

**Skirmont** teaches means for assigning not well-behaved flows to higher drop probabilities and therefore, creating an increased drop rate, than a flow that is well-behaved (col. 4 ln. 64-67). It would have been obvious to one of ordinary skill in the art at the time the invention was created to apply the teachings of **Skirmont** to the penalty function of **Jacobson** et al for penalty enforcement on misbehaving flows.

Consider claims **12** and **32**, as applied to claims **8** and **28**, **Jacobson** et al teach the claimed invention except may not have *explicitly* mentioned the penalty is determined and enforced on the flow even when no congestion condition is encountered. **Skirmont** mentions a Random Early Detection (RED) algorithm comprising means for allowing the dropping of packets *without regard* to the characteristics (e.g. congestion) of a flow (col. 5 ln. 21-24). It would have been obvious to one of ordinary skill in the art at the time the invention was created to incorporate the RED algorithm as mentioned by **Skirmont** to the load balancer of **Jacobson** et al for improving network flow performance.

Consider claims **18** and **38**, as applied to claims **5** and **25**, **Jacobson** et al teach the claimed invention except may not have *explicitly* mentioned the behavioral statistics comprising an average size for the information packets of a flow. **Skirmont** teaches in figure 2 an average queue (flow) size is taken into account when deciding a drop probability (col. 4 ln. 26-34). It would have been obvious to one of ordinary skill in the art at the time the invention was created to apply the teachings of **Skirmont** to the penalty function of **Jacobson** et al for enforcing flow traffic.

Claims **9** and **29** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Jacobson** et al (**US 2005/0226149 A1**) in view of **Malan** et al (**US 2002/0032717 A1**) and in further view of **Zikan** et al (**US 6,310,881 B1**).

Consider claims **9** and **29**, as applied to claims **8** and **28**, **Jacobson** et al teach means for the penalty has an effect (enforcing) of correcting the flow's behavior such that the flow exhibits less undesirable behavior ([0097-0098]: DEM for a flow). **Jacobson** et al do not very explicitly teach "causing the badness factor to improve." **Zikan** et al teach concept of causing  $E_{\alpha,\beta}(f)$  (e.g. badness factor) to improve (*maximization* of merit functions: col. 10 ln. 20-28). It would have been obvious to one skilled in the art to apply a function of causing improvement in some badness factor as taught by **Zikan** et al to the single flow processing means of **Jacobson** et al to dynamically regulate each flow individually.

Claims **11** and **31** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Jacobson** et al (**US 2005/0226149 A1**) in view of **Malan** et al (**US 2002/0032717 A1**) and in further view of **Afanador** (**US 6,167,041**).

Consider claims **11** and **31**, as applied to claims **8** and **28**, **Jacobson** et al disclose the claimed invention except may not have *explicitly* mentioned no penalty is enforced on a flow unless a congestion is encountered, regardless of how undesirably the flow is behaving. **Afanador** teaches that only offending queues (flows) are penalized in time of congestion (col. 8 ln. 25-33). It would have been obvious to one of ordinary skill in the art at the time the invention was created to apply the teachings of **Afanador** to the penalty function of **Jacobson** et al for fair penalization of flows.

Claims **15, 16, 17, 35, 36** and **37** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Jacobson et al (US 2005/0226149 A1)** in view of **Malan et al (US 2002/0032717 A1)** and in further view of **Scifres et al (US 7,113,990 B2)**.

Consider claims **15, 16, 17, 35, 36** and **37**, as applied to claims **1, 5, 16, 25** and **36, Jacobson et al** teach the claimed invention except may not have *explicitly* mentioned the behavioral statistics comprising: T for an amount of total information contained in all of the information packets belonging to a flow, an L for how long the flow has been existing, and using T/L to obtain R, which is a rate for information transfer of the flow. **Scifres et al** teach a flow volume 32 (e.g. T) is divided by a time period 46 (e.g. L) to obtain an average flow rate (e.g. R) (col. 5 ln. 9-13). It would have been obvious to one of ordinary skill in the art at the time the invention was created to apply the calculation method as taught by **Scifres et al** to the penalty function of **Jacobson et al** for flow restriction and allocation.

Claims **19, 20, 39** and **40** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Jacobson et al (US 2005/0226149 A1)** in view of **Malan et al (US 2002/0032717 A1)** and in further view of **Kejriwal et al (US 6,934,250 B1)**.

Consider claims **19, 20, 39** and **40**, as applied to claims **5** and **25, Jacobson et al** disclose the claimed invention except may not have *explicitly* mentioned means for receiving and determining whether to forward a particular information packet to a destination; updating, in response to a determination to forward the particular packet, a

set of behavioral statistics to reflect processing of the particular packet; and updating regardless of whether the particular information packet is discarded or forwarded to a destination. **Kejriwal** et al teach means for a policing embodiment determines whether a received packet is to be rejected (discarded) or enqueued (forwarded out of a processor pipeline) to a destination based on a length indicator (packet conforming or non-conforming information); as a statistics table 921 is being written based on the information of the packet, *either* rejected or forwarded. (col. 24 lines 30-43 & 47-65; fig. 9 @ 917,922,924,950 → fig. 5A). It would have been obvious to one of ordinary skill in the art at the time the invention was created to apply the functions as taught by **Kejriwal** et al to the penalty function of **Jacobson** et al for distinguishing good and bad flows individually.

