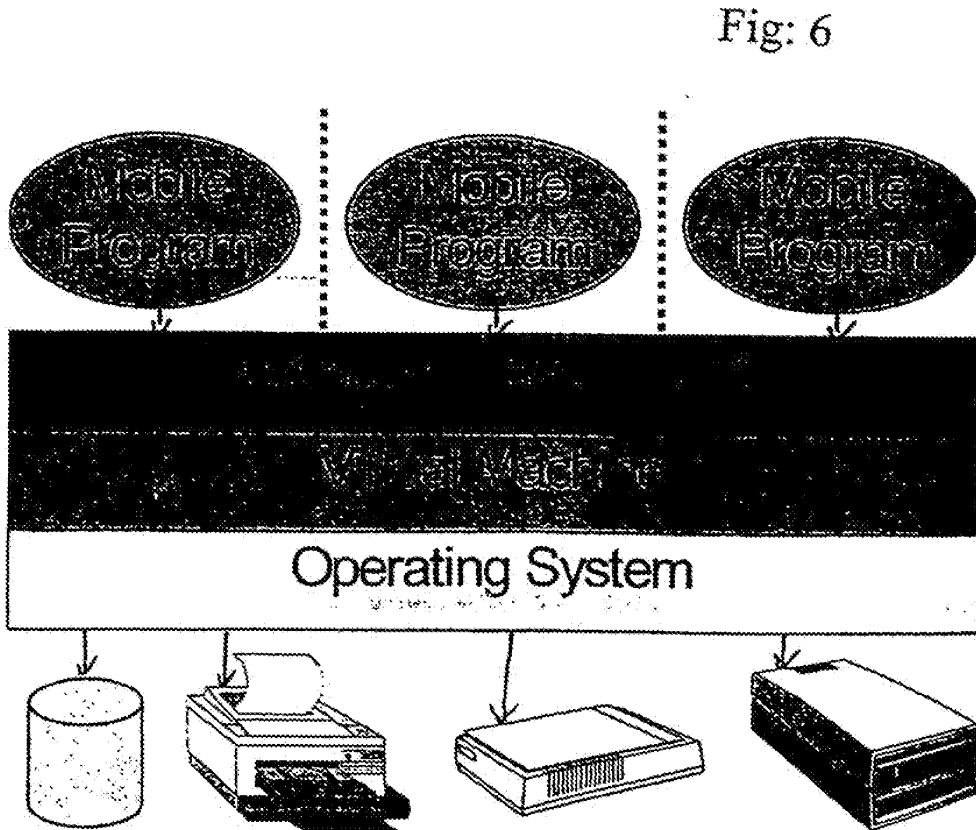


Fig: 6



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 10 4966

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X	EP 0 813 133 A (IBM) 17 December 1997 (1997-12-17) * abstract * * column 3, line 5 - column 4, line 7 * * column 6, line 33 - line 50 *	1-3,5	
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Y	WO 98 07085 A (SMITH BENJAMIN HEWITT; SMITH FRED HEWITT (US); BEN SMITH INC (US)) 19 February 1998 (1998-02-19) * abstract; figures 1,3 * * page 4, line 2 - page 5, line 14 * * page 9, line 1 - page 10, line 27 *	6,7	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			G06F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 20 December 2000	Examiner Sigofo, A
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 00 10 4966

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Publication number: **0 636 977 A2**

12

EUROPEAN PATENT APPLICATION

21 Application number: **94305551.7**

51 Int. Cl.⁶ **G06F 11/00**

22 Date of filing: **27.07.94**

30 Priority: **29.07.93 US 99368**

43 Date of publication of application:
01.02.95 Bulletin 95/05

84 Designated Contracting States:
BE DE FR GB IT

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54 **Method and apparatus for detection of computer viruses.**

57 A behavior analyzing antivirus program detects viral infection of a target program by emulating the execution of the target program and analyzing the emulated execution to detect viral behavior. The antivirus monitor program contains both variables corresponding to the CPU's registers and emulation procedures corresponding to the CPU's instructions. The target program is loaded into memory and its execution is emulated by the antivirus monitor program. Intelligent procedures contained in the monitor program are given control between every instruction emulated so as to detect aberrant or dangerous behavior in the target program in which case the danger of a viral presence is flagged and emulation is terminated.

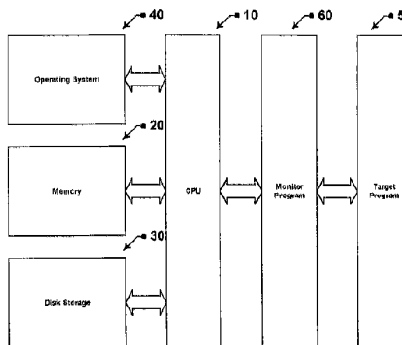


Figure 1B

EP 0 636 977 A2

BACKGROUND OF THE INVENTION

The present invention relates generally to a method and apparatus for emulating the execution of a program on a computer system. In particular, the present invention relates to monitoring program behavior to detect and terminate harmful or dangerous behavior in a program. More particularly, the present invention relates to monitoring program behavior to detect computer viruses.

In recent years, the proliferation of "computer viruses" (generally designed by rogue programmers either maliciously or as "pranks") has become an increasingly significant problem for the owners and users of computer systems. True computer viruses vary, but they share the general characteristic that they comprise executable computer code capable of replicating itself by attachment to and modification of standard computer files. Such files are then considered "infected". On most computer systems, viruses are limited to infecting program applications. When the application is executed, the virus can then replicate and attach copies to further application files. Typically, viruses also engage in other forms of behavior that are considered undesirable, such as re-formatting a hard disk.

Often grouped with true computer viruses are some other types of malevolent computer programs: worms and trojan horses. Worms do not infect other applications but merely replicate, either in memory or in other storage media. The harmful effect of worms is generally to reduce system performance. Worms are of concern for large multiuser computer systems, but are generally not of concern for personal computers. Trojan horses are programs that masquerade as useful programs or utilities; they generally run only once and have a harmful effect (such as destroying or damaging the computer system data storage). Trojan horses do not replicate, and after being run once by a user, the user is usually alerted to the harmful behavior and will not run the trojan horse again.

In response to the proliferation of computer viruses, a variety of "antivirus" methodologies and programs have been developed to detect the presence of infected files. These antivirus programs can be generally categorized into groups: behavior interceptors, signature scanners, and checksum monitors.

BEHAVIOR INTERCEPTORS

The earliest antivirus programs were generally of the behavior interceptor type: they would allow a virus program to execute in memory but would intercept strategic operating system function requests made by the computer virus. Such requests would generally be functions which the virus re-

quired to be performed in order to replicate or to destroy its host, i.e., "Write to a file", "Erase a file", "Format a disk" etc. By intercepting these requests, the computer operator/user could be informed that a potentially dangerous function was about to be performed. Control could be halted or continued as necessary. Some antivirus programs actually modify the instructions of the discovered virus program and make them inoperable so as to "kill" them.

The behavior interceptor method of virus detection has several drawbacks. The first problem is that it relies entirely on user input and decision making when potentially dangerous behavior is detected. This places a great burden on the user, for it is often very difficult to determine whether the flagged behavior is part of the normal operation of the program being executed. For example, disk optimizing programs routinely reformat hard disks to improve the interleave value. In response to a warning message, a user might suspect that their disk optimizer was infected with a virus (when in fact it was not) and halt program execution. Or, worse yet, if the user knows that such behavior is part of the normal operation of a disk optimizer program, they would likely allow the format to continue uninterrupted, which would be disastrous if the program were actually infected.

A second problem with behavior interceptor antivirus programs is that computer virus technology has advanced to such a state that some computer viruses are able to bypass the interception points used by the antivirus. The virus can then make operating system function requests that are never intercepted by the antivirus, thus avoiding detection.

A third problem with behavior interceptor antivirus programs is that by allowing the virus to execute, the virus has an opportunity to locate and identify the antivirus program in computer memory. Once the antivirus program is located, the virus can modify the antivirus-- rendering it completely ineffective in exactly the same manner that antivirus programs locate and modify virus programs to render them ineffective.

A fourth and very significant problem with behavior interceptor antivirus programs is that there are no low level operating system function requests employed by computer viruses that are not also used by any of thousands of non-virus programs. At an instruction by instruction level, or at a function-call by function-call level, a computer virus performs the same operations as legitimate computer programs. In other words, the closer a computer virus is examined, the less distinguishable it becomes from any other computer program.

SIGNATURE SCANNERS

The next generation of antivirus technology, signature scanners, answered the problem of over-reliance on user interaction as well as the problem of allowing the virus to execute. A signature scanner operates by knowing exactly what a target virus program code looks like ("signature" code) and then scanning for these program codes in any programs requested to be executed or otherwise requested to be scanned. As long as the signature codes were sufficiently long enough so as not to be confused with another program's code, then positive identification was virtually guaranteed and the request to execute could be stopped before execution ever began. The primary problem with this technique is that it requires the antivirus developer to have previously collected and analyzed the target viruses, and included the signature codes in the antivirus program. The antivirus program thus relies on an extensive virus signature library, for there are currently several thousand known IBM PC viruses and several new viruses appear each day. Any new viruses appearing after the antivirus program was developed are not included in the library of program codes for which the antivirus can scan. Signature scanning antivirus programs therefore require frequent updates to keep them current with the increasing number of viruses. If the antivirus developer is lax in providing updates, or the user is lax in obtaining and employing available updates, a signature scanning antivirus program can rapidly lose its effectiveness.

CHECKSUM MONITORS

The last standard technique of virus detection does not look for anything to do with viruses in particular, but concentrates on the host programs which the viruses attack. Every program on a system can be "checksummed" at antivirus installation time. Then, when a virus attaches itself to the unsuspecting host program, the checksum value will (probably) be different and the file infected with the virus can be isolated. The primary problem with this technique is that many programs store varying program information within themselves; this will change the checksum value and thus trigger a false alarm virus detection. Another problem is ensuring the integrity of the checksum information, which is typically attached to the program file itself or stored in a separate file. Both locations are vulnerable to covert virus modification. Once a virus infects a host, it can then update the stored checksum value to correspond to the newly infected file and then execute undetected.

SUMMARY OF THE INVENTION

An improved antivirus program according to a first aspect of the present invention avoids the problems of the prior art and detects viral infection of a target program by emulating the execution of the target program and scanning for viral behavior. By emulating the execution of the target program, viruses are prevented from circumventing the monitor program's protective mechanisms. A second aspect of the present invention recognizes that a key viral behavior is replication: viruses generally operate by passing replication/program-modification code onto uninfected programs. Uninfected programs, on the other hand, do not generally add program-modification code to other programs. According to this aspect of the invention, the emulated target program is tested for replication behavior to determine whether the target program is virus-infected.

A monitor program according to the first aspect of the present invention contains both variables corresponding to the CPU's registers and emulation procedures corresponding to the CPU's instructions. The monitor program includes means for loading a target program into memory and emulating its execution. The monitor program also includes means for analyzing the emulated behavior of the target program and for signalling a warning if the emulated behavior is determined to be aberrant, dangerous or otherwise undesirable.

In one embodiment according to the second aspect of the present invention, the monitor program further includes means, responsive to a file access request by the target program, for providing a dummy program, having known behavior, for modification by the target program. The monitor program also has means for emulating the execution of the modified dummy program after the emulation of the target program is complete. If the modified dummy program is determined to have modified functionality, the original target program is flagged as possessing viral behavior. In one particular embodiment according to this aspect of the invention, a first dummy program is known to not possess the ability to modify another file. If after modification by the target program the first dummy program is emulated and found to modify a second dummy program, then the original target program is flagged as virus infected, for having "infected" the first dummy file with aberrant behavior.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1A is a block diagram illustrating the primary components of a computer system executing a target program in a standard manner.

Fig. 1B is a block diagram illustrating the primary components of a computer system executing a target program according to the present invention.

Figs. 2A and 2B are diagrams illustrating memory maps of the computer systems of Figs. 1A and 1B, respectively.

Fig. 3 is a block diagram illustrating the register set emulated by a particular embodiment of the present invention.

Figs. 4A and 4B are flowcharts illustrating respectively the installation and replication procedures typically employed by computer viruses.

Fig. 5 is a flowchart illustrating the general emulation process performed by a monitor program according to a particular embodiment of the present invention.

Fig. 6 is a flowchart illustrating in further detail the memory access control step of the flowchart of Fig. 5.

Fig. 7 is a flowchart illustrating in further detail the procedure access control step of the flowchart of Fig. 5.

Fig. 8 is a flowchart illustrating in further detail the operating system entry point monitoring step of the flowchart of Fig. 5.

Fig. 9 is a flowchart illustrating the process performed by a particular embodiment of the present invention to check the behavior of an interrupt handler.

Fig. 10 is a flowchart illustrating the process performed by a particular embodiment of the present invention to identify viral replication behavior.

In Fig. 1A a block diagram is shown illustrating the primary components of a computer system executing a target program in a standard manner. The computer system includes a CPU 10, a memory 20, and a disk storage device 30. This is simply an exemplary configuration; the system could of course employ a tape storage device rather than disk storage, and many other variations are possible as well. Operating system 40 typically exists in Read Only Memory, but may also be partially loaded from the disk storage 30 into memory 20. At power up, the CPU begins executing the instructions of operating system 40, which thereafter controls the loading and execution of application programs such as target program 50.

In this standard configuration, if a user selects target program 50 for execution, operating system 40 would load target program 50 from disk storage 30 into memory 20 and then transfer control to target program 50 by loading the start address of target program 50 into the program counter register, or instruction pointer register, of CPU 10. CPU 10 would then begin executing the instructions of target program 50, as pointed to by the instruction

pointer register. Target program 50 will typically include calls to operating system routines, which are identified by a table of pointers, commonly known as interrupt vectors. It is by remapping these interrupt vectors that standard behavior intercepter antivirus programs attempt to maintain control and supervision of target programs. As discussed above, however, many computer viruses are able to circumvent this remapping of the interrupt vectors and are able to use operating system routines without being monitored by the antivirus program.

In order to prevent this circumvention of monitoring code, a particular embodiment of the present invention is invoked by a user to request that an application program be analyzed for viral behavior. This embodiment takes the form of a monitor program that emulates the execution of the application for a period of time, monitoring its behavior. By emulating the execution of the application program, the application program can be maintained in a controlled environment that cannot be circumvented by a virus.

The configuration of the monitor program and target application program is illustrated in Fig. 1B. Monitor program 60 loads target program 50 into memory and emulates the execution of the instructions of target program 50, serving as a protective barrier between the application program and the remainder of the computer system. If the application program has not shown any viral behavior at the end of the monitor period, then it is loaded and executed in the standard manner, such as illustrated in Fig. 1A.

In the secure environment created by the monitor program of Fig. 1B, every aspect of execution can be scrutinized and the operation of the virus can be controlled completely. If the virus were to request a hard disk format operation, a successfully completed status would be returned to it making the virus "believe" that the operation was successful when in fact it was never executed in the first place.

Figs. 2A and 2B respectively show the general layout in memory 70 for an IBM PC type computer system with a target program loaded directly by PC DOS as in Fig. 1A, and for a target program loaded by an embodiment of the present invention as in Fig. 1B. As shown in Fig. 2A, ROM occupies the upper portion of the memory address space with the remainder of memory being filled up from the bottom: first the operating system 40 in lower memory, followed by device drivers and memory resident programs, then user selected programs such as target program 50. Fig. 2B illustrates memory usage as in Fig. 2A, but additionally with monitor program 60 loaded.

Fig. 3 illustrates the various CPU registers employed by an 8086 type CPU, the general type of CPU employed by many personal computers, and for which the presently described preferred embodiment is intended. Flags register 300 is a set of bit-wise flags that may be set or cleared during the execution of various types of instructions. These bits can be examined by other instructions to alter program flow or to perform other tasks. Registers 310 are general purpose and are used for a variety of tasks. Index registers 320 are typically used to indirectly reference memory. Stack pointer 330 is used to maintain a data storage stack in memory. Instruction pointer (program counter) 340 points to the location in memory at which the next instruction to be executed resides. Finally, segment registers 350 are used to prepend and additional 4 bits onto other memory addressing registers (16 bits wide), allowing them to access a broader range of memory. Because these registers are intimately involved in the execution of programs, they are all emulated by the monitor program of the preferred embodiment, so as to fully control the execution of a target program.

Viral Code

Fig. 4A illustrates the installation procedure typically employed by computer viruses. The virus execution begins at block 400 and proceeds to block 410, at which the virus determines if a copy of itself has already been installed in memory. If not, execution proceeds to block 420, where the virus the current value of interrupt vector 21h (the operating system entry point on 8086 type computers), and saves this value for later use. Next, at block 430, the virus sets the entry point to point to a procedure within the virus itself, after which at block 440 control is passed to the host program. If at block 410 the virus had determined that a copy had previously been installed, control would pass immediately to block 440.

Fig. 4B illustrates a typical viral procedure for replication. The beginning of such a procedure would be the replacement entry point stored by the viral code at step 430 of Fig. 4A. When a program later attempts to make an operating system call through int 21, the call would be directed to beginning block 450 of the viral procedure of Fig. 4B. The viral code would then execute, and at block 460 would determine if there was a file name associated with the operating system call. Such operating system calls are typically used by a normal program to open a file or execute another program. If there was a name associated with the operating system call, then at block 470 the viral code would replicate itself by writing its own executable code to the file that was the subject of the

operating system call, in some instances after having checked to ensure that this file was not already infected by the virus. After block 470, the viral code would then exit at block 480, passing control to the original interrupt handler, a pointer to which had been saved at block 420 of Fig. 4A. If at block 460 the viral code had determined that there was no filename associated with the operating system call, then execution would have passed directly from block 460 to block 480. In this manner the operating system continues to function normally except for a slight interruption while the viral code executes.

Emulation to Detect Viral Code

Fig. 5 illustrates the operation of monitor program 60 according to a preferred embodiment of the invention. The monitor program can be executed explicitly by the user with a designated target program, or in alternative embodiments can be executed automatically whenever an operating system call is placed to execute a program. At block 500, the monitor program loads the target program into memory, in exactly the same manner as the operating system would have loaded the target program, but rather than passing execution to the target program immediately, the monitor program retains control for a period of time, to evaluate the target program.

After the target program is loaded at block 500, at block 510 the monitor program initializes the emulated registers, which correspond to the registers used by CPU 10. These register variables are used by a set of instruction emulation routines that are capable of emulating the instructions of CPU 10. The emulated registers are initialized with the same values that the real registers would have had if the target program had been loaded by the operating system for execution.

After the emulation registers are initialized, the main emulation loop is entered. At block 520 the instruction pointed to by the emulated program counter register is fetched by the emulation software and the emulated program counter register is incremented by the size of the fetched instruction, so that it points to the next instruction. Control then proceeds to a set of evaluation procedures for the instruction. At block 530, the monitor program determines if the target program is attempting to access memory selected for controlled access. In the preferred embodiment, operating system procedures and data areas the address range of the monitor program are selected for controlled access. Optionally, any memory not belonging to the target program can be selected for controlled access. The memory access process is explained in more detail below with reference to Fig. 6.

After block 530, at block 540 the monitor program evaluates the instruction for attempted access to a controlled procedure, explained more fully below with reference to Fig. 7, and then also emulates the execution of the instruction. Following block 540 is block 550, at which the monitor program evaluates any possible modifications to the operating system entry points. The processes performed at block 550 are described in more detail below with reference to Figs. 8-10.

Following the emulation and evaluation blocks 530-550, at block 560 the monitor code determines if the target application has terminated. If so, emulation is terminated at block 570. The determination of step 560 can be according to whether the target program terminates of its own accord, or the determination can be set by a total number of instructions to be emulated or by a fixed period of time for emulation. If the target program has not terminated of its own accord at step 560, and if the monitor program has not forcibly terminated it, control returns to block 520, where the next cycle of the emulation loop is begun. The emulation termination at block 570 includes some "cleanup" on the part of the monitor program. This includes displaying to the user a status report of all operating system requests performed by the target program. This step may optionally also include reporting any memory accesses that have been performed outside of the area provided for the target program by the monitor program.

Controlling Access to Memory

The memory access monitoring process of block 530 is illustrated in further detail in Fig. 6. The described process involves remapping selected parts of memory, which effectively virtualizes those memory areas, making them inaccessible to the target program, and thus protected. In alternative embodiments, access by the target program to these areas of memory is simply denied by the monitor program.

From the starting point at block 600, the procedure passes to block 610, at which the monitor program determines if the current instruction is one whose function is to access memory. If so, then control passes to block 620, where the monitor program determines if the memory location to be accessed by the current instruction is in an area selected for controlled access. If so, then control passes to block 630, which implements a remapping of the memory address. The monitor program's representation of the instruction is modified to point to the mapping destination, so that the original memory location is protected from the target program.

In the preferred embodiment, the contents of the original memory location are copied to the mapping destination the first time the location is accessed by the target program. In other embodiments, the contents of the entire memory area selected for controlled access are copied into the mapping destination area when the monitor program first starts. In yet other embodiments, certain areas selected for controlled access can have their mapping destination areas initialized with null or dummy values. For example, it may be desirable that the content of the monitor program be protected and hidden from the target program, so that a virus cannot detect the presence of the monitor program.

After the remapping of block 630, at block 640 the attempted access to a controlled memory area is logged for later analysis and reporting to the user. After block 640, the memory access control procedure ends at block 650, which returns control to the main process of Fig. 5, at block 540. A negative determination at either of blocks 610 or 620 also results in control passing immediately to block 650.

Controlling Access to Procedures

In some instances, it is desirable to control access to certain procedures. For instance, operating system procedures, ROM procedures, and interrupt handling procedures can have powerful effects and can be subject to misuse by a virus. For these reasons, it is desirable to control access to them and substitute special purpose procedures in their place, to encapsulate viral code within the emulated environment.

After the memory access control procedure of block 530 of Fig. 5, control passes to block 540, which is illustrated in further detail in Fig. 7. From beginning block 700 control passes to block 710, at which the monitor program determines if the emulated program counter points to a controlled procedure entry point; a list of such entry points is maintained by the monitor program. If so, then at block 720 the attempted access to a controlled procedure is noted. This can be by displaying a message to the user on the screen, writing to a log file, etc.

Next, at block 730 the monitor program determines if the instruction is to be directly emulated. This determination is made according to information stored for each controlled procedure entry point; for certain such procedures a special case emulation may be desired rather than directly emulating the instructions of the procedure. If the procedure is not to be directly emulated, then control passes to block 740, where a special case emulation of the entry point instruction is performed. In

some instances this special case emulation will entail emulation of the entire controlled procedure at this point.

If at block 730 it were determined that the controlled procedure was to be directly emulated, or if at block 710 it were determined that the emulated instruction pointer did not indicate a controlled procedure entry point, then control would pass to block 750, where the instruction indicated by the emulated instruction pointer is emulated in the same manner as other instructions. Following the emulation according to either of blocks 740 or 750, control passes to block 760, which returns execution to the main process of Fig. 5

Controlling Access to Operating System Entry Points

Block 550 is illustrated in further detail by Fig. 8. This control of operating system entry points need not be performed to obtain substantial benefits from the emulation of the target program; however, this process does a higher level of control over the target program and also allows for a more accurate evaluation of viral behavior on the part of the target program.

From beginning block 800 control passes to block 810, at which the monitor program examines a list of operating system entry points to determine if any have changed as a result of the instruction just emulated. This would indicate that the target program had replaced an interrupt handler with a routine of its own. If there is such a change, then it is logged at block 820. At block 820 a flag is also preferable set to indicate that the entry point has changed, so that the change will not be logged redundantly later. In some embodiments, the flag indicates the new value of the entry point, so the monitor program can determine if the entry point gets modified yet again.

After block 820, at block 830 the emulated instruction pointer, emulated code segment register, and emulated flag register are saved onto the emulated stack. Then the emulated stack pointer is decremented the corresponding 6 bytes, in the same manner as if a hardware interrupt had been received. Next, at block 840, the emulated code segment register and emulated instruction pointer are set to a special purpose monitor program routine to test the interrupt handler just installed by the target program. This interrupt handler testing routine is described below with reference to Fig. 9.

After block 840, execution passes to block 850, which returns control to the basic process of Fig. 5. This causes the interrupt handler routine of Fig. 9 to be emulated in the same step by step manner as the target program. This maintains the highest degree of encapsulation around the target program,

although if detecting viral replication is essentially the only concern, the interrupt handler testing routine of Fig. 9 may alternatively be executed in a more straightforward emulation without many of the execution safeguards described above.

If at block 810 the monitor program had determined that no operating system entry points had been changed, then control would have passed directly to block 850, and thus returned to the process of Fig. 5 to emulate the remainder of the target program.

Interrupt Handler Testing

The basic tack of the interrupt handler testing routine is to offer up a guinea pig file for "sacrifice" to a potential viral interrupt handler, and then test the guinea pig file for corruption. This requires that a "clean" guinea pig file already be at hand and also be disposable. This can be easily provided for by several methods, such as by creating the guinea pig file or copying the guinea pig file from a clean library copy at the very start of the monitor program. The guinea pig file should have a known content. It is preferably executable, but without its execution involving writing to other files. The guinea pig file can thus be essentially a null file that does nothing when executed, simply returning immediately.

