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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/836,824	06/16/2020	10686871	TAAG001CONT1	9801
112449	7590	05/27/2020		
Roark IP 1438 Dahlia Loop San Jose, CA 95126				

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 106 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):

Pouya Taaghol, San Jose, CA;
Big Data Federation, Inc., Santa Clara, CA;
Vivek Ramanna, San Jose, CA;

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.



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/836,824	12/09/2017	Pouya Taaghoh	TAAG001CONT1	9801
112449	7590	05/14/2020	EXAMINER	
Roark IP 1438 Dahlia Loop San Jose, CA 95126			HIGA, BRENDAN Y	
			ART UNIT	PAPER NUMBER
			2441	
			MAIL DATE	DELIVERY MODE
			05/14/2020	PAPER

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.

Supplemental Notice of Allowability	Application No. 15/836,824	Applicant(s) Taaghol et al.	
	Examiner BRENDAN HIGA	Art Unit 2441	AIA (FITF) Status Yes

-- 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 Applicant's 12/09/2017 IDS.
☐ 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 1-2,5,7 and 11-18. 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. ☐ Notice of References Cited (PTO-892) 2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date <u>12/09/2017</u> . 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____. 4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.	5. ☐ Examiner's Amendment/Comment 6. ☐ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____.
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/BRENDAN Y HIGA/ Primary Examiner, Art Unit 2441	
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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.

Substitute for form 1449/PTO

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**

(Use as many sheets as necessary)

Complete if Known

Application Number	15/836824
Filing Date	
First Named Inventor	Taaghol
Art Unit	
Examiner Name	
Attorney Docket Number	TAAGCONT1

Sheet 1 of 3

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code ² (if known)			
		US-8,528,108	09-2013	Ammer, Gerhard	
		US-8,756,595	06-2014	Arcilla, Andre	
		US-9,226,333	12-2015	Steiner, Moritz	
		US-20090300057	12-2009	Friedman, Nathaniel	
		US-20140241158	08-2014	Anthony, Jr., Bruce	
		US-20110075611	03-2011	Choi, Hyung-Nam	
		US-7,630,706	12-2009	Weigand, David	
		US-20130007254	01-2013	Fries, Robert	
		US-20090113327	04-2009	Pogrebinsky, Vladimir	
		US-20080209491	08-2008	Hasek, Charles	
		US-20140317293	10-2014	Shatzkamer, Kevin	
		US-20140254373	09-2014	Varma, Subir	
		US-20140259012	09-2014	Nandiali, Vishwamitra	
		US-20150173121	06-2015	Miklos, Gyorgy	
		US-20070078988	04-2007	Miloushev, Vladimir	
/B.Y.H./		US-2009027677 ¹	11-2009	Nickolov, Peter	
		US-20020016954	02-2002	Charities, Dietrich	
		US-7114021	09-2006	Seshadri	
		US-8132166	03-2012	DeHaan	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T ⁶
		Country Code ³ -Number ⁴ -Kind Code ⁵ (if known)				

Examiner
Signature

/BRENDAN Y HIGA/

Date
Considered

05/13/2020

*EXAMINER: Initial if reference 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 to applicant. ¹ Applicant's unique citation designation number (optional). ² See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ³ Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English language Translation is attached.

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 2 hours 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, 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 (1-800-786-9199) and select option 2.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /B.Y.H./

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.

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. Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>		Complete if Known	
		Application Number	15/836824
		Filing Date	
		First Named Inventor	Taaghoh
		Art Unit	
		Examiner Name	
Sheet 2	of 3	Attorney Docket Number	TAAG001CONT1

[illegible][illegible]

Examiner Signature	/BRENDAN Y HIGA/	Date Considered	05/13/2020
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*EXAMINER: Initial if reference 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 to applicant. ¹ Applicant's unique citation designation number (optional). ² See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ³ Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English language Translation is attached.

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 2 hours 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, 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 (1-800-786-9199) and select option 2.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /B.Y.H/

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.

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>		Complete if Known	
		Application Number	15/836824
		Filing Date	
		First Named Inventor	TAAGHOL
		Art Unit	
		Examiner Name	
Sheet 3	of 3	Attorney Docket Number	TAAG001CONT1

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. ¹	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²
		Bansai, et al., "OpenRadio: A Programmable Wireless Dataplane", published in HotSDN'12, Aug. 13, 2012, Helsinki, Finland	
		Stallings et al., "Software-Defined Networks and Open Flow" published in The Internet Protocol Journal, Vol. 16, No. 1, March 2012	
		Luo et al., "Software Defined Networking across Distributed Datacenters over Cloud" published 2013 IEEE International Conference on Cloud Computing Technology and Science	
		McKeown et al., "OpenFlow: Enabling Innovation in Campus Networks", March 14, 2008.	
		Li et al., "Toward Software-Defined Cellular Networks", March 14, 2008.	
		"Network Functions Visualization", White Paper published Oct. 22-24, 2012, at the "SDN and OpenFlow World Congress", Darmstadt-Germany	
		Yap et al., "OpenRoads: Empowering Research in Mobile Networks" published in 2010 ACM SIGCOMM Computer Communication Review	
		"A Short Introduction To Cloud Platforms" by David Chappell, Aug 2008	

Examiner Signature	/BRENDAN Y HIGA/	Date Considered	05/13/2020
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*EXAMINER: Initial if reference 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 to applicant.

¹ Applicant's unique citation designation number (optional). ² Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 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 2 hours 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, 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 (1-800-786-9199) and select option 2.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /B.Y.H/

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (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)

112449 7590 05/04/2020
Roark IP
1438 Dahlia Loop
San Jose, CA 95126

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 transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/836,824	12/09/2017	Pouya Taaghoh	TAAG001CONT1	9801

TITLE OF INVENTION: DISTRIBUTED SOFTWARE DEFINED NETWORKING

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$500	\$0.00	\$0.00	\$500	08/04/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
HIGA, BRENDAN Y	2441	709-201000

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 03-09 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 ROARK IP

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 must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

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

BIG DATA FEDERATION, INC.

Santa Clara, CA

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

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies

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

☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No.

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 forms 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: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Christopher J. Horgan/

Date 5/6/2020

Typed or printed name Christopher J. Horgan

Registration No. 40,394

Electronic Patent Application Fee Transmittal				
Application Number:		15836824		
Filing Date:		09-Dec-2017		
Title of Invention:		DISTRIBUTED SOFTWARE DEFINED NETWORKING		
First Named Inventor/Applicant Name:		Pouya Taaghol		
Filer:		Christopher James Horgan		
Attorney Docket Number:		TAAG001CONT1		
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
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	2501	1	500	500

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				500

Electronic Acknowledgement Receipt	
EFS ID:	39369001
Application Number:	15836824
International Application Number:	
Confirmation Number:	9801
Title of Invention:	DISTRIBUTED SOFTWARE DEFINED NETWORKING
First Named Inventor/Applicant Name:	Pouya Taaghol
Customer Number:	112449
Filer:	Christopher James Horgan
Filer Authorized By:	
Attorney Docket Number:	TAAG001CONT1
Receipt Date:	06-MAY-2020
Filing Date:	09-DEC-2017
Time Stamp:	15:43:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 500
RAM confirmation Number	E202056F45384792
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

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)	TAAG001CONT1_ISSUE_FEE. pdf	90815	no	1
			a4c808ab14227b103d4a9e1c9895edcbdd 80748a		
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30514	no	2
			69ee1843f711a3971e17eb9df527c8a5d09 3b624		
Warnings:					
Information:					
Total Files Size (in bytes):			121329		
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. <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. <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. <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.					



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

112449 7590 05/04/2020
Roark IP
1438 Dahlia Loop
San Jose, CA 95126

EXAMINER

HIGA, BRENDAN Y

ART UNIT

PAPER NUMBER

2441

DATE MAILED: 05/04/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/836,824	12/09/2017	Pouya Taaghol	TAAG001CONT1	9801

TITLE OF INVENTION: DISTRIBUTED SOFTWARE DEFINED NETWORKING

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$500	\$0.00	\$0.00	\$500	08/04/2020

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: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (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)

112449 7590 05/04/2020
Roark IP
1438 Dahlia Loop
San Jose, CA 95126

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 transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/836,824	12/09/2017	Pouya Taaghol	TAAG001CONT1	9801

TITLE OF INVENTION: DISTRIBUTED SOFTWARE DEFINED NETWORKING

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$500	\$0.00	\$0.00	\$500	08/04/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
HIGA, BRENDAN Y	2441	709-201000

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 03-09 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, 1 _____
- (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 _____
- 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 must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). 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

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

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

☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

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 forms 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: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____



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.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/836,824	12/09/2017	Pouya Taaghol	TAAG001CONT1	9801
112449	7590	05/04/2020	EXAMINER	
Roark IP 1438 Dahlia Loop San Jose, CA 95126			HIGA, BRENDAN Y	
			ART UNIT	PAPER NUMBER
			2441	
DATE MAILED: 05/04/2020				

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

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

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.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B 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 30 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.

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. 15/836,824	Applicant(s) Taaghol et al.	
	Examiner BRENDAN HIGA	Art Unit 2441	AIA (FITF) Status Yes

-- 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 Applicant's Terminal Disclaimer filed on 04/20/2020.
☐ 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 1-2,5,7 and 11-18. 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. ☐ Notice of References Cited (PTO-892)	5. ☐ Examiner's Amendment/Comment
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.	6. ☐ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.	7. ☐ Other _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____.	

/BRENDAN Y HIGA/ Primary Examiner, Art Unit 2441	
---	--

<i>Index of Claims</i> 	Application/Control No. 15/836,824	Applicant(s)/Patent Under Reexamination Taaghoh et al.
	Examiner BRENDAN HIGA	Art Unit 2441

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS									
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☒ T.D. ☐ R.1.47									
CLAIM		DATE							
Final	Original	06/16/2019	01/17/2020	04/26/2020					
1	1	✓	✓	=					
2	2	✓	✓	=					
	3	✓	-	-					
	4	✓	-	-					
3	5	✓	✓	=					
	6	✓	-	-					
4	7	✓	✓	=					
	8	✓	-	-					
	9	✓	-	-					
	10	✓	-	-					
5	11	✓	✓	=					
6	12	✓	✓	=					
7	13	✓	✓	=					
8	14	✓	✓	=					
9	15	✓	✓	=					
10	16	✓	✓	=					
11	17	✓	✓	=					
12	18	✓	✓	=					

<i>Search Notes</i> 	Application/Control No. 15/836,824	Applicant(s)/Patent Under Reexamination Taaghola et al.
	Examiner BRENDAN HIGA	Art Unit 2441

CPC - Searched*		
Symbol	Date	Examiner
H04L 9/08-0819, 32-3213; 29/08135, 0845-08459; 41/08-082, 0866-0893; 45/563, 64; 63/0218; 67/10,1074-1087	04/27/2020	BH
G06F 8/60-61, 65, 70-71, 76; 9/4406, 45533-45558; 21/44-53' 2009/45562-45595;	04/27/2020	BH

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
see EAST search history	04/27/2020	BH
google scholar search: "distributed software defined network" "distributed software defined networking"; Openflow OR SDN controller "application store" OR "app store";	01/17/2020	BH

/R.K./ Examiner, Art Unit 2441	
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<i>Search Notes</i> 	Application/Control No. 15/836,824	Applicant(s)/Patent Under Reexamination Taaghola et al.
	Examiner BRENDAN HIGA	Art Unit 2441

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
H04L	9/08-0819, 32-3213; 29/08135, 0845-08459; 41/08-082, 0866-0893; 45/563, 64; 63/0218; 67/10, 1074-1087	04/27/2020	BH
G06F	8/60-61, 65, 70-71, 76; 9/4406, 45533-45558; 21/44-53; 2009/45562-45595;	04/27/2020	BH