Claim **43** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Jacobson** et al (**US 2005/0226149 A1**) in view of **Yazaki** et al (**US 2010/0110889 A1**) and in further view of **Malan** et al (**US 2002/0032717 A1**).

Consider claim **43**, **Jacobson** et al teach an article of manufacture (fig. 1: gateway 106) comprising:

a computer-readable medium having stored thereon a data structure (figs. 9 and 10 tables);

a first field containing data representing a flow block (fig. 9: column 904 contains indicia of flow of packet; [0082] lines 10-18); and

a second field containing data representing payload-content-agnostic behavioral statistics about a flow (fig. 9: column 906 drop times; [0083] – drop times involve behavior of the packet as shown in [0101]).

While **Jacobson** et al mention:

i.) data representing pre-determined behavior threshold values (fig. 2: lower and upper thresholds; [0098] + claims 4 and 5: comparing DEM of a flow to a range);

ii.) data representing the results of a heuristic determination of whether said flow exhibits undesirable behavior determined by comparing said behavioral statistics to said pre-determined threshold values ([0098]: changing parameters... statistical method for a flow; [0098] + claims 4 and 5: comparing DEM of a flow to a range); and

iii.) data representing at least one penalty to be enforced against *at least one* packet upon determination that said flow exhibits undesirable behavior ([0101-0103]: penalty);

**Jacobson** et al may not have very explicitly mentioned “a third field,” “a fourth field,” and “a fifth field” to indicate on the table of processes i., ii. and iii. respectively.

**Yazaki** shows fields ([0061]) that indicate i ([0097] lines 1-4: THR – threshold); ii ([0097] lines 1-4: CNT – count of bytes); and iii ([0097] lines 1-4: W – weight; [0061] lines 13-23: PRIC/PRIN – priority conformance or non-conformance) (see claim 1 also). It would have been obvious to one skilled in the art to modify the data structure (table) of **Jacobson** et al to include fields for i., ii. and iii. as taught by **Yazaki** et al for the purpose of providing more information to judge whether a flow or packet is conformant or not.

**Jacobsen-Yazaki** do not very explicitly mention the set of behavioral statistics is updated based on each information packet belonging to the flow, as each information packet belonging to the flow is processed, *regardless of the presence or absence of congestion*. **Malan** et al teaches concept function of set of behavioral statistics is updated based on each information packet belonging to the flow, as each information packet belonging to the flow is processed, *regardless of the presence or absence of congestion* ([0119]: Flow statistics aggregate a flow's individual packet statistics into a single statistic – when individual packet statistics are aggregated (e.g. accumulated), the single statistic varies accordingly as individual packet statistics get accumulated; there is no congestion condition requirement in **Malan**). It would have been obvious to one of ordinary skill in the art when the invention was made to modify the behavioral statistic update method of Jacobsen-Yazaki to that of Malan et al for more effective profiling of network flows.

### ***Response to Arguments***

Arguments filed on 22<sup>nd</sup> February 2011 have been considered but are moot in view of *new grounds* of rejections. See **Malan** et al for “set of behavioral statistics is updated based on each information packet belonging to the flow, as each information packet belonging to the flow is processed, *regardless of the presence or absence of congestion*” limitation.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, THIS ACTION IS MADE FINAL. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Xavier Wong whose telephone number is 571.270.1780. The examiner can normally be reached on Monday through Friday 10:30 am - 8:00 pm (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Seema Rao can be reached on 571.272.3174. 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.

Art Unit: 2462

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.

*/Xavier Szewai Wong/*  
Patent Examiner AU 2462  
4<sup>th</sup> May 2011



<b>Notice of References Cited</b>	Application/Control No. 11/022,599	Applicant(s)/Patent Under Reexamination NATCHU, VISHNU	
	Examiner Xavier Szewai Wong	Art Unit 2462	Page 1 of 1

**U.S. PATENT DOCUMENTS**

*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A US-2002/0032717 A1	03-2002	Malan et al.	709/105
B	US-			
C	US-			
D	US-			
E	US-			
F	US-			
G	US-			
H	US-			
I	US-			
J	US-			
K	US-			
L	US-			
M	US-			


**FOREIGN PATENT DOCUMENTS**

*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
N					
O					
P					
Q					
R					
S					
T					

**NON-PATENT DOCUMENTS**

*	Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
U	
V	
W	
X	

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

<b>Search Notes</b>  	<b>Application/Control No.</b>  11022599	<b>Applicant(s)/Patent Under Reexamination</b>  NATCHU, VISHNU
	<b>Examiner</b>  Xavier Szewai Wong	<b>Art Unit</b>  2462