As shown in Fig. 9, when the interrupt handler routine is entered at block 900, the first action is to open the guinea pig file, at block 910, after which the guinea pig file is closed at block 920. Next, at block 930 the interrupt handler testing routine examines the guinea pig file to determine if its content has been changed. Such would be the result of a virus having contaminated the interrupt handlers for opening or closing files. If a change is not detected at block 930, then at block 940 the guinea pig file is executed, after which at block 950 the guinea pig file is again examined by the interrupt handler testing routine to determine if its content has been changed by the execution interrupt handler.

If a positive determination had been made at either of blocks 930 or 950, then execution would pass from the respective block to block 960, at which the unauthorized access to the guinea pig file would be logged. After block 960, and also after a negative determination at block 950, execution passes to block 970, which executes an (emulated) IRET instruction. This is a return from interrupt instruction, which causes the values placed onto the emulated stack at block 830 of Fig. 8 to be restored to the emulated registers. This completes the interrupt handler testing, and returns the emulation to its last point of emulation in the target program.

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For a more refined and definitive degree of analysis, block 960 can also initiate a routine to determine not just if the guinea pig was contaminated, but if it was contaminated in a way so as to contaminate other files; i.e., if it was infected with viral replication behavior. Such a routine is illustrated in Fig. 10. The process of Fig. 10 essentially creates a completely new emulation, with the modified guinea pig file serving as the target program. If this first guinea pig file now passes modification behavior on to a second guinea pig file, then the original target program has been shown to be contaminated with viral code having replicative behavior. To prevent needless additional recursion, the second level of emulation should be identified as such, through use of a flag, etc., so that if block 960 is reached during the second level of emulation, viral behavior is confirmed and the second level of emulation is terminated (rather than beginning another level of testing with yet another guinea pig file).

This replication detection process is illustrated in Fig. 10. After beginning at block 1000, at block 1010 the complete state of the current emulation is saved, and all operating system entry points, etc., are returned to their values at the beginning of the first emulation. Block 1010 also then includes the step of initiating emulation again, but with the guinea pig file specified as the target program. As noted above, this emulation level should be flagged as a second level emulation.

Block 1020 indicates the point at which the emulation of the guinea pig file has terminated, after which at block 1040 the first level emulation determines if the emulated guinea pig file had written to a second guinea pig file. This determination is most straightforward if a flag is simply passed from the second level emulation back to the first; it can also be by examining a checksum for the file. If the determination is positive, then at block 1050 the initial target program is confirmed and logged as being virus-contaminated. At block 1060 at the end of the process of Fig. 10, control is passed back to block 970 of Fig. 9, to continue emulation of the initial target program. Alternatively, reaching block 1050 can result in the entire emulation being terminated, as the target program has been confirmed as being virus-contaminated.

Alternative Embodiments

Rather than requiring the user to load the monitor program which then loads the target program, a "zero length loader" TSR version could be installed in a system and every program requested to be executed could be emulated. If no abnormal behavior is found in the first 'n' instructions, the monitor program could pass control to the CPU to allow the

target to execute at "full speed" and the end user would not have to be aware of the existence of the monitor program (other than a slight delay during the initial execution).

Another alternative approach would be where a recursive parser/emulator could effectively evaluate every single instruction of executable code in a program by noting the address of conditional branch instructions, and returning to that branch location, restoring the cpu/memory state of the machine at that instant, and continuing emulation as if the branch had taken the alternate route instead. Emulation continues until all instructions have been evaluated. This would be a time consuming process; however, the information revealed would definitively answer the question of whether the original code was virus infected.

It is also important to note that, although the described embodiment is oriented towards identifying viral behavior, the disclosed emulation techniques can be constructively employed to emulate program execution in all types of situations where potentially destructive or other predetermined program behavior is a concern.

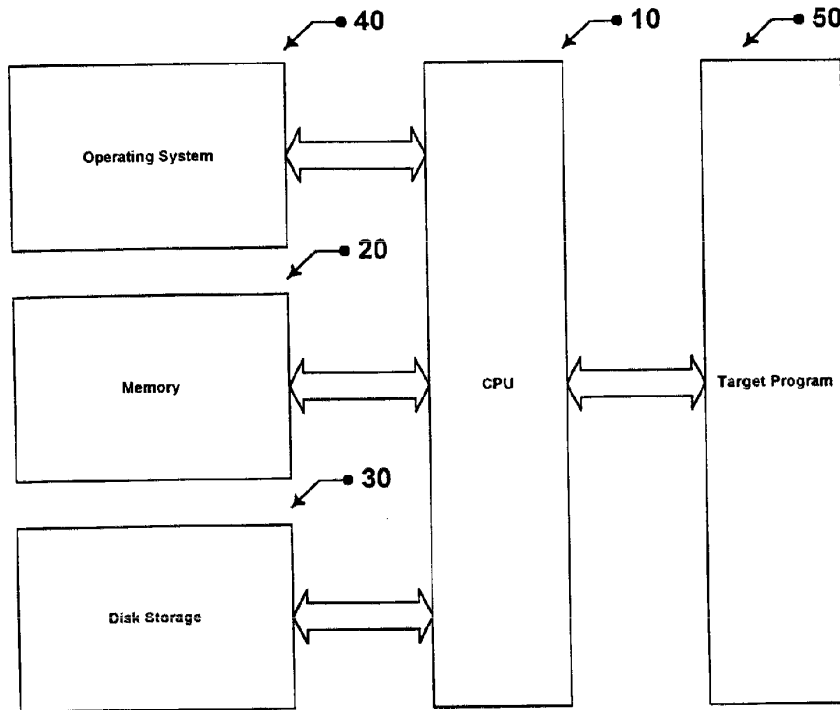
It is to be understood that the above description is intended to be illustrative and not restrictive. Many other embodiments will be apparent to those of skill in the art upon reviewing the above description. For instance, the instructions of the emulated application program could be read directly from disk storage rather than being loaded into memory first. The scope of the invention should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled.

Claims

1. A computer system configured to monitor the execution of a target program, said computer system comprising:
 - a processing unit having an instruction set;
 - instruction emulation means for emulating instructions in the target program corresponding to said instruction set;
 - monitor means, coupled to said instruction emulation means, for emulating execution of said target program and for monitoring said emulated target program execution to detect a predetermined behavior by said target program; and
 - means, coupled to said monitor means, for logging said predetermined behavior when detected.
2. The computer system of claim 1, wherein said computer system is configured to detect a computer virus associated with said target pro-

- gram, wherein said predetermined behavior is chosen to be indicative of replication of said computer virus.
- 3. The computer system of claim 1 wherein said instruction emulation means comprises:
 - a register emulator for emulating registers of said processing unit; and
 - a procedure controller for substituting emulation procedures for procedures accessed by said target program during emulation.
 - 4. The computer system of claim 1 wherein said instruction emulation means comprises:
 - a memory access controller for controlling access by said instructions to memory.
 - 5. In a computer system, a method for monitoring execution of a target program comprising the steps of:
 - emulating the target program; and
 - monitoring emulation of the target program to detect a predetermined behavior indicating presence of a computer virus.
 - 6. A computer system configured to monitor the execution of a target program, said computer system comprising:
 - a processing unit having an instruction set;
 - an instruction emulator for emulating instructions corresponding to the instruction set;
 - an entry point access controller for controlling access to operating system entry points; and
 - a logger for logging improper access by said instructions to operating system entry points.
 - 7. The computer system of claim 6 further comprising a procedure access controller for controlling access to procedures during instruction emulation, wherein said logger logs improper access by said instructions to procedures.
 - 8. The computer system of claim 6 further comprising a memory access controller for controlling access by said instructions to memory during instruction emulation wherein said logger logs improper access by said instructions to memory.
 - 9. The computer system of claim 6 wherein said entry point access controller includes an interrupt tester for checking if a viral interrupt has been installed.

- 10. The computer system of claim 9 wherein said interrupt tester executes a guinea pig file and tests for modification of the guinea pig file to determine if a viral interrupt has been installed.
- 11. The computer system of claim 9 wherein said interrupt tester opens and closes a guinea pig file and tests for modification of the guinea pig file to determine if a viral interrupt has been installed.
- 12. The computer system of claim 10 wherein said interrupt tester executes the guinea pig file as a new target program, thereby creating a second guinea pig file, and tests for modification of the second guinea pig file to determine if a replicative viral interrupt has been installed.



**Figure 1A
(Prior Art)**

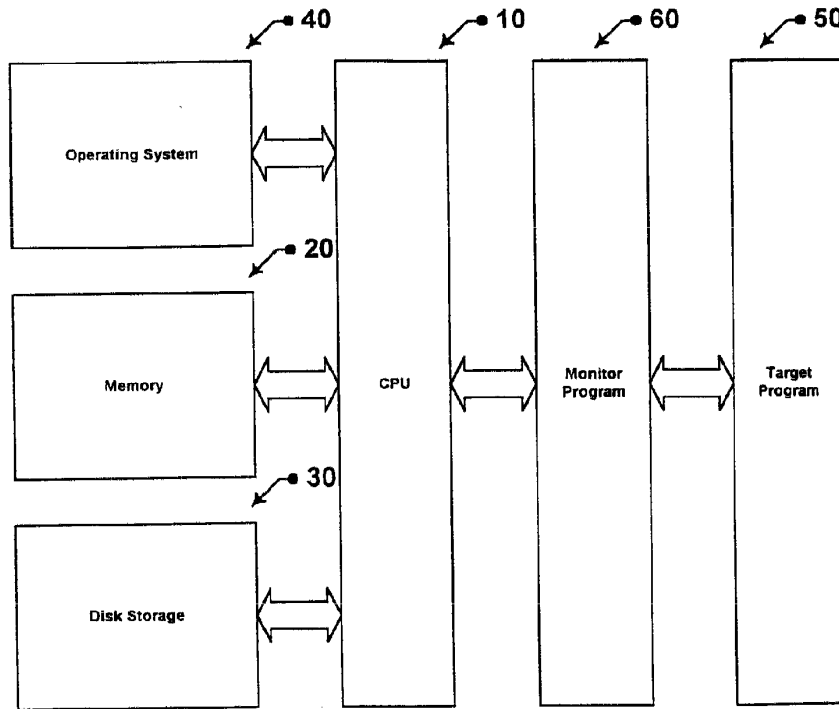
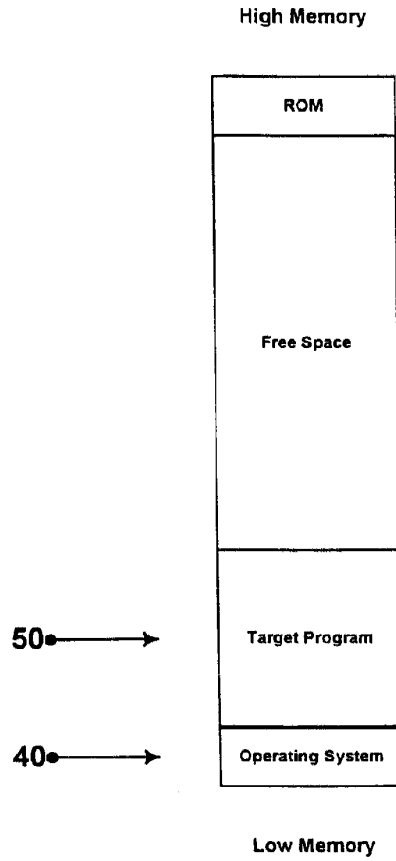


Figure 1B



**Figure 2A
(Prior Art)**

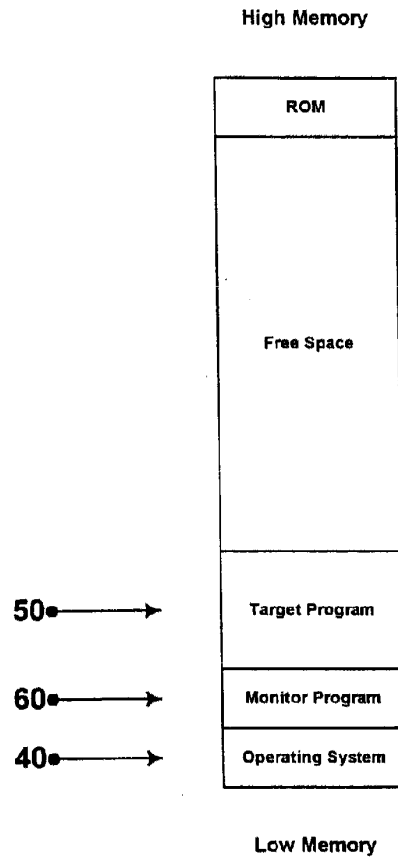
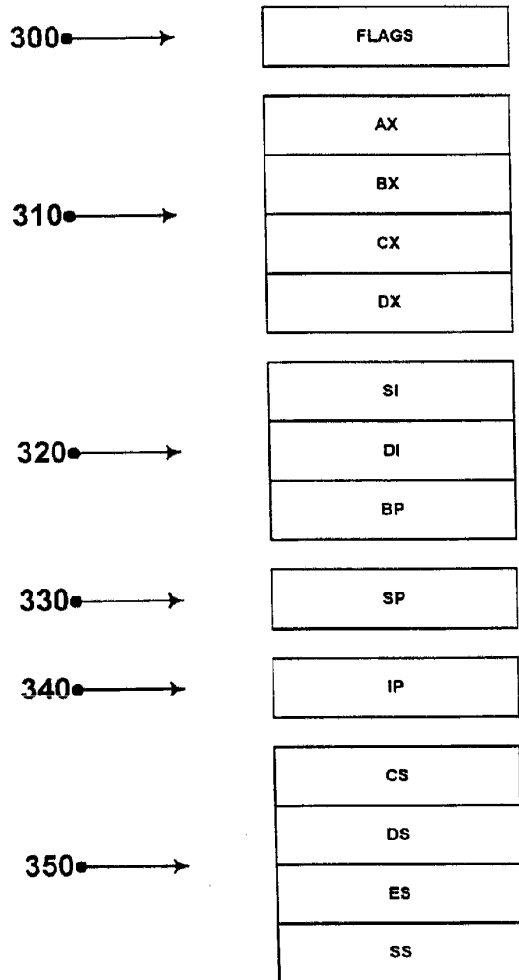
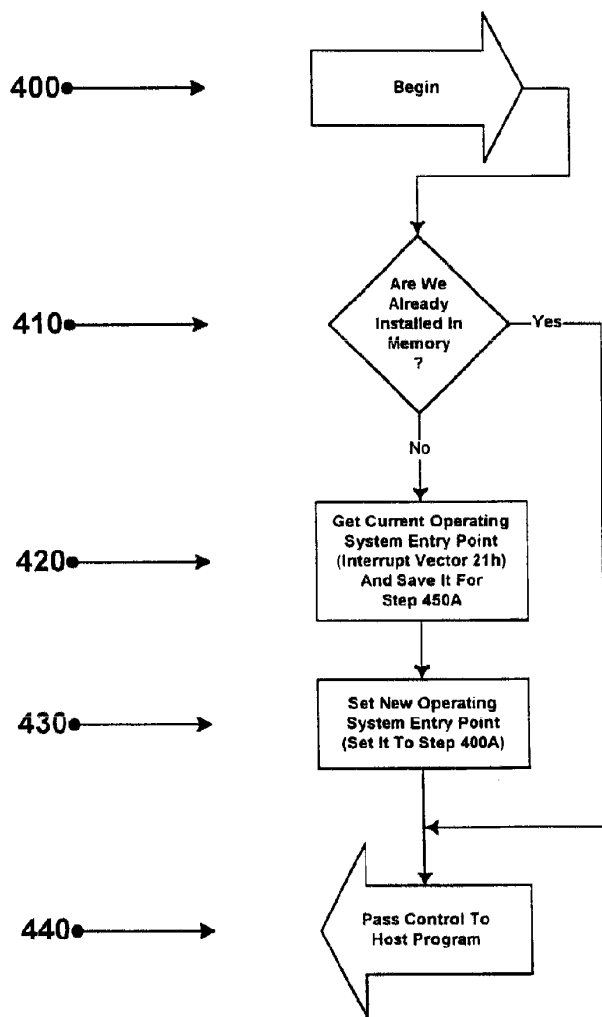