/R.K./ Examiner, Art Unit 2441	
-----------------------------------	--

Issue Classification 	Application/Control No. 15/836,824	Applicant(s)/Patent Under Reexamination Taaghoh et al.
	Examiner BRENDAN HIGA	Art Unit 2441

CPC						
Symbol					Type	Version
H04L	/	67	/	10	F	2013-01-01
H04L	/	41	/	042	I	2013-01-01
G06F	/	9	/	4406	I	2013-01-01
G06F	/	21	/	53	I	2013-01-01
H04L	/	29	/	08135	I	2013-01-01
H04L	/	41	/	0893	I	2013-01-01
H04L	/	29	/	08459	I	2013-01-01
H04L	/	9	/	0822	I	2013-01-01
H04L	/	45	/	64	I	2013-01-01
H04L	/	45	/	563	I	2013-01-01
H04L	/	67	/	1076	I	2013-01-01
G06F	/	8	/	60	A	2013-01-01
H04L	/	63	/	0218	A	2013-01-01
G06F	/	21	/	44	A	2013-01-01
H04W	/	4	/	00	A	2013-01-01
G06F	/	21	/	57	A	2013-01-01
G06F	/	2009	/	45575	A	2013-01-01
G06F	/	8	/	70	A	2013-01-01

CPC Combination Sets					
Symbol		Type	Set	Ranking	Version
/	/				

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	12	
/BRENDAN Y HIGA/ Primary Examiner, Art Unit 2441	27 April 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	3

U.S. Patent and Trademark Office

Part of Paper No.: 20200426

Issue Classification 	Application/Control No. 15/836,824	Applicant(s)/Patent Under Reexamination Taaghoh et al.	
	Examiner BRENDAN HIGA	Art Unit 2441	

INTERNATIONAL CLASSIFICATION				
CLAIMED				
H04L29/08	/	29	/	08
H04L12/24	/	12	/	24
G06F9/4401	/	9	/	4401
G06F21/53	/	21	/	53
H04L9/08	/	9	/	08
H04L12/715	/	12	/	715
H04L12/771	/	12	/	771
G06F8/60	/	8	/	60
H04L29/06	/	29	/	06
G06F21/44	/	21	/	44
H04W4/00	/	4	/	00
G06F21/57	/	21	/	57
G06F9/455	/	9	/	455
G06F8/70	/	8	/	70

NON-CLAIMED				
H04L	/	29	/	08
H04L	/	12	/	24
G06F	/	9	/	4401
G06F	/	21	/	53
H04L	/	9	/	08
H04L	/	12	/	715
H04L	/	12	/	771
G06F	/	8	/	60
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G06F	/	21	/	44
H04W	/	4	/	00
G06F	/	21	/	57
G06F	/	9	/	455
G06F	/	8	/	70

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	12	
/BRENDAN Y HIGA/ Primary Examiner, Art Unit 2441	27 April 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	3

U.S. Patent and Trademark Office

Part of Paper No.: 20200426

<i>Issue Classification</i> 	Application/Control No. 15/836,824	Applicant(s)/Patent Under Reexamination Taaghoh et al.
	Examiner BRENDAN HIGA	Art Unit 2441

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE (Assistant Examiner) (Date)		Total Claims Allowed: 12	
/BRENDAN Y HIGA/ Primary Examiner, Art Unit 2441 (Primary Examiner) (Date)		O.G. Print Claim(s) 1	O.G. Print Figure 3

U.S. Patent and Trademark Office

Part of Paper No.: 20200426

Issue Classification 	Application/Control No. 15/836,824	Applicant(s)/Patent Under Reexamination Taaghoh et al.
	Examiner BRENDAN HIGA	Art Unit 2441

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☒ T.D. ☐ R.1.47															
CLAIMS															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	10	16												
2	2	11	17												
3	5	12	18												
4	7														
5	11														
6	12														
7	13														
8	14														
9	15														

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 12	
/BRENDAN Y HIGA/ Primary Examiner, Art Unit 2441 (Primary Examiner) _____ (Date) _____		O.G. Print Claim(s) 1	O.G. Print Figure 3

U.S. Patent and Trademark Office

Part of Paper No.: 20200426

Bibliographic Data

Application No: 15/836,824

Foreign Priority claimed: ☐ Yes ☒ No

35 USC 119 (a-d) conditions met: ☐ Yes ☒ No ☐ Met After Allowance

Verified and Acknowledged:

Examiner's Signature Initials

Title:

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
12/09/2017	709	2441	TAAG001CONT1
RULE			

APPLICANTS

Big Data Federation, Inc., Santa Clara, CA,

INVENTORS

Pouya Taaghola San Jose, CA, UNITED STATES

Vivek Ramanna San Jose, CA, UNITED STATES

CONTINUING DATA

This application is a CON of 14295331 06/04/2014 PAT 9843624

14295331 has PRO of 61834807 06/13/2013

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

01/10/2018

**** SMALL ENTITY ****

STATE OR COUNTRY

UNITED STATES

ADDRESS

Roark IP

1438 Dahlia Loop

San Jose, CA 95126

UNITED STATES

FILING FEE RECEIVED

\$730

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

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L7	4877921	(container tenant mult\$1tenant sandbox\$4 virtual adj2 machine)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/04/27 09:50
L8	9084	(VM cloud server) adj25 (application web\$1app app) same (open\$1flow \$3SDN software adj2 network\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/04/27 09:50
L9	72547	(VM cloud server) adj25 (application web\$1app app cloud\$1app) same L7	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/04/27 09:50
L10	27	(portal merchant market\$1place) adj15 (application web\$1app cloud\$1app app) same L9 and L8	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/04/27 09:50
L11	20	L10 and (@pd @ptad @prad @ad @rlad)<"20130613"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/04/27 09:50

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	5714	(VM cloud server) adj25 (application web\$1app app) same (virtual\$5 hyper\$2visor open\$1flow \$3SDN software adj2 network\$3).clm.	US- PGPUB; USPAT	OR	ON	2020/04/27 09:50

L2	2447	(portal web web\$1sit\$3 web\$1pag\$3 store merchant market\$1place) adj25 (application web\$1app app) adj10 (download\$3 installation install\$3).clm.	US-PGPUB; USPAT	OR	ON	2020/04/27 09:50
L3	84	L1 and L2	US-PGPUB; USPAT	OR	ON	2020/04/27 09:50
L4	70	L3 and (@pd @ptad @prad @ad @rlad)<"20130613"	US-PGPUB; USPAT	OR	ON	2020/04/27 09:50
L5	17393	(version\$3 updat\$3 recent\$3 up\$1grad\$3) adj15 (authenticat\$3 password authentic key check\$1sum authoriz\$6).clm.	US-PGPUB; USPAT	OR	ON	2020/04/27 09:50
L6	0	L4 and L5	US-PGPUB; USPAT	OR	ON	2020/04/27 09:50

4/27/2020 10:49:20 AM

C:\Users\bhiga\Documents\EAST\Workspaces\15836824_1.wsp



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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	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
15/836,824	12/09/2017	2441	730	TAAG001CONT1	18	3

CONFIRMATION NO. 9801
CORRECTED FILING RECEIPT



000000011839934

112449
Roark IP
1438 Dahlia Loop
San Jose, CA 95126

Date Mailed: 04/23/2020

Receipt is acknowledged of this non-provisional utility 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 FIRST INVENTOR, 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 corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction 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 provided that the request is grantable.

Inventor(s)

Pouya Taaghol, San Jose, CA;
Vivek Ramanna, San Jose, CA;

Applicant(s)

Big Data Federation, Inc., Santa Clara, CA;

Power of Attorney: The patent practitioners associated with Customer Number 112449

Domestic Priority data as claimed by applicant

This application is a CON of 14/295,331 06/04/2014 PAT 9843624
which claims benefit of 61/834,807 06/13/2013

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.

Permission to Access Application via Priority Document Exchange: No

Permission to Access Search Results: No

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 01/10/2018

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/836,824**

Projected Publication Date: Request for Non-Publication Acknowledged

Non-Publication Request: Yes

Early Publication Request: No

**** SMALL ENTITY ****

Title

DISTRIBUTED SOFTWARE DEFINED NETWORKING

Preliminary Class

709

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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, 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

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

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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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.



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
15/836,824	12/09/2017	Pouya Taaghoh	TAAG001CONT1

CONFIRMATION NO. 9801

POA ACCEPTANCE LETTER

112449
Roark IP
1438 Dahlia Loop
San Jose, CA 95126



Date Mailed: 04/23/2020

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/17/2020.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/mmasfaw/

Application Number * 15/836,824 *	Application/Control No. 15/836,824	Applicant(s)/Patent under Reexamination Taaghol et al.	
	Examiner HIGA, BRENDAN Y	Art Unit 2441	
Document Code - DISQ		Internal Document - DO NOT MAIL	

TERMINAL DISCLAIMER	☐ APPROVED	☒ DISAPPROVED
Date Filed: <u>05 March 2020</u>	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:
/FELICIA D ROBERTS/ Technology Center: OPLC Telephone: (571)272-0550 The person who signed the terminal disclaimer is not the applicant, patentee or an attorney or agent of record. 37 CFR 1.321(a) and (b). (See FP 14.26.08) Please file a POA that gives power to the attorney who is signing the TD, along with another copy of the TD, or file a TD that is signed by the applicant. (No new fee required) Thanks.

<i>Application Number</i> * 15/836,824 *	Application/Control No. 15/836,824	Applicant(s)/Patent under Reexamination Taaghoh et al.	
	Examiner HIGA, BRENDAN Y	Art Unit 2441	
Document Code - DISQ		Internal Document - DO NOT MAIL	

TERMINAL DISCLAIMER	☒ APPROVED	☐ DISAPPROVED
Date Filed: <u>17 April 2020</u>	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:
/FELICIA D ROBERTS/ Technology Center: OPLC Telephone: (571)272-0550 9843624

**TERMINAL DISCLAIMER TO OBTAIN A DOUBLE PATENTING
REJECTION OVER A "PRIOR" PATENT**

Docket Number (Optional)
TAAG001 CONT1

In re Application of: Taaghol

Application No.: 15/836,824

Filed: 12/9/2017

For: DISTRIBUTED SOFTWARE DEFINED NETWORKING

The applicant, Big Data Federation, Inc., owner of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of **prior patent** No. 9843624 as the term of said **prior patent** is presently shortened by any terminal disclaimer. The applicant hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the **prior patent** are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the applicant does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the **prior patent**, "as the term of said **prior patent** is presently shortened by any terminal disclaimer," in the event that said **prior patent** later:

- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1. ☐ The undersigned is the applicant. If the applicant is an assignee, the undersigned is authorized to act on behalf of the assignee.

I hereby acknowledge that any willful false statements made are punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

2. ☒ The undersigned is an attorney or agent of record. Reg. No. 40,394

/Christopher J. Horgan/

Signature

4/17/2020

Date

Christopher J. Horgan

Typed or printed name

Attorney for Applicant

Title

408-687-8306

Telephone Number

- ☒ Terminal disclaimer fee under 37 CFR 1.20(d) included.

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.

This collection of information is required by 37 CFR 1.321. 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: 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.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Big Data Federation, Inc.

Application No./Patent No.: 15/836,824 Filed/Issue Date: 12/9/2017

Titled: Distributed Software Defined Networking

Big Data Federation, Inc., a corporation

(Name of Assignee)

(Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☒ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

☐ The extent (by percentage) of its ownership interest is ____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (e.g., bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Pouya Taaghoh To: Big Data Federation, Inc.

The document was recorded in the United States Patent and Trademark Office at
Reel 050963, Frame 0054, or for which a copy thereof is attached.

2. From: Vivek Ramanna To: Pouya Taaghoh

The document was recorded in the United States Patent and Trademark Office at
Reel 035569, Frame 0334, or for which a copy thereof is attached.