SEARCHED			
Class	Subclass	Date	Examiner
370	229-236	10.30.09	XSW
updated	above	08.14.2010	/XSW/
updated	above	2011.05.09	/XSW/

SEARCH NOTES		
Search Notes	Date	Examiner
EAST image, class and keyword search in USPAT, US-PGPUB, DERWENT, EPO, JPO, and IBM_TDB (please see search history)	10.30.09	XSW
Inventor Name and Assignee search in PALM and EAST	10.30.09	XSW
updated above	08.14.2010	/XSW/
updated above	2011.05.09	/XSW/

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

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**EAST Search History**

**EAST Search History (Prior Art)**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L5	131	(Natchu near Vishnu).in. SABLE. as.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/05/09 16:51
L6	1	L5 and (penalty and behavio\$1r\$5). clm.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/05/09 16:51
L7	8750	370/229-236.ccls. and (@rlad < "20041222" @ad < "20041222")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/05/09 16:57
L8	7	L7 and (each individual\$3) with behavio\$5 with (packet frame)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/05/09 16:57
L9	117781	("370"/\$ "455"/\$.709/\$).ccls. and (@rlad < "20041222" @ad < "20041222")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/05/09 17:24
L10	46	L9 and (each individual\$3) with behavio\$5 with (packet frame)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/05/09 17:24
L11	1	L9 and (each individual\$3) near (packet frame) with (behavio\$5 stasis\$5) same conges\$6	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/05/09 17:49
L12	272321	("370"/\$ "455"/\$.709/\$).ccls. and (@rlad < "20041222" @ad < "20041222")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/05/09 17:51

L13	0	L12 and (each individual\$3) near3 (packet frame) with (behavio\$5 statis\$5) same updat\$4	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/05/09 17:54
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**EAST Search History (Interference)**

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**5/ 9/ 2011 5:55:14 PM**

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**EAST Search History**

**EAST Search History (Prior Art)**

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L10	46	L9 and (each individual\$3) with behavio\$5 with (packet frame)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/05/09 17:24
L11	1	L9 and (each individual\$3) near (packet frame) with (behavio\$5 statis\$5) same conges\$6	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/05/09 17:49
L12	272321	("370"/\$ "455"/\$ "709"/\$).ccls. and (@rlad < "20041222" @ad < "20041222")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/05/09 17:51
L13	51	L12 and (each individual\$3) near (packet frame) with (behavio\$5 statis\$5)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/05/09 17:55

**EAST Search History (Interference)**

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Doc code: RCEX

Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (07-09)

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.

**REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL  
(Submitted Only via EFS-Web)**

Application Number	11022599	Filing Date	2004-12-22	Docket Number (if applicable)	SABLE-01008US	Art Unit	2462
First Named Inventor	NATCHU			Examiner Name	Xavier S. Wong		

**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. The Instruction Sheet for this form is located at WWW.USPTO.GOV

**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).

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.

Consider the arguments in the Appeal Brief or Reply Brief previously filed on \_\_\_\_\_

Other \_\_\_\_\_

Enclosed

Amendment/Reply

Information Disclosure Statement (IDS)

Affidavit(s)/ Declaration(s)

Other \_\_\_\_\_

**MISCELLANEOUS**

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(i) required)

Other \_\_\_\_\_

**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 any underpayment of fees, or credit any overpayments, to  
Deposit Account No 503203

**SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED**

Patent Practitioner Signature

Applicant Signature

Doc code: RCEX

Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (07-09)

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

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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.

Signature of Registered U.S. Patent Practitioner			
Signature	/Stuart J. WEST/	Date (YYYY-MM-DD)	2011-09-02
Name	Stuart J. WEST	Registration Number	43258

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.

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

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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.
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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 Patent Application Fee Transmittal

<b>Application Number:</b>	11022599			
<b>Filing Date:</b>	22-Dec-2004			
<b>Title of Invention:</b>	Mechanism for identifying and penalizing misbehaving flows in a network			
<b>First Named Inventor/Applicant Name:</b>	Vishnu Natchu			
<b>Filer:</b>	Stuart James West/Carolina Nunez			
<b>Attorney Docket Number:</b>	SABLE-01008			
Filed as Small Entity				
<b>Utility under 35 USC 111(a) Filing Fees</b>				
<b>Description</b>	<b>Fee Code</b>	<b>Quantity</b>	<b>Amount</b>	<b>Sub-Total in USD(\$)</b>
<b>Basic Filing:</b>				
<b>Pages:</b>				
<b>Claims:</b>				
<b>Miscellaneous-Filing:</b>				
<b>Petition:</b>				
<b>Patent-Appeals-and-Interference:</b>				
<b>Post-Allowance-and-Post-Issuance:</b>				
<b>Extension-of-Time:</b>				
Extension - 1 month with \$0 paid	2251	1	65	65