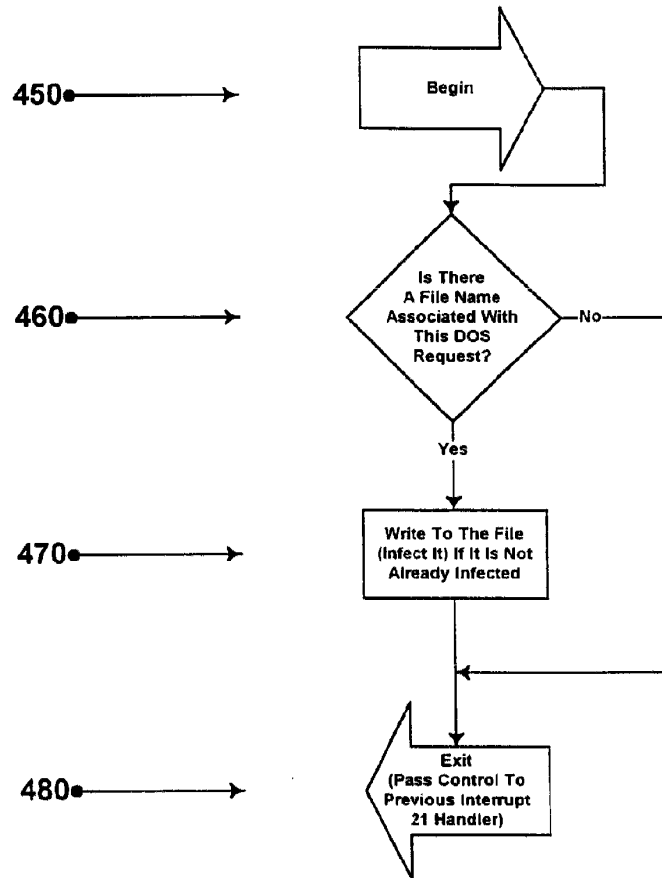
Figure 2B



**Figure 3
(Prior Art)**



**Figure 4A
(Prior Art)**



**Figure 4B
(Prior Art)**

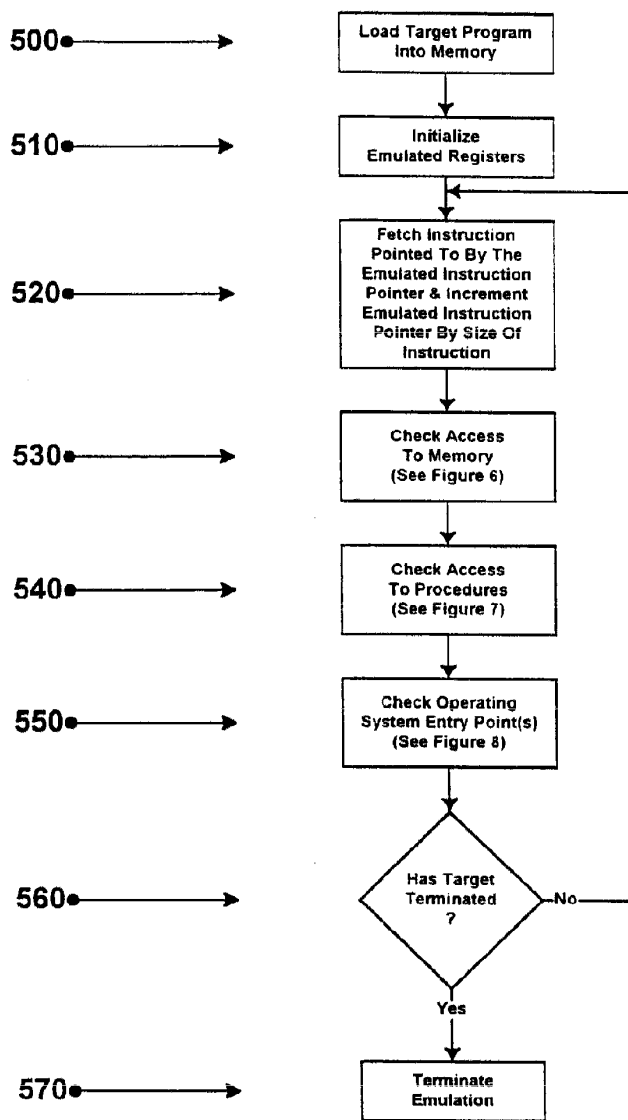


Figure 5

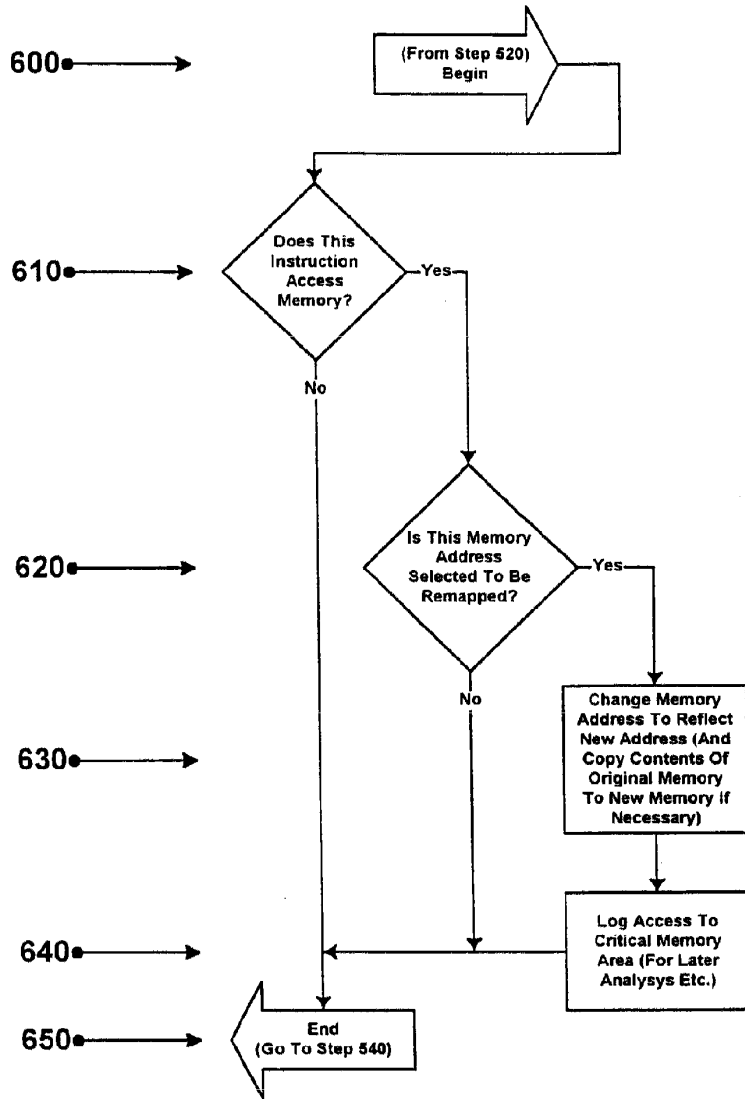


Figure 6

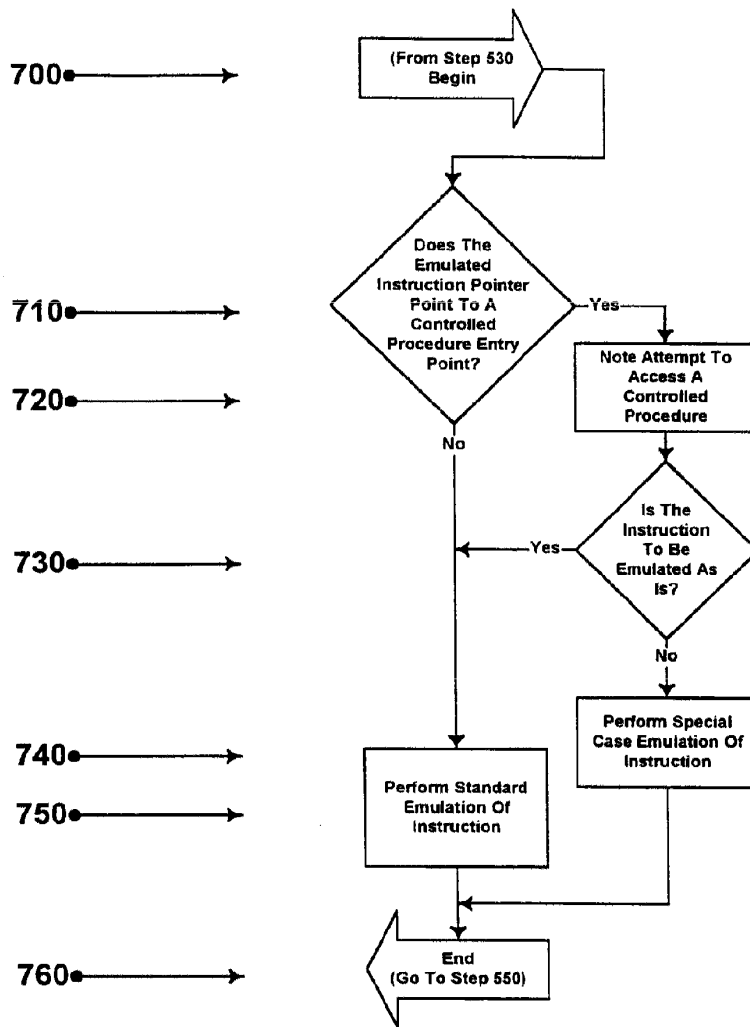


Figure 7

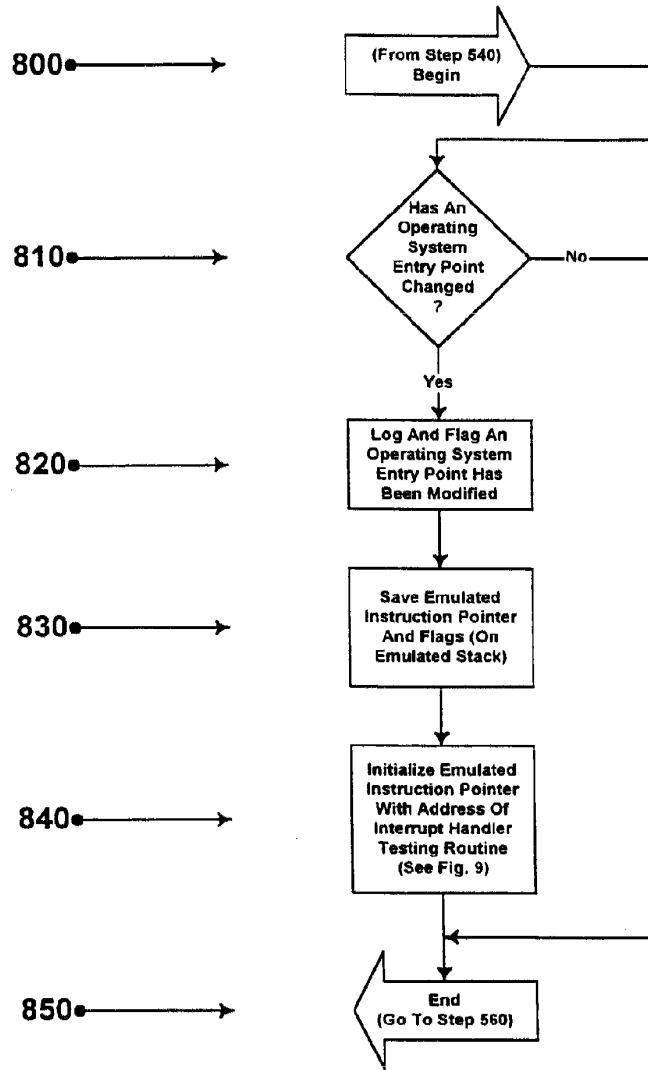


Figure 8

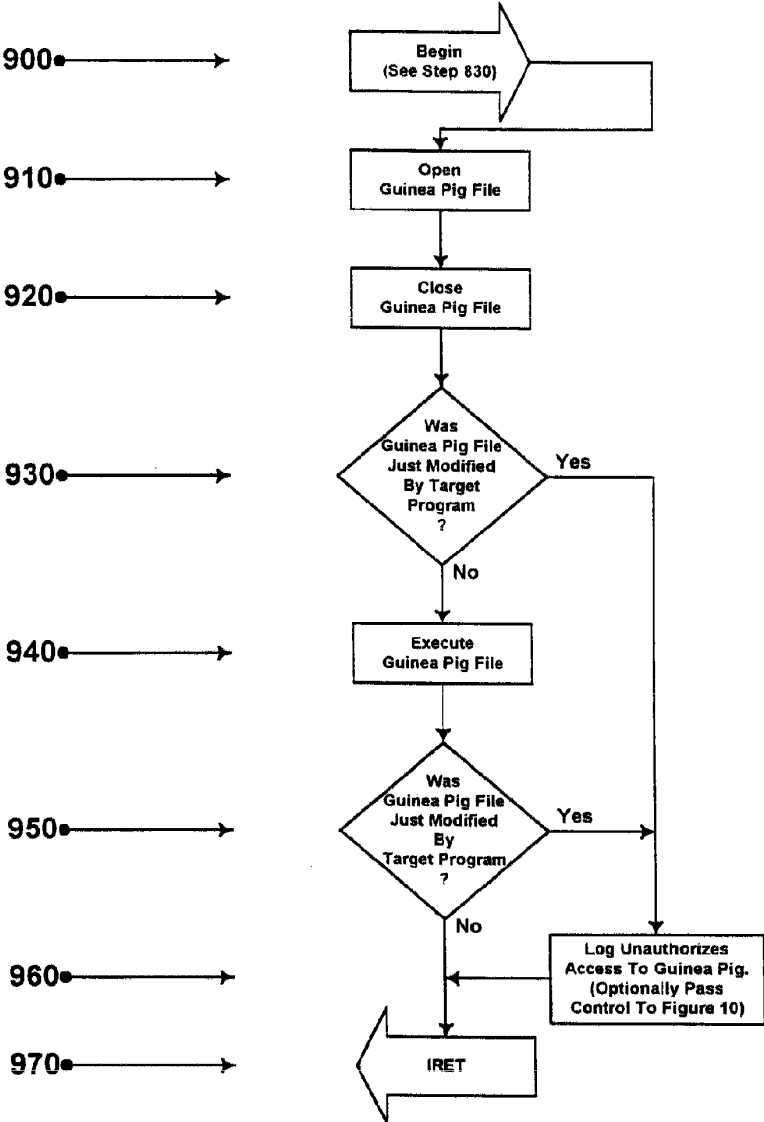


Figure 9

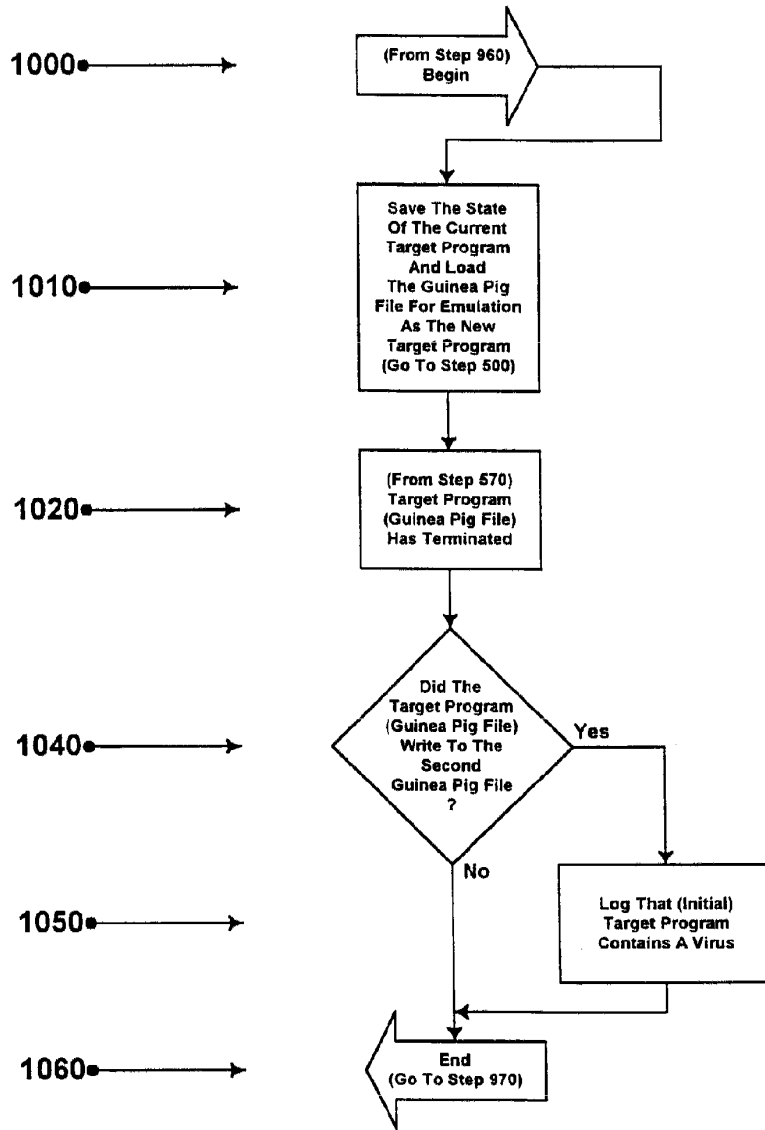


Figure 10

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
29 July 2004 (29.07.2004)

PCT

(10) International Publication Number
WO 2004/063948 A1

(51) International Patent Classification⁷: G06F 17/30

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(21) International Application Number:
PCT/US2004/000409

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(22) International Filing Date: 9 January 2004 (09.01.2004)

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/438,847 9 January 2003 (09.01.2003) US
10/755,188 8 January 2004 (08.01.2004) US

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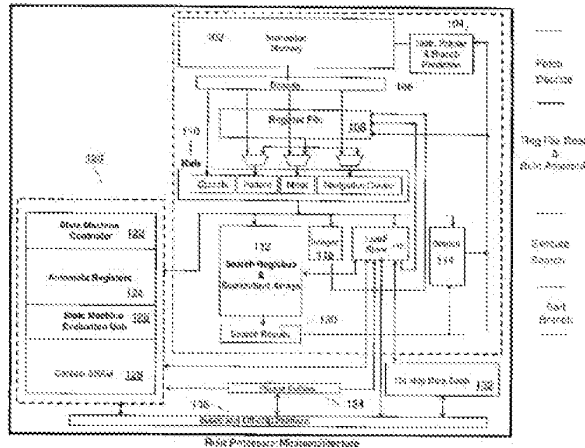
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(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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(54) Title: A PROGRAMMABLE PROCESSOR APPARATUS INTEGRATING DEDICATED SEARCH REGISTERS AND DEDICATED STATE MACHINE REGISTERS WITH ASSOCIATED EXECUTION HARDWARE TO SUPPORT RAPID APPLICATION OF RULESETS TO DATA



(57) Abstract: A rule processor and method for using the same are disclosed. In one embodiment, the rule processor comprises a general purpose register file, an instruction sequencer to provide instructions, a decoder coupled to the general purpose register file to decode a set of instructions specified by the instruction sequencer, and a state machine unit coupled to the decoder and having state machine registers to store one or more state machines and state machine execution hardware coupled to the state machine registers to evaluate the one or more state machines in response to executing one or more of the set of instructions and based on information from one or both of the decoder and the general purpose register file.

WO 2004/063948 A1



Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

**A PROGRAMMABLE PROCESSOR APPARATUS INTEGRATING
DEDICATED SEARCH REGISTERS AND DEDICATED STATE MACHINE
REGISTERS WITH ASSOCIATED EXECUTION HARDWARE TO
SUPPORT RAPID APPLICATION OF RULESETS TO DATA**

[0001] This application is a non-provisional application of U.S. Provisional Patent Application Serial No. 60/438,847, filed January 9, 2003, which is incorporated herein by reference.

RELATED APPLICATIONS

[0002] The present application is related to U.S. Patent Application No. 10/650,363 entitled "Programmable Rule Processing Apparatus for Conducting High Speed Contextual Searches and Characterizations of Patterns in Data," filed on August, 27, 2003; U.S. Patent Application No. 10/650,364 entitled "Method and Apparatus for Efficient Implementation and Evaluation of State Machines and Programmable Finite State Automata," filed on August, 27, 2003; and U.S. Patent Application No. _____ entitled "_____" concurrently filed with this application, the entire contents of which are hereby incorporated by reference.

FIELD OF THE INVENTION

[0003] The present invention relates to the field of information processing, specifically the field of content analytics and processing.

BACKGROUND OF THE INVENTION

[0004] Significant trends in computing and communications are leading to the emergence of environments that abound in content analytics and processing. These environments require high performance as well as programmability on a certain class of functions, namely searching, parsing, analysis, interpretation, and transformation of content in messages, documents, or packets. Notable fields that stress such rich content analytics and processing include content-aware networking, content-based security systems, surveillance, distributed computing, wireless communication, human interfaces to computers, information storage and retrieval systems, content search on the semantic web, bio-informatics, and others.

[0005] The field of content-aware networking requires searching and inspection of the content inside packets or messages in order to determine where to route or forward such packages and messages. Such inspection has to be performed on in-flight messages at "wire-speed", which is the data-rate of the network connection. Given that wire rates in contemporary networks range from 100Mbits/second all the way to 40Gbits/second, there is tremendous pressure on the speed at which the content inspection function needs to be performed.

[0006] Content-based security systems and surveillance and monitoring systems are required to analyze the content of messages or packets and apply a set of rules to determine whether there is a security breach or the possibility of an intrusion. Typically, on modern network intrusion detection systems (NIDS), a large number of patterns, rules, and expressions have to be applied to the input payload at wire speed to ensure that all potential system vulnerabilities are uncovered. Given that the network and computing infrastructure is continuously evolving, fresh vulnerabilities continue to arise. Moreover, increasingly sophisticated attacks are employed by intruders in order to evade detection. Intrusion detection systems need to be able to detect all known attacks on the system, and also be intelligent enough to detect unusual and suspicious behavior that is indicative of new attacks. All these factors lead to a requirement for both programmability as well as extremely high performance on content analysis and processing.

[0007] With the advent of distributed and clustered computing, tasks are now distributed to multiple computers or servers that collaborate and communicate with one another to complete the composite job. This distribution leads to a rapid increase in computer communication, requiring high performance on such message processing. With the emergence of XML (Extensible Markup Language) as the new standard for universal data interchange, applications communicate with one another using XML as the "application layer data transport". Messages and documents are now embedded in XML markup. All message processing first requires that the XML document be parsed and the relevant content extracted and interpreted, followed by any required transformation and filtering. Since these functions need to be performed at a high message rate, they become computationally very demanding.

[0008] With the growth of untethered communication and wireless networks, there is an increase in the access of information from the wireless device. Given the light form factor of the client device, it is important that data delivered to this device be filtered and the payload be kept small. Environments of the future will filter and transform XML content from the wireline infrastructure into lightweight content (using the Wireless Markup Language or WML) on the wireless infrastructure. With the increasing use of wireless networks, this content transformation function will be so common that an efficient solution for it's handling will be needed.

[0009] Another important emerging need is the ability to communicate and interact with computers using human interfaces such as speech. Speech processing and natural language processing is extremely intensive in content searching, lexical analysis, content parsing, and grammar processing. Once a voice stream has been transduced into text, speech systems need to apply large vocabularies as well as syntactic and semantic rules on the incoming text stream to understand the speech.

[0010] The emergence and growth of the worldwide web has placed tremendous computational load on information retrieval (IR) systems. Information continues to be added to the web at a high rate. This information typically gets fully indexed against an exhaustive vocabulary of words and is added to databases of search engines and IR systems. Since information is continuously being created and added, indexers need to be "always-on". In order to provide efficient real-time contextual search, it is necessary that there be a high performance pattern-matching system for the indexing function.

[0011] Another field that stresses rich content analytics and processing is the field of bio-informatics. Gene analytics and proteomics entail the application of complex search and analysis algorithms on gene sequences and structures. Once again, such computation requires high performance search, analysis, and interpretation capability.

[0012] Thus, emerging computer and communications environments of the future will stress rich analysis and processing of content. Such environments will need efficient and programmable solutions for the following functions - searching, lexical analysis, parsing, characterization, interpretation, filtering and transformation of content in documents, messages, or packets.

[0013] Central to these rich content processing functions are (1) operations to perform contextual and content-based search, lookup, navigation, and rich associative lookup, and (2) the capability to efficiently evaluate state machines against an input data stream.

[0014] In the prior art, search and lookup processing has typically has been performed in one of two ways. First, such processing has been performed using fixed application specific integrated circuits (ASIC) solutions using a combination of content addressable memories (CAMs), comparator hardware and dedicated logic. For example, search rules are stored in a content-addressable memory, and the data is streamed across the structure, shifting it 1 byte or 1 word at a time. Alternatively, specific comparators are arranged at fixed locations to recognize specific values in the incoming data. Incidences of matches are recorded and consumed by the dedicated logic as per the requirements of the target application. Although the fixed ASIC approach can increase performance, it lacks easy programmability, and hence its application is severely restricted. Furthermore, the expense associated with designing and tailoring specific chips for each targeted solution is prohibitive.

[0015] Second, traditional general-purpose microprocessors with general-purpose execution datapaths have been used to handle rich search and lookup functions and associated content processing. Microprocessors are fully programmable devices and are able to address the evolving needs of problems -- by simply reprogramming the software the new functionality can be redeployed. However, the traditional microprocessor is limited in the performance level it can offer to rich content analytics and processing.

[0016] The limitation in performance on content analytics is inherent in the design and evolution of the microprocessor architecture. The microprocessor originated as a computing unit, performing arithmetic operations on 1,2,4,8 byte words. Subsequently, as the field of computing evolved, more functionality was progressively added to the microprocessor to address emerging fields. As a result, the general purpose microprocessor is functional across a very wide range of applications, but not very well tuned for any one in particular. Fundamentally, as it applies to the needs of content analytics, the microprocessor architecture has two key limitations -- (1) it lacks the capability to simultaneously perform massively parallel and fine-grain

pattern-matching and comparison operations on large datasets, and (2) it lacks the capability to make rapid and multiple state transitions and efficient multi-directional control flow changes based on input data.

[0017] A number of search and pattern matching algorithms have evolved to make best use of the microprocessor. The Boyer-Moore algorithm is widely regarded as one of the best-known techniques employed on a microprocessor to find occurrences of patterns in a given data set. The algorithm processes only one pattern at a time and must be repeatedly invoked if more than one pattern is to be searched in a data set. For each pattern to be searched, it advances sequentially through the data set making selective comparisons based on observations obtained from pre-characterizing the pattern. This algorithm provides superior performance relative to other pattern matching algorithms by reducing the total number of comparisons within a given data set. However, due to the sequential nature of the algorithm, the performance is limited by fundamental constraints of microprocessor architecture, namely the scalar instruction set and the penalty incurred on branching.

[0018] Owing to the aforementioned architectural limitations of the microprocessor, the efficiency and capability of conventional microprocessors are severely challenged by the emerging computing and communications environments described earlier. Several data points can be provided to support these arguments. For example, in a Network Intrusion Detection System (NIDS) such as Snort, it is already desirable to apply signature detection of hundreds of strings on incoming packets. Performing this workload with signatures of 8-byte patterns on a 3GHz Pentium IV processor in a commercial microprocessor-based system that employs an improved version of the Boyer-Moore pattern matching algorithm limits the packet rate to less than 50Mbps. Likewise, parsing of XML documents on such a platform is limited to the 10MB/s range, and speech processing is limited to 1 real-time stream on restricted grammars and vocabularies. These data points indicate that the conventional microprocessor of 2003 or 2004 will be able to deliver rich content analytics and processing at rates around the 100Mbps range. However, by that timeframe, data rates of between 1Gbps to 10Gbps will not be uncommon in enterprise networks and environments. Clearly, there is a severe mismatch of one to two orders of magnitude between the performance that can be delivered by the conventional microprocessor and that which

is demanded by the environment. While it is possible to employ multiple parallel microprocessor systems to execute some of the desired functions at the target rate, this greatly increases the cost of the system. There is clearly a need for a more efficient solution for these target functions.

[0019] A similar parallel exists in the case of state machine evaluation. The history of state machines dates back to early computer science. In their simplest formulation, state machines are formal models that consist of states, transitions amongst states, and an input representation. Starting with Turing's model of algorithmic computation (1936), state machines have been central to the theory of computation. In the 1950s, the regular expression was developed by Kleene as a formal notation to describe and characterize sets of strings. The finite state automaton was developed as a state machine model that was found to be equivalent to the regular expression. Non-deterministic automata were subsequently developed and proven to be equivalent to deterministic automata. Subsequent work by Thompson and others led to a body of construction algorithms for constructing finite state automata to evaluate regular expressions. A large number of references are available for descriptions of Regular Expressions and Finite State Automata. For a reference text on the material, see "Speech and Language Processing" (by Daniel Jurafsky and James H. Martin, Prentice-Hall Inc, 2000).

[0020] Using techniques available in the prior art, state machine and finite state automata processing can be performed in one of three ways. First, such processing has been performed using fixed application specific integrated circuits (ASIC) solutions that directly implement a fixed and chosen state machine that is known a priori. Although the fixed ASIC approach can increase performance, it lacks programmability, and hence its application is severely restricted. Furthermore, the expense associated with designing and tailoring specific chips for each targeted solution is prohibitive.

[0021] Second, Field Programmable Gate Arrays (FPGA) can be used to realize state machines in a programmable manner. Essentially, the FPGA architecture provides generalized programmable logic that can be configured for a broad range of applications, rather than being specially optimized for the implementation of state machines. Using this approach, one can only accommodate a small number of state

machines on a chip, and furthermore the rate at which evaluation can progress is limited. The density and performance characteristics of the implementations make this choice of solution inadequate for the broad range of emerging applications.

[0022] Third, traditional general-purpose microprocessors have been used to implement a variety of state machines. Microprocessors are fully programmable devices and are able to address the evolving needs of problems – by simply reprogramming the software the new functionality can be redeployed. However, the traditional microprocessor is limited in the efficiency with which it can implement and evaluate state machines.

[0023] There is a need for a new solution for a programmable processing apparatus that is more suitable for content analytics and processing, and that is efficient on a set of functions that include state machine evaluation as well as the execution of operations for contextual search, lexical analysis, parsing, interpretation, and transformation of content on messages, packets, or documents.

SUMMARY OF THE INVENTION

[0024] A rule processor and method for using the same are disclosed. In one embodiment, the rule processor comprises a general purpose register file, an instruction sequencer to provide instructions, a decoder coupled to the general purpose register file to decode a set of instructions specified by the instruction sequencer, and a state machine unit coupled to the decoder and having state machine registers to store one or more state machines and state machine execution hardware coupled to the state machine registers to evaluate the one or more state machines in response to executing one or more of the set of instructions and based on information from one or both of the decoder and the general purpose register file.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] The present invention will be understood more fully from the detailed description given below and from the accompanying drawings of various embodiments of the invention, which, however, should not be taken to limit the invention to the specific embodiments, but are for explanation and understanding only.

[0026] **Figure 1** is a block diagram of a rule processor.

[0027] **Figure 2** is an example of the use of one embodiment of a rule processor.

[0028] **Figure 3** illustrates interfaces of one embodiment of a rule processor.

[0029] **Figure 4** is a block diagram of one embodiment of a line card with a look-aside configuration.

[0030] **Figure 5** is a block diagram of one embodiment of a line card with a flow-through configuration.

[0031] **Figure 6** is a block diagram of one embodiment of a server co-processor configuration.

[0032] **Figure 7** is a block diagram of one embodiment of a rule processor with a search apparatus.

[0033] **Figure 8A** is a block diagram of one embodiment of a search register and the search execution hardware.

[0034] **Figure 8B** is a block diagram of one embodiment of a search array.

[0035] **Figure 9A** is a block diagram of one embodiment of a sorter.

[0036] **Figure 9B** is a block diagram of one embodiment of a range select mechanism in a sorter.

[0037] **Figure 10** is a circuit schematic of one embodiment of a search array.

[0038] **Figure 11** illustrates an exemplary micro-architecture of a rule processor comprising of four processing stages.

[0039] **Figure 12** illustrates an example pseudo-code of a complex pattern matching rule-set and the corresponding micro-code for an exemplary rule-processor.

[0040] **Figure 13** illustrates the clock-by-clock pipelined execution of the micro-code shown in Figure 12.

[0041] **Figure 14** illustrates a basic state machine evaluation building block or finite state automata building block (FSA building block) from a programming perspective in accordance with one embodiment of the invention.

[0042] **Figure 15** illustrates a logic circuit for implementing an FSA building block in accordance with one embodiment of the invention.

[0043] **Figure 16** illustrates an FSA building block in which a number of features have been implemented to provide additional functionality in accordance with one embodiment of the invention.

[0044] **Figure 17** illustrates an on-chip state machine unit, referred to as a RE processor, in accordance with one embodiment of the invention.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

[0045] A programmable rule processor apparatus integrating dedicated search registers and dedicated state machine registers with execution hardware to support rapid application of rulesets and gramunars to data is described. Such a processor may be used for content analysis and searches. In one embodiment, the programmable rule processor includes portions or apparatus typically found in a general purpose processor along with search registers coupled with a search/parse execution array and also state machine registers coupled with state machine evaluation units. The portions of a general purpose processor may includes the use of an instruction (or rule) memory, instruction pointer and instruction sequencer, as well as a decoder and general purpose register file. Other portions may be used and will be described in more detail below.

[0046] In one embodiment, the search registers store data or content in an array and the general purpose processor front end presents rules to the array for executing searches. The content may be a packet, stream, message or a document. The search registers and search/parse execution array allow for parallel and recursive sequencing of rules against the content payload, as well as parallel pattern matching capability and the capability of making multiple rapid content-based state transitions. Operations such as, for example, pattern matching, lexical analysis, parsing and interpretation functions, may be performed.

[0047] In contrast, in one embodiment, the state machine registers and state machine evaluation engines operate in an inverse fashion by storing rules programmed into the state machine registers and by streaming data through them. Note that for the discussion herein the terms state machine registers, automata registers and expression registers may be used interchangeably.

