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Wei et al.

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(54) **SYSTEMS AND METHODS FOR CONTENT TYPE CLASSIFICATION**

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(22) Filed: **Nov. 22, 2013**

Related U.S. Application Data

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H04L 12/26 (2006.01)

(52) **U.S. Cl.**
CPC ***H04L 43/18*** (2013.01)
USPC **370/241**

(58) **Field of Classification Search**
None
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,361,379	A	11/1994	White	
6,157,955	A	12/2000	Narad et al.	
6,608,816	B1	8/2003	Nichols	
6,665,725	B1	12/2003	Dietz et al.	
7,006,502	B2	2/2006	Lin	
7,082,102	B1	7/2006	Wright	
7,095,715	B2	8/2006	Buckman et al.	
7,242,681	B1 *	7/2007	Van Bokkelen et al.	370/389
7,420,992	B1	9/2008	Fang et al.	
7,580,974	B2	8/2009	Wei et al.	
7,945,522	B2	5/2011	Mcgovern et al.	
8,204,933	B2	6/2012	Wei et al.	
8,639,752	B2	1/2014	Wei et al.	
2003/0012147	A1	1/2003	Buckman et al.	
2004/0002930	A1	1/2004	Oliver et al.	
2004/0261016	A1	12/2004	Glass et al.	
2005/0249125	A1 *	11/2005	Yoon et al.	370/252
2006/0112043	A1	5/2006	Oliver et al.	
2006/0229902	A1	10/2006	Mcgovern et al.	
2006/0239273	A1	10/2006	Buckman et al.	
2007/0192481	A1	8/2007	Wei et al.	
2008/0052326	A1	2/2008	Evanchik et al.	
2009/0268617	A1	10/2009	Wei et al.	

(Continued)

OTHER PUBLICATIONS

"U.S. Appl. No. 11/357,654, 312 Amendment filed Jun. 23, 2009", 5 pgs.

(Continued)

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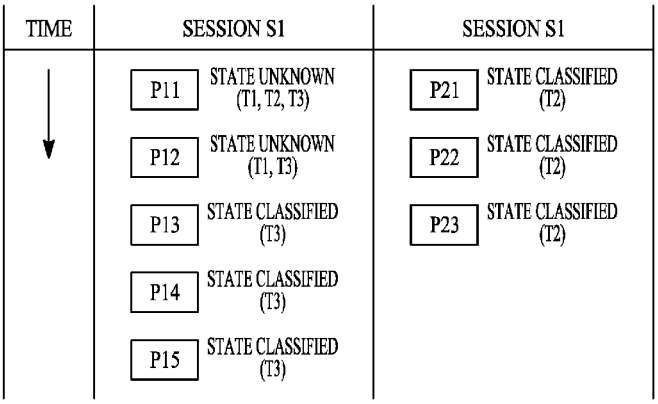
(57) **ABSTRACT**

Various embodiments illustrated and described herein include systems, methods and software for content type classification. Some such embodiments include determining a potential state of classification for packets associated with a session based at least in part on a packet associated with the session that is a packet other than the first packet of the session.

20 Claims, 7 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

2012/0023557	A1*	1/2012	Bevan et al.	726/4
2012/0163186	A1	6/2012	Wei et al.	
2013/0258863	A1	10/2013	Wei et al.	

OTHER PUBLICATIONS

"U.S. Appl. No. 11/357,654, Non-Final Office Action mailed Sep. 18, 2008", 10 pgs.
"U.S. Appl. No. 11/357,654, Notice of Allowance mailed Mar. 23, 2009", 10 pgs.
"U.S. Appl. No. 11/357,654, Response filed Dec. 18, 2008 to Non-Final Office Action mailed Sep. 18, 2008", 8 pgs.
"U.S. Appl. No. 11/357,654, Response to Rule 312 Communication mailed Jul. 23, 2009", 2 pgs.
"U.S. Appl. No. 12/503,100, Final Office Action mailed Jun. 9, 2011", 12 pgs.
"U.S. Appl. No. 12/503,100, Non-Final Office Action mailed Oct. 18, 2010", 12 pgs.
"U.S. Appl. No. 12/503,100, Notice of Allowance mailed Feb. 17, 2012", 13 pgs.
"U.S. Appl. No. 12/503,100, Response Filed Feb. 9, 2012 to Final Office Action Jun. 9, 2011", 8 pgs.
"U.S. Appl. No. 12/503,100, Response filed Mar. 18, 2011 to Non Final Office Action mailed Oct. 18, 2010", 10 pgs.
"U.S. Appl. No. 12/503,100, Supplemental Notice of Allowability mailed Apr. 25, 2012", 9 pgs.
"U.S. Appl. No. 13/409,141, Non Final Office Action mailed Aug. 8, 2013", 6 pgs.
"U.S. Appl. No. 13/409,141, Notice of Allowance mailed Sep. 18, 2013", 9 pgs.
"U.S. Appl. No. 13/409,141, Response filed Sep. 3, 2013 to Office Action mailed Aug. 8, 2013", 5 pgs.
"Application U.S. Appl. No. 13/409,141, Supplemental Notice of Allowability mailed Dec. 20, 2013", 5 pgs.