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
<b>Miscellaneous:</b>				
Request for continued examination	2801	1	405	405
<b>Total in USD (\$)</b>				<b>470</b>

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	10875514
<b>Application Number:</b>	11022599
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	8956
<b>Title of Invention:</b>	Mechanism for identifying and penalizing misbehaving flows in a network
<b>First Named Inventor/Applicant Name:</b>	Vishnu Natchu
<b>Customer Number:</b>	43490
<b>Filer:</b>	Stuart James West/Carolina Nunez
<b>Filer Authorized By:</b>	Stuart James West
<b>Attorney Docket Number:</b>	SABLE-01008
<b>Receipt Date:</b>	02-SEP-2011
<b>Filing Date:</b>	22-DEC-2004
<b>Time Stamp:</b>	17:36:39
<b>Application Type:</b>	Utility under 35 USC 111(a)

### Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	\$470
RAM confirmation Number	4046
Deposit Account	
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### File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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1	Amendment After Final	20110902_ROA_SABLE-01008.pdf	25119 99f012a449444ef7e6a5a2926a1b3eaaa7211880	no	16
<b>Warnings:</b>					
<b>Information:</b>					
2	Request for Continued Examination (RCE)	20110902-RCE-SABLE-01008US.pdf	705812 49f696dff468552e64c7f1915c21e799dd0cbf8	no	3
<b>Warnings:</b>					
<b>Information:</b>					
3	Fee Worksheet (SB06)	fee-info.pdf	32274 398078e59ae11c4ea47aa9f742b0cee6824b95c4	no	2
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<b>Information:</b>					
<b>Total Files Size (in bytes):</b>				763205	
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application

Inventor(s): Natchu, Vishnu

Appln. No.: 11/022,599

Confirm. No.: 8956

PATENT APPLICATION

Art Unit: 2462

Examiner: Wong, Xavier S.

Filed: December 22, 2004

Title: MECHANISM FOR IDENTIFYING AND  
PENALIZING MISBEHAVING FLOWS IN  
A NETWORK

Customer No. 43490

RESPONSE TO OFFICE ACTION UNDER 37 C.F.R. §1.111

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

Sir:

This RESPONSE is in reply to the Office Action mailed May 16, 2011. The time for response was set for three months and ended on August 16, 2011. A one-month extension of time is hereby requested and the required fee submitted. This response filed on September 2, 2011, is therefore timely. A Request for Continued Examination is also hereby requested and the required fee submitted.

**Remarks**

These remarks are in response to the Office Action mailed May 16, 2011. The total number of claims submitted for consideration is forty-four (44).

### **Response to Rejections under 35 USC § 103**

Claims 1, 2, 4-8, 10, 21, 22, 24-28, 30, 41, 42, and 44 were rejected as being unpatentable over Jacobson et al (US 2005/0226149 A1) in view of Malan et al (2002/0032717 A1). Claims 3, 12-14, 18, 23, 32-34, and 38 were rejected as being unpatentable over Jacobson in view of Malan, and in further view of Skirmont (US 6,252,848 B1). Claims 9 and 29 were rejected as being unpatentable over Jacobson in view of Malan, and in further view of Zikan et al (US 6,310,881 B1). Claims 11 and 31 were rejected as being unpatentable over Jacobson in view of Malan, and in further view of Afanador (US 6,167,041). Claims 15-17 and 35-37 were rejected as being unpatentable over Jacobson in view of Malan, and in further view of Scifres et al (US 7,113,990 B2). Claims 19, 20, 39 and 40 were rejected as being unpatentable over Jacobson in view of Malan, and in further view of Kejriwal et al (US 6,934,250 B1). Claim 43 was rejected as being unpatentable over Jacobson in view of Yazaki et al (US 2010/0110889 A1), and in further view of Malan.

#### **I. Jacobson is Not Analogous Prior Art**

Jacobson is not analogous prior art, and therefore cannot be used for an obviousness determination under § 103. A reference can only qualify as prior art for § 103 when it is analogous to the claimed invention. *In re Klein*, No. 2010-1411, slip op. at 7 (Fed. Cir. June 6, 2011) (citing *Innovation Toys, LLC v. MGA Entertainment, Inc.* No 2010-1290, slip op. at 12 (Fed. Cir. Mar. 21, 2011)). “Two separate tests define the scope of analogous prior art: (1) whether the art is from the same field of endeavor, regardless of the problem addressed and, (2) if the reference is not within the field of the inventor’s endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved.” *In re Bigio*,

381 F.3d 1320, 1325 (Fed. Cir. 2004) (citing *In re Deminski* 796 F.2d 436, 442 (Fed. Cir. 1986)).

**A. First Test For the Scope of Analogous Prior Art is Not Met**

The first test for the scope of analogous prior art, “whether the art is from the same field of endeavor,” is not met here because the current application is related to a different field of endeavor than Jacobson. The field of endeavor must be determined by looking at the “explanations of the invention’s subject matter in the patent application, including the embodiments, function, and structure of the claimed invention.” *In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004). The embodiments, function, and structure of the invention described in the present application are very different than those of Jacobson.