[0048] The coupling of the search registers and the search/parse array with the state machine registers and evaluation logic using a generalized sequencer and an instruction set format provide for a powerful programmable rule processor that accelerates rule-processing functions through dedicated and tailored hardware, and that allows a rich mix of operations to be performed in a single integrated processor apparatus.. By integrating dedicated search registers and associated search/parse execution hardware with the general purpose processor apparatus, the associative

search and lookup functionality can be accelerated efficiently, and yet a rich mix of general purpose operations can be simultaneously performed. Likewise, by integrating state machine registers and associated state machine execution hardware with the general purpose processor apparatus, the state machine evaluation functionality can be accelerated, and simultaneously, a rich mix of general purpose functions can be performed on the data. The integration of all three pieces of apparatus – search registers and search execution hardware, state machine registers and state machine evaluation hardware, and general purpose processor hardware, yields a powerful programmable rule processor solution. Data can be fed into the rule processor and a mix of search functions, state machine evaluation functions as well as general purpose programming functions can be simultaneously performed. The state machine hardware and the search hardware can be viewed as another dedicated resource in the rule processor. A variety of operations can be performed on the data, which can be both analyzed and transformed progressively. In one embodiment, the various functional operations that can be performed in this rule processor can be performed in any sequence or order, and also in parallel, leading to accelerated content analysis and transformation capability.

[0049] Some portions of the detailed descriptions that follow are presented in terms of algorithms and symbolic representations of operations on data bits within a computer memory. These algorithmic descriptions and representations are the means used by those skilled in the data processing arts to most effectively convey the substance of their work to others skilled in the art. An algorithm is here, and generally, conceived to be a self-consistent sequence of steps leading to a desired result. The steps are those requiring physical manipulations of physical quantities. Usually, though not necessarily, these quantities take the form of electrical or magnetic signals capable of being stored, transferred, combined, compared, and otherwise manipulated. It has proven convenient at times, principally for reasons of common usage, to refer to these signals as bits, values, elements, symbols, characters, terms, numbers, or the like.

[0050] It should be borne in mind, however, that all of these and similar terms are to be associated with the appropriate physical quantities and are merely convenient labels applied to these quantities. Unless specifically stated otherwise as apparent from the following discussion, it is appreciated that throughout the description,

discussions utilizing terms such as "processing" or "computing" or "calculating" or "determining" or "displaying" or the like, refer to the action and processes of a computer system, or similar electronic computing device, that manipulates and transforms data represented as physical (electronic) quantities within the computer system's registers and memories into other data similarly represented as physical quantities within the computer system memories or registers or other such information storage, transmission or display devices.

[0051] The present invention also relates to apparatus for performing the operations herein. This apparatus may be specially constructed for the required purposes, or it may comprise a general purpose computer selectively activated or reconfigured by a computer program stored in the computer. Such a computer program may be stored in a computer readable storage medium, such as, but is not limited to, any type of disk including floppy disks, optical disks, CD-ROMs, and magnetic-optical disks, read-only memories (ROMs), random access memories (RAMs), EPROMs, EEPROMs, magnetic or optical cards, or any type of media suitable for storing electronic instructions, and each coupled to a computer system bus.

[0052] The algorithms and displays presented herein are not inherently related to any particular computer or other apparatus. Various general purpose systems may be used with programs in accordance with the teachings herein, or it may prove convenient to construct more specialized apparatus to perform the required method steps. The required structure for a variety of these systems will appear from the description below. In addition, the present invention is not described with reference to any particular programming language. It will be appreciated that a variety of programming languages may be used to implement the teachings of the invention as described herein.

[0053] A machine-readable medium includes any mechanism for storing or transmitting information in a form readable by a machine (e.g., a computer). For example, a machine-readable medium includes read only memory ("ROM"); random access memory ("RAM"); magnetic disk storage media; optical storage media; flash memory devices; electrical, optical, acoustical or other form of propagated signals (e.g., carrier waves, infrared signals, digital signals, etc.); etc.

Overview

[0054] A programmable rule processor is disclosed that comprises a general purpose processor portion having general purpose registers, a general purpose execution data path attached thereto, and an instruction sequencer. The general purpose processor portion is tightly coupled with search registers with search execution units and state machine registers with state machine execution units. Together the search registers with search execution units and together the state machine recognition units the state machine execution units may each be considered processor execution units much like a floating point unit and an integer unit are execution units in a general purpose processor. Based on the type of instruction (e.g., opcode), a decoder in the general purpose processor portion is able to direct instructions to either of these execution blocks.

[0055] The general purpose processor portion feeds data and rules to the search registers and the state machine registers and is able to receive results from either one and supply them to the other or to both. That is, the general purpose processor portion is integrated with the search registers and the state machine registers such that the general purpose processor portion can access all the data in the search registers and the state machine registers, as well as move data between the search registers, and the state machine register, and the general purpose registers.

[0056] The general purpose processor portion also includes a (rule) instruction memory to store instructions, a instruction sequencer, including an instruction pointer, to sequence through a set of instructions stored in the instruction memory, a decoder to decode each instruction. The decoder is able to examine the instructions fed to it and to obtain search parameters and operands or retrieve indexes to locations in a general purpose register file that store such parameters and operands. Thus, the decoder decodes the instructions and then assembles the operands and parameters and prepares the rules that will be presented to the various rule processing execution units.

[0057] Figure 1 is a block diagram of one embodiment of a programmable rule processor. The programmable rule processor integrates traditional microprocessor capability with grammar processing, expression processing and string matching capabilities. Simple string matching is provided by search registers and a search/parse array that search for a set of bytes. The expression processing is

provided by state machine hardware that detects and processes combinations of multiple strings and operators. The grammar processing is achieved by the combined use of these two pieces of specialized hardware along with the general purpose processor to perform contextual and progressive parsing by applying a tree of rules and expressions, resulting in a contextual search with complex control flow.

[0058] Thus, the programmable processor of the present invention integrates parallel pattern matching, contextual search, navigation and progressive rule analysis, state machine hardware and elements of a conventional processor (e.g., integer, load/store, associative lookup, branching).

[0059] Referring to Figure 1, the instructions are stored in an instruction memory 102. Instructions are selected by flow control using an instruction fetch pointer and branch prediction unit 104. The instruction pointer points to locations in instruction memory 102 from which instructions are to be fetched. This occurs during the fetch stage of the hardware pipeline. Instruction fetch pointer and branch prediction unit 104 operate in a manner well known in the art to sequence instructions to decoder 106.

[0060] Decoder 106 reads and decodes instructions during a decoding stage. As far as decoded instructions for rule processing by the search registers and search hardware is concerned, the results from decoder 106 include an identification of the opcode, pattern, mask and navigation control (e.g., windows of where to begin and end searching) for each rule, such as instruction 110, or an indication of where in the general purpose register file 108 such information is stored. The instruction format is expanded to specify rules for searching and analysis of data. Note that other instruction formats may be used. After reading from register file 108, the values can be used to incorporate or write specific values into various fields of a rule that is being assembled.

[0061] As far as decoded instructions for rule processing by the state machine apparatus is concerned, the results from the decoder include an identification of the opcode, the input data values or a pointer to where the data values reside (either in general purpose register 108, or in packet buffers 134, or in an external address), as well as a code or indication as to which of state machine registers 124 and state machine units need to be invoked.

[0062] Next, the parameters of each instruction are supplied by decoder 106 to state machine unit 120, search registers & search/sort arrays 112, integer (or other arithmetic logic unit (ALU)) unit 118, load/store unit 116, and branch unit 114. In another embodiment, this is done with an instruction sequencer unit, which acts both as an instruction sequencer and a decoder.

[0063] Load/store unit 116 loads values into or stores values from the search registers as well as state machine registers 124 as well as streams data into the state machine unit 120.

[0064] The instructions may specify rules for searching and analysis of data. In such a case, the rule is presented to the search registers of search registers & search/sort arrays 112. The search execution hardware finds the specified pattern in the search registers, if it exists. Sort array sorts and delivers the desired match location and match results and completes execution of the search(es). Results of the searching are sent to search results storage 130.

[0065] More specifically, search registers & search/sort arrays 112 comprises search register and a sorter. These will be described in more detail below. The search register stores searchable data, which may be content from a document, message, packet, or any other well-known source of data that can undergo searching. The size of the search register may be arbitrary, and in one embodiment is organized within a larger array, called a search array having multiple rows of a predetermined number of bytes each. Data from search register is stored in a replicated manner inside the search array. Irrespective of the manner in which the searchable data is organized throughout the search array, the search array receives a pattern and mask from rule 110. The pattern is compared against entries in the search array. The mask provides an indication of those bytes in the pattern that are not part of the pattern being searched. In one embodiment, the search array has an output line for each of the rows in the search array indicating whether the pattern being searched matched that content data stored in that particular row. The output lines of the search array are coupled to inputs of the sorter.

[0066] The sorter receives offsets that indicate a starting and ending point, respectively, of a range in the search register that is to be searched. Based on the match indication lines from the search array and the start and end range as specified

by the offsets, the sorter processes the results of the search array. Such processing may include performing one or more operations. These operations may be index resolution functions that output a specific match index pursuant to the type of operation. In one embodiment, the operations include Find_First_Forward, Find_First_Reverse and Find_Population_Count. The operations are specified by the opcode in search instruction 110. The sorter may store intermediate or final results of previous operations that may be used in subsequent operations in conjunction with the match indication lines from the search array. In this manner, the sorter may be used to progressively navigate through the searchable data set by issuing a series of operations that utilize the results of previous operations. Thus, after processing, the sorter generates outputs indicating whether there is a match, and an index associated with the match. The index may indicate the location (address) in the search register where the first match occurs or where the last match occurs with respect to the top of the search register. Alternatively, the index may indicate the number of matches that occurred within the range specified by offsets.

[0067] Following the computation of the outputs, namely, the match indication and the index, they may be utilized to control the execution of one or more search instructions that follow by storing the outputs in general-purpose registers and utilizing indirect specification in subsequent instructions, branching to a specified address in the instruction memory (e.g., instruction memory 102) dependent on the match indication or other similar techniques. For example, the search results in search results storage 130 can be made available for branching via branch unit 114, which causes branching based on those results, or to instruction pointer & branch prediction unit 104 for changing values of the instruction pointer and determining a new set of rules that are to be executed by the rule processor. Note that the branch unit 114 may branch based on a value specified in a rule or opcode field, which branch unit 114 receives after decoding. Branch unit 114 operates in a manner well-known in the art and is described in greater detail below.

[0068] Additionally, the sorter may also be coupled to a register file for storage of results of previous operations for use in subsequent operations that may be executed after an arbitrary number of other operations have been executed. The results of the

sorter may also be coupled to the rule processor instruction sequencer 104 to generate or assist in the generation of rule program offsets (e.g., branch addresses).

[0069] Alternatively, the instructions may specify rules for expression processing or state machine evaluation. Such an instruction may indicate that the state machine unit is to be invoked, what state machines are to be tested and what data is to be streamed or input to those state machines. In such a case, state machine unit 120 performs the expression processing in response to the instructions. State machine controller 122 controls state machine registers 124 based on state machine configuration information. State machine configuration information may be received by state machine unit 120 via load/store unit 116, packet buffers 134 or the buses 136, and state machine controller 122 loads this information in state machine registers 124. The state machine configuration information is used to program state machine behavior into state machine registers 124. Once programmed, data may be streamed across the state machines and the state machines may be evaluated. State machine evaluation unit 126 comprises hardware that evaluates one or more state machines programmed into the state machine registers 124 in view of the data being presented to state machine unit 120. In one embodiment, state machine evaluation unit 126 evaluates a large number of state machines in parallel. One embodiment of state machine unit 120 is described in more detail below.

[0070] Multiple state machines may be evaluated in parallel. Each state machine's behavior is specified in a set of state machine registers. For each state machine register set, a state machine evaluation unit executes the state machine specified in the register set against input data. Multiple state machines are specified via multiple sets of state machine registers. Multiple state machines can be evaluated in parallel, by providing an execution unit for each state machine register set. Each state machine could be fed independent data so that multiple state machines could be evaluated in parallel on multiple distinct data streams.

[0071] Context static random access memory (SRAM) 128 is used to store context information for multiple sets of data being evaluated (e.g., data from multiple different streams). If a packet is from a different stream or connection, then the front-end of the programmable rule processor issues an indication to state machine controller 122 that indicates a new stream (or connection) and not part of the same

stream as the previous bytes being processed. This indication can be issued on either a dedicated instruction or issued on a field of the instruction that invokes the state machine operation. In response, state machine controller 122 causes the accumulated state machine evaluation information that exists in state machine registers 124 and state machine evaluation unit 126 to be stored away as context in context SRAM 128. More specifically, once a new rule provides this indication (e.g., via opcode), state machine controller 122 first stores all temporary status of the execution thus far in context SRAM 128 and loads in the context for the stream corresponding to the new rule. If it is a new stream, there is no context accumulated as yet and it starts with the register context initialized. Note that in this case after the end of the first packet of a fresh stream, fresh context is created. Note that in one embodiment, load/store unit 116 has access to context SRAM 128.

[0072] Note that the state machine unit 120 and search registers and search/sort array 116 act as distinct execution units that may operate in parallel. They may be processing the same or different data, or process the same data at different times.

[0073] In one embodiment, load/store unit 116 stores values into search registers 112 or remove values from search registers 112. Load/store unit 116 could load values into general purpose registers file 108 in a manner well-known in the art. Load/store unit 116 communicates with an on-chip data memory or data cache 132 and external memory (through bus and off-chip interface 136).

[0074] Load/store unit 116 also reads from and writes from a message buffer or packet buffer (temporary storage) 134. Packets flow into the message buffer or data buffer or packet buffer 134. Load/store unit 116 may move those into search registers 112 to enable an entire packet or message or document to be stored in search registers 112 via packet buffer 134. This allows the programmable rule processor to receive packet, message, document or stream data and load it into search registers 112 and, using the rule processor, do a series of finds or navigated windowed searches to locate specific portions of the data, characterize the packet, or delineate various zones in the packet or regions of interest in the packet wherein more pattern matching or state machine evaluation has to be performed. Rulesets stored in instruction memory specify the high level control flow of the program that includes the overall control flow graph specifying the graph or tree of rules that needs to be applied or performed.

A variety of rich sequences or rulesets or grammars could thus be applied to the data. For example, initially, based on a context search to be performed, search registers 112 are loaded to find a zone of interest. Once the zone of interest in the data has been found, load/store unit 116 transfers that region to state machine unit 120 for application of a certain number of rules or regular expressions to that zone or portion of data. After transfer, a new rule is presented to state machine controller 122 that indicates which state machines to evaluate against this zone of data.

[0075] Load/store unit 116 can access state machine unit 120. For example, load/store unit 116 can send values to program state machine registers 124 with state machine behavior. Load/store unit 116 may provide data from a number of sources for evaluation. Load/store unit 116 may provide data from packet buffers 134 and can be streamed or fed to state machine unit 120. Load/store unit 116 can provide data or from buses via off-chip interface 136. Load/store unit 116 may send program or data values. State machine unit 120 then evaluates such data by having state machine controller 122 take the data and feed it to state machine registers 124 and state machine evaluation unit 126 for evaluation.

[0076] Note that although not shown, in one embodiment, state machine unit 120 and the search registers and search/sort arrays 112 may be coupled together using dedicated buses or shared buses to transfer data and/or results between each other.

[0077] Integer unit 118 performs general purpose integer functions. In one embodiment, integer unit 118 computes indexes or addresses, or transforms data that may be then fed back to the search registers or state machine registers.

[0078] Thus, one embodiment of the programmable rule processor includes three sets of registers. These include general purpose registers and two other sets of registers, namely search registers and state machine registers. An execution unit is coupled to each of the search registers and the state machine registers. For the state machine registers, the execution unit is the state machine evaluation unit, while for the search registers, the execution unit is the search and sort array. Thus, the rule processor takes a conventional microprocessor front-end and adds search registers and a search and sort execution hardware and state machine registers and state machine evaluation unit to evaluate state machines.

[0079] Figure 2 is an example illustrating the capability of one embodiment of the rule processor executing a rich rule tree comprising a sequence of operations that include a protocol decode function followed by the use of regular expression processing to find patterns of interest in specific portions of the input data. Referring to Figure 2, the rule tree is shown with two phases or levels. The first phase involves a protocol decode operation in which packets going through a network are examined and decoded to understand what protocol is in effect. This requires pattern matching on potentially all the bytes in each packet. In this case, the search registers and search/parse array are used to perform a series of find operations. In this example, various routines of FindForward and FindNotForward operations, which are discussed in more detail below are used to determine if the protocol being used is HTTP and to determine if a GET command or a POST command is being used. More specifically, FindNotForward and FindForward operations locate where the commands begin and end as well as locating arguments for any universal resource indicator (URI). Note that each of a series of such location operations may be executed in a single iteration of a cycle.

[0080] After determining that the packet is some type of HTTP packet, determining if a get command or a post command exists, and after locating the arguments, the last sequence shown in the program, the FINDRE sequence or function, is used to determine if a set of patterns exists. To that end, the start and end locations that were found by the search register and search/parse execution hardware identify where the relevant bytes are in the search registers that may be extracted by the load/store unit and sent to the state machine unit for processing thereby. The instruction sequencer provides a command to point to a group of state machines for evaluation and the state machine controller decodes the group and invokes them against the data. In the end, results are available that indicate whether any of the URIs were found in that zone (i.e., whether there was a match). The result information can be passed back to the remainder of the rule processor, which may, for example, use the branch unit to branch to some other location based on those results (maybe due to some pattern identified in the payload of the packet).

[0081] Thus, one embodiment of the programmable rule processor performs stateful inspection, pattern matching, analysis, and state machine evaluation on high speed data streams.

[0082] Embodiments of the rule processor described herein include one or more advantageous features. For example, one embodiment of the rule processor may utilize a non-procedural high-level language to describe data and data patterns. The use of high level descriptions reduces coding effort. Embodiments of the present invention also provide support for complex protocols and data layouts, such as, for example, variable size, string terminated, conditional, overlaid, or arbitrarily ordered data, as well as arbitrary data layouts.

Exemplary Card Configurations

[0083] Figure 3 illustrates interfaces of one embodiment of a rule processor.

Referring to Figure 3, rule processor 300 includes a host interface 301, a streaming interface 302, a memory interface 303, and a look-aside interface 304. Host interface 301 may comprise, for example, a PCI-X interface. Streaming interface 302 may comprise, for example, a SPI 4.2 interface or a HT & Cascade interface. Memory interface 303 may comprise, for example, a DDRII interface. Look-aside interface 304 may comprise, for example, a LA-1 interface. Note that in other embodiments, the rule processor may have additional interfaces or a subset of the interfaces shown in Figure 3.

[0084] A rule processor, such as rule processor 300, may be included in a number of card configurations. Figures 4-6 illustrate a number of exemplary card configurations. Figure 4 is a block diagram of a line card look-aside configuration. Figure 5 is a block diagram of a line card flow-thru configuration. The in-line codes operate on a stand-alone basis. Therefore, in such a configuration, the rule processor does not send results back to a host processor. The rule processor receives packets on one interface, unravels the packets and determines the protocol to detect packets. The rule processor creates results and may modify the data to be sent. Subsequently, the rule processor sends the data to its next destination. Note that rule processor performs, storing, routing, delivery and other network functions.

[0085] Figure 6 is a block diagram of a server co-processor card configuration. In this configuration, the host processor receives a message, because the host processor handles all of the network functions. The host processor sends a message (packet or buffer) and some instructions indicating what type of rule processing is to be applied to the rule processor. In response, the rule processor applies a rule processing sequence or program and then sends the results to the host processor. The host is then able to take any action, if necessary.

[0086] Referring to Figure 4, the line card configuration comprises a rule processor 401 having a memory 402 coupled to its memory interface and a network processor 403 coupled to a streaming interface of rule processor 401. Rule processor 401 has a host interface for coupling to a host or other control plane.

[0087] Network processor 403 is coupled to a memory 404 and includes an interface 407 for coupling to a host or other control plane. Network processor 403 has an input 405A and an output 405B. Input 405A is coupled to receive network traffic, which network processor 403 forwards to rule processor 401 for processing (e.g., attack detection using patterns, rules, expressions and grammar). The network traffic is forwarded from network processor 403 via output 406.

[0088] Referring to Figure 5, the line card flow-thru configuration comprises a rule processor 501 having a memory 502 coupled to its memory interface, an output 505B of a network processor 503A coupled to its streaming interface, and an input 506A of a network processor 503B coupled to its look-aside interface. Rule processor 501 has a host interface for coupling to a host or other control plane.

[0089] Network processor 503A is coupled to a memory 504A and includes an interface 507A for coupling to a host or other control plane. Network processor 503A has an input 505A and an output 505B. Input 505A is coupled to receive network traffic, which network processor 503A forwards to rule processor 501, via output 505B, for processing (e.g., attack detection using patterns, rules, expressions and grammar). After processing, rule processor 501 forwards the network traffic to network processor 503B via input 506A. Network processor 503B is coupled to a memory 504B and includes an interface 507B for coupling to a host or other control plane. Network processor 506B outputs network traffic via output 506B.

[0090] Referring to Figure 6, the co-processor card resembles a standard PCI-X card that includes a host processor 606 coupled to a chipset 604 via a host interface.

Chipset 604 includes a memory interface coupled to host memory 605. Chipset 604 also includes two PCI-X interfaces, one coupled to a network interface card (NIC) 603 and the other coupled to a host interface of rule processor 601. Rule processor 601 also includes a memory interface coupled to memory 602.

[0091] In the arrangement in Figure 6, content is received via NIC 603 and is sent via chipset 604 to host memory 605. Processor 606 receives an indication (e.g., interrupt) indicating that content has been received and is stored in host memory 605. In response, host processor 606 signals rule processor 601 to handle the content processing. Once completed, rule processor 601 signals host processor 606, which signals NIC 603 indicating to NIC 603 that the data in host memory 605 is ready for transfer. Finally, NIC 603 access the network traffic from host memory 605 via chipset 604 and sends the network traffic out to the network

An Exemplary Embodiment of Search Register and Search/Sort Array Hardware

[0092] One embodiment of the search register and search/sort array hardware is given below. Note that alternative embodiments of search register and search/sort array hardware may be used.

[0093] Figure 7 is a block diagram of a portion of one embodiment of a rule processor comprising search registers 701 and search execution hardware 702. Such a portion may be part of the rule processor of Figure 1. Search instruction 703 is presented to search registers 701 and search execution hardware 702. As described above, the processor further comprises of an instruction store referred to as rule/instruction memory 704 and an apparatus to control the flow of instructions that includes, in one embodiment, instruction sequencer 705 and instruction pointer 706.

[0094] A typical search entails presentation of an instruction or rule to the search registers. The rule specifies a pattern along with one or more additional search parameters. In one embodiment, the search function returns a number of results. These include an indication of whether or not a match was found between the pattern and the content in the search registers, and also a match location indicating where in the payload search registers the match occurred.

[0095] Additional search control parameters are provided by the rule processor to search execution hardware 702. Search instructions might provide a mask vector along with a set of bytes comprising the target search pattern. The mask vector might be comprised of bits that correspond to the target pattern byte or bytes. In one embodiment, specific bytes in the target pattern to be ignored during the search operation are selected by setting the corresponding bits in the mask vector to a predetermined logic level of 0 or 1. Thus, the target pattern used in the search may be reduced in size. Additionally, the rule processing instructions may specify starting and ending locations that constitute a search window or a range of bytes in search registers 701 within which the search is constrained.

[0096] Additional parameters to search instructions may include a branch address to be utilized by the rule processor in the event of an unsuccessful search.

[0097] An example of a search instruction is a windowed-find-first-forward instruction. In one embodiment, in a windowed-find-first-forward search, given an 8-byte pattern specified in or by a rule, an 8-bit mask, a starting location offset address pointing to a starting byte in the content data (e.g., document data) in search registers 701, and an ending location offset address pointing to an ending byte in the content data (e.g., document data) in search registers 701, the search returns the starting address in search registers 701 of the first string after the specified starting location address that matches the masked pattern, providing this address starts before the ending location offset address. In another example, a windowed-find-first-reverse search may be performed. In one embodiment, in a windowed-find-first-reverse search, given an 8-byte pattern in the rule, an 8-bit mask, a starting location offset address pointing to a starting byte in the content in search registers 701, and an ending location address pointing to an ending byte in the content in search registers 701, the search returns the starting address of the last string before the specified ending location address that matches the masked pattern, providing this address starts after the starting location offset address.

[0098] The rule processor also provides a control store or rule memory 704 that contains rules or rule sets to be applied to the payload data. In one embodiment, the memory 704 holds rule sets or sequences of instructions or code that describe patterns, rules, expressions or grammars that need to be applied and detected in search

registers 701. The rule vocabulary may specify a range of operations, including, but not limited to, global or local (windowed) searches with either exact matches or partial matches, with individual and multiple match information delivered to some registers, primitives to generate offsets and addresses in the output payload of the rule processor, as well as logical and computational operators to be applied to the search results. Such rules may be composed of multiple fields that specify the various parameters described above. Each parameter may be directly specified within the rule or, alternatively, indirectly specified through the use of a pointer to a register or memory location containing the value to be used. In embodiments where both direct and indirect specifications are permissible, each such field may contain an additional sub-field that indicates whether direct or indirect specification is being utilized.