[Page 1 of 2]

This collection of information is required by 37 CFR 3.73(b). 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: 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.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☒ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Christopher J. Horgan/

April 17, 2020

Signature

Christopher J. Horgan

Date

40,394

Printed or Typed Name

Title or Registration Number

Electronic Patent Application Fee Transmittal				
Application Number:		15836824		
Filing Date:		09-Dec-2017		
Title of Invention:		DISTRIBUTED SOFTWARE DEFINED NETWORKING		
First Named Inventor/Applicant Name:		Pouya Taaghol		
Filer:		Christopher James Horgan		
Attorney Docket Number:		TAAG001CONT1		
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
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:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension - 1 month with \$0 paid	2251	1	100	100
Miscellaneous:				
Total in USD (\$)				100

Electronic Acknowledgement Receipt	
EFS ID:	39196448
Application Number:	15836824
International Application Number:	
Confirmation Number:	9801
Title of Invention:	DISTRIBUTED SOFTWARE DEFINED NETWORKING
First Named Inventor/Applicant Name:	Pouya Taaghol
Customer Number:	112449
Filer:	Christopher James Horgan
Filer Authorized By:	
Attorney Docket Number:	TAAG001CONT1
Receipt Date:	17-APR-2020
Filing Date:	09-DEC-2017
Time Stamp:	18:19:21
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$100
RAM confirmation Number	E20204GI23538947
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Req to correct/update/change appl name until pay issue fee	TAAG001CONT1_LETTER__.pdf	18719	no	1
			60e263869243c23059de8ab3d0406f7a60b88250		
Warnings:					
Information:					
2	Application Data Sheet	TAAG001CONT1_NEW_ADS__.pdf	910981	no	5
			ad51a89f380b94b1032a10b2b10be0703ebe5485		
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
3	Power of Attorney	TAAG001CONT1_NEW_POA__.pdf	178160	no	2
			ac00991a694205caa589bbd69d698afff3ddaccc		
Warnings:					
Information:					
4	Terminal Disclaimer Filed	TAAG001CONT1_NEW_TD__.pdf	83265	no	1
			b06abebe6e175399c4abc37fd67a1fb3f31d2e4		
Warnings:					
Information:					
5	Assignee showing of ownership per 37 CFR 3.73	TAAG001CONT1_CERT__.pdf	170268	no	2
			10d0468c0c2ba5f3b07d779d79302eecd4bbcb268		
Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	30796	no	2
			53ce70a95285cd7d81921b1b81635e12577230c387		
Warnings:					

Information:	
Total Files Size (in bytes):	1392189
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. <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. <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. <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.	

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Taaghol

Examiner: Higa, Brendan

Serial No.: 15/836,824

Art Unit: 2441

Filed: 12/09/2017

Attorney Docket No.: TAAG001CONT1

For: DISTRIBUTED SOFTWARE DEFINED NETWORKING

Mail Stop Amendment Commissioner for Patents

PO Box 1450

Alexandria, VA 22313-1450

Dear Sir:

RENEWED REQUEST UNDER 37 CFR 1.46(c)

Applicants offer the following request to change the Applicant to Big Data Federation, Inc. Applicant is submitting the following:

- 1) A Supplemental ADS with the Applicant corrected.
- 2) A new Terminal Disclaimer.
- 3) A new Power of Attorney.
- 4) Statement Under 37 CFR 3.73(c).

No new matter has been added.

Respectfully submitted,
ROARK IP
By: /Christopher J. Horgan/

Christopher J. Horgan
Registration No. 40,394
1438 Dahlia Loop
San Jose, CA 95126
Telephone: (408) 687-8306

Date: April 17, 2020

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.

Supplemental		Attorney Docket Number	TAAG001CONT1
Application Data Sheet 37 CFR 1.76		Application Number	
Title of Invention	Distributed Software Defined Networking		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--------------------------	---

Inventor Information:

Inventor 1					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Pouya		Taaghol		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	San Jose	State/Province	CA	Country of Residence	US
Mailing Address of Inventor:					
Address 1		1260 Trestlewood Lane			
Address 2					
City	San Jose	State/Province	CA		
Postal Code	95138	Country	US		
Inventor 2					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Vivek		Ramanna		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	San Jose	State/Province	CA	Country of Residence	US
Mailing Address of Inventor:					
Address 1		549 Manhattan Place			
Address 2					
City	San Jose	State/Province	CA		
Postal Code	95126	Country	US		
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.					
Add					

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
 For further information see 37 CFR 1.33(a).

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	TAAG001CONT1
		Application Number	
Title of Invention	Distributed Software Defined Networking		

☐ An Address is being provided for the correspondence information of this application.			
Customer Number	112449		
Email Address	chris.horgan@roarkip.com	Add Email	Remove Email

Application Information:

Title of the Invention	Distributed Software Defined Networking		
Attorney Docket Number	TAAG001CONT1	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	5	Suggested Figure for Publication (if any)	1

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)	
☒ Request Not to Publish. I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application has not and will not be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.	

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative information during processing.			
Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	112449		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.			
Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Continuation of	14295331	2014-06-04
Prior Application Status	Pending	Remove	

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	TAAG001CONT1
		Application Number	
Title of Invention	Distributed Software Defined Networking		
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
14295331	non provisional of	61834807	2013-06-13
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)¹ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number	Country ²	Filing Date (YYYY-MM-DD)	Remove
			Access Code ³ (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			

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

This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

☐ NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Authorization to Permit Access:

☐ Authorization to Permit Access to the Instant Application by the Participating Offices

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	TAAG001CONT1
		Application Number	
Title of Invention	Distributed Software Defined Networking		

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

☒ Assignee ☐ Legal Representative under 35 U.S.C. 117 ☐ Joint Inventor

☐ Person to whom the inventor is obligated to assign. ☐ Person who shows sufficient proprietary interest

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor: _____

If the Applicant is an Organization check here. ☒

Organization Name Big Data Federation, Inc.

Mailing Address Information For Applicant:

Address 1 990 Linden Drive, #220

Address 2 _____

City Santa Clara State/Province CA

Country US Postal Code 95050

Phone Number 408-623-8529 Fax Number _____

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	TAAG001CONT1
		Application Number	
Title of Invention	Distributed Software Defined Networking		
Email Address	pouya@bigdatafed.com		
Additional Applicant Data may be generated within this form by selecting the Add button.			

Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1				
Complete this section only if non-applicant assignee information is desired to be included on the patent application publication in accordance with 37 CFR 1.215(b). Do not include in this section an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest), as the patent application publication will include the name of the applicant(s).				
If the Assignee is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee Data may be generated within this form by selecting the Add button.				

Signature:

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications.				
Signature	/Christopher J. Horgan/		Date (YYYY-MM-DD)	04-17-2020
First Name	Christopher	Last Name	Horgan	Registration Number 40394
Additional Signature may be generated within this form by selecting the Add button.				

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA/82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	15/836,824
Filing Date	12/9/2017
First Named Inventor	Taaghol
Title	Distributed Software Defined Networking
Art Unit	2441
Examiner Name	Higa
Attorney Docket Number	TAAG001CONT1

SIGNATURE of Applicant or Patent Practitioner

Signature	/Christopher J. Horgan/	Date (Optional)	April 17, 2020
Name	Christopher J. Horgan	Registration Number	40,394
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.



*Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. 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 3 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.

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date
15/836,824	12/9/2017

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

- ☒ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above:
- OR
- ☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

- ☒ The address associated with the above-mentioned Customer Number
- OR
- ☐ The address associated with Customer Number:
- OR

☐ Firm or Individual Name

Address

City

State

Zip

Country

Telephone

Email

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

- ☐ Inventor or Joint Inventor (title not required below)
- ☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
- ☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
- ☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature

Date (Optional)

1/26/2020

Name

Pouya Taaghol

Title

CEO, Big Data Federation, Inc.

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☒ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. 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 3 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.



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
15/836,824	12/09/2017	Pouya Taaghoh	TAAG001CONT1

112449
Roark IP
1438 Dahlia Loop
San Jose, CA 95126

**CONFIRMATION NO. 9801
IMPROPER CPOA LETTER**



Date Mailed: 03/05/2020

NOTICE REGARDING POWER OF ATTORNEY

This is in response to the power of attorney filed 03/03/2020. The power of attorney in this application is not accepted for the reason(s) listed below:

- The power of attorney has not been accepted because the party who is giving power has not been identified. Power of attorney may only be signed by the applicant for patent (37 CFR 1.42) or the patent owner. A party who is not the applicant must become the applicant in accordance with 37 CFR 1.46(c) and appoint any power of attorney in compliance with 37 CFR 3.71 and 3.73. For a reissue application, reexamination proceeding, or supplemental examination proceeding, a patent owner who was not the applicant under 37 CFR 1.46 must appoint any power of attorney in compliance with 37 CFR 3.71 and 3.73. See 37 CFR 1.32(b)(4).

The power of attorney filed 03/03/2020 has not been accepted because the power of attorney must be signed by the applicant for patent. See 37 CFR 1.32(b)(4).

- The person or entity attempting the change to power of attorney is not the applicant of record in the application. Any request to change the applicant once the applicant has been specified must include (1) an application data sheet (ADS) specifying the new applicant in the Applicant Information section, and (2) a statement under 37 CFR 3.73(c) (USPTO Form PTO/AIA/96 or an equivalent) to show chain of title to the new applicant. The ADS must contain markings to show the information that is being changed, with underlining for insertions and strike-through or brackets for text removed. See 37 CFR 1.76(c)(2).

Because the request to change or update the applicant cannot be accepted, the power of attorney is not properly signed by the applicant and cannot be accepted. The change to applicant must be acceptable before the new applicant can appoint power of attorney.

112449
Roark IP
1438 Dahlia Loop
San Jose, CA 95126
UNITED STATES

/dtdinh/

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

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA/82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	15/836,824
Filing Date	12/9/2017
First Named Inventor	Taaghol
Title	Distributed Software Defined Networking
Art Unit	2441
Examiner Name	Higa
Attorney Docket Number	TAAG001CONT1

SIGNATURE of Applicant or Patent Practitioner

Signature	/Christopher J. Horgan/	Date (Optional)	March 2, 2020
Name	Christopher J. Horgan	Registration Number	40,394
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.



*Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. 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 3 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.

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date
15/836,824	12/9/2017

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

- ☒ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above:
- OR**
- ☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

- ☒ The address associated with the above-mentioned Customer Number
- OR**
- ☐ The address associated with Customer Number:
- OR**

☐ Firm or Individual Name

Address

City

State

Zip

Country

Telephone

Email

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

- ☐ Inventor or Joint Inventor (title not required below)
- ☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
- ☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
- ☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature

Date (Optional)

1/26/2020

Name

Pouya Taaghol

Title

CEO, Big Data Federation, Inc.

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☒ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. 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 3 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.

**TERMINAL DISCLAIMER TO OBTAIN A DOUBLE PATENTING
REJECTION OVER A "PRIOR" PATENT**

Docket Number (Optional)
TAAG001CONT1

In re Application of: Taaghol

Application No.: 15/836,824

Filed: 12/9/2017

For: DISTRIBUTED SOFTWARE DEFINED NETWORKING

The applicant, Big Data Federation, Inc., owner of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of **prior patent** No. 9843624 as the term of said **prior patent** is presently shortened by any terminal disclaimer. The applicant hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the **prior patent** are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the applicant does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the **prior patent**, "as the term of said **prior patent** is presently shortened by any terminal disclaimer," in the event that said **prior patent** later:

- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1. ☐ The undersigned is the applicant. If the applicant is an assignee, the undersigned is authorized to act on behalf of the assignee.

I hereby acknowledge that any willful false statements made are punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

2. ☒ The undersigned is an attorney or agent of record. Reg. No. 40,394

/Christopher J. Horgan/

Signature

3/2/2020

Date

Christopher J. Horgan

Typed or printed name

Attorney for Applicant

Title

408-687-8306

Telephone Number

- ☒ Terminal disclaimer fee under 37 CFR 1.20(d) included.