For purposes of applying the first test, and not for purposes of claim construction or interpretation, the embodiments and functions of the inventions are different. Jacobson’s invention “is only instantiated during periods of congestion and most of the state is only for a subset of flows receiving drops.” (Paragraph [0102]). In contrast, claim 1 of the present application has a clear order, and requires that before anything else is done, the “set of behavioral statistics is updated based on each information packet belonging to the flow, as each information packet belonging to the flow is processed, regardless of the presence or absence of congestion.” (Emphasis added.) Only then does claim 1 describe “determining, based at least partially upon the set of behavioral statistics, whether the flow is exhibiting undesirable behavior; and in response to a determination that the flow is exhibiting undesirable behavior, enforcing a penalty on the flow.” The other claims have a similar order that requires processing each information packet in a flow prior to any penalty or computation of a badness factor. Therefore, the



inventions have different embodiments and functions since Jacobson works only on congested flows using dropped packets, and Natchu works on all packets regardless of congestion.

Also for purposes of applying the first test, and not for purposes of claim construction or interpretation, the structures of the inventions are different. Jacobson's technique will only begin if the network is experiencing congestion. (Paragraph [0102]). If it is, Jacobson will record timestamps of dropped packets, determine time intervals between the dropped packets, determine a "Departure from Exponential Mean" (DEM) from the drop intervals, and use the DEM to determine if a flow is non-responsive. (Paragraphs [0097-98]). In contrast, as an example for purposes of determining the structure of the invention for application of the first test and not for limiting the claims, Natchu's written description indicates that an embodiment of the behavioral statistics can include a total byte count, a life duration, a flow rate, a number of packets processed up to the current time, an average packet size, a badness factor, a timestamp of when the flow block was created, as well as other sets of information. (Paragraph [0035]). These types of statistics are based on all the packets in a flow, not just a subset of dropped packets within a flow like Jacobson's DEM, and therefore the inventions have different structures. Since the embodiments, function, and structure of the two inventions are different, Jacobson and Natchu are in different fields of endeavor, and the first test for the scope of analogous prior art is not met.

**B. Second Test for the Scope of Analogous Prior Art is Not Met**

The second test for the scope of analogous prior art, if the reference is not within the field of the inventor's endeavor, is "whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved." *In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004) (citing *In re Deminski* 796 F.2d 436, 442 (Fed. Cir. 1986)). A court recently applied this test

and found that an inventor seeking to solve the problem of how to make a container with a movable divider in order to *mix* its contents would not have been motivated to consider references with containers that used movable dividers to *separate* its contents, because those references were not pertinent to the mixing problem the inventor was addressing. *In re Klein*, No. 2010-1411, slip. op. at 11-12. (Fed. Cir. June 6, 2011). Similarly, Jacobson is not analogous prior art here because it is not pertinent to the problem addressed by Natchu's present invention. Natchu is concerned with a problem of how to detect misbehaving flows based on the flow's observed behavior such that the misbehaving flows cannot avoid detection. (Natchu paragraph [0005]). Jacobson can only detect misbehaving flows in a congested network where packets are being dropped and DEM can be computed (Jacobson paragraph [0092]), but would not detect them in non-congested networks where there are no dropped packets and DEM cannot be computed. An inventor looking to solve the problem addressed by Natchu in the present application would not find Jacobson pertinent to the problem because misbehaving flows would avoid detection in Jacobson when the network is not congested. Since Jacobson is not pertinent to the particular problem with which Natchu's present invention is involved, it is not analogous prior art and cannot be used in a § 103 obviousness rejection.

## **II. The Prior Art References Do Not Teach or Suggest All Claim Limitations**

Even if Jacobson were analogous prior art, it would not have been obvious to combine Jacobson with the other cited references. The prior art reference (or references when combined) must teach or suggest all the claim limitations. MPEP § 2143. The Examiner states that Jacobson does not mention the concept of a "set of behavioral statistics is updated based on each information packet belonging to the flow, as each information packet belonging to the flow is

processed, *regardless of the presence or absence of congestion*’ The Examiner believes that Malan does teach those elements, specifically the concept of a “set of behavioral statistics is updated based on each information packet belonging to the flow, as each information packet belonging to the flow is processed, *regardless of the presence or absence of congestion*” Examiner argues that it would have been obvious to modify Jacobson’s method of updating statistics to the method used in Malan to gain “more effective profiling of network flows.”