[0099] In one embodiment, the rule processor performs sequences of prioritized and directed searches of anchored or unanchored patterns and windowed and ranged searches for an arbitrary long pattern starting at any arbitrary location in a document, stream, message, or packet. The patterns as well as the range control and program control flow (e.g., branch addresses) can be specified statically in rules contained in the program store or dynamically selected indirectly from a register file using a pointer or index set forth in a rule. This enables powerful dynamic and contextual pattern matching.

[00100] The rule processor presents one or more rules of a search to a search register structure. In one embodiment, the search register is a 2KB register file with each entry being one byte wide. Data to be searched is loaded in the search register file. Each rule may specify a pattern that is presented to the search register file to determine if the pattern is present in the data stored therein. A mask may also be provided to further configure the pattern and/or to reduce the size of the pattern being used in the search.

[00101] Referring to Figure 7, search registers 701 and search execution hardware 702 is collectively presented with a search instruction 703. Search instruction 703 is further illustrated in Figure 8A. Referring to Figure 8A, search instruction 801 comprises an opcode 801a that describes the type of search operation, a search pattern 801b, a mask 801c that specifies the bytes in the pattern that are relevant to the current search instruction and two offsets 801d and 801e that specify

the starting and ending bounds, respectively, of the locations in the search register that are relevant to the current search instruction. Search execution unit 802 outputs a result 803 that, in one embodiment, comprises an indication of the success of the search operation and additionally includes one or more parameters such as, but not limited to, an index that indicates the location within the search register that met the search instruction of the search operation.

[00102] Search execution hardware 802 comprises search register 802a and a sorter 802b as shown in Figure 8A. Search register 802a stores searchable data, which may be content from a document, message, packet, or any other well-known source of data that can undergo searching. The size of search register 802a may be arbitrary, M bytes, and in one embodiment is organized within a larger array, called a search array 802c, of M rows of N bytes each. Data from search register 802a is stored in a replicated manner inside the search array

[00103] In one embodiment, data to be searched is stored in search register 802a by use of a data generator 813, based on addresses generated from address generator 811, which are decoded by address decoder 812. The process of storing also entails recording the size of the searchable data in search register 802a. For data sets that are smaller in size than the capacity of search register 802a, search register 802a provides a mechanism to restrict the search operation to the appropriate data. In one embodiment, data generator 813 may store a pattern that is established a priori to be data that will be ignored for search operations in the remaining locations of search array 802c or in an alternate embodiment search register 802a disables the appropriate locations of search array 802c from participating in search operations.

[00104] Irrespective of the manner in which the searchable data is organized throughout search array 802c, search array 802c receives a pattern 801b and mask 801c. Pattern 801b is compared against entries in search array 802c. In one embodiment, search array 802c has M rows of N bytes, where N is the same number of bytes as are in pattern 801b. Mask 801c provides an indication of those bytes in pattern 801b that are not part of the pattern being searched. In other words, if pattern 801b is a pattern that is less than N bytes, mask 801c specifies which bytes of pattern 801b search array 802c is to ignore. In one embodiment, search array 802c has an output line for each of the M rows in search array 802c indicating whether the pattern

being searched matched that content data stored in that particular row. In one embodiment, if the output is a 1, the pattern matched content data in the particular row. The M output lines of search array 802c are coupled to inputs of sorter 802b.

[00105] Sorter 802b is also coupled to receive offsets 801d and 801e that indicate a starting and ending point, respectively, of a range in search register 802a that is to be searched. In one embodiment, these offsets are $\log_2 M$ -bit numbers. Based on the match indication lines from search array 802c and the start and end range as specified by offsets 801d and 801e, sorter 802b processes the results of search array 802c. Such processing may include performing one or more operations. These operations may be index resolution functions that output a specific match index pursuant to the type of operation. In one embodiment, the operations include Find_First_Forward, Find_First_Reverse and Find_Population_Count. The operations are specified by opcode 801a in search instruction 801. Sorter 802b may store intermediate or final results of previous operations that may be used in subsequent operations in conjunction with the match indication lines from search array 802c. In this manner, sorter 802b may be used to progressively navigate through the searchable data set by issuing a series of operations that utilize the results of previous operations. Additionally, sorter 802b may also be coupled to a register file for storage of results of previous operations for use in subsequent operations that may be executed after an arbitrary number of other operations have been executed. The results of sorter 802b may also be coupled to the rule processor instruction sequencer, such as instruction sequencer 705 of Figure 7, to generate or assist in the generation of rule program offsets (e.g., branch addresses).

[00106] After processing, sorter 802b generates outputs indicating whether there is a match, and an index associated with the match. The index may indicate the location (address) in search register 802a where the first match occurs or where the last match occurs with respect to the top of search register 802a. Alternatively, the index may indicate the number of matches that occurred within the range specified by offsets.

[00107] Note that the range specified by the offsets may be changed dynamically. For example, a first search instruction may be applied to search array 802c initially while a range that is specified by offset 801d and offset 801e comprises all rows of search array 802c. However, after the first search instruction and a match is

identified, the start and end ranges may be changed in a subsequent search instruction such that the searching begins from a location that includes the match lines found within the range specified by the previous search instruction. This capability is achieved by using the indirection functionality that allows fields of a rule or an instruction to reference values in a general purpose register file.

[00108] In Figure 8A, in one embodiment, search array 802c is comprised of 2K rows of 8 bytes each. Thus, search register 802a holds 2K bytes of data. Search array 802c holds replicated data. Each 8-byte string that begins with a distinct byte in search register 802a is stored as a distinct row of bytes in search array 802c. These strings are comprised of the distinct byte from search register 802a and additionally 7 consecutive bytes that follow that byte in search register 802a. Thus, each row of search array 802c holds the 7 most significant bytes of the previous row and additionally one immediately succeeding higher order byte, which is appended to the right of these 7 bytes.

[00109] Data is loaded into search array 802c by data generator 813, which, in one embodiment, supplies the appropriate 8 bytes of data for each row from the source data.

[00110] In one embodiment, an 8-byte search pattern is presented in each search instruction. The search pattern is aligned with search array 802c such that each of the 8 columns in the array is presented with a unique byte. This is shown in Figure 8B. Referring to Figure 8B, state bytes 1 through 8 are stored in the search array for each of rows 1 through 2K. For each byte that is stored as an element of the search array of 2K rows and 8 columns shown in Figure 8B, there exists a signal line 310. For example, byte 1 of row 1 generates signal line 310₁₁, byte 2 of row 1 generates signal line 310₁₂, byte 1 of row 2 generates signal line 310₂₁, and so forth. The signal for each byte is asserted during a search operation when the stored byte matches the byte of the search pattern that is presented to the same column that the element belongs to. In this embodiment, where each row contains 8 bytes, 8 signal lines, for example 310₁₁ through 310₁₈, are used to indicate each of the byte level matches in the row. The byte level matches for each row are ANDed together with the masks from masks 102c in row & mask resolver blocks 311. The result of the AND function is an indication of whether a match occurred in each row. In this embodiment, where the

search array includes 2K rows, 2K match lines are output to the sorter. The circuit structure of two of the byte elements 312 in this array is shown in Figure 10. The circuit operates in a manner that provides a fully parallel search operation by performing a simultaneous search within all its rows in one clock period. When a search operation is conducted, all byte level match lines 401 in a column simultaneously indicate matches with their respective stored bytes. A search operation is invoked on all columns simultaneously allowing the masked reduction block in each row to indicate a row level match. Thus, in this embodiment of the search array, in a single clock, a parallel search of all 2K strings in the search register that are comprised of 8 contiguous bytes is performed and the results are indicated on the 2K match lines.

[00111] Figure 9A is a block diagram of one embodiment of a sorter. Referring to Figure 9A, match lines 910 from the search array are coupled to and input to a range mask and select unit 901. In one embodiment, match lines 910 comprise match 1 to match 2048. Range mask and select unit 901 receives a pair of offsets specifying a range of rows of the M match lines from search array to perform further processing. In one embodiment, the offsets are 11 bit numbers that are converted into 2K mask bits that may be ANDed together with the match lines to provide an output. Such an example is shown in Figure 9B in which the offset for the start range is converted to one or more zeros with the remainder of the bits being a one bit, while the offset for the end of the range is converted to all zeros starting from the bottom up to a certain point after which all bits are ones. By ANDing these registers with the match lines, the matches that occur within the specified start and ending range are output without change, while other match lines outside the range are masked (e.g., changed to a predetermined logic level).

[00112] The output of range mask and the select unit 901 is coupled to the inputs of index resolution functions unit 902. In one embodiment, index resolution functions unit 902 includes one or more functions that are performed on the outputs of range mask and select unit 901. For example, as shown, the sorter includes an ascending priority encoder 902A to find the first occurrence (with respect to the top of the search array) of a match between the specified pattern of N bytes and the content data in the search array as indicated by the non-masked match lines. A descending priority

encoder 902B may also be included to find the last occurrence (with respect to the top of the search array) of a match between the N byte pattern and the content data in the search array as indicated by the non-masked match lines. A population counter 902C indicates the number of matches that occur between the N byte pattern and the data in the search array as indicated by the non-masked match lines. Other index selectors may also be used.

[00113] The outputs of index resolution functions unit 902 are input to an index combine and select unit 903, which is also coupled to receive opcode 102a. The opcode 102a is specified in the search instruction and selects one of the index resolution function outputs as the output of the sorter. Index combine and select unit 903 generates a match indicator 921 indicating that there was match along with an index 922 indicating that the location within the search array of the data that is either the first occurrence of a match if the output ascending priority encoder 902A is selected, the last occurrence of a match in case the output of descending priority indicator 902B is selected, indicates the number of matches in the non-masked match lines if the pop counter 902C is selected, etc. Following the computation of the outputs, namely, match indicator 921 and index 922, they may be utilized to control the execution of one or more search instructions that follow by storing the outputs in general-purpose registers and utilizing indirect specification in subsequent instructions, branching to a specified address in the instruction memory (e.g., instruction memory 704) dependent on the match indicator 921 or other similar techniques.

[00114] Figure 11 illustrates the micro architecture of a rule processor that includes search apparatus. Referring to Figure 11, the search instructions are stored in an instruction memory 1101. Instructions are selected by flow control using an instruction fetch pointer register 1102. Instructions are decoded by a decoder 1103. The individual subsets of each instruction are either taken from the instruction or fetched from general purpose register file 1104. Then the various subsets of each instruction are supplied to the separate units, namely, search array 1105, sorter 1106 comprising of a sort unit 1106a followed by a characterization unit 1106b, a conventional arithmetic logic unit (ALU) 1107, as set forth above. In one embodiment, the processing of each instruction follows a 4-stage pipeline consisting

of (i) instruction fetch stage 1108, (ii) an instruction assembly stage 1109, (iii) a search/execute stage 1110, and (iv) a sort and delivery of results and/or branch stage 1111.

[00115] In one embodiment, the rule engine instruction format comprises a number of bits are divided into subsets that contain various fields to issue directives to various hardware engines on the rule processor. In one embodiment, the search subset contains a search/sort opcode field, a pattern field (in one embodiment, this contains a value or a pointer to a location that provides a value along with an additional bit(s) that specifies whether the value in the instruction is a pointer or not), a byte level mask field, a start location address field (in one embodiment, this field, comprises a value or a pointer to a register that provides the value, and including an additional bit(s) to indicate whether the start location address contains the value or such a pointer), an end location address field (in one embodiment, this field, comprises a value, or a pointer to a register that provides the value, with an additional bit(s) to specify whether the end location address information is a pointer or not), a result register field that specifies where the results of the search operations are to be returned and a branch address field (in one embodiment, this field comprises a value or a pointer to a register that provides the value, with an additional bit(s) to specify whether the branch address information is a pointer or not)

[00116] Figure 12 illustrates an example pseudo-code 1201 of a rule-set that may be processed by one embodiment of the rule processor described above. The rule has multiple patterns with some specific constraints on the locations of where such patterns may exist in a message or document or packet. The constraints are expressed in the pseudo-code through the use of key words such as BEFORE and AND. For purposes of simplicity, the patterns in 1201 are used in this example without any additional delimiters between strings, which may be the case in practice. Also, in Figure 12 is a listing 1202 of the corresponding micro-code for the exemplary rule processor. The format of the instructions is as described earlier. Using the first instruction 1203 for illustration, it consists of the FIND_FIRST_FORWARD opcode where all 8 bytes of the Pattern "cp /bin/" are relevant for the search (through the use of 0xFF as Mask) with the start and end offsets expressed as constant values (through the use of Indirection Flags) to denote the start and end of the searchable payload held

in the search registers. For purposes of brevity, the derivation of the constant numbers has been skipped here. The result of this opcode is shown to be loaded into general purpose register A and lastly the branch address is specified as the constant value of 11 which is the instruction that would follow the micro-code snippet shown in Figure 12. This instruction will cause the search execution hardware to search for the occurrence of "cp /bin/" within byte locations 0x03D and 0x800 of the search registers 802a. All rows in the search array 802c that match will assert their respective match lines 910 by the end of the search execution stage 1110 of the micro-architectural pipeline. In the sort and branch stage 1111, the sorter 802b converts 0x03D and 0x800 into bit vectors as illustrated in Figure 9B. The bit vectors are used to perform the range mask and select function 901 to negate any matches that start outside of the location window from 0x03D to 0x800. Of the remaining matches that are now within the location window, the opcode of this instruction chooses the ascending priority encoder 902a from the index resolution functions 902 to convert the lowest numbered match into an 11-bit binary encoded location. If such a match was found, match 921 would be asserted and index 922 would hold the 11-bit location. If match 921 were to be not asserted because a match was not found, the instruction sequencer 705 would load the branch address 0xB into the instruction pointer 706. Index 922 would be loaded into general-purpose register A by the control circuitry of the register file 1104. The load into general-purpose register A and the load of the instruction pointer, if applicable, will be completed by the end of the sort and branch execution stage 1111. Second instruction I204, FIND_FORWARD_ANCHORED, further illustrates the rich vocabulary of the exemplary rule engine. It is a variant of FIND_FIRST_FORWARD in that the match begins at the start_offset for the search to be successful.

[00117] Figure 13 illustrates the execution of the micro-code shown in Figure 12 within the micro-architecture of the exemplary rule processor shown in Figure 11. Table 701 shows the execution across multiple clock cycles. For purposes of simplicity, it is assumed that all the search instructions are successful in finding the specified patterns in the search registers. In one embodiment, the execution proceeds in a pipelined fashion through the 4 stages described in Figure 11. Through the use of indirect specification, the execution of a search instruction can use the offsets

calculated in the immediately preceding instruction. Therefore, instructions 1 through 8 are executed in consecutive cycles. Instruction 8 is a branch dependent on the result of the comparison of the contents of general purpose register A and general purpose register B which are computed in clock cycle 8 and clock cycle 9 respectively. The branch is taken in clock cycle 11 and the instruction execution completed in clock cycle 14. Thus, the complex pattern matching expression described using pseudo-code 1201 is executed in only 14 clock cycles using the rich instruction vocabulary of the exemplary rule processor. This example illustrates the capability and efficiency of the exemplary rule processor on execution of functions that include dynamic and contextual search and analysis of documents, messages or packets.

An Exemplary Embodiment of State Machine Unit Hardware

[00118] One embodiment of state machine unit hardware is described below. Note that other embodiments of state machine unit hardware may be used.

[00119] A state machine evaluation architecture is described that allows for efficient implementation and evaluation of state machines and finite state automata. In one embodiment, the apparatus employs a technique of building graphs using circuits in a way that enables, in a programmable manner, the physical realization of any arbitrary control flow graph in hardware. The apparatus provides a high performance and compact solution for implementation of multiple state machines as well as large and complex state machines. The apparatus can be used for efficient parsing and evaluation of data via the hierarchical application of thousands of regular expressions on the incoming data stream. Such an apparatus may be the central evaluation engine for a regular expression processor. Note that one embodiment of finite state machine units are described in U.S. Patent Application No. 10/650,364 entitled "Method and Apparatus for Efficient Implementation and Evaluation of State Machines and Programmable Finite State Automata," filed on August, 27, 2003; and U.S. Patent Application No. _____ entitled "_____" concurrently filed with this application, which are incorporated herein by reference.

[00120] Figure 14 illustrates a basic state machine evaluation building block or finite state automata building block (FSA building block) from a programming perspective in accordance with one embodiment of the invention. FSA building block 1400,

shown in Figure 14 includes a number of registers that allow the FSA building block to be fully programmable. Register 1401 contains node elements that specify the current state of the FSA. Register 1402 contains state transition evaluation symbols on which match a state will be transitioned. Register 1403 contains a state transition connectivity control matrix that specifies which states of the FSA are connected (i.e., the enabled state connections).

[00121] Initially, the nodes are in a certain state. With each evaluation cycle, an input (e.g., an input byte) 1405 is input to the state transition dynamic trigger computation 1410, which compares the input to the state transition evaluation symbols contained in register 1402. The comparison information is input to the state transition interconnections and next state evaluation logic 1415. Then, based on the nodal connections contained in register 1403, the next state is computed and latched and then becomes the current state. That is, the next states are calculated using triggers, connectivity controls, and current state bits. The architecture of the FSA building block allows a character of input data to be analyzed every clock cycle without the need for external memory.

[00122] Figure 15 illustrates a logic circuit for implementing an FSA building block in accordance with one embodiment of the invention. The logic circuit 1500, shown in Figure 15, may be used to implement a state machine architecture for realization of a non-deterministic finite state automata with R nodes, R symbols, and R^2 arcs. In Figure 15, R has been set to a variable M , and the hardware organization is designed and laid out to be scalable for any M . By fixing the value of M and providing the appropriate level of hardware, an FSA building block with specifically M instantiated nodes can be realized.

[00123] The node elements N_1-N_M are fully connected with interconnections 1501. Each node element has an arc or interconnection to itself, as well as to each of the other node elements. Hence, for $M=32$, there are 32×32 or 1024 interconnections 1501. Likewise, for $M=16$, there are 16×16 or 256 interconnections 1501.

[00124] For $M=32$, the state transition connectivity controls 1502 comprise 1024 bits organized as a matrix of 32 bits \times 32 bits. Likewise, for $M=16$, the state transition connectivity controls 1502 comprise 256 bits organized as a matrix of 16 bits \times 16 bits. A bit in row Y and column Z represents the control to enable or disable an

interconnection between node element N_y and node element N_z . The mechanism by which the interconnections 1501 between node elements N_1 - N_M can be enabled or disabled by the state transition connectivity controls 1502 is embodied as a switch on the interconnection (e.g., wire) 1501, with the switch being gated by the relevant control bit for that interconnection. This could be implemented using AND gate logic as well.

[00125] In this embodiment, there are as many state transition evaluation symbols 1503 as there are states in the machine. For $M=32$, there are 32 symbols. For $M=16$, there are 16 symbols. Each symbol could comprise a single 8-bit character value and compare operator, so that input data is specified for comparison to the 8-bit character value to compute the state transition dynamic trigger 1504. In this embodiment, the logic for the state transition dynamic trigger 1504 computation is as follows. A fresh byte of input data is fed simultaneously to all M comparators. A set of M match lines act as state transition dynamic triggers 1504. Once again, M may be either 16 or 32.

[00126] The mechanism by which the state transition dynamic triggers 1504 govern the update and transfer of values between node elements N_1 - N_M (over interconnections 1501 that have been enabled) is implemented in this embodiment as simple AND gate logic. That is, AND gates in cooperation with OR gates act to enable and/or disable interconnections 1501.

[00127] The data transfer unit 1505 dynamically configures and programs the state transition connectivity controls 1502 and the state transition evaluation symbols 1503. This enables dynamic realization of a range of control flow graph structures or configurations. In this embodiment, for $M=32$, the bit matrix for the state transition connectivity controls 1502 can be implemented as 32 registers of 32 bits each. Likewise, for $M=16$, the bit matrix for the state transition connectivity controls 1502 can be implemented as 16 registers of 16 bits each. In this embodiment, for $M=32$, the storage for the state transition evaluation symbols 1503 can be implemented as 32 registers of 8 bits each. Likewise, for $M=16$, the storage for the state transition evaluation symbols 1503 can be implemented as 16 registers of 8 bits each.

[00128] The data transfer unit 1505 also provides access to read and write the node elements N_1 - N_M . For $M=32$, the node elements could be viewed as a logical register of 32 bits. Likewise, for $M=16$, the node elements could be viewed as a logical

register of 16 bits. The data transfer unit 1505 executes load and store operations to read and write values from and into all these registers. This ability to read and write the node elements N_1-N_M can be used to enable the data transfer unit 1505 to communicate with an external interconnect fabric to connect the state machine building block to other such building blocks, in order to construct larger state machines or graphs. The data transfer unit 1505 outputs values from selected node elements on dedicated signal wires, which can be sent to, for example, other state machines (e.g., another FSA building block) or an external interconnect fabric. Likewise, it receives values from the external interconnect fabric on dedicated signal wires. These values can be transferred into selected node elements.

[00129] A single reset signal 1507 is fed to various elements of the apparatus to clear values to zero.

[00130] Before the start of the state machine evaluation, the state transition connectivity controls 1502 and the state transition evaluation symbols 1503 should have been programmed with desired configuration values. Hence, the signal values in the storage assigned for these controls will be stable before the state machine evaluation begins.

[00131] In one embodiment, there is a mechanism to control the start of the state machine evaluation. In one embodiment, for $M=32$, the start state select controls 1509 consist of a register of 32 bits. In one embodiment, for $M=16$, the start state select controls 1509 consist of a register of 16 bits. Each bit in this register corresponds to a node element. Any number of bits in this register could be set to 1 (active). Upon initialization of the state machine, node elements that correspond to active bits in the start state select controls 1509 register will start as active states.

[00132] In one embodiment, the progress of the state machine evaluation is conditioned by a clock 1508 that determines an evaluation cycle. In one embodiment, every evaluation cycle, a fresh byte of input data is presented to the apparatus, and this byte is evaluated in parallel against all state transition evaluation symbols (in this embodiment, this is a comparison of the input byte versus the 8-bit character value), leading to an update of set of M match lines representing the state transition dynamic triggers 1504. These M triggers 1504, along with the M^2 bits corresponding to the state transition connectivity controls 1502, combine with the current state values in

the node elements N_1-N_M to compute the next state value for each node element. The logic equation for the computation of the next state of each node element is as follows:

If the state transition dynamic triggers are T_1 to T_M

If node elements are N_1 to N_M

If state transition connectivity controls are a bit matrix $C_{I,J}$ with $I=1,M$, and $J=1,M$

Then, given previous state PS_K for node element N_K , the next state NS_K is as follows:

$$NS_K = OR ($$

$$[PS_1 AND T_1 AND C_{1,K}],$$

$$[PS_2 AND T_2 AND C_{2,K}],$$

$$.....$$

$$.....$$

$$[PS_I AND T_I AND C_{I,K}],$$

$$.....$$

$$.....$$

$$[PS_M AND T_M AND C_{M,K}]$$

$$)$$

Effectively, for each node element, the next state computation is a large OR function of M terms. Each term is computed by ANDing together 3 values – the previous state value of a node element, the corresponding dynamic trigger, and the corresponding connectivity control bit that indicates whether that particular interconnection 1501 is enabled.

[00133] Once the next state computation is complete, the node elements are updated with the next state values, and the state machine completes a single evaluation cycle. As can be seen by the logic equations for the next state computation, the evaluation cycle time for the apparatus is three levels of logic evaluation. The first level comprises of AND gates to compute the triggers, the second level comprises of AND gates to factor in the connectivity controls, and finally an M-input OR gate. This

evaluation cycle time is considerably shorter than the cycle time that governs the operating frequency of commercial microprocessors.

[00134] Note that the sequence of steps described above represents the computation needed in a single logical evaluation cycle. Physically speaking, additional pipelining is possible, to further boost the frequency of operations. For example, the computation of the state transition dynamic triggers (given a fresh byte of input data) can be decoupled from the next state evaluation.

[00135] In one embodiment, there is a mechanism to control the halting of the state machine evaluation. For $M=32$, the accept state select controls 1510 consist of a register of 32 bits. For $M=16$, the accept state select controls 1510 consist of a register of 16 bits. Each bit in this register corresponds to a node element. Any number of bits in this register could be set to 1 (active). Once the state machine enters into any of these states (corresponding node element goes active), the state machine halts its evaluation.

[00136] The foregoing provided a description of the evaluation cycle for a single FSA building block. When such an FSA building block is coupled to other state machines (e.g., another FSA building block) via the external interconnect fabric, an additional synchronization handshake would be incurred to enable the respective evaluation cycles to be coordinated.

[00137] The basic FSA building block, as described above, may be implemented in various ways. The remainder of the detailed description will discuss specific embodiments that address a number of concerns.

[00138] As discussed above, embodiments of the invention provide a fixed-size FSA building block (i.e., an FSA building block having a fixed number of states) to facilitate efficient implementation. In alternative embodiments, FSA building blocks of various sizes may be implemented. However, a regular, repeatable structure of a fixed size FSA building block allows for efficient implementation of a large number (e.g., 1000) of FSA building blocks on a chip.