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.

This collection of information is required by 37 CFR 1.321. 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: 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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Taaghol

Examiner: Higa, Brendan

Serial No.: 15/836,824

Art Unit: 2441

Filed: 12/09/2017

Attorney Docket No.: TAAG001CONT1

For: DISTRIBUTED SOFTWARE DEFINED NETWORKING

Mail Stop Amendment Commissioner for Patents

PO Box 1450

Alexandria, VA 22313-1450

Dear Sir:

RENEWED REQUEST UNDER 37 CFR 1.46(c)

Applicants offer the following request to change the Applicant to Big Data Federation, Inc. Applicant is submitting the following:

- 1) A Supplemental ADS with the Applicant corrected.
- 2) A new Terminal Disclaimer.
- 3) A new Power of Attorney.

No new matter has been added.

Respectfully submitted,
ROARK IP
By: /Christopher J. Horgan/

Christopher J. Horgan
Registration No. 40,394
1438 Dahlia Loop
San Jose, CA 95126
Telephone: (408) 687-8306

Date: March 3, 2020

Electronic Acknowledgement Receipt	
EFS ID:	38754923
Application Number:	15836824
International Application Number:	
Confirmation Number:	9801
Title of Invention:	DISTRIBUTED SOFTWARE DEFINED NETWORKING
First Named Inventor/Applicant Name:	Pouya Taaghol
Customer Number:	112449
Filer:	Christopher James Horgan
Filer Authorized By:	
Attorney Docket Number:	TAAG001CONT1
Receipt Date:	03-MAR-2020
Filing Date:	09-DEC-2017
Time Stamp:	14:28:16
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	Application Data Sheet	TAAG001CONT1_SUPP_ADS_.pdf	1532613 d0d26a6d442461f3f32d52a7145072f5de6a1dd0	no	5

Warnings:

Information:					
This is not an USPTO supplied ADS fillable form					
2	Power of Attorney	TAAG001CONT1_NEW_POA_.pdf	197572	no	2
			42e39b5d639d291bc5bd9f4c18012f5ae8b5c901		
Warnings:					
Information:					
3	Application Data Sheet	TAAG001CONT1_NEW_TD_.pdf	84597	no	1
			87b94ac88601c75b20f13e83a792d805aaade0		
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
4	Req to correct/update/change appl name until pay issue fee	TAAG001CONT1_REQUEST_.pdf	35797	no	1
			f3eecd712be8f6259b9621f15288c0f9c55f70		
Warnings:					
Information:					
Total Files Size (in bytes):			1850579		
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. <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. <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. <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.					

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.

Supplemental		Attorney Docket Number	TAAG001CONT1
Application Data Sheet 37 CFR 1.76		Application Number	
Title of Invention	Distributed Software Defined Networking		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--------------------------	---

Inventor Information:

Inventor 1					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Pouya		Taaghol		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	San Jose	State/Province	CA	Country of Residence	US
Mailing Address of Inventor:					
Address 1		1260 Trestlewood Lane			
Address 2					
City	San Jose	State/Province	CA		
Postal Code	95138	Country	US		
Inventor 2					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Vivek		Ramanna		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	San Jose	State/Province	CA	Country of Residence	US
Mailing Address of Inventor:					
Address 1		549 Manhattan Place			
Address 2					
City	San Jose	State/Province	CA		
Postal Code	95126	Country	US		
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.					
					Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
 For further information see 37 CFR 1.33(a).

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	TAAG001CONT1
		Application Number	
Title of Invention	Distributed Software Defined Networking		

☐ An Address is being provided for the correspondence information of this application.			
Customer Number	112449		
Email Address	chris.horgan@roarkip.com	Add Email	Remove Email

Application Information:

Title of the Invention	Distributed Software Defined Networking		
Attorney Docket Number	TAAG001CONT1	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	5	Suggested Figure for Publication (if any)	1

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)	
☒ Request Not to Publish. I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application has not and will not be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.	

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative information during processing.			
Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	112449		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.			
Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Continuation of	14295331	2014-06-04
Prior Application Status	Pending	Remove	

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	TAAG001CONT1
		Application Number	
Title of Invention	Distributed Software Defined Networking		
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
14295331	non provisional of	61834807	2013-06-13
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)¹ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number	Country ²	Filing Date (YYYY-MM-DD)	Remove
			Access Code ³ (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			

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

This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

☐ NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Authorization to Permit Access:

☐ Authorization to Permit Access to the Instant Application by the Participating Offices

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	TAAG001CONT1
		Application Number	
Title of Invention	Distributed Software Defined Networking		

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

☒ Assignee ☐ Legal Representative under 35 U.S.C. 117 ☐ Joint Inventor

☐ Person to whom the inventor is obligated to assign. ☐ Person who shows sufficient proprietary interest

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name Big Data Federation, Inc.

Mailing Address Information For Applicant:

Address 1 990 Linden Drive, #220

Address 2

City Santa Clara State/Province CA

Country US Postal Code 95050

Phone Number 408-623-8529 Fax Number

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	TAAG001CONT1
		Application Number	
Title of Invention	Distributed Software Defined Networking		
Email Address	pouya@bigdatafed.com		
Additional Applicant Data may be generated within this form by selecting the Add button.			

Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.				
Assignee 1				
Complete this section only if non-applicant assignee information is desired to be included on the patent application publication in accordance with 37 CFR 1.215(b). Do not include in this section an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest), as the patent application publication will include the name of the applicant(s).				
If the Assignee is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country ¹		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee Data may be generated within this form by selecting the Add button.				

Signature:

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications.				
Signature	/Christopher J. Horgan/		Date (YYYY-MM-DD)	2020-03-02
First Name	Christopher	Last Name	Horgan	Registration Number
40394				
Additional Signature may be generated within this form by selecting the Add button.				

Application Number * 15/836,824 *	Application/Control No. 15/836,824	Applicant(s)/Patent under Reexamination Taaghol et al.	
	Examiner HIGA, BRENDAN Y	Art Unit 2441	
Document Code - DISQ		Internal Document - DO NOT MAIL	

TERMINAL DISCLAIMER	☐ APPROVED	☒ DISAPPROVED
Date Filed: <u>27 January 2020</u>	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:
/ FELICIA D ROBERTS/ Technology Center: OPLC Telephone: (571)272-0550 See Continuation Sheet

Continuation of Approved/Disapproved Comments: The terminal disclaimer identifies a party who is not the applicant (only for applications filed on or after September 16, 2012; See FP 14.26.10):

For cases filed on/after 9/16/12, 37 CFR 1.321 specifies that the applicant can disclaim, and the terminal disclaimer must specify the extent of the applicant's ownership.

To remedy this:

A request under 37 CFR 1.46(c) to change the applicant needs to be filed, which is (1) a request, signed by a 1.33(b) party, (2) a corrected ADS (37 CFR 1.76(c)) that identifies the "new" applicant in the applicant information, and is underlined since it is new, and (3) a 3.73(c) statement showing chain of title to the new applicant. Along with the § 1.46(c) request we need a POA that gives power to the attorney who is signing the TD, along with another copy of the TD, unless they file a TD that is signed by the applicant.

Please make corrections as suggested above and also resubmit the TD. (No new fee required)



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
15/836,824	12/09/2017	Pouya Taaghoh	TAAG001CONT1

CONFIRMATION NO. 9801

IMPROPER CFR REQUEST



112449
Roark IP
1438 Dahlia Loop
San Jose, CA 95126

Date Mailed: 01/29/2020

RESPONSE TO REQUEST FOR CORRECTED FILING RECEIPT

Power of Attorney, Claims, Fees, System Limitations, and Miscellaneous

In response to your request for a corrected Filing Receipt, the Office is unable to comply with your request because:

- The ADS submitted on 01/27/2020 was not properly marked up to show the desired changes. For information being changed relative to the information already of record, additions must be shown with underlining, and deletions must be shown with strike-through or brackets. See 37 CFR 1.76(c)(2)

In order to make changes to the information of record, an ADS must be properly signed and properly marked up relative to the current information of record.

Proper signature: The ADS must be signed with a handwritten signature or proper S-signature by:

- A patent practitioner, with the practitioner's registration number accompanying the signature (e.g., immediately below or adjacent to the signature), or
- The applicant, if the applicant is an individual other than the inventor(s) and no power of attorney has been appointed, or
- All of the inventors, if no other applicant has been established and no power of attorney has been appointed.

A proper S-signature consists of only letters and/or Arabic numerals, with appropriate spaces and commas, periods, apostrophes, or hyphens for punctuation contained between a first single forward slash mark before, and a second single forward slash mark after, the S-signature.

Proper markings: The ADS must identify the changes being made with underlining for insertions and strike-through or brackets for text removed. No other markings or indications are acceptable. Where an ADS providing corrected or updated information does not contain all of the sections of the ADS, the entire section in which changes are being made must be included in the ADS. Information of record can generally be found on the latest filing receipt.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/sstephanos/



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
15/836,824	12/09/2017	Pouya Taaghola	TAAG001CONT1

112449
Roark IP
1438 Dahlia Loop
San Jose, CA 95126

CONFIRMATION NO. 9801
IMPROPER CPOA LETTER



Date Mailed: 01/29/2020

NOTICE REGARDING POWER OF ATTORNEY

This is in response to the power of attorney filed 01/27/2020. The power of attorney in this application is not accepted for the reason(s) listed below:

- The power of attorney has not been accepted because the party who is giving power has not been identified. Power of attorney may only be signed by the applicant for patent (37 CFR 1.42) or the patent owner. A party who is not the applicant must become the applicant in accordance with 37 CFR 1.46(c) and appoint any power of attorney in compliance with 37 CFR 3.71 and 3.73. For a reissue application, reexamination proceeding, or supplemental examination proceeding, a patent owner who was not the applicant under 37 CFR 1.46 must appoint any power of attorney in compliance with 37 CFR 3.71 and 3.73. See 37 CFR 1.32(b)(4).

/sstephanos/

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

112449
Roark IP
1438 Dahlia Loop
San Jose, CA 95126
UNITED STATES

**TERMINAL DISCLAIMER TO OBTAIN A DOUBLE PATENTING
REJECTION OVER A "PRIOR" PATENT**

Docket Number (Optional)
TAAG001CONT1

In re Application of: Taaghol

Application No.: 15/836,824

Filed: 12/9/2017

For: DISTRIBUTED SOFTWARE DEFINED NETWORKING

The applicant, Big Data Federation, Inc., owner of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of **prior patent** No. 9843624 as the term of said **prior patent** is presently shortened by any terminal disclaimer. The applicant hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the **prior patent** are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the applicant does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the **prior patent**, "as the term of said **prior patent** is presently shortened by any terminal disclaimer," in the event that said **prior patent** later:

- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1. ☐ The undersigned is the applicant. If the applicant is an assignee, the undersigned is authorized to act on behalf of the assignee.

I hereby acknowledge that any willful false statements made are punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

2. ☒ The undersigned is an attorney or agent of record. Reg. No. 40,394

/Christopher J. Horgan/

Signature

1/26/2020

Date

Christopher J. Horgan

Typed or printed name

Attorney for Applicant

Title

408-687-8306

Telephone Number

- ☒ Terminal disclaimer fee under 37 CFR 1.20(d) included.

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.

This collection of information is required by 37 CFR 1.321. 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: 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.

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA/82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	15/836,824
Filing Date	12/9/2017
First Named Inventor	Taaghol
Title	Distributed Software Defined Networking
Art Unit	2441
Examiner Name	Higa
Attorney Docket Number	TAAG001CONT1

SIGNATURE of Applicant or Patent Practitioner

Signature	/Christopher J. Horgan/	Date (Optional)	January 27, 2020
Name	Christopher J. Horgan	Registration Number	40,394
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.



*Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. 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 3 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.

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date
15/836,824	12/9/2017

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

- ☒ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above:
- OR
- ☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

- ☒ The address associated with the above-mentioned Customer Number
- OR
- ☐ The address associated with Customer Number:
- OR

☐ Firm or Individual Name

Address

City

State

Zip

Country

Telephone

Email

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

- ☐ Inventor or Joint Inventor (title not required below)
- ☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
- ☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
- ☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature

Date (Optional)

1/26/2020

Name

Pouya Taaghol

Title

CEO, Big Data Federation, Inc.

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☒ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. 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 3 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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Taaghol

Examiner: Higa, Brendan

Serial No.: 15/836,824

Art Unit: 2441

Filed: 12/09/2017

Attorney Docket No.: TAAG001CONT1

For: DISTRIBUTED SOFTWARE DEFINED NETWORKING

Mail Stop Amendment Commissioner for Patents

PO Box 1450

Alexandria, VA 22313-1450

Dear Sir:

REQUEST UNDER 37 CFR 1.46(c)

Applicants offer the following request to change the Applicant to Big Data Federation, Inc. Applicant is submitting the following:

- 1) A Supplemental ADS with the Applicant corrected.
- 2) A new Terminal Disclaimer.
- 3) A Statement Under 37 CFR 3.73(c).
- 4) A new Power of Attorney.

No new matter has been added.

Respectfully submitted,
ROARK IP
By: /Christopher J. Horgan/

Christopher J. Horgan
Registration No. 40,394
1438 Dahlia Loop
San Jose, CA 95126
Telephone: (408) 687-8306

Date: January 26, 2020

Electronic Acknowledgement Receipt	
EFS ID:	38400092
Application Number:	15836824
International Application Number:	
Confirmation Number:	9801
Title of Invention:	DISTRIBUTED SOFTWARE DEFINED NETWORKING
First Named Inventor/Applicant Name:	Pouya Taaghol
Customer Number:	112449
Filer:	Christopher James Horgan
Filer Authorized By:	
Attorney Docket Number:	TAAG001CONT1
Receipt Date:	27-JAN-2020
Filing Date:	09-DEC-2017
Time Stamp:	00:29:30
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	Application Data Sheet	TAAG001CONT1_NEW_ADS.pdf	845487	no	6
			d6bd28beb81a65018ad2d6628f1a7210d5 473d4a		

Warnings:

Information:					
This is not an USPTO supplied ADS fillable form					
2	Assignee showing of ownership per 37 CFR 3.73	TAAG001CONT1_CERT.pdf	89497 bd1f817d107762edae7eaf65eab58e5915612473	no	2
Warnings:					
Information:					
3	Terminal Disclaimer Filed	TAAG001CONT1_NEW_TD.pdf	98136 a1983b1b36e095f627a7a65cb08b45871a51816d	no	1
Warnings:					
Information:					
4	Power of Attorney	TAAG001CONT1_POA_.pdf	198703 557b94f72e6d1b0e9f5e1b15b2b4101814dda7f0	no	2
Warnings:					
Information:					
5	Transmittal Letter	TAAG001CONT1_REQUEST_.pdf	55322 87bfb03e4dd222b52520a3b1aefc47f1ed2b0057	no	1
Warnings:					
Information:					
Total Files Size (in bytes):			1287145		
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. <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. <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. <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.					

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	TAAG001CONT1
		Application Number	
Title of Invention	Distributed Software Defined Networking		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--------------------------	---

Inventor Information:

Inventor 1					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Pouya		Taaghoh		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	San Jose	State/Province	CA	Country of Residence	US
Mailing Address of Inventor:					
Address 1		1260 Trestlewood Lane			
Address 2					
City	San Jose	State/Province	CA		
Postal Code	95138	Country	US		
Inventor 2					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Vivek		Ramanna		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	San Jose	State/Province	CA	Country of Residence	US
Mailing Address of Inventor:					
Address 1		549 Manhattan Place			
Address 2					
City	San Jose	State/Province	CA		
Postal Code	95136	Country	US		
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.					

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	TAAG001CONT1
		Application Number	
Title of Invention	Distributed Software Defined Networking		

☐ An Address is being provided for the correspondence information of this application.

Customer Number	112449		
Email Address	chris.horgan@roarkip.com	Add Email	Remove Email

Application Information:

Title of the Invention	Distributed Software Defined Networking		
Attorney Docket Number	TAAG001CONT1	Small Entity Status Claimed ☒	
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	5	Suggested Figure for Publication (if any)	1

Publication Information:
☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☒ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.
Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative information during processing.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	112449		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Continuation of	14295331	2014-06-04
Prior Application Status	Expired	Remove	

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	TAAG001CONT1
		Application Number	
Title of Invention	Distributed Software Defined Networking		
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
14295331	non provisional of	61834807	2013-06-13
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)¹ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove			
Application Number	Country ¹	Filing Date (YYYY-MM-DD)	Access Code ¹ (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			

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

This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

☐ NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Authorization to Permit Access:

☐ Authorization to Permit Access to the Instant Application by the Participating Offices

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	TAAG001CONT1
		Application Number	
Title of Invention	Distributed Software Defined Networking		

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.				
Applicant 1				
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.				
Clear				
☐ Assignee	☐ Legal Representative under 35 U.S.C. 117	☐ Joint Inventor		
☐ Person to whom the inventor is obligated to assign.	☐ Person who shows sufficient proprietary interest			
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:				
Name of the Deceased or Legally Incapacitated Inventor :				
If the Applicant is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	TAAG001CONT1
		Application Number	
Title of Invention	Distributed Software Defined Networking		
Mailing Address Information For Applicant:			
Address 1			
Address 2			
City		State/Province	
Country		Postal Code	
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button.			

Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.				
Assignee 1				
Complete this section only if non-applicant assignee information is desired to be included on the patent application publication in accordance with 37 CFR 1.215(b). Do not include in this section an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest), as the patent application publication will include the name of the applicant(s).				
If the Assignee is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee Data may be generated within this form by selecting the Add button.				

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	TAAG001CONT1
		Application Number	
Title of Invention	Distributed Software Defined Networking		

Signature:

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Signature	/Christopher J. Horgan/		Date (YYYY-MM-DD)	2017-12-08	
First Name	Christopher	Last Name	Horgan	Registration Number	40394

Additional Signature may be generated within this form by selecting the Add button.

This collection of information is required by 37 CFR 1.76. 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 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet 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.**

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Big Data Federation, Inc.

Application No./Patent No.: 15/836,824 Filed/Issue Date: 12/9/2017

Titled: Distributed Software Defined Networking

Big Data Federation, Inc., a corporation

(Name of Assignee)

(Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☒ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

☐ The extent (by percentage) of its ownership interest is ____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (e.g., bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Pouya Taaghoh To: Big Data Federation, Inc.

The document was recorded in the United States Patent and Trademark Office at
Reel 050963, Frame 0054, or for which a copy thereof is attached.

2. From: Vivek Ramanna To: Pouya Taaghoh

The document was recorded in the United States Patent and Trademark Office at
Reel 035569, Frame 0334, or for which a copy thereof is attached.

[Page 1 of 2]

This collection of information is required by 37 CFR 3.73(b). 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: 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.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☒ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Christopher J. Horgan/

January 26, 2020

Signature

Christopher J. Horgan

Date

40,394

Printed or Typed Name

Title or Registration 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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/836,824	12/09/2017	Pouya Taaghoh	TAAG001CONT1	9801
112449	7590	01/21/2020	EXAMINER	
Roark IP			HIGA, BRENDAN Y	
1438 Dahlia Loop				
San Jose, CA 95126				
			ART UNIT	PAPER NUMBER
			2441	
			MAIL DATE	DELIVERY MODE
			01/21/2020	PAPER

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.

Office Action Summary	Application No. 15/836,824	Applicant(s) Taaghol et al.	
	Examiner BRENDAN HIGA	Art Unit 2441	AIA (FITF) Status Yes

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10/25/2019.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ 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.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

- 5) ☒ Claim(s) 1-2,5,7 and 11-18 is/are pending in the application.
5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☒ Claim(s) 1-2,5,7 and 11-18 is/are rejected.
- 8) ☐ Claim(s) ____ is/are objected to.
- 9) ☐ Claim(s) ____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, 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.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

- 12) ☐ 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)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date ____.
- 3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date ____.
- 4) ☐ Other: ____.

DETAILED ACTION

This case has been reassigned to a new Examiner, see below for updated Examiner contact information.

This Office action is in response to Applicant's amendment and request for reconsideration filed on October 25, 2019.

Claims 1-2, 5, 7, and 11-18 are pending.

Response to Arguments

Applicant's arguments, see remarks filed October 25, 2019, with respect to the previous rejection of claims 1-2, 5, 7, and 11-18 under 35 USC 112(a) and/or 112(b), and 103 have been fully considered and are persuasive. The rejection of claims 1-2, 5, 7, and 11-18 under 35 USC 112(a), 112(b), and 103 have been withdrawn.

Terminal Disclaimer

The terminal disclaimer does not comply with 37 CFR 1.321 because:

This application was filed on or after September 16, 2012. For cases filed on or after September 16, 2012, 37 CFR 1.321 specifies that only the applicant can disclaim, and the terminal disclaimer must specify the extent of the applicant's ownership.

Below is what needs to be done to correct the defects:

A request under 37 CFR 1.46(c) to change the applicant needs to be filed, which is (1) a request, signed by a 1.33 (b) party, (2) a corrected ADS (37 CFR 1.76(c)) that identifies the "new" applicant in the applicant information, and is underlined since it is

new, and (3) a 3.73(c) statement showing chain of title to the new applicant. Along with the § 1.46(c) request we need a POA that gives power to the attorney who is signing the TD, along with another copy of the TD, or a TD that is signed by the applicant.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the claims at issue are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the reference application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions

of the AIA as explained in MPEP § 2159. See MPEP §§ 706.02(I)(1) - 706.02(I)(3) for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/forms/. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to <http://www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp>.

Claims 1, 2, 5, 7, and 11-18 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-21 of **US Patent No. 9,843,624** (624' Patent). The current application merely broadens the scope of the 624' Patent, as such the current Application is anticipated by the narrower claim scope of the 624' Patent.

Allowable Subject Matter

Claims 1, 2, 5, 7, and 11-18 are allowable over the prior art.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure (see PTO 892).

THIS ACTION IS MADE FINAL. 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 mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRENDAN HIGA whose telephone number is (571)272-5823. The examiner can normally be reached on Monday - Friday 8:30 AM - 5:00 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wing Chan can be reached on (571) 272-7493. 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.

/BRENDAN Y HIGA/
Primary Examiner, Art Unit 2441

<i>Notice of References Cited</i>	Application/Control No. 15/836,824		Applicant(s)/Patent Under Reexamination Taaghola et al.	
	Examiner BRENDAN HIGA		Art Unit 2441	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20190165997-A1	05-2019	SHAIKH; Nazneen	H04L41/0806	1/1
*	B	US-20160224460-A1	08-2016	BRYANT; Andy	G06F8/61	1/1
*	C	US-20150242237-A1	08-2015	Spivak; Vadim	G06F9/5055	718/1
*	D	US-20150160877-A1	06-2015	Larkin; Michael	G06F3/0689	711/114
*	E	US-20120096071-A1	04-2012	Murphey; C. Michael	G06F8/63	709/203
*	F	US-20120066665-A1	03-2012	Kunze; Tobias	G06F8/62	717/124
*	G	US-20110265077-A1	10-2011	COLLISON; Derek	G06F8/71	717/172
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC 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.