**A. Malan Does Not Teach the Claimed Behavioral Statistics**

The Examiner’s interpretation of Malan is incorrect, because Malan does not teach the concept of a “set of behavioral statistics is updated based on each information packet belonging to the flow, as each information packet belonging to the flow is processed, *regardless of the presence or absence of congestion*” Malan does describe flow-based statistics that “aggregate a flow’s individual packet statistics into a single statistic,” such as a “flow’s duration, number of packets, mean bytes per packet, etc.” (Paragraph [0119]). However, Malan goes on to say that “Cisco System’s Netflow and Juniper Network’s Cflowd mechanism are widely deployed flow-based statistic packages.” *Id.* Malan’s exemplary listing of Netflow and Cflowd show that Malan did not anticipate the type of behavioral statistics claimed in Natchu. Natchu requires that the statistics be “updated based on each information packet belonging to the flow, as each information packet belonging to the flow is processed,” but Netflow and Cflowd type statistics do not update “as each information packet belonging to the flow is processed.”

Cisco’s website shows that Netflow captures flow data over a period of time, but does not update or calculate statistics about the flow as each packet is processed. Instead, flow statistics are not analyzed until after raw flow data has been collected and packets have been processed.

Introduction to Cisco IOS NetFlow - A Technical Overview,

[http://www.cisco.com/en/US/prod/collateral/iosswrel/ps6537/ps6555/ps6601/prod\\_white\\_paper0900aecd80406232.html](http://www.cisco.com/en/US/prod/collateral/iosswrel/ps6537/ps6555/ps6601/prod_white_paper0900aecd80406232.html) (last visited Aug. 25, 2011). Statistics or reports are not generated until a user requests the information manually, or the data is exported to a “NetFlow collector” that analyzes the data. *Id.* The data can be automatically exported after a flow has become inactive, lasts longer than a preset period of time, or terminates. *Id.* Juniper Network’s Cflowd operates similarly to Netflow. NetFlow at AllExperts, <http://www.associatepublisher.com/e/n/ne/netflow.htm> (last visited Aug. 25, 2011). The type of flow statistics envisioned by Malan are therefore statistics that are calculated about the data at some point after the data is collected and after the packets within the flow have been processed. The statistics are not “updated as each information packet belonging to the flow is processed” as Natchu’s claim limitations require.

**B. Combination of Jacobson and Malan Is Not Obvious**

Even if the type of statistics described and envisioned by Malan were the type used in the present application, the combination of Jacobson and Malan would still not have been obvious to one of ordinary skill in the art when the invention was made, because the combination would not achieve the desired result. Malan does include the idea of keeping statistics that are updated based on all packets in a flow, but there would have been no motivation to use that idea in combination with Jacobson since Jacobson relies exclusively on data kept about dropped packets. If Jacobson kept statistics on the overall flow based on each and every one of the flow’s packets, Jacobson would not be able to detect adaptive flows from non-adaptive flows.

Critically, Jacobson requires that information is kept about dropped packets only. The system described in Jacobson saves timestamp information reflecting when packets are dropped (paragraph [0083]), and then compares the timestamps to calculate the interval of time between

dropped packets (paragraph [0084]). Adaptive flows and non-adaptive flows can be identified by comparing the distribution of drop intervals for each type of flow. (Paragraph [0085]).

“Responsive and non-responsive flows can be differentiated by the experimentally determined distribution of their drop intervals.” Paragraph [0127] (emphasis added).

Jacobson therefore requires that data be kept on certain individual packets, specifically dropped packets, in order to calculate the drop intervals required for the invention to identify non-adaptive flows. Malan teaches the concept of flow-based statistics that “aggregate a flow’s individual packet statistics into a single statistic.” (Paragraph [0119]). The Examiner argues that Malan’s flow-based statistics are “updated based on each information packet belonging to the flow, as each information packet belonging to the flow is processed.” As discussed above, Applicant disputes this interpretation of Malan’s flow-based statistics. However, even if it were taken as true, Malan would not keep flow-based statistics on only those packets within a flow that are dropped, it would update them based on each packet in the flow. If Jacobson were to use Malan’s flow-based statistics, information on each individual packet would be combined into a single statistic, and the individual timestamps of individual dropped packets that Jacobson requires to function would be lost. One single statistic that represents a characteristic of the overall flow based on dropped and non-dropped packets could not be used to calculate the drop intervals between specific dropped packets, or the distribution of drop intervals within a flow.

Jacobson in fact teaches away from the idea of tracking statistics on all packets. Paragraph [0102] states that “[p]reviously, all proposed techniques to identify non-responsive flows have required keeping a good deal of per-flow state continuously, on responsive as well as non-responsive flows.” It goes on to say “[o]ur approach requires a smaller amount of state, is only instantiated during periods of congestion and most of the state is only for a subset of flows

receiving drops.” Therefore, Jacobson indicates that keeping statistics on only a smaller subset of packets is desirable for its invention. Jacobson gives no suggestion or motivation for one of skill in the art to generate statistics based on all packets as described by Malan.