[00139] The fixed size FSA building block, while easier to implement, raises the issue of how to address REs having a number of states greater than the fixed size of the FSA building block. For one embodiment of the invention, a fixed size for the FSA building block is determined based upon the particular problem space, and two

or more FSA building blocks are connected (stitched) to accommodate REs having a greater number of states.

[00140] For one embodiment, the stitching of FSA building blocks to solve REs having an excessive number of states is accomplished as follows. The RE is converted into a syntax tree. The syntax tree is then split into a number of sub-trees, each having a number of characters that is no greater than the fixed size of the FSA building block. This division of the syntax tree may be effected using a number of well-known algorithms. Each sub-tree is then converted to an NFA having a number of states that can be accommodated by the fixed size FSA building blocks. The NFA for each sub-tree is then implemented on a separate FSA building block and each of the separate FSA building blocks are then stitched together to effect evaluation of the RE.

[00141] Depending upon the size of the REs in the problem space, a number of the FSA building blocks may be grouped together. For example, for a fixed size FSA building block of 16 states, grouping 16 FSA building blocks together would accommodate an RE having 256 states. For one embodiment of the invention, the approximately 1000 FSA building blocks on a chip are divided into groups of 16 FSA building blocks each. By interconnecting each FSA building block with all FSA building blocks within its group, clock penalties for cross-group transitions are avoided.

[00142] For one embodiment, each group of FSA building blocks is not interconnected with every group, rather the groups are cascaded with some groups "triggering" one or more particular other groups. For one embodiment, where such architecture is unable to accommodate an excessively large RE, a controller is employed to read the state of the FSA building block(s) and explicitly write the transitions states.

[00143] As described above, an RE may be too large to be solved by a single FSA building block. By the same token, occasionally REs are smaller than the fixed size of the FSA building block. For one embodiment, two or more REs are solved using a single FSA building block as described below.

[00144] For one embodiment, the number of REs that can be solved is not limited by the number of REs instantiated within the FSA building blocks. For one embodiment,

REs can be loaded to the FSA building blocks from a rule memory (e.g., conventional memory), that can store many more RE's than are implemented in hardware.

Coupling the FSA building blocks to a rule memory allows REs to be stored in memory and used to dynamically program the FSA building blocks.

[00145] Occasionally, the input data to an FSA building block is fragmented, that is, a first portion of the input data is followed immediately by unrelated data, which is followed subsequently by the remaining portion of the input data. To address this situation, one embodiment of the invention provides the capability of storing a partial context to a context memory and accessing the partial context at the appropriate time.

[00146] For one embodiment of the invention, the FSA building blocks include counters, pointers, and status registers to provide additional information (e.g., beyond whether or not a pattern has been discerned). For example, a counter may be used to indicate the number of times a particular RE matched or to implement more complex REs; a pointer may be used to indicate the start and end locations of an RE match; and status bits may be used to indicate various occurrences during an RE search.

SYSTEM

[00147] Figure 16 illustrates an FSA building block in which a number of features have been implemented to provide additional functionality in accordance with one embodiment of the invention. FSA building block 1600 shown in Figure 16 is a 16-state FSA building block. FSA building block 1600 includes an enable signal 1615 that is driven by an externally programmed start offset/end offset register. That is, when receiving an input data stream, it is not necessary to commence evaluation at the beginning of the stream.

[00148] The starting and ending points of the evaluation can be determined and programmed to drive the enable signal 1615 of FSA building block 1600. A clock signal 1608 controls the evaluation process and a reset signal 1607 resets the FSA building block (i.e., sets all node elements 1616 to zero). A start state register 1609 is programmed via software to indicate which of the 16 states are initially active. When the initial clock signal 1608 is received, if the enable signal 1615 is high, the values contained in start state register 1609 are latched into node elements 1616. When an input byte 1606 is received, it is compared to the evaluation symbols of the symbol

evaluation unit (SEU) 1603. The determination, as to whether or not the input byte is a match, is forwarded to the state transition interconnection and next state evaluation logic (STINSEL) 1617. Then upon a match, and based upon the nodal connections as programmed into the state transition connectivity control (STCC) register 1602, the dynamic next state (DNS) 1625 is enabled and used by the next state determination logic (NSDL) 1618 to determine the next state. The NSDL 1618 then latches the next state to the node elements 1616 at the end of the clock cycle. The latched value then becomes the current state of the FSA building block, the next input data byte is received, and the evaluation continues.

SYMBOL EVALUATION UNIT

[00149] In accordance with one embodiment of the invention, the SEU 1603 contains a number of registers and accompanying logic to allow for efficient evaluation of complex REs.

[00150] An RE may be defined to employ a range rather than a single character symbol. For example, the RE may reference a character in the range of a – z or 0 – 9. As shown in Figure 16, the SEU 1603 includes two range registers, namely rangelower register 1620 and rangeupper register 1621, to specify the lower range value and an upper range value, respectively, for multiple (e.g., up to four) ranges. The input byte 1606 and the upper and lower range values are provided to a range detection logic 1619 to determine if the input was within the specified range. This information, together with input byte 1606 and the programmed match symbol from symbol register 1622, is provided to the symbol match detection logic (SMDL) 1622 that evaluates the input byte 1606 against the symbol itself. This allows the software to program a state transition on a range, a character, or a combination thereof. This is accomplished by expanding the character definition (e.g., to include range information) and providing additional space for the character definition. For one embodiment, 16 symbol registers of 24 bits each are implemented, with 12 of the 24 bits used to define the extended character and 12 used for a bit-mask (discussed below). Of the 12 bits used for the extended character, 8 are used for the character itself, and four are used to specify whether the extended character has a range.

[00151] SEU 1603 includes a symbol mask register 1623 to indicate a particular bit or bits that is not to be compared. For some applications it may be more efficient to mask a bit of the input data (i.e., to program the evaluation logic such that a particular bit is not considered). For example, ASCII provides an 8-bit character to represent characters a-z (lower case) and A-Z (upper case), with the fifth bit specifying the case. If an RE employed a range of a-z and A-Z, it could be more efficiently implemented by ignoring the case (i.e., masking the fifth bit). That is, by masking the case bit (fifth bit) it would not be necessary to effect a comparison for lower case and a separate comparison for upper case, a single state can complete the comparison.

[00152] SEU 1603 includes a logical operation register 1624 that may be used to indicate state transition upon the occurrence of a matching symbol in conjunction with a logical operator. For example, an RE may be programmed such that transition occurs upon the negative polarity of the evaluation instead of the positive polarity of the evaluation (e.g., transition occurs on "NOT" match instead of match). For one such embodiment, the logical operation register provides 16 bits (i.e., one bit per state) to specify the logical operator "NOT".

ACCEPT STATE DETECTION UNIT

[00153] When the DNS 1625 is enabled, the next state is checked to determine if an accept state has been reached. Accept state detection unit 1610 includes accept state registers 1626 and accept state detection logic (ASDL) 1627. The accept state registers 1626 are programmed with accept states. The ASDL 1627 used the DNS 1625 to determine if the programmed accept state has reached, if so, a hit is recorded in hit register 1628a corresponding to the accept state register 1626. the hit register, then, records the number of hits, this information can be made available externally via register read/write bus 1628b. In accordance with one embodiment of the invention, the ASDU 1610 includes two accept state registers 1626 to facilitate the packing of two REs into a single FSA building block. As described above, two or more REs having a total number of states not greater than the fixed number of states of the FSA building block may be packed into a single FSA building block. Each RE may have unique accept states, and therefore an accept state register should be implemented on the FSA building block for each packed RE. Because each RE may reach accept

states separately, a corresponding hit register should be implemented for each accept state register. For the embodiment shown in Figure 16, two accept state registers 1626 are implemented along with corresponding hit registers 1628a and 1628b. To maintain flexibility, each register is a full 16-bit register, which allows packing REs of various sizes. For example, a 12-state RE may be packed with a 4-state RE, or in the extreme a 15-state RE could be packed with a 1-state RE. If the particular FSA building block is not being packed, the additional accept state register and corresponding hit register are not used.

MATCH LOCATION POINTER

[00154] For some applications, it is useful to determine the location at which a match begins and ends. To effect such determination, a start location register 1629 and an end location register 1630, as well as a byte count 1631, are implemented in the FSA building block in accordance with one embodiment. When the evaluation starts, a byte count 1631 is provided, when a transition of the next state occurs (e.g., a match is initiated), the value of the byte count at that point is latched to the start location register 1629. When, subsequently, the DNS 1625 is enabled, a determination is made as to whether an accept state is reached (e.g., a match is determined), the value of the byte count 1631 at that point is latched to the end location register 1630, thus providing start and end locations for the match.

STATE TRANSITION COUNTER UNIT

[00155] The FSA building block 1600 includes a state transition counter unit (STCU) 1632 that contains a number of registers and accompanying logic to allow for efficient evaluation of complex REs. For example, the counter allows an RE to be programmed that employs state transitions not just upon receipt of a specified symbol, but upon receipt of the specified symbol a specified number of times. So, for example, an RE may be programmed as a b {2, 4} c, which indicates a match when "a" is received followed by the occurrence of "b" from two to four times, followed by "c" (i.e., abbc, abbbc, and abbbbc). A counter trigger state (CTS) register 1633 can be programmed with a trigger state (e.g., state 1, the state corresponding to "b") for the counter 1634. For this example, the CTS register 1633 is programmed to state 1,

the counter lower value (CLV) register 1635 is programmed to 2 (i.e., the minimum number of occurrences for a match), and the counter upper value (CUV) register 1636 is programmed to 4 (i.e., the maximum number of occurrences for a match). The programmed values of the CTS 1633, the CLV 1635, and the CUV 1636, together with the value of the counter 1634, are input to the counter logic 1637. When the conditions of the RE are satisfied, the counter logic output 1638 will be activated. The transition from one state to the next is controlled by the counter logic output 1638, so no transition will occur until the counter logic output is high.

[00156] For one embodiment the CTS register 1633 can be programmed with multiple trigger states to effect more complex REs. For example, an RE programmed as a (b|c) {2, 4} would require programming the states corresponding to "b" and "c" (i.e., states 1 and 2) as trigger states.

[00157] For one embodiment, the trigger state of CTS 1633 can be programmed to an accept state of the RE to count the number of times the RE has hit.

[00158] To effect stitching, the FSA building block 1600 includes a stitch out control unit (SOCU) 1639 with two caller outgoing state (COS) registers 1640 and two corresponding caller's target FSA (CTF) registers 1641. Each COS register is programmed with the states at which to stitch to another FSA building block. The corresponding CTF registers 1641 indicate which FSA building blocks to stitch to (i.e., the callee FSA building blocks). The stitch trigger computation logic (STCL) 1642 receives the stitch state information and the target FSA building block information from the COS registers 1640 and the corresponding CTF registers 1641, respectively, and uses the information to activate FSA startout 1643. FSA startout 1643 is connected to, and activates, the FSA startin 1644 of the callee FSA building blocks. At the callee FSA building blocks, the receiving states selector (RSS) 1645 is programmed to determine which of the callee receiving state (CRS) registers 1646 to access for the callee receiving states. The NSDL 1618 then uses the value in the selected CRS register 1646, the start state 1609, and the DNS 1625 to determine the next state for the callee FSA building block, which is then latched to the node elements 1616. For one embodiment the values in the selected CRS register(s) 1646, the start state 1609, and the DNS 1625 are OR'd to determine the next state.

[00159] Similarly, when the callee FSA building block reaches an accept state contained in an accept state register 1626, it determines which FSA building block to return to by reference to the accept's target FSA (ATF) register 1647. The ASDL 1627 uses the value in the accept state register 1626 and the value in the ATF register 1647 to determine when to activate stitch return out (SRO) 1648. SRO 1648 is connected to, and activates, the stitch return in (SRI) 1649 of the target FSA building blocks, and the evaluation continues at the target FSA building blocks.

[00160] FSA building blocks may be interconnected to provide FSA building block stitching in accordance with one embodiment of the invention. Each FSA building block may be connected to itself via an internal connection.

[00161] Figure 17 illustrates an on-chip state machine unit, referred to as a RE processor, in accordance with one embodiment of the invention. RE processor 1700, shown in Figure 17, includes a number of FSA building blocks 1705, that may be interconnected in groups as described above. For one embodiment, the number of FSA building blocks 1705 may be approximately 1000 – 2000. RE processor 1700 also includes an automata controller 1710 that provides input data to the FSA building blocks 1705. Automata controller 1710 couples the FSA building blocks 1705 to a rule memory 1715 and a context memory 1720, as well as to an on-chip bus and interface 1725, for communication with off-chip memory 1730 and with other system devices through an off-chip interface 1735.

CONTEXT MEMORY

[00162] As discussed above, if the input data is fragmented, then the state (context) of the FSA building block should be saved in order to resume appropriate evaluation when the input data resumes. The context of the FSA building block includes the node element values, the counter values, and potentially, the location registers. Upon resuming the input data, the saved context memory is loaded to the FSA building block so that the evaluation may continue. In accordance with one embodiment, upon interruption of the input data, the automata controller 1710, which is capable of reading from, and writing to, the FSA building block, reads the context from the appropriate registers of the FSA building block, and stores the context, on-chip, in context memory 1720. Upon resumption of the input data, the automata controller

1710 loads the context from context memory 1720 to the FSA building block. The amount of context data is small relative to the programmed registers of the FSA building block. Therefore, by implementing an on-chip context memory, it is possible to efficiently handle multiple concurrent fragmented RE evaluations.

RULES MEMORY

[00163] Initially, the FSA building blocks are programmed with rules that define the relevant REs. Without more, the FSA building blocks could evaluate only those particular REs. However, applications frequently contain more REs than can be practically implemented as FSA building blocks. Embodiments of the invention provide FSA building blocks that are fully programmable and reprogrammable. For one embodiment, additional rules are stored in rule memory 1715. The automata controller 1710 moves rules from the rule memory 1715 into the appropriate FSA building block and vice versa. That is, based upon an externally provided instruction, the automata controller 1710 reprograms particular FSA building blocks with rules stored in rule memory 1715. Storing the additional rules on-chip allows for the rapid reprogramming of the FSA building blocks. The amount of rules that can be practically stored on-chip is at least several times the amount of rules implemented in the on-chip FSA building blocks.

[00164] The interconnection of FSA building blocks in groups allows for the context and rule information to be written to, or read from, the FSA building blocks in parallel. Such interconnection also allows for increasing throughput by concurrently evaluating multiple data input streams. For example, if an application requires only a portion of the available FSA building blocks, then the relevant rules may be loaded repeatedly into the available FSA building blocks and the REs evaluated through multiple data input streams.

[00165] Whereas many alterations and modifications of the present invention will no doubt become apparent to a person of ordinary skill in the art after having read the foregoing description, it is to be understood that any particular embodiment shown and described by way of illustration is in no way intended to be considered limiting. Therefore, references to details of various embodiments are not intended to limit the

scope of the claims, which in themselves recite only those features regarded as essential to the invention.

CLAIMS

We claim:

1. A programmable rule processor comprising:
 - a general purpose register file;
 - an instruction sequencer to provide instructions;
 - a decoder coupled to the general purpose register file to decode a set of instructions specified by the instruction sequencer; and
 - a state machine unit coupled to the decoder and having state machine registers to store one or more state machines and state machine execution hardware coupled to the state machine registers to evaluate the one or more state machines in response to executing one or more of the set of instructions and based on information from one or both of the decoder and the general purpose register file.

2. The programmable rule processor defined in Claim 1 wherein the state machines being evaluated are finite state automata to detect regular expressions on input data.

3. A programmable rule processor comprising:
 - a general purpose register file;
 - an instruction sequencer to provide instructions;
 - a decoder coupled to the general purpose register file to decode a set of instructions specified by the instruction sequencer;
 - search registers and search execution hardware coupled to the plurality of search registers and coupled to receive search parameters from one or both of the decoder and the general purpose register file to perform one or more contextual searches on content in the search registers in response to executing one or more of the set of instructions; and
 - a state machine unit coupled to the decoder and having state machine registers to store one or more state machines and state machine execution hardware coupled to the state machine registers to evaluate the one or more state machines in response to

executing one or more of the set of instructions and based on information from one or both of the decoder and the general purpose register file.

4. The processor defined in Claim 3 wherein either results from performing one or more contextual searches by the search execution hardware are subsequently used by the state machine unit in evaluating at least one state machine or results from evaluation of the one or more state machines are subsequently used the search execution hardware in performing at least one contextual search.

5. The processor defined in Claim 3 wherein the search execution hardware performs at least one of the one or more contextual searches via parallel pattern matching in response to executing one or more search instructions specifying the one or more pattern searches and presenting one or more patterns to the content in the search registers.

6. The rule processor defined in Claim 5 wherein the search execution hardware comprises:

a search array coupled to the plurality of search registers, wherein content in the plurality of search registers is replicated and stored in the search array; and

a sorter coupled to the search array to perform the one or more operations in response to information specified by one or more search instructions.

7. The processor defined in Claim 3 wherein the state machine execution hardware comprises a state machine evaluation unit.

8. The rule processor defined in Claim 3 further comprising a memory to store the one or more search instructions to be applied to data in the search registers or to be applied to be evaluated by the state machine execution hardware.

9. The rule processor defined in Claim 3 further comprising an instruction sequencer for applying one or more search instructions to the search execution engine and the state machine execution hardware.

10. The rule processor defined in Claim 3 wherein at least one search instruction includes a field that specifies a parameter to use to control the search or a pointer into a memory that stores the parameter to control the search.

11. The rule processor defined in Claim 10 wherein the pointer points to a general purpose register.

12. The programmable rule processor defined in Claim 3 wherein state machines being evaluated are finite state automata to detect regular expressions on input data.

13. The rule processor defined in Claim 3 wherein at least one of the one or more search instructions specifies a pattern that is to be searched against the content in the plurality of search registers and zero or more search parameters.

14. The rule processor defined in Claim 13 wherein one parameter specifies a portion of the pattern to be masked to enable a subset of the pattern to be searched against the content in the search registers.

15. The rule processor defined in Claim 14 wherein the portion of the pattern to be masked is specified by a mask vector to mask off specific bytes in the pattern.

16. The rule processor defined in Claim 14 wherein the zero or more parameters specify starting and ending locations that constitute a range of the content within the search registers within which the search execution engine is to constrain a search.

17. The rule processor defined in Claim 3 wherein the one or more search instructions specify at least one pattern, range control, and program control flow.

18. A programmable rule processor comprising:
a general purpose register file;
a plurality of search registers;
a plurality of state machine registers;
a plurality of execution units;
an instruction sequencer to provide instructions;
a decoder coupled to the general purpose register file, the plurality of search registers, the plurality of state machine registers, and the plurality of execution units, to decode a set of instructions specified by the instruction sequencer and provide the decoded instructions to one or more execution units and one or more of the plurality of search registers and plurality of state machine registers for execution thereby based on an opcode in each instruction in the set of instructions.

19. The processor defined in Claim 18 wherein one of the plurality of execution units comprises a state machine evaluation unit.

20. The programmable rule processor defined in Claim 18 wherein at least one of the execution units evaluates state machines represented by data in the state machine registers.

21. The programmable rule processor defined in Claim 20 wherein the state machines being evaluated are finite state automata to detect regular expressions on input data.

22. The processor defined in Claim 18 wherein one of the plurality of execution units comprises a sort array.

23. The processor defined in Claim 18 wherein two of the execution unit comprise a state machine evaluation unit and search execution hardware, and further wherein either results from processing data by the search execution hardware are subsequently used by the state machine evaluation unit in evaluating at least one state machine or results from evaluation of the one or more state machines are subsequently used the search execution hardware in performing at least one search.

24. The processor defined in Claim 18 further comprising a branch unit to branch to another set of one or more instructions based on results of data processing involving one or more of the state machine registers and the search registers.

25. A process for performing contextual searches using a rule processor, the process comprising:

fetching a first rule from a memory on the rule processor;

decoding the first rule to identify whether search parameters are located in the first rule or a general purpose register file in the rule processor;

executing one or more search operations on values in a plurality of search registers in the rule processor using the search parameters obtained from either or both of the first rule and the general purpose register file, the plurality of search registers storing content therein;

generating search results of executing the one or more search operations;

fetching a second rule from the memory;

evaluating one or more state machines with respect to data identified by the search results using state machine execution hardware in the rule processor according to parameters obtained from either or both of the first rule and the general purpose register file.

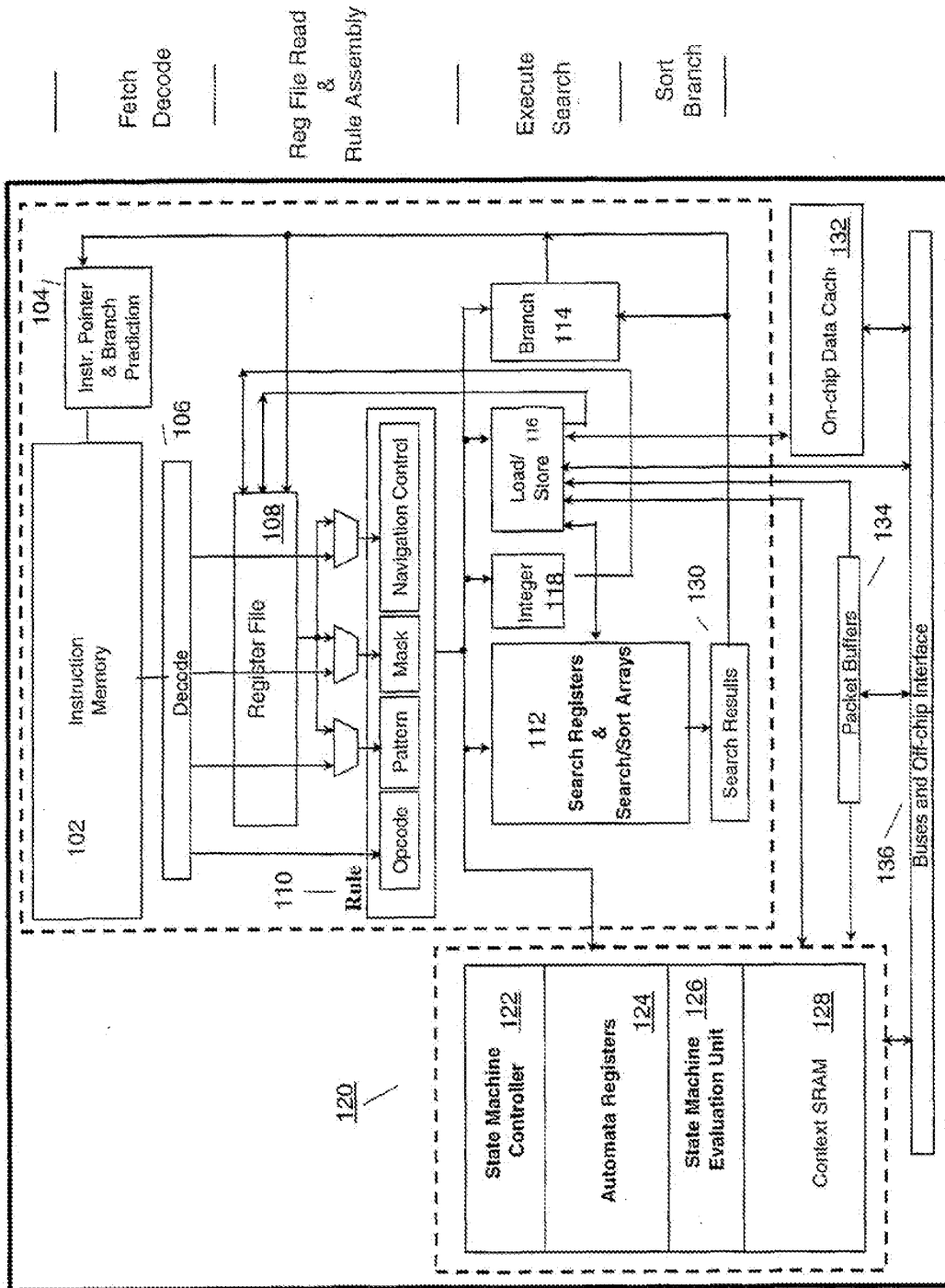


Figure 1: Rule Processor Microarchitecture

204

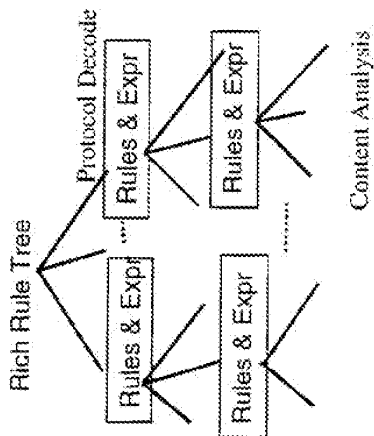
Code Fragment for UriClass: Used Search Register Apparatus

```

// Parse the Request Line
methodStartLoc = (0, docSize, space)
methodEndLoc = (0, docSize, space)
uriArgsStartLoc = (methodEndLoc, docSize, space)
uriArgsEndLoc = (uriArgsStartLoc, docSize, space)
.....
methodIsGet = (methodStartLoc, methodEndLoc, "GET")
methodIsPost = (methodStartLoc, methodEndLoc, "POST")
If (methodIsGet > docSize) & (methodIsPost > docSize) return;
.....
(uriArgsStartLoc, uriEndLoc, UriGroup);
.....