* cited by examiner

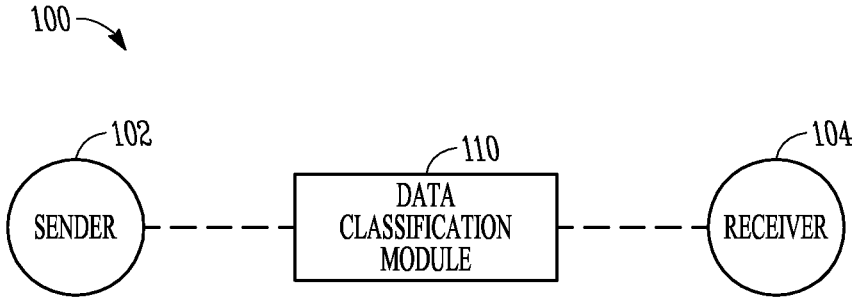


FIG. 1

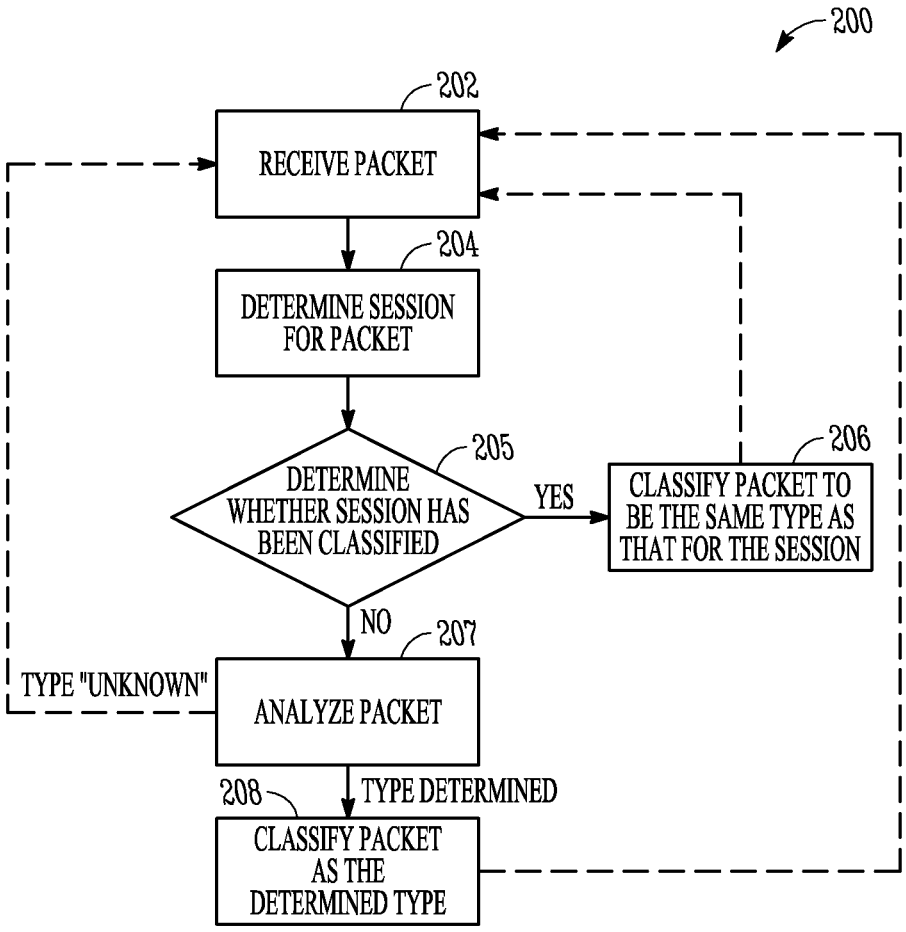


FIG. 2

Example 1: TCP traffic

#	direction	packet_size	port	using proxy	(p,s) matchs skype
1	C --> S	14	!80/!443	no	unknown
2	S --> C	28-36	!80/!443	no	unknonwn
3	C --> S	14	!80/!443	no	Yes (confirm)

FIG. 3A

Example 2: TCP traffic

#	direction	packet_size	port	using proxy	(p,s) matchs skype
1	C --> S	16	80	no	unknown
2	S --> C	14	80	no	unknown
3	C --> S	28-36	80	no	unknown
4	S --> C	14	80	no	Yes

FIG. 3B

Example 3: TCP traffic

#	direction	packet_size	port	using proxy	pattern	(p,s) mat
1	C --> S	72	443	no	|80 46 01 03 01 00 2d|	unknown
2	S --> C	93	443	no	|16 03 01 00 4a 02|	unknown
3	C --> S	14	443	no	N/A	yes (co

FIG. 3C

Example 4: UDP traffic:

#	direction	packet_size	port	pattern(3rd byte)	(p,s) matchs s
1	C --> S	18/27	>1024	0x02	unknown
2	S --> C	>10	>1024	0x02/0x07	yes

FIG. 3D

Example 5: normal Yahoo login, through port 80
protocol: TCP; client (C): 192.168.5.186:1734; server (S): 216.155.193.1

#	direction	pattern	classifier(p,s, yahoo)
1	C --> S	|YMSG| + ver_number + pkt_len test	session is Yahoo! candidate However, without server_side packet, the classifier returns "unknown"
2	S --> C	|YMSG| + ver_num	Confirmed. The content type is marked as Yahoo!

FIG. 3E

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