In contrast, claim 1 of the pending application describes “maintaining a set of behavioral statistics for the flow” that is “updated based on each information packet belonging to the flow” and then “determines, based at least partially upon the set of behavioral statistics, whether the flow is exhibiting undesirable behavior.” As shown above, Jacobson does not maintain “a set of behavioral statistics for the flow” that is “updated based on each information packet belonging to the flow” (emphasis added). Malan may teach that idea, but as shown above, it would not have been obvious to modify the behavioral statistic update method of Jacobson to that of Malan for more effective profiling of network flows, because such a combination would render Jacobson’s invention inoperable, and because Jacobson taught against the idea. Since the combination cited by the Examiner would not have been obvious to one of skill in the art, Applicant respectfully requests that the rejection to claim 1 be withdrawn.

Independent claims 21 and 44 were also rejected as being unpatentable over Jacobson in view of Malan for the same reasons described in the rejection of claim 1. The elements of claims 21 and 44 parallel those of claim 1. Thus, the arguments made above with respect to the rejection of claim 1 also apply to the rejection of claims 21 and 44 under §103, and Applicant respectfully requests that the rejections to claims 21 and 44 be withdrawn.

Independent claims 5, 25, 41, and 42 were also rejected as being unpatentable over Jacobson in view of Malan for the same reasons described in the rejection of claim 1. While not all elements of claims 5, 25, 41, and 42 directly parallel those of claim 1, claims 5, 25, 41, and 42 all include similar limitations regarding a set of behavioral statistics being updated based on each

information packet belonging to the flow, as each information packet belonging to the flow is processed, regardless of the presence or absence of congestion. The Examiner rejected claims 5, 25, 41, and 42 based on these specific shared limitations for the same reasons as in the rejection of claim 1. Thus, the arguments made above with respect to the rejection of claim 1 also apply to the rejection of claims 5, 25, 41, and 42 under §103, and Applicant respectfully requests that the rejections to claims 5, 25, 41, and 42 be withdrawn.

**C. Yazaki Does Not Teach the Claimed Data Fields**

Independent claim 43 was rejected as being unpatentable over Jacobson in view of Yazaki, and in further view of Malan. The Examiner believes that Jacobson teaches “data representing pre-determined behavior threshold values,” “data representing the results of a heuristic determination of whether said flow exhibits undesirable behavior determined by comparing said behavioral statistics to said pre-determined threshold values,” and “data representing at least one penalty to be enforced against at least one packet upon determination that said flow exhibits undesirable behavior,” but that Jacobson does not teach storing these types of data in “a third field,” “a fourth field,” and “fifth field” respectively.

The Examiner believes that Yazaki does teach storing these types of data in fields. Regarding the “data representing pre-determined behavior threshold values,” the Examiner points to data disclosed in Yazaki as THR, defined as a “bucket capacity” for important or unimportant packets, as measured in bytes. (Paragraph [0061]). Regarding the “data representing the results of a heuristic determination of whether said flow exhibits undesirable behavior determined by comparing said behavioral statistics to said pre-determined threshold values,” the Examiner points to data disclosed in Yazaki as CNT, defined as the “water level of important packets and that of unimportant packets” as measured in bytes. (Paragraph [0061]).

Applicant respectfully disagrees with the Examiner's interpretation of the variables THR and CNT stored in data fields in Yazaki, and believes that they are different from the data types disclosed in claim 43. First, THR is not "data representing pre-determined behavior threshold values." It is an expression of the total number of bytes capable of being stored in a "bucket." (Paragraph [0061]). THR is therefore not a "behavioral threshold value" since the capacity of a bucket does not depend on the behavior of the data placed into it. THR simply describes the capacity of the bucket itself, and not any behavioral characteristic of the packets within the bucket.

Similarly, Yazaki's CNT is not "data representing the results of a heuristic determination of whether said flow exhibits undesirable behavior determined by comparing said behavioral statistics to said pre-determined threshold values." CNT indicates the "water level" of packets within a "bucket." (Paragraph [0061]). CNT is therefore determined by simply counting the number of packets within a given bucket, not through a "heuristic determination of whether said flow exhibits undesirable behavior." CNT is also not "determined by comparing said behavioral statistics to said pre-determined threshold values" since CNT is a count, not a comparison.

Because the data fields disclosed in Yazaki hold different types of data than described in claim 43, it would not have been obvious to one of skill in the art to combine Jacobson and Yazaki. Applicant therefore respectfully requests that the rejection to claim 43 be withdrawn.