```

202



UriGroup REs: Used in the Search Register Apparatus

```

"X"
"Y"
"Z"
.....

```

206

Figure 2

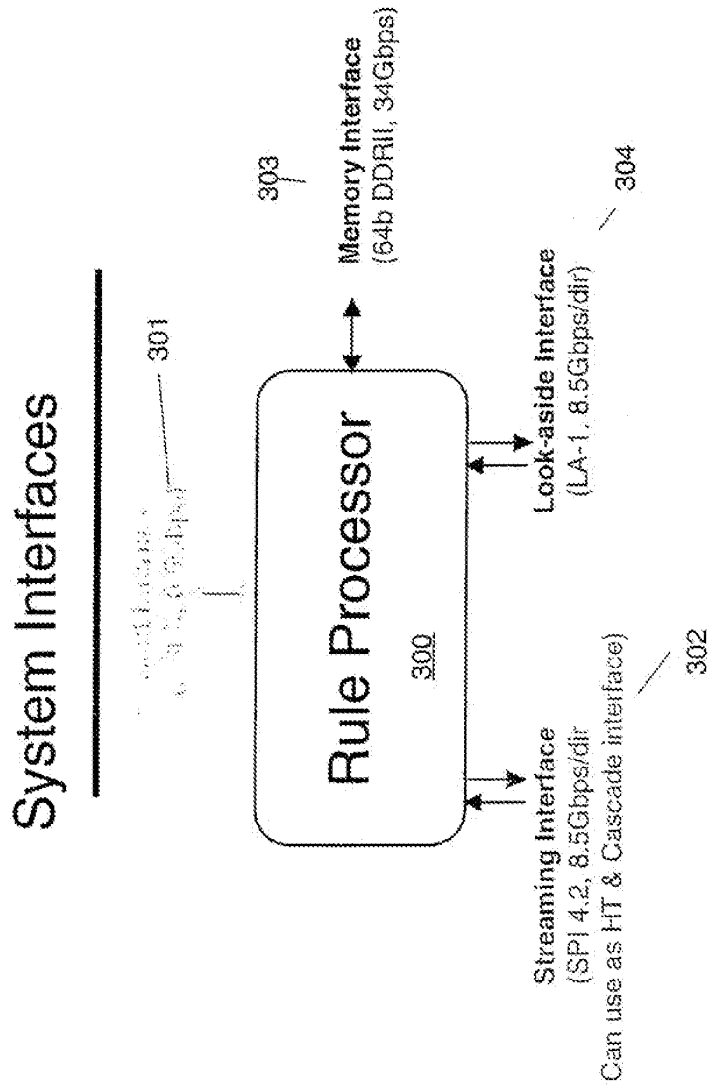


Figure 3

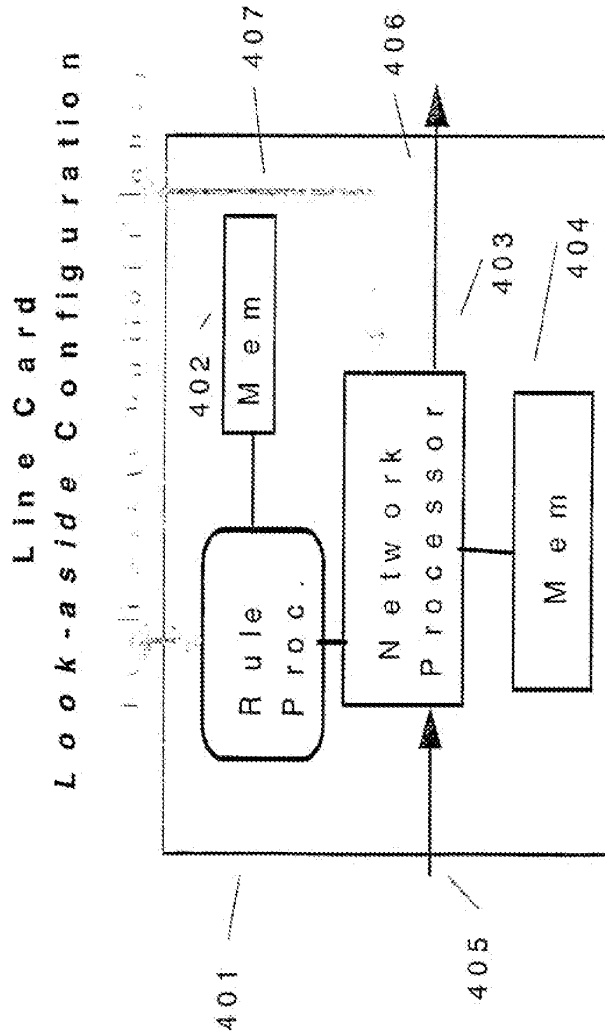


Figure 4

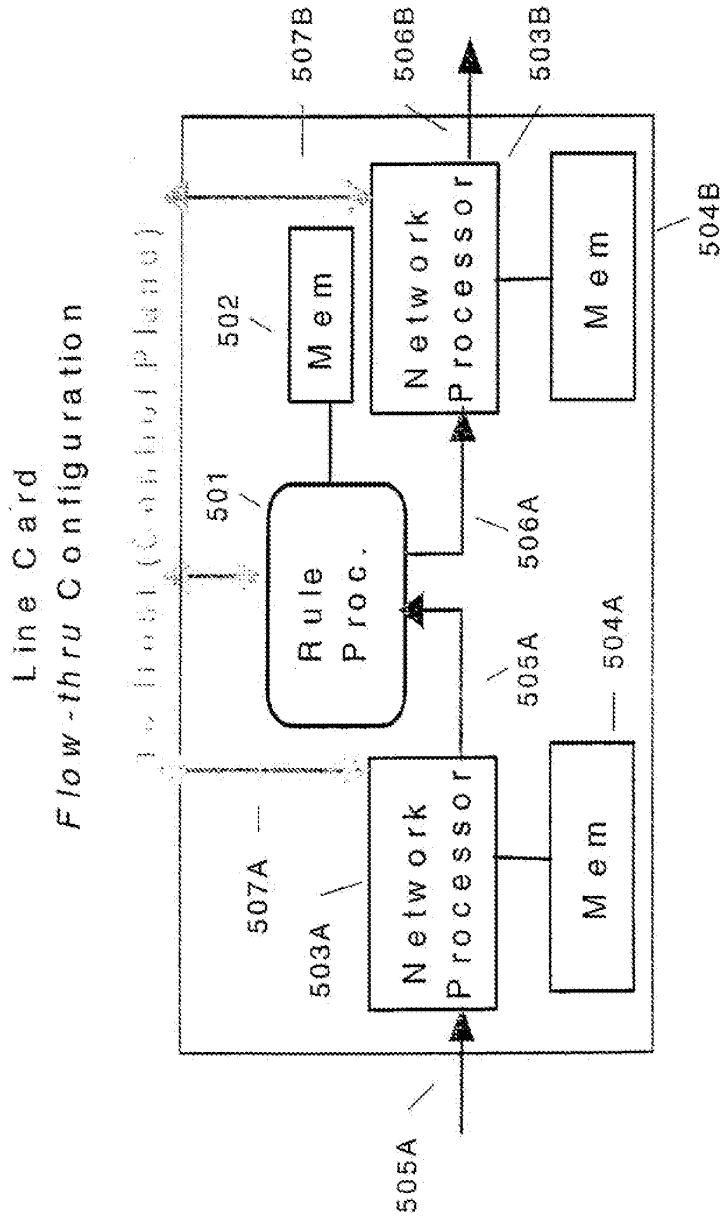


Figure 5

S e r v e r C o - P r o c e s s o r
C o n f i g u r a t i o n

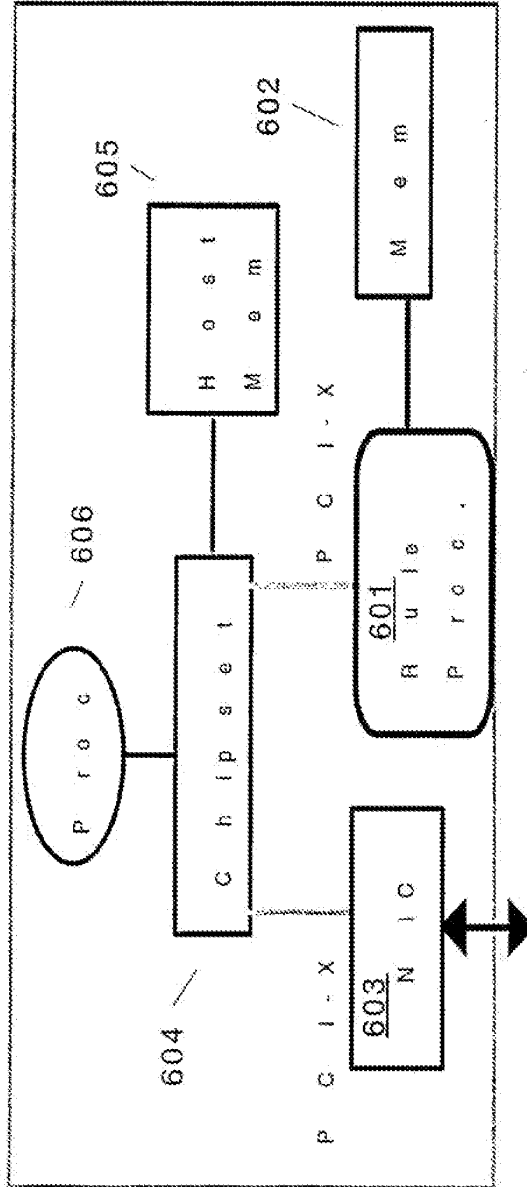


Figure 6

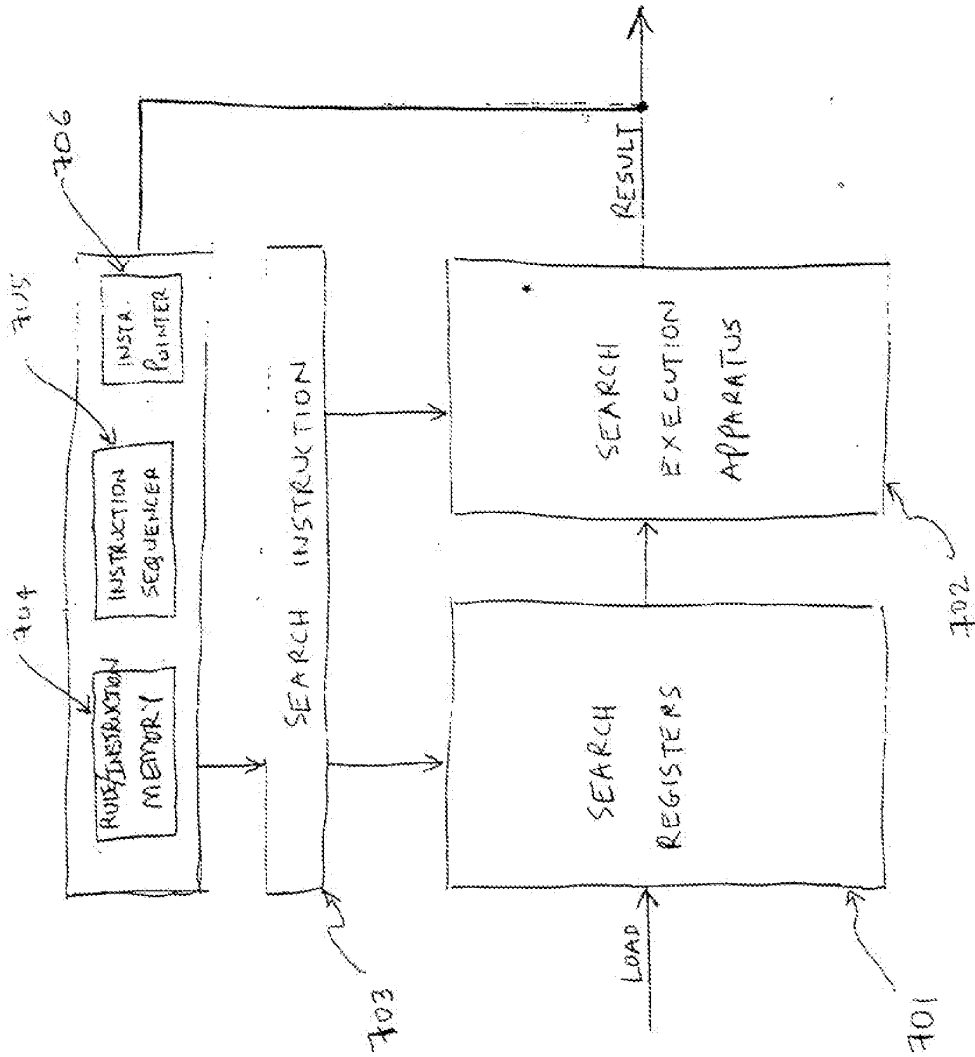


FIGURE 7

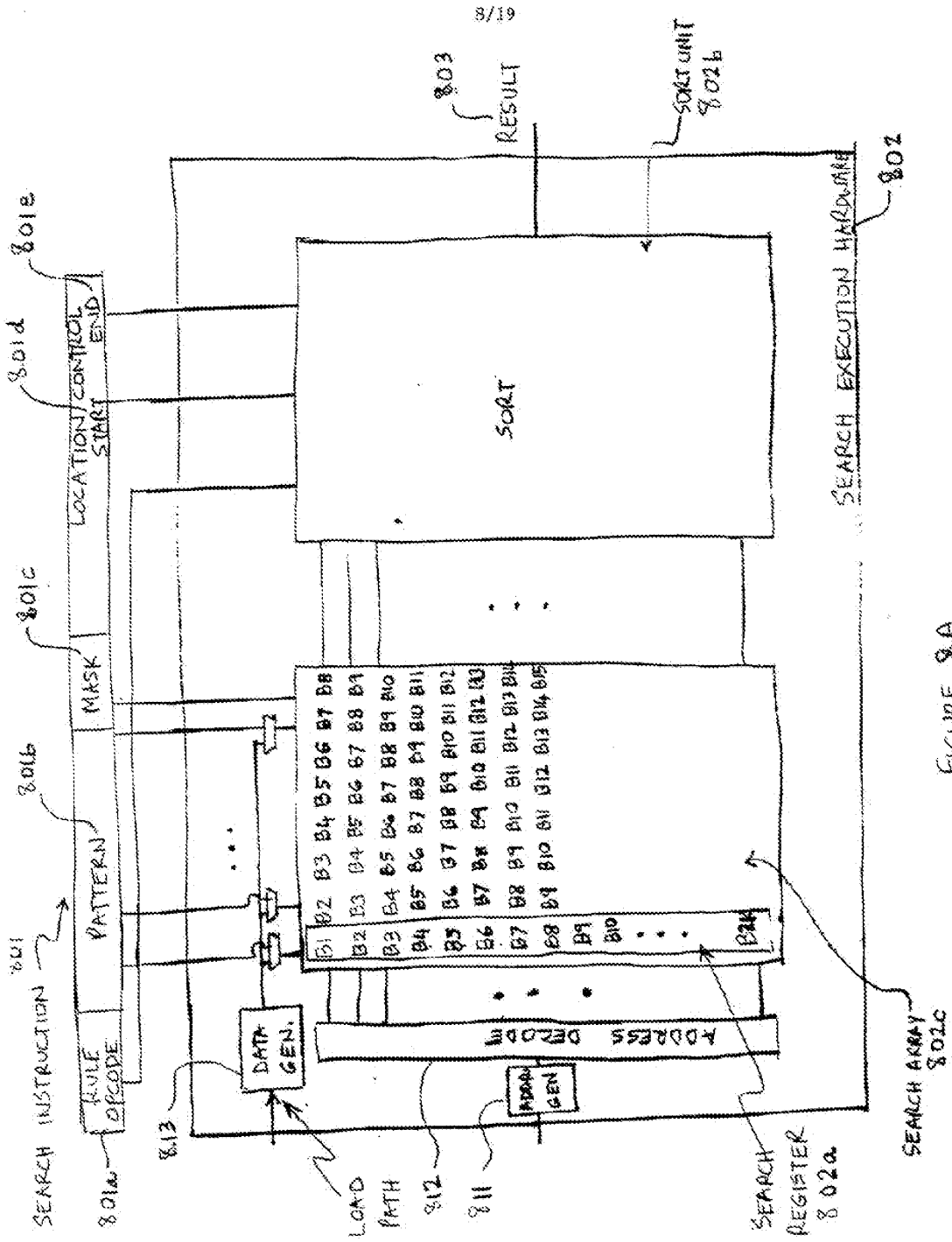


FIGURE 8A

9/19

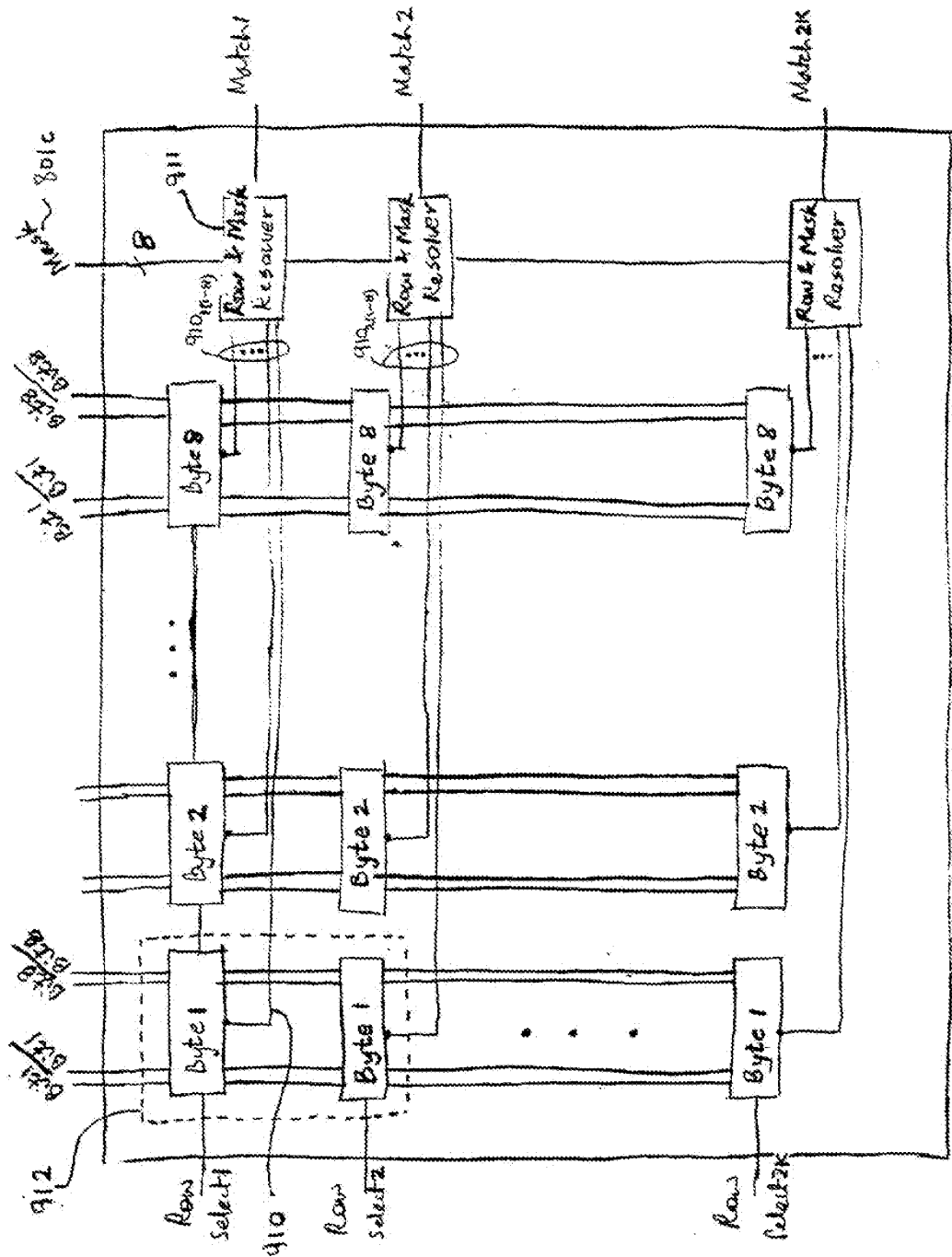
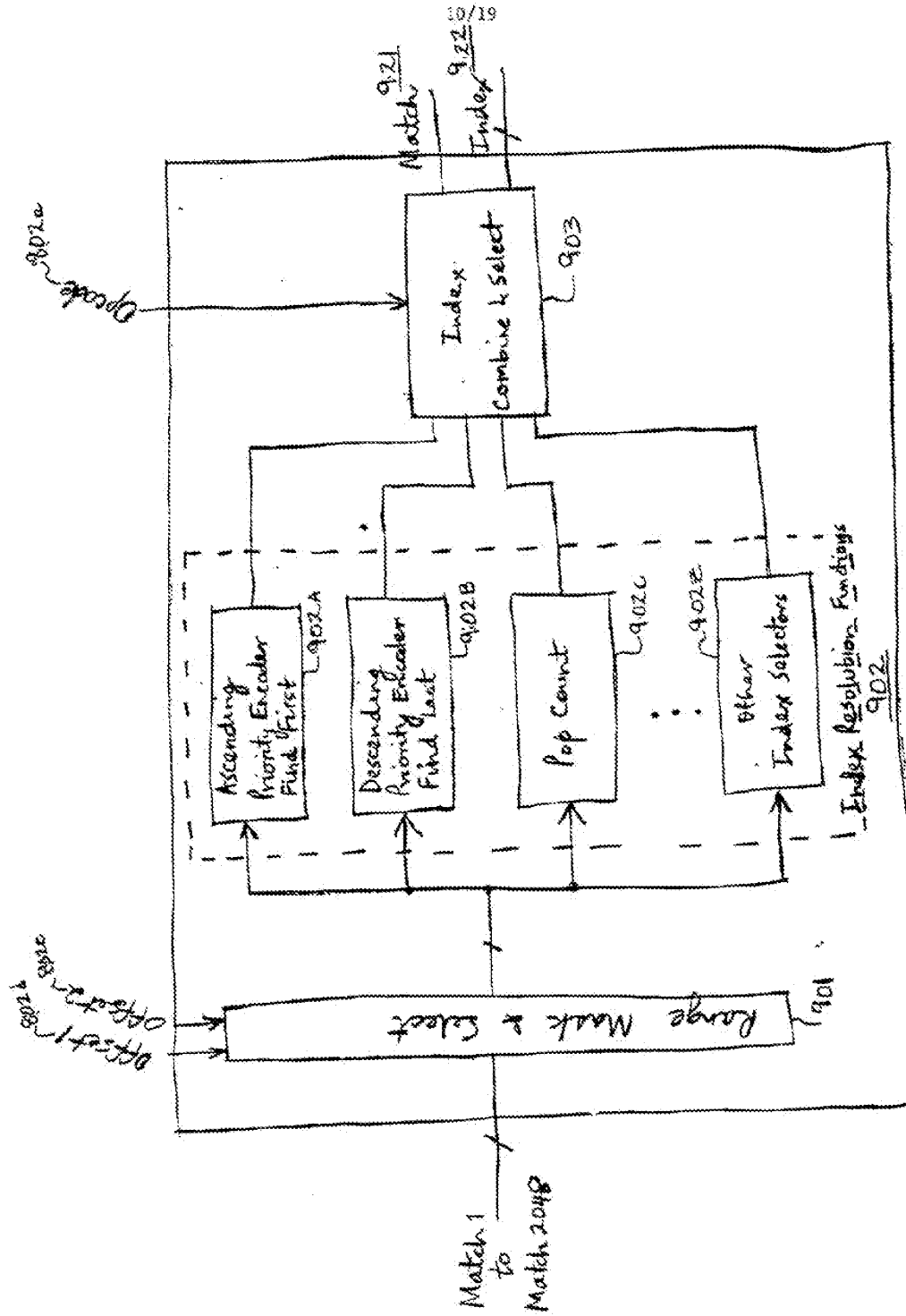