<i>Index of Claims</i> 	Application/Control No. 15/836,824	Applicant(s)/Patent Under Reexamination Taaghoh et al.
	Examiner BRENDAN HIGA	Art Unit 2441

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS									
☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47									
CLAIM		DATE							
Final	Original	06/16/2019	01/17/2020						
	1	✓	✓						
	2	✓	✓						
	3	✓	-						
	4	✓	-						
	5	✓	✓						
	6	✓	-						
	7	✓	✓						
	8	✓	-						
	9	✓	-						
	10	✓	-						
	11	✓	✓						
	12	✓	✓						
	13	✓	✓						
	14	✓	✓						
	15	✓	✓						
	16	✓	✓						
	17	✓	✓						
	18	✓	✓						

<i>Search Notes</i> 	Application/Control No. 15/836,824	Applicant(s)/Patent Under Reexamination Taaghol et al.
	Examiner BRENDAN HIGA	Art Unit 2441

CPC - Searched*		
Symbol	Date	Examiner
H04L 9/08-0819, 32-3212; 29/08135, 0845-08504; 41/08-082, 0866, 0876-0893; 45/563, 64; 67/10,1074-1087	01/17/2020	BH
G06F 8/60-61, 65, 70-71, 76; 9/44006, 45533-4856;	01/17/2020	BH

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
see EAST search history	01/17/2020	BH
google scholar search: "distributed software defined network" "distributed software defined networking"; Openflow OR SDN controller "application store" OR "app store";	01/17/2020	BH

/R.K./ Examiner, Art Unit 2441	
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<i>Search Notes</i> 	Application/Control No. 15/836,824	Applicant(s)/Patent Under Reexamination Taaghola et al.
	Examiner BRENDAN HIGA	Art Unit 2441

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
H04L	9/08-0819, 32-3212; 29/08135, 0845-08504; 41/08-082, 0866, 0876-0893; 45/563, 64; 67/10, 1074-1087	01/17/2020	BH
G06F	8/60-61, 65, 70-71, 76; 9/44006, 45533-4856;	01/17/2020	BH

/R.K./ Examiner, Art Unit 2441	
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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	42956	(VM cloud server) adj25 (application web\$1app app) same (open\$1flow software adj3 network SDN orchestrat\$3 controller)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 20:29
L2	8152	(portal web web\$1sit\$3 web\$1pag\$3 store merchant market\$1place) adj15 (application web\$1app app) same L1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 20:29
L3	330	(version\$3 updat\$3 recent\$3 up\$1grad\$3) adj15 (application web\$1app app) same L2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 20:29
L4	222	L3 and (@pd @ptad @prad @ad @rlad)<"20130613"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 20:29
L5	109053	(VM cloud server) adj25 (application web\$1app app) same (virtual\$5 hyper\$2visor open\$1flow \$3SDN software adj2 network\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 20:57
L6	36934	(portal web web\$1sit\$3 web\$1pag\$3 store merchant market\$1place) adj25 (application web\$1app app) adj10 (download\$3 installation install\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 20:57
L7	797	L5 same L6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 20:57
L8	171	L7 and L1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 20:57
L9	153	L8 NOT 4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 20:57
L10	4770934	(container tenant mult\$1tenant sandbox\$4 virtual adj2 machine)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2020/01/16 21:04

			IBM_TDB			
L11	8709	(VM cloud server) adj25 (application web\$1app app) same (open\$1flow \$3SDN software adj2 network\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16: 21:04
L14	67820	(VM cloud server) adj25 (application web\$1app app cloud\$1app) same 10	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16: 21:06
L15	7226	14 and (open\$1flow \$3SDN software adj2 defin\$3 adj2 network\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16: 21:06
L17	435	(portal web web\$1sit\$3 web\$1pag\$3 store merchant market\$1place) adj15 (application web\$1app app) same 14 and 11	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16: 21:07
L18	239	17 and (@pd @ptad @prad @ad @rlad)<"20130613"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16: 21:08
L20	25	(portal merchant market\$1place) adj15 (application web\$1app cloud\$1app app) same 14 and 11	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16: 21:10
L21	18	20 and (@pd @ptad @prad @ad @rlad)<"20130613"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16: 21:10
S2	3	((("Ramanna") near3 ("Vivek"))).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2020/01/16: 16:39
S3	1467	distribut\$3 adj2 (Software adj2 defin\$3 adj2 Network (SDN)) d\$1sdn	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16: 16:40
S4	109053	(VM cloud server) adj25 (application web\$1app app) same (virtual\$5 hyper\$2visor open\$1flow \$3SDN software adj2 network\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16: 16:59
S5	36934	(portal web web\$1sit\$3 web\$1pag\$3 store merchant market\$1place) adj25 (application web\$1app app) adj10 (download\$3 installation install\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16: 16:59
S6	7	S3 and S4 and S5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16: 17:00

S7	797	S4 same S5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 17:03
S8	576	S7 and (@pd @ptad @prad @ad @rlad)<"20130613"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 17:04
S9	21048	(version\$3 updat\$3 recent\$3 up\$1grad\$3) adj15 (application web\$1app app) adj25 (download\$3 installation install\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 17:25
S10	137975	(version\$3 updat\$3 recent\$3 up\$1grad\$3) adj15 (authenticat\$3 password authentic key check\$1sum authoriz\$6)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 17:26
S11	13	S8 and S9 and S10	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 17:26
S12	342	S4 same S9	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 17:28
S13	29	S7 and S12	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 17:28
S14	15	S13 and (@pd @ptad @prad @ad @rlad)<"20130613"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 17:28
S16	42956	(VM cloud server) adj25 (application web\$1app app) same (open\$1flow software adj3 newtork SDN orchestrat\$3 controller)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 17:34
S17	286	S5 same S16	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 17:34
S18	8152	(portal web web\$1sit\$3 web\$1pag\$3 store merchant market\$1place) adj15 (application web\$1app app) same S16	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 17:35
S19	171	S7 and S16	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 17:35

EAST Search History

S20	146	S19 and (@pd @ptad @prad @ad @rlad)<"20130613"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 17:36
S21	330	(version\$3 updat\$3 recent\$3 up\$1grad\$3) adj15 (application web\$1app app) same S18	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/16 17:36

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S23	5560	(VM cloud server) adj25 (application web\$1app app) same (virtual\$5 hyper\$2visor open\$1flow \$3SDN software adj2 network\$3).clm.	US-PGPUB; USPAT	OR	ON	2020/01/16 17:17
S24	2383	(portal web web\$1sit\$3 web\$1pag\$3 store merchant market\$1place) adj25 (application web\$1app app) adj10 (download\$3 installation install\$3).clm.	US-PGPUB; USPAT	OR	ON	2020/01/16 17:17
S25	80	S23 and S24	US-PGPUB; USPAT	OR	ON	2020/01/16 17:17
S26	70	S25 and (@pd @ptad @prad @ad @rlad) <"20130613"	US-PGPUB; USPAT	OR	ON	2020/01/16 17:17
S27	16953	(version\$3 updat\$3 recent\$3 up\$1grad\$3) adj15 (authenticat\$3 password authentic key check\$1sum authoriz\$6).clm.	US-PGPUB; USPAT	OR	ON	2020/01/16 17:27
S28	0	S26 and S27	US-PGPUB; USPAT	OR	ON	2020/01/16 17:27

1/16/2020 9:12:43 PM

C:\Users\bhiga\Documents\EAST\Workspaces\15836824_1.wsp

Application Number * 15/836,824 *	Application/Control No. 15/836,824	Applicant(s)/Patent under Reexamination Taaghol et al.	
	Examiner CHAN, WING F	Art Unit 2441	
Document Code - DISQ		Internal Document - DO NOT MAIL	

TERMINAL DISCLAIMER	☐ APPROVED	☒ DISAPPROVED
Date Filed: <u>25 October 2019</u>	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:
/CHARRISSA S BROWN/ Technology Center: PLRC Telephone: (571)272-1558 The terminal disclaimer identifies a party who is not the applicant (only for applications filed on or after September 16, 2012; See FP 14.26.10): For cases filed on/after 9/16/12, 37 CFR 1.321 specifies that only the applicant can disclaim, and the terminal disclaimer must specify the extent of the applicant's ownership. Below is what needs to be done to correct the defects: A request under 37 CFR 1.46(c) to change the applicant needs to be filed, which is (1) a request, signed by a 1.33 (b) party, (2) a corrected ADS (37 CFR 1.76(c)) that identifies the "new" applicant in the applicant information, and is underlined since it is new, and (3) a 3.73(c) statement showing chain of title to the new applicant. Along with the § 1.46(c) request we need a POA that gives power to the attorney who is signing the TD, along with another copy of the TD, or a TD that is signed by the applicant.

TERMINAL DISCLAIMER TO OBTAIN A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT	Docket Number (Optional) TAAG001CONT1
In re Application of: Taaghol Application No.: 15/836,824 Filed: 12/9/2017 For: DISTRIBUTED SOFTWARE DEFINED NETWORKING The applicant, <u>Pouya Taaghol</u>, owner of <u>100</u> percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of prior patent No. <u>9843624</u> as the term of said prior patent is presently shortened by any terminal disclaimer. The applicant hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns. In making the above disclaimer, the applicant does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior patent is presently shortened by any terminal disclaimer," in the event that said prior patent later: - expires for failure to pay a maintenance fee; - is held unenforceable; - is found invalid by a court of competent jurisdiction; - is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321; - has all claims canceled by a reexamination certificate; - is reissued; or - is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer. Check either box 1 or 2 below, if appropriate. 1. ☐ The undersigned is the applicant. If the applicant is an assignee, the undersigned is authorized to act on behalf of the assignee. I hereby acknowledge that any willful false statements made are punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both. 2. ☒ The undersigned is an attorney or agent of record. Reg. No. <u>40,394</u> <u>/Christopher J. Horgan/</u> Signature <u>October 16, 2019</u> Date <u>Christopher J. Horgan</u> Typed or printed name <u>Attorney for Applicant</u> Title <u>408-687-8306</u> Telephone Number ☒ Terminal disclaimer fee under 37 CFR 1.20(d) included. 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.	

This collection of information is required by 37 CFR 1.321. 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: 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:		15836824		
Filing Date:		09-Dec-2017		
Title of Invention:		DISTRIBUTED SOFTWARE DEFINED NETWORKING		
First Named Inventor/Applicant Name:		Pouya Taaghoul		
Filer:		Christopher James Horgan		
Attorney Docket Number:		TAAG001CONT1		
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
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:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension - 1 month with \$0 paid	2251	1	100	100
Miscellaneous:				
STATUTORY OR TERMINAL DISCLAIMER	2814	1	160	160
Total in USD (\$)				260

Electronic Acknowledgement Receipt	
EFS ID:	37568833
Application Number:	15836824
International Application Number:	
Confirmation Number:	9801
Title of Invention:	DISTRIBUTED SOFTWARE DEFINED NETWORKING
First Named Inventor/Applicant Name:	Pouya Taaghol
Customer Number:	112449
Filer:	Christopher James Horgan
Filer Authorized By:	
Attorney Docket Number:	TAAG001CONT1
Receipt Date:	25-OCT-2019
Filing Date:	09-DEC-2017
Time Stamp:	17:18:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$260
RAM confirmation Number	E201900H24521608
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After Non-Final Reject	TAAG001CONT1_RESPONSE_.pdf	104191	no	14
			c5c33448506c4c6eae5fb2234920b95f21dd34b2		
Warnings:					
Information:					
2	Terminal Disclaimer Filed	TAAG001CONT1_TD.pdf	142282	no	1
			c127d5666d7d6622e46e98a5520e391faa1a487d		
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	32741	no	2
			01abc58debbf39b4960c76bde8fe9b74e2d0033b		
Warnings:					
Information:					
Total Files Size (in bytes):			279214		
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. <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. <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. <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.					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Taaghol

Examiner: Krishnan, Rajeshwari

Serial No.: 15/836,824

Art Unit: 2441 Filed:

12/09/2017

Attorney Docket No.: TAAG001CONT1

For: DISTRIBUTED SOFTWARE DEFINED NETWORKING

Mail Stop Amendment Commissioner for Patents PO Box 1450

Alexandria, VA 22313-1450

Dear Sir:

AMENDMENT

Applicants offer the following election in response to the Office Action (hereinafter "Office Action") mailed on June 25, 2019.