Moreover, even if the Jacobson-Yazaki combination were obvious, the combination would still not teach the elements of claim 43 that Examiner believes are taught by Malan. The Examiner stated on page 12 of the Office Action that Jacobson-Yazaki combination did not mention that "the set of behavioral statistics is updated based on each information packet belonging to the flow, as each information packet belonging to the flow is processed, *regardless*



*of the presence or absence of congestion*’ but that Malan did teach those concepts. Examiner rejected claim 43 in further view of Malan for the same reasons as in the rejection of claim 1. However, the cited claim limitations regarding “the set of behavioral statistics is updated based on each information packet belonging to the flow, as each information packet belonging to the flow is processed, *regardless of the presence or absence of congestion*” do not actually appear in claim 43. Applicant presumes that the Examiner meant to reference the limitation about “behavioral statistics about dropped and non-dropped packets of a flow” since that limitation most nearly corresponds to “the set of behavioral statistics is updated based on each information packet belonging to the flow, as each information packet belonging to the flow is processed, *regardless of the presence or absence of congestion*” Since this claim limitation includes “behavioral statistics about dropped and non-dropped packets in a flow” the arguments made above with respect to the rejection of claim 1, which pointed out that Jacobson required keeping data on only dropped packets and that a combination with Malan would render Jacobson’s invention inoperable, also apply to the rejection of claim 43 under §103. Applicant therefore respectfully requests that the rejection to claim 43 be withdrawn.

### **III. Dependent Claims**

Claims in dependent form shall be construed to include all the limitations of the claim incorporated by reference into the dependent claim. 37 CFR 1.75. Claims 2-4 are dependent on independent claim 1 and therefore include all the limitations of claim 1. Claims 6-20 are dependent on independent claim 5 and therefore include all the limitations of claim 5. Claims 22-24 are dependent on independent claim 21 and therefore include all the limitations of claim 21. Claims 26-40 are dependent on independent claim 25 and therefore include all the

limitations of claim 25. As explained above with respect to the rejection of claim 1, it would not have been obvious to one skilled in the art to combine Jacobson and Malan, and therefore independent claims 1, 5, 21, 25, and 41-44 are not obvious. It follows that Jacobson, in view of any combination of cited references, does not teach or suggest all of the claim limitations of dependent claims 2-4, 6-20, 22-24, or 26-40. Therefore, Applicant respectfully requests that the rejections to these dependent claims be withdrawn.

Moreover, with respect to claims 12 and 32, the Examiner stated that Jacobson did not mention that a “penalty is determined and enforced even when no congestion condition is encountered,” but that Skirmont mentioned “a Random Early Detection (RED) algorithm comprising means for allowing the dropping of packets *without regard* to the characteristics (e.g. congestion) of a flow (col. 5 ln. 21-24).” The Examiner’s interpretation of Skirmont’s discussion of RED algorithms is incorrect. It is clear that the RED algorithm only works in the presence of congestion. “When the network becomes congested, packets can be dropped due to a lack of resources. . . . A packet is dropped according to the RED algorithm (Random Early Detection) in the packet’s corresponding queue.” (Col. 1, ln. 31-37). The RED algorithm therefore requires the presence of congestion before it is triggered.

Furthermore, the Examiner’s belief that the “characteristics of a flow” can include “congestion” is misplaced. Congestion is a characteristic of an overall network, not an individual flow. Congestion can occur when a flow, or multiple flows, overwhelm a network. “A flow of data entering a network is routed to a designated queue while other flows are simultaneously routed to their designated queues. A queue can build up (i.e., congest) when the egress rate is less than the ingress rate for a queue.” (Col. 1, ln.14-17). Congestion is therefore related to the overall level of traffic through a network, not a characteristic of any individual

flow. The sentence regarding “characteristics of a flow” pointed to by the Examiner goes on to say that the RED algorithm can drop packets “in a flow that is critical for system performance but is not responsible for congestion in the system.” (Col. 5, ln. 23-24). The “characteristics of a flow” therefore can include whether the flow is critical for system performance, and whether it is responsible for congestion in the overall system. They cannot include whether the flow itself is congested, as congestion is a characteristic of the overall network. Applicant therefore respectfully requests that the rejections to claims 12 and 32 be withdrawn.

The Examiner also used Skirmont to reject claims 18 and 38. The Examiner says that Jacobson taught the claimed invention except for the limitation regarding “behavioral statistics comprising an average size for the information packets of a flow,” but that Skirmont taught an average queue size in Figure 2. Skirmont does show and describe an average queue size, but an average queue size is entirely different than the claimed “average size for the information packets belonging to the flow.” Queues are different from flows, as Skirmont makes clear. “The data in each of the flows F1’-F9’ consists of a sequence of packets (i.e., units of data). The packets corresponding to a given flow (i.e., one of F1’-F9’) pass through a designated channel (i.e., one of C1’-C3’) and are routed by Switch S’ to a designated queue (i.e., one of Q1’-Q3-).” (Col. 1, ln. 26-30). The average queue size would therefore be the average number of packets at a specific queue, which is very different than the claimed “average size for the information packets belonging to a flow.” Applicant therefore respectfully requests that the rejections to claims 18 and 38 be withdrawn.

**Conclusion**

Applicant respectfully asserts that the cited references do not render the claims unpatentable, either singularly or in combination. In light of the above, it is respectfully submitted that all of the claims now pending in the subject patent application should be allowed and a Notice of Allowance is earnestly solicited. The Examiner is respectfully requested to telephone the undersigned if he can assist in any way in expediting the issuance of a patent.

Respectfully submitted,

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Dated: September 2, 2011

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