FIGURE 8B

FIGURE A



11/19

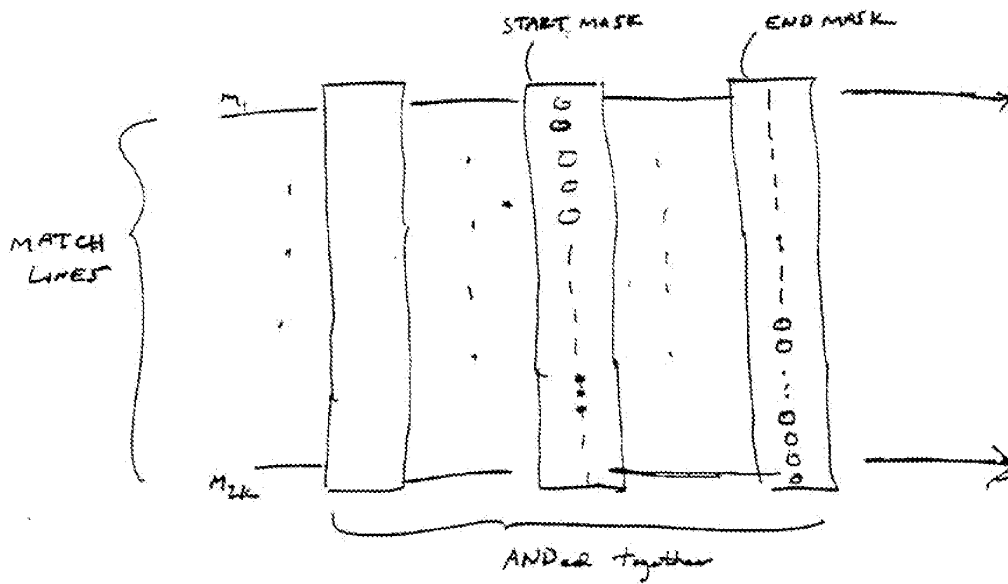


Figure 9B

12/19

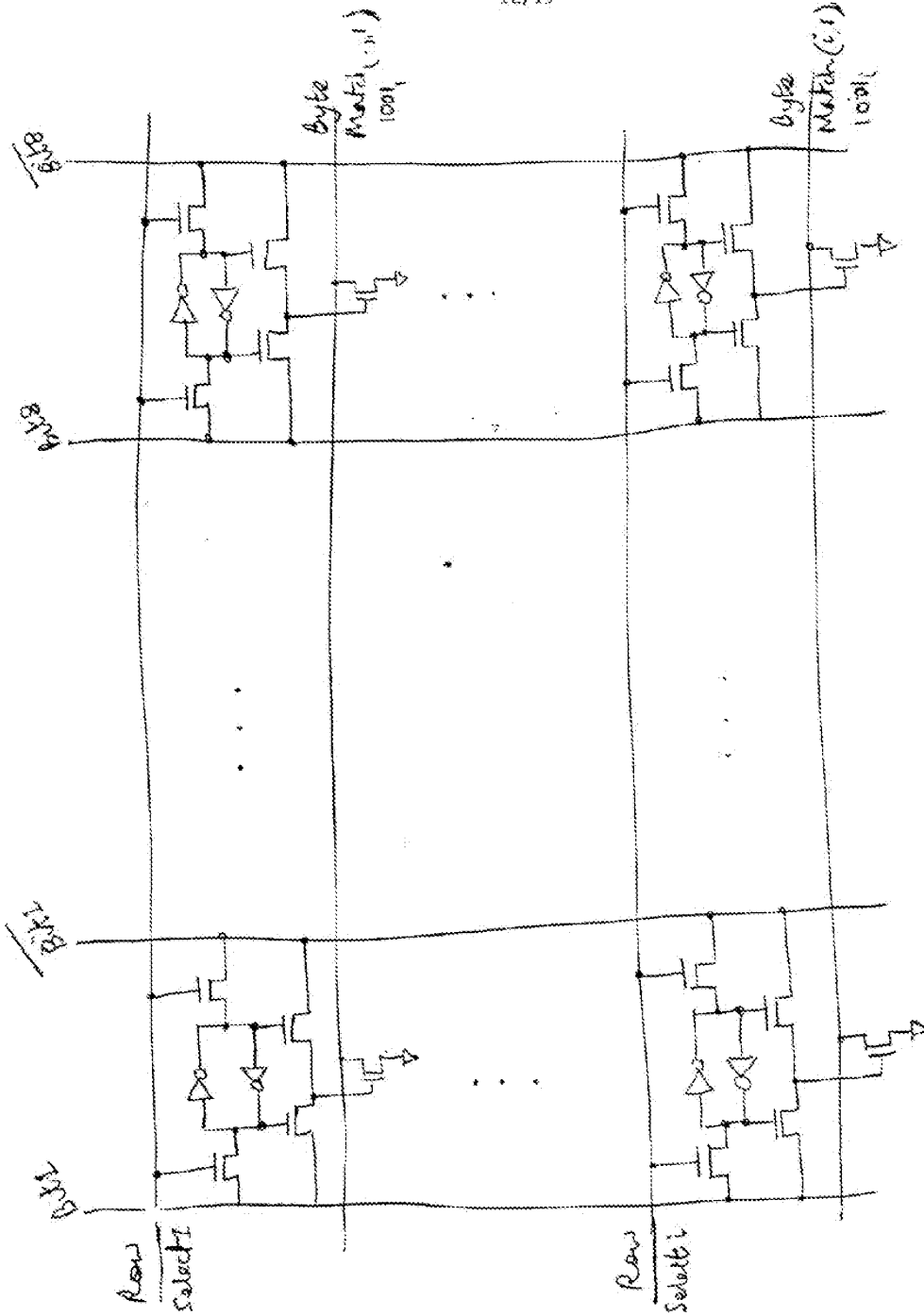
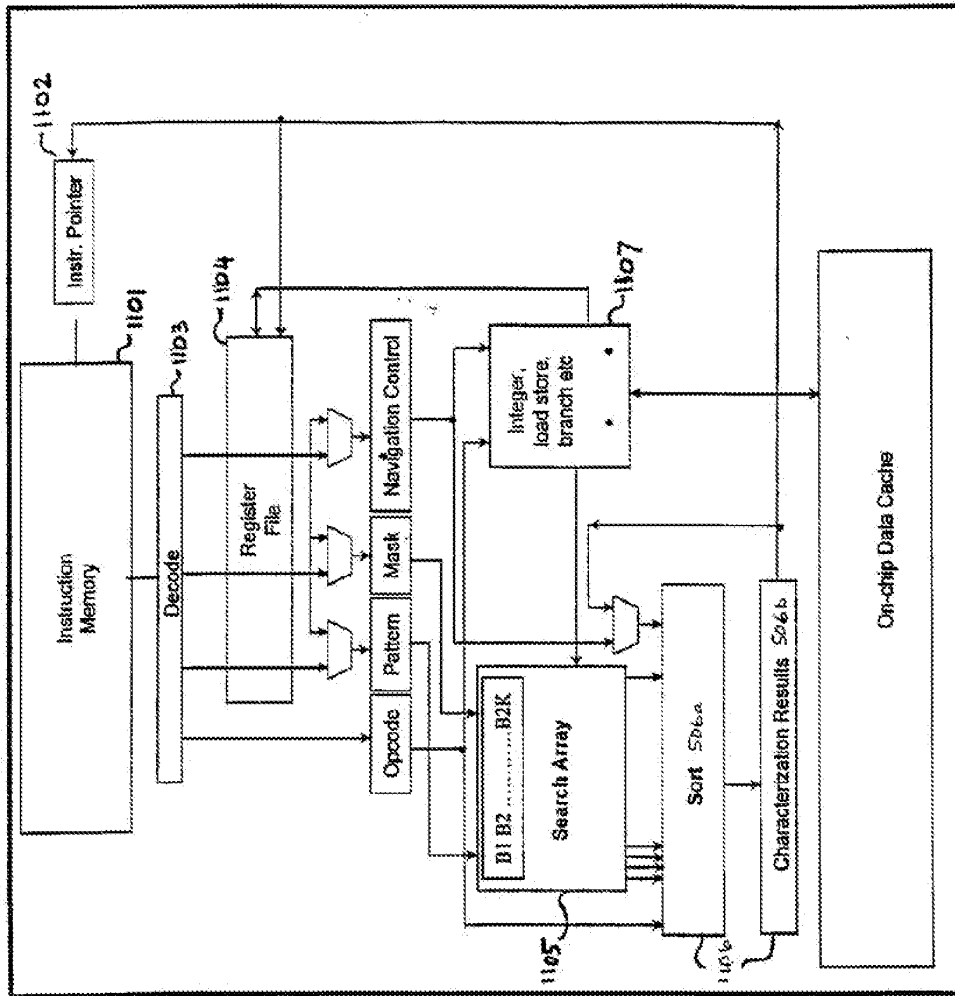


FIGURE 10

Microarchitecture Diagram



- Fetch ~ 1108
- Reg File Read ~ 1104 & Rule Assembly
- Execute/Search ~ 1105
- Sort & Branch ~ 1106

Figure 11

8/23/02

Example pseudo-code and Rule Engine micro-code

Pseudo-code (A01)

FIND ("cp/bin/sh /usr/spool/mail/root" BEFORE "chmod 4755 /s" AND "touch") BEFORE "mail"*

Micro-code for an exemplary Rule Engine (A02)

	Opcode	Pattern	Mask	Start Offset	Start Offset Indirect	End Offset	End Offset Indirect	Result Register	Branch Address
1	FIND_FIRST_FORWARD	"cp/bin/*"	0xFF	0x03D	0	0x800	0	A	0xB
2	FIND_FORWARD_ANCHORED	"sh /usr/*"	0xFF	<A + 8>	1	0x800	0	A	0xB
3	FIND_FORWARD_ANCHORED	"spool/mail"	0xFF	<A + 8>	1	0x800	0	A	0xB
4	FIND_FORWARD_ANCHORED	"/root"	0xFE	<A + 8>	1	0x800	0	A	0xB
5	FIND_FIRST_FORWARD	"chmod 475"	0xFF	<A + 7>	1	0x800	0	A	0xB
6	FIND_FORWARD_ANCHORED	"55 /s*"	0xF8	<A + 8>	1	0x800	0	A	0xB
7	FIND_FIRST_FORWARD	"touch"	0xF8	0x03D	0	0x800	0	B	0xB
8	CMP(B+5, A+5)_BRANCH(10)	-	-	-	-	-	-	-	0xA
9	FIND_FIRST_FORWARD	"mail"	0xF0	<A + 5>	1	0x800	0	C	0xB
10	FIND_FIRST_FORWARD	"mail"	0xF0	<B + 5>	1	0x800	0	C	0xB

FIGURE 1a

Execution of example micro-code: pipeline diagram

1301	Clock 14	-	-	-	10
	Clock 13	-	-	10	-
	Clock 12	-	10	-	-
	Clock 11	10	-	-	-
	Clock 10	-	-	-	8
	Clock 9	-	-	8	7
	Clock 8	-	8	7	6
	Clock 7	8	7	6	5
	Clock 7	7	6	5	4
	Clock 6	6	5	4	3
	Clock 5	5	4	3	2
	Clock 4	4	3	2	1
	Clock 3	3	2	1	-
	Clock 2	2	1	-	-
	Clock 1	1	-	-	-
	Fetch	Assemble	Search/ Execute	Sort & Branch	

FIGURE 13

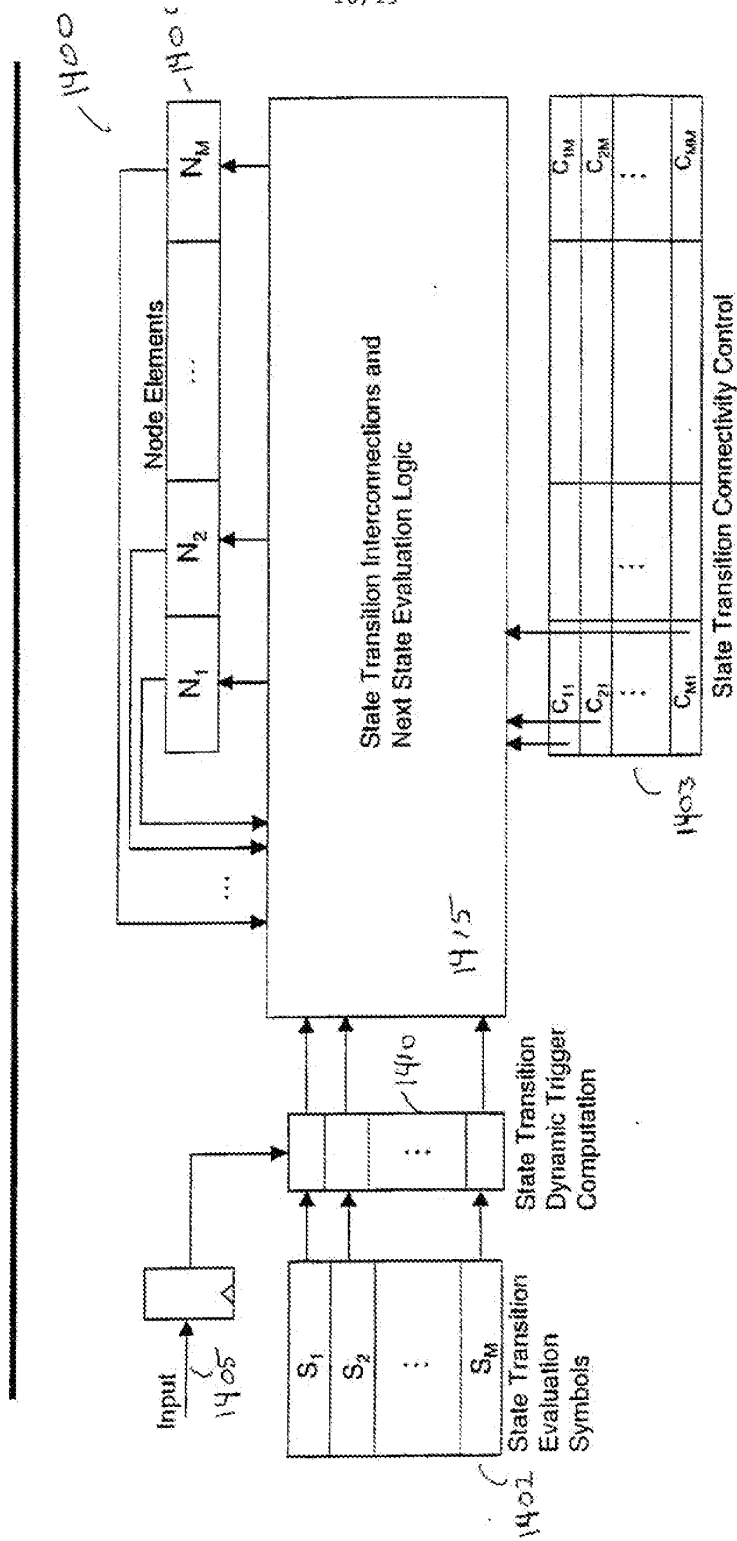


Fig. 14

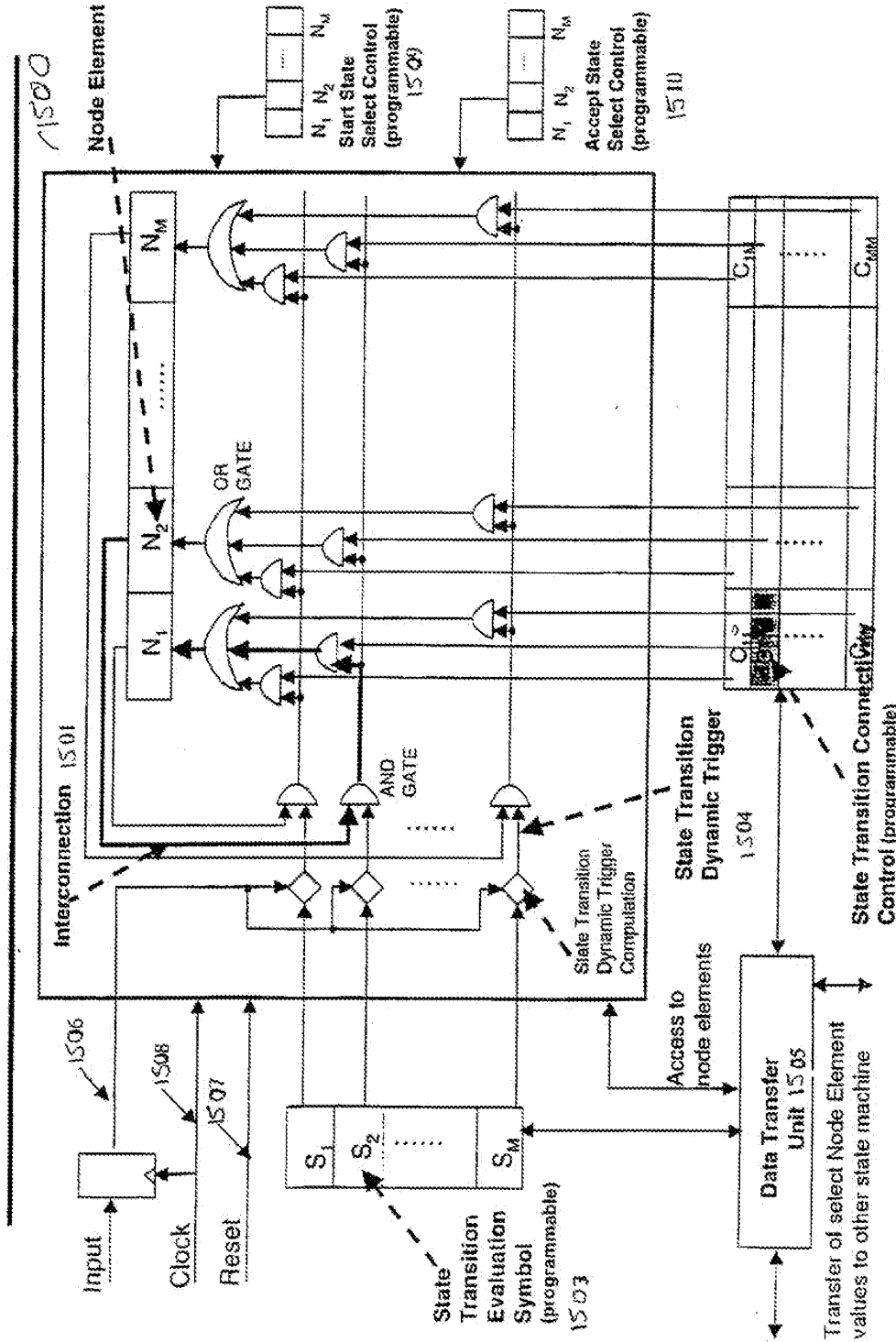


Fig 15

FSA Building Block

1600

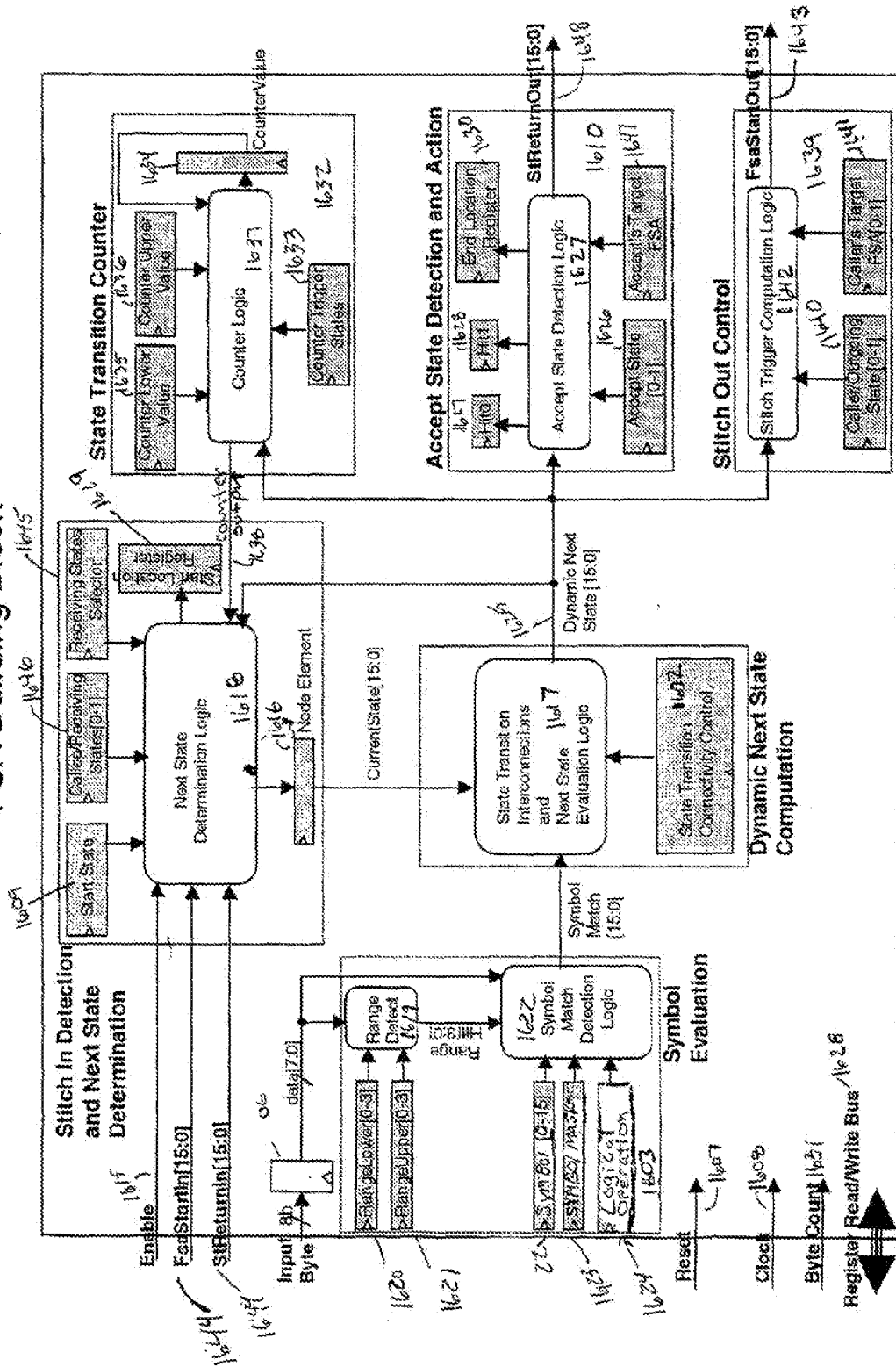


Fig. 16

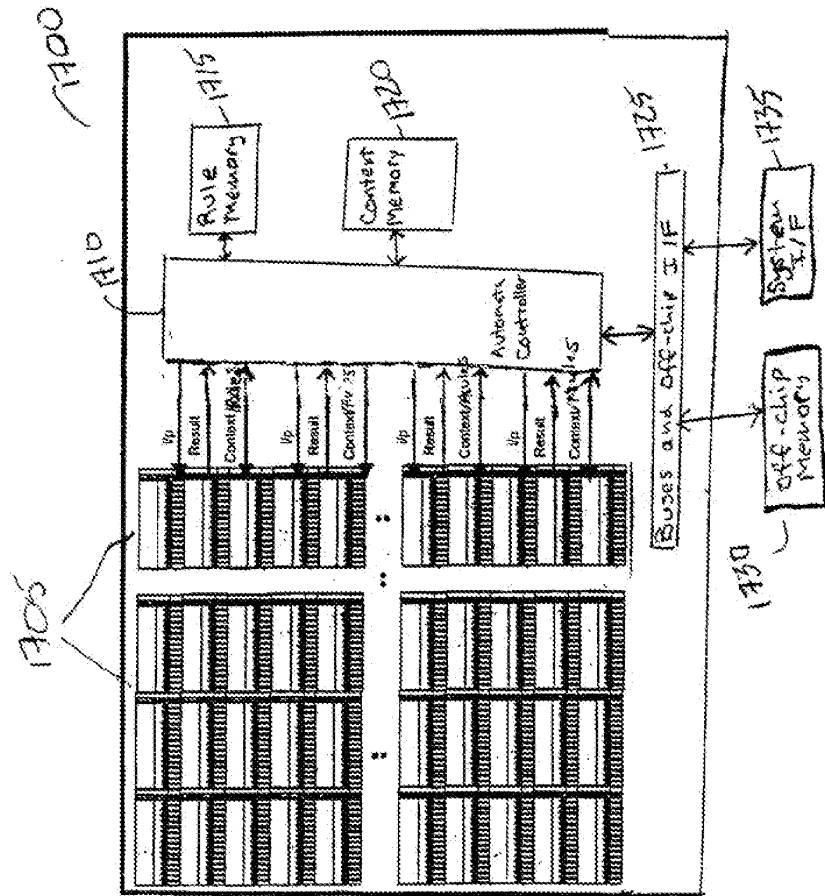


Fig. 17

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/US2004/000409

A. CLASSIFICATION OF SUBJECT MATTER IPC 7 G06F17/30		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) IPC 7 G06F G05B		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the International search (name of data base and, where practical, search terms used) EPO-Internal, INSPEC, IBM-TDB		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 212 625 B1 (RUSSELL RICHARD G) 3 April 2001 (2001-04-03) abstract	1,2 3-25
A	column 2, line 55 - column 3, line 11 column 5, line 6 - column 5, line 25 column 6, line 57 - column 7, line 21 figures 1-6	3-25
A	US 6 327 508 B1 (MERGARD JIM) 4 December 2001 (2001-12-04) abstract	3-25
A	EP 0 488 297 A (HITACHI LTD ; HITACHI MAXELL (JP)) 3 June 1992 (1992-06-03) the whole document	3-25
----- -/--		
<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C.		
<input checked="" type="checkbox"/> Patent family members are listed in annex.		
* Special categories of cited documents :		
A document defining the general state of the art which is not considered to be of particular relevance *E* earlier document but published on or after the international filing date *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) *O* document referring to an oral disclosure, use, exhibition or other means *P* document published prior to the international filing date but later than the priority date claimed		
I later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. *&* document member of the same patent family		
Date of the actual completion of the international search	Date of mailing of the international search report	
1 June 2004	09/06/2004	
Name and mailing address of the ISA European Patent Office, P.O. 5616 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Abbing, R	