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

Amendments to the Claims begin on page 5 of this paper.

Remarks/Arguments begin on page 11 of this paper.

In the specification:

Please make the following correction In paragraph [0025] in the Table.

[0025] ...

fxManager	FleXible Manager that ~~manager~~ <u>manages</u> the fxOS lifecycle (provisioning, usage, de-provisioning)
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Please replace paragraph [0068] with the following amended paragraph.

[0068] The flexible Software Development Kit (fxSDK) may include a development environment and other tools to facilitate development, testing, debugging and verifications of applications for dSDN environments. The fxSDK is unique in several aspects exemplified as follows. First, since the dSDN applications may have a device component (fxDevice 302) and cloud component (fxCloud 304), the fxSDK allows the developer to develop the components together to simplify the development and testing. Second, the dRMS offers various system level APIs with remote accessibility. In other words, the APIs in the fxDevice 302 could be accessed via the applications in the fxCloud (fxCloudApps) and vice versa. The fxSDK simplifies the usage of system created APIs and application created APIs. Third, it is essential for the dSDN to ensure quality and security of applications in the network. The fxSDK may be accompanied with an extensive Risk Analysis Utility (RAU) which verifies all the APIs that are being used by the application and based on its potential danger to the network, it would show the risk analysis and may make specific suggestions to reduce the risk. Once completed, the risk analysis result is included in the dAP for posting to the fxStore and consumed by the fxManager user (the admin). Fourth, the fxSDK would also ensure that the applications do not exceed their planned memory and resource usage. Fifth, the Integrated Development Environment (IDE) may provide

various tools to actively demonstrate errors, defined APIs, security dangers, and excessive resource usage. Sixth, the IDE could also provide a flexible Simulator (fxSimulator) for the developer test the application in a network setup in presence of other network elements.

Please replace paragraph [0084] with the following amended paragraph.

[0084] The Virtual Fabric (fxVF) provides an abstraction layer for ~~application~~ applications to communicate with each other whether they are in the fxDevice or fxCloud. Various frameworks and services may use the fxVF service. Figure 15 illustrates fxVF 1502a, 1503a, 1504a in the fxDevices 1502 and 1503 and fxCloud 1504. The fxVF 1502a, 1503a, 1504a may use Extensible Messaging and Presence Protocol (XMPP) for this messaging as the default protocol. It is important that the developers may use their own communication protocols between the fxDeviceApps 1502b, 1503b and the associated fxCloudApp 1504b. fxVF 1502a, 1503a, 1504a provide a secure routing mechanism.

Please replace paragraph [0088] with the following amended paragraph.

[0088] An app (fxDeviceApp or fxCloudApp) could expose APIs to be used by the other apps. The inter-app communication is enabled by the fxVF where the policy and security provisions are enforced. The APIs exposed may be RESTful (representational state transfer) and could travel across physical network elements. Since the fxManager defines fxVF policies, the administrator could ultimately specify which APIs between which apps could communicate with each other. Figure 16 demonstrates the logical interfaces between the platform resources and applications. As shown in Figure 16, the distributed Resources Service (dRS) 1602, 1603 comprises software agents residing in the fxDevice 1604 and the fxCloud 1606. These dRS agents manage the access to the platform ~~resolutions~~ resources (including potential configuration conflict resolution) as well as facilitating inter-app APIs. The dRS 1602, 1603 allows or disallows access to platform resource or inter-app communication according to the policies defined by the network administrator using the fxManager. In summary, the dRS 1602, 1603 provides services to application developers for:

Exposing APIs to other applications;
Configuring and managing platform
resource;
Policy enforcement and authorization of applications access to platform
resource and other app's APIs; and
Policy conflict resolution.

Please replace paragraph [0096] with the following amended paragraph.

[0096] It is important for the target network element to verify the authenticity and integrity of loaded software prior to install. The uniquely defined security keys of the application developers sign the applications. The following rules may be followed to ensure software security verification:

Only the verified OS/Firmware software can install on verified hardware;

Only the verified OS/Firmware software can run on verified hardware (continuous verification of essential parts of the software);

Only the verified fxDeviceApp software can install on verified hardware;

Only the verified fxDeviceApp software can run on verified hardware (continuous verification of essential parts of the software).

In the Claims:

1. (Currently Amended) A system for processing data packets in a network, the system comprising:

a programmable network device hosting a plurality of first network applications;

a programmable cloud device hosting a plurality of second network applications[;],
wherein at least one of the plurality of first network applications in the programmable network device and at least one of the plurality of second network applications in the programmable cloud device are in secure communication with each other through a virtual fabric to form a distributed application;

wherein the programmable network device and programmable cloud device are each powered by a sandboxing operating system which facilitates deployment of the plurality of first and second network applications and ~~facilitates upgrades of the first and second network applications with substantially no interruption to operation of the programmable network device and programmable cloud device;~~

an application management portal coupled to the programmable network device and programmable cloud device and capable of managing upgrades of the first and second network applications with substantially no interruption to operation of the programmable network device and programmable cloud device;

wherein the ~~programmable network device~~ application management portal verifies authenticity of the upgrades to the plurality of first network applications and the ~~programmable cloud device~~ verifies authenticity of the upgrades to the plurality of second network applications and wherein the verification is based on unique security keys associated with each of the plurality of first and second network applications;

an application repository coupled to the application management portal and capable of storing distributed applications ~~which have been tested~~ for installation in the programmable network device and programmable cloud

device; and

~~an application management portal coupled to the programmable network device, programmable cloud device and the application repository,~~ wherein the application management portal further manages usage of the distributed applications on the programmable network device and programmable cloud device.

2. (Previously Presented) The system of claim 1, wherein each of the programmable network device and programmable cloud device include an access network interface unit to send and receive communications and a processor with a memory associated with the network interface unit.

3. (Canceled)

4. (Canceled)

5. (Previously Presented) The system of claim 1, wherein the programmable network device is a Long Term Evolution (LTE) evolved NodeB (eNB) and the programmable cloud device hosts LTE core network functions in separate virtual machines, the network functions consisting of: Mobility Management Entity (MME), Serving Gateway (S-GW), and Packet Gateway (P-GW).

6. (Canceled)

7. (Previously Presented) The system of claim 1, further comprising:
a second programmable network device which includes the at least one of the plurality of first network applications which is in the first programmable network device.

8. (Canceled)

9. (Canceled)

10. (Canceled)

11. (Currently Amended) The system of claim 1, wherein the programmable network device and programmable cloud device further comprise:

a distributed content service wherein ~~contents~~ content generated by the at least one of the plurality of first network applications may be shared through the virtual fabric with the at least one of a plurality of second network applications.

12. (Currently Amended) The system of claim 1, wherein the programmable network device and programmable cloud device further comprise:

a distributed notification service wherein notice of a particular event is sent through the virtual fabric from at least one of the plurality of first network applications to at least one of the plurality of second network applications.

13. (Currently Amended) The system of claim [10] ~~1, wherein the DRS further includes a load controller; and wherein the~~ further comprising a load controller [is] adapted to monitor loads on the programmable network device and the programmable cloud device at least one of the plurality of first network applications and at least one of the plurality of second network applications and effect affect change in accordance with thresholds received from the application management portal.

14. (Previously Presented) The system of claim 1, wherein the programmable network device, at least one of the plurality of first network applications, the programmable cloud device, and at least one of the plurality of second network applications each have unique identities.

15. (Currently Amended) A system for processing data packets, the system comprising:

a programmable network device processing data flows hosting at least one of a plurality of first network applications;

a programmable cloud device having a plurality of virtual machines wherein at least one of the virtual machines hosts at least one of a plurality of second network applications[;] wherein the at least one of the plurality of first and the at least one of the plurality of second network applications are in secure communication through a virtual fabric to form a distributed application;

wherein the programmable network device and programmable cloud device are each powered by a sandboxing operation system which facilitates deployment of the plurality of first and second network applications and ~~facilitates upgrade of the plurality of first and second network applications with substantially no interruption to operation of the programmable network device and programmable cloud device;~~

an application management portal coupled to the programmable network device and programmable cloud device and capable of managing upgrades of the first and second network applications with substantially no interruption to operation of the programmable network device and programmable cloud device;

wherein the ~~programmable network device~~ application management portal verifies authenticity of the upgrades to the plurality of first network applications and the ~~programmable cloud device~~ verifies the authenticity of the upgrades to the plurality of second network applications and wherein the verification is based on unique security keys associated with each of the plurality of first and second network applications;

an application repository storing distributed applications ~~which have been tested~~ for installation in the programmable network device and programmable cloud device; and

~~an application management portal coupled to the programmable~~

~~network device, programmable cloud device and the application repository,~~
wherein the application management portal further manages provisioning,
usage and de-provisioning of the distributed applications on the
programmable network device and programmable cloud device.

16. (Previously Presented) The system of claim 15, wherein the
programmable network device is a Long Term Evolution (LTE) evolved NodeB
(eNB) and the programmable cloud device hosts LTE core network
functions in separate virtual machines, the network functions consisting of:
Mobility Management Entity (MME), Serving Gateway (S-GW), and Packet
Gateway (P-GW).

17. (Currently Amended) A system for processing data packets in a network, -
the system comprising:

a programmable network device processing data flows, hosting at least
one of a plurality of first network applications;

a programmable cloud device partitioned into a plurality of zones,
wherein at least one of the plurality of zones hosts at least one of a plurality of
second network applications; ~~]~~ wherein the at least one of the plurality of first
network applications and at least one of the plurality of second network
applications are in secure communication through a virtual fabric to form a
distributed application;

wherein the programmable network device and programmable cloud
device are each powered by a sandboxing operation system which facilitates
deployment of the plurality of first and second network applications and
~~facilitates upgrade of the plurality of first and second network applications with~~
~~substantially no interruption to operation of the programmable network device~~
~~and programmable cloud device;~~

an application management portal coupled to the programmable
network device and programmable cloud device and capable of managing
upgrades of the first and second network applications with substantially no
interruption to operation of the programmable network device and

programmable cloud device

wherein the ~~programmable network device~~ application management portal verifies authenticity and integrity of upgrades to the plurality of first network applications and the ~~programmable cloud device verifies the authenticity of the upgrades to the plurality of second network applications~~ and wherein the verification is based on unique security keys associated with each of the plurality of first and second network applications;

an application repository storing distributed applications which have been tested for installation in the programmable network device and programmable cloud device; and

~~an application management portal coupled to the programmable network device, programmable cloud device and the application repository,~~ wherein the application management portal further manages usage of the distributed applications on the programmable network device and programmable cloud device.

18. (Previously Presented) The system of claim 17, wherein the programmable network device is a Long Term Evolution (LTE) evolved NodeB (eNB) and the programmable cloud device hosts LTE core network functions in separate virtual machines, the network functions consisting of: Mobility Management Entity (MME), Serving Gateway (S-GW), and Packet Gateway (P-GW).

REMARKS

Claims 1-2, 5, 7 and 11-18 are currently pending. By this Amendment, Applicant has canceled claim 3, 4, 6 and 8-10 and amended claims 1, 11, 12, 13, 15 and 17.

OBJECTIONS TO THE SPECIFICATION

The specification was objected to for several spelling errors. Applicant has made the appropriate corrections.

CLAIM OBJECTIONS

The Examiner has objected to claims 1, 13, 15 and 17. Applicant has made the appropriate corrections.

