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Wei et al.

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

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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)

Related U.S. Application Data

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H04L 12/26 (2006.01)

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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.

20 Claims, 7 Drawing Sheets

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.

TIME	SESSION S1	SESSION S1
↓	P11 STATE UNKNOWN (T1, T2, T3)	P21 STATE CLASSIFIED (T2)
	P12 STATE UNKNOWN (T1, T3)	P22 STATE CLASSIFIED (T2)
	P13 STATE CLASSIFIED (T3)	P23 STATE CLASSIFIED (T2)
	P14 STATE CLASSIFIED (T3)	
	P15 STATE CLASSIFIED (T3)	

(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

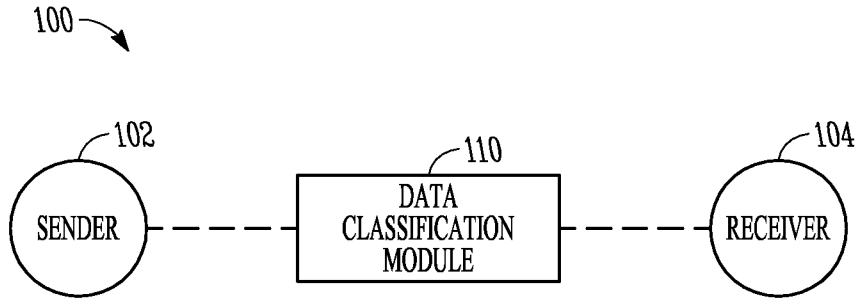


FIG. 1

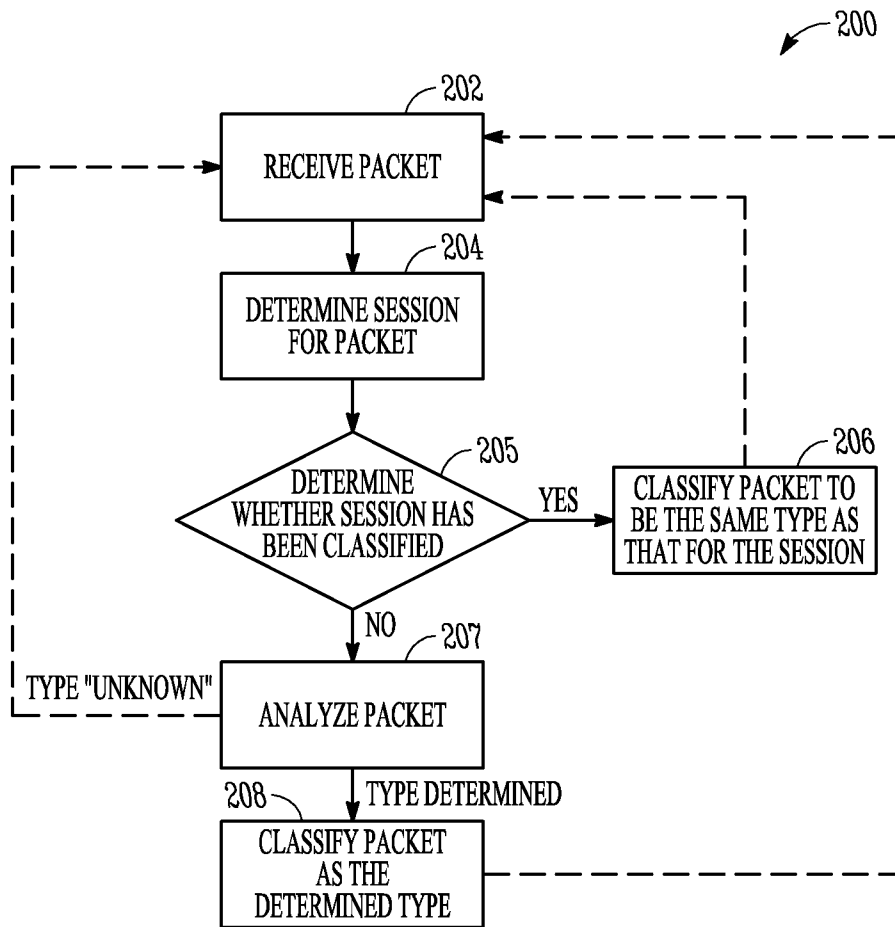


FIG. 2

Example 1: TCP traffic

#	direction	packet_size	port	using proxy	(p,s) matches skype
1	C --> S	14	180/1443	no	unknown
2	S --> C	28-36	180/1443	no	unknown
3	C --> S	14	180/1443	no	Yes (confirm)

FIG. 3A

Example 2: TCP traffic

#	direction	packet_size	port	using proxy	(p,s) matches 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) matches skype
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 (confirm)

FIG. 3C

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Example 4: UDP traffic:
# direction packet_size port pattern(3rd byte) (p,s) matches skype
-----
1 C --> S 18/27 >1024 0x02 unknown
-----
2 S --> C >10 >1024 0x02/0x07 yes
-----

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FIG. 3D

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Example 5: normal Yahoo login, through port 80
protocol: TCP; client (C): 192.168.5.186:1734; server (S): 216.155.193.142:80
# direction pattern
-----
1 C --> S |YMSG| + ver_number session is Yahoo! candidate
          + pkt_len test   However, without server_side
                              packet, the classifier
                              returns "unknown"
-----
2 S --> C |YMSG| + ver_num Confirmed. The content type
                              is marked as Yahoo!
-----

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FIG. 3E

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