CLAIM INTERPRETATION – CONTINGENT CLAUSES NOT EVALUATED

The Examiner has indicated that limitations in several of the claims will be given no patentable weight. The Applicant has addressed these issues in the following ways. Firstly, the Applicant has added the “virtual fabric limitation to claims 1, 15 and 17. Secondly, the Applicant has clarified in the claims that the application management portal manages the upgrades. Third, Applicant has deleted the limitation regarding the testing of the distributed applications. Fourthly, claims 3 and 4 have been canceled. Fifthly, Applicant has added in claim 11 that the distributed content service shares the content through the virtual fabric. Sixthly, Applicant has added in claim 12 that the notice is sent through the virtual fabric.

CLAIM INTERPRETATION – 35 USC 112(f)

The Examiner has indicated that limitations in several of the claims will be interpreted as means plus function claims. The Applicant has addressed these issues in the following ways. Firstly, Applicant has canceled claims 6, 8 and 10. Secondly, Applicant acknowledges that claim 13 may be treated as a means plus function claim.

CLAIM REJECTIONS – 35 USC 112(a), 112(f)

Claims 6, 8 and 10 are rejected under 35 USC 112(a) for failing to comply

with the written description requirement. Accordingly, claims 6, 8 and 10 have been deleted.

CLAIM REJECTIONS – 35 USC 112(b), 112(f)

Claims 6, 8 and 10 are rejected under 35 USC 112. Accordingly, claims 6, 8 and 10 have been deleted.

CLAIM REJECTIONS – 35 USC 112(a)

With regard to independent claims 1, 15 and 17, on page 17 of the Office Action the Examiner states that “the disclosure fails to sufficiently identify how the fxOS performs the function of the hot upgrade with substantially no interruption”. The Examiner’s attention is called to paragraphs [0060] and [0077] to [0083] of the specification for a discussion of implementation of the hot upgrading.

Also, with regard to claims 1, 15 and 17 on page 17 of the Office Action, the Examiner asserts that the application management portal verifies the application. Applicant has amended claims 1, 15 and 17 accordingly.

Further, with regard to claims 1, 15 and 17 on page 18 of the Office Action, the Examiner objects to the use of the testing language in the claims. Accordingly, this language has been deleted.

With regard to claim 11, on page 18 of the Office Action, the Examiner objects to the language of the claim. Applicant has added language to the claims to make it clear that the information is shared through the virtual fabric.

With regard to claim 12, on page 19 of the Office Action, the Examiner objects to the language of the claim. Applicant has language to the claims to make it clear that the notice is sent through the virtual fabric.

CLAIM REJECTIONS – 35 USC 112(b)

On page 19 of the Office Action, the Examiner to the antecedent basis in claim 9. Applicant has canceled claim 9 by this amendment.

DOUBLE PATENTING REJECTION

Claims 1-18 are rejected on the ground of nonstatutory double patenting as being unpatentable over Claims 1-14, 18 and 19 of U.S. Patent No. 9,843,624. Accordingly, Applicant has filed a Terminal Disclaimer with this response.

REJECTIONS UNDER 35 USC 103

Claims 1, 2, and 5-18 are rejection under 35 USC 103 as being unpatentable over Pentikousis, "MobileFlow: Toward Software-Defined Mobile Networks", IEEE Communications Magazine, July 2013 (hereinafter, "Pentikousis") in view of U.S. Patent Application Serial No. 20130223442 to Narayanan (hereinafter, "Narayanan") and U.S. Patent Application Serial No. 20140317293 to Shatzkamer (hereinafter, "Shatzkamer"). Claim 4 is rejected under Pentikousis in view of Narayana and Shatzkamer and further in view of U.S. Patent Application No. 20140052976 to Marino (hereinafter "Marino"). Claim 5 is rejected under Pentikousis in view of Narayana and Shatzkamer and further in view of U.S. Patent Application No. 20130263104 to Baset (hereinafter "Baset").

Applicant notes that all of the rejections use the Pentikousis reference as the base reference. Applicant filed U.S. Patent Provisional Application No. 61/834,807 on June 13, 2013 upon which this application ultimately depends and which predates the Pentikousis reference published in July 2013. Therefore Applicant submits that the outstanding 35 USC 103 rejections are overcome by this fact.

CONCLUSION

Therefore it is respectfully submitted that claims 1-2, 5, 7 and 11-18 are allowable over the prior art. No new matter has been added in the new claims and/or limitations presented in this Amendment.

Respectfully submitted,

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/836,824	12/09/2017	Pouya Taaghoh	TAAG001CONT1	9801
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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.

Office Action Summary	Application No. 15/836,824	Applicant(s) Taaghol et al.	
	Examiner RAJESHWARI KRISHNAN	Art Unit 2441	AIA (FITF) Status Yes

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on 12/09/2017.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.

3) ☐ 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.

4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☒ Claim(s) 1-18 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☒ Claim(s) 1-18 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, 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.

Application Papers

10) ☒ The specification is objected to by the Examiner.

11) ☒ The drawing(s) filed on 12/09/2017 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12) ☐ 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)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date 12/09/2017

3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____

4) ☐ Other: _____

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.
2. This Office action is in response to US Patent Application 15/836824 filed 12/09/2017.

Priority

3. The Examiner acknowledges Applicant's claim to priority from US Patent Application 14/295331 filed 6/4/2014 and Issued as US Patent US 9843624 on 12/12/2017, which in turn claims priority from US provisional patent application 61/834807 filed on June 13, 2013.

Information Disclosure Statement

4. The information disclosure statement (IDS) submitted on 12/9/2017 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Reference US 2014/0062976 cited on page 2 of this IDS indicates "Name of the Applicant of Cited Document" to be "Marino, Joseph". But, US 2014/0062976 is by Park et al. This document by Park et al has been considered by the examiner

Specification

5. **The disclosure is objected** to because of the following informalities. Appropriate correction is required.

Table on page 5: “Flexible Manager that manager the ...” should be replaced with
Flexible Manager that ~~manager~~ manages the ...

Paragraph [0068] on page 28: “fxSDK simplifies the usage system created APIs” should
be replaced with *fxSDK simplifies the usage of system created APIs*

Paragraph [0084] on page 34: “Virtual Fabric (fxVF) provides an abstraction layer for
application to communicate with each other” should be replaced with *Virtual Fabric
(fxVF) provides an abstraction layer for ~~application~~ applications to communicate with
each other*

Paragraph [0088] on page 36: “dRS agents manage the access to the platform
resolutions” should be replaced with *dRS agents manage the access to the platform
~~resolutions~~ resources*

Paragraph [0096] on page 39: “verify the authenticity and integrity loaded software”
should be replaced with *verify the authenticity and integrity of loaded software*

Claim Objections

6. **Claims 1, 15, 13, 17 objected** to because of the following informalities.

Appropriate correction is required.

Regarding claims 1, 15, 17,

The semicolon (“;”) at the end of the limitation “a programmable cloud device hosting ...” should be replaced with a comma (“,”), because the limitation is followed by a “wherein” clause

the clause “the programmable network device and the programmable cloud device are each powered by” should begin with a “wherein” because this clause recites a further feature of the previously recited *programmable network device* and *programmable cloud device*.

And the same clause “the programmable network device and the programmable cloud device are each powered by” should end with “; and” because it is the penultimate *wherein* clause of the three wherein clauses.

Regarding claim 13, in light of Specification paragraphs [0090-0091], it appears that “load controller is adapted to monitor loads on at least one of the plurality of first network applications and at least one of the plurality of second network applications” should be replaced with *load controller is adapted to monitor loads on the programmable network device and the programmable cloud device ~~at least one of the plurality of first network applications and at least one of the plurality of second network applications~~*.

Regarding claim 13, it appears that “effect change in accordance with thresholds” should be replaced with *~~effect~~ affect change in accordance with thresholds*, because effect is a noun, whereas the verb “affect” would be more appropriate in this limitation.

Claim Interpretation – Contingent clauses not evaluated

7. **In claims 1, 15, 17**, regarding the limitation “wherein at least one of the plurality of first network applications in the programmable network device and at least one of the plurality of second network applications in the programmable cloud device are in secure communication with each other to form a distributed application”

This limitation has not been given patentable weight, and will be ignored while evaluating the claim, because the *devices that host applications* define the scope of the claimed system, but the features of the hosted applications as recited in the *wherein* clause are outside the scope of the system. See MPEP 2111.04.

Note that in order to be given patentable weight, this clause may be amended to recite “how” the devices are configured to enable the applications to have secure communication and to form a distributed application. For instance, “... device further comprise a virtual fabric which provides a secure communication layer” in claim 6 further defines the scope of the claim.

8. **In claims 1, 15, 17**, regarding the limitation, “a sandboxing operating system which facilitates deployment of the plurality of first and second network applications and facilitates upgrades of the first and second network applications with substantially no interruption to operation of the programmable network device and programmable cloud device”

This limitation has not been given patentable weight, and will be ignored while evaluating the claim. While *devices powered by a sandboxing OS* further defines the

scope of the claimed system, the features of the OS with respect to the deployment/upgrade of applications are outside the scope of the claim. Further, “upgrading applications with substantially no interruption to operation of the devices” is an intended result clause that has no patentable weight in claim interpretation. See MPEP 2111.04.

Note that the limitation may be amended to recite “how” the OS is employed by the devices in the system to upgrade applications, thus making it an active limitation for claim evaluation.

9. **In claims 1, 15, 17**, regarding the limitation, “an application repository storing distributed applications which have been tested for installation in the programmable network device and programmable cloud device”

This limitation has not been given patentable weight, and will be ignored while evaluating the claim. While *application repository storing distributed applications* further defines the scope of the claimed system, the property of the applications such as *being tested for installation in the programmable network device and programmable cloud device* as recited, is outside the scope of the repository and the claim. See MPEP 2111.04. Perhaps, the system includes another component that is configured to provide tested applications for storage in the repository.

10. **In claims 3 and 4**, the limitation, “wherein the at least one of the first/second network applications is responsible for a plurality of functional capabilities of the programmable network/cloud device and is capable of at least one of the group

consisting of ..." cannot be given patentable weight because it recites the properties of the applications, which are outside the scope of the claimed *devices which host the applications*, and therefore outside the scope of the claimed system comprising the devices.

11. **In claim 11**, regarding "...device further comprise a distributed content service wherein contents generated by the at least one of the plurality of first network applications may be shared with the at least one of a plurality of second network applications – while "distributed content service" further defines the claimed system, the wherein clause cannot be given patentable weight because it defines features of *contents generated by ... applications* which are not relevant to the scope of the claimed system. Perhaps the limitation can be amended to recite "how" the *distributed content service* is configured to provide this capability.

12. **In claim 12**, regarding "... device further comprise a distributed notification service wherein notice of a particular event is sent from at least one of the plurality of first network applications to at least one of the plurality of second network applications – while "distributed notification service" further defines the claimed system, the wherein clause cannot be given patentable weight because it defines features of *notice of events sent from/to applications* which are not relevant to the scope of the claimed system. Perhaps the limitation can be amended to recite "how" the *distributed notification service* is configured to provide this capability.

Claim Interpretation -112(f)

13. The following is a quotation of 35 U.S.C. 112(f):

(f) Element in Claim for a Combination. – An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

The following is a quotation of pre-AIA 35 U.S.C. 112, sixth paragraph:

An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

14. The claims in this application are given their broadest reasonable interpretation using the plain meaning of the claim language in light of the specification as it would be understood by one of ordinary skill in the art. The broadest reasonable interpretation of a claim element (also commonly referred to as a claim limitation) is limited by the description in the specification when 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is invoked.

As explained in MPEP § 2181, subsection I, claim limitations that meet the following three-prong test will be interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph:

- (A) the claim limitation uses the term “means” or “step” or a term used as a substitute for “means” that is a generic placeholder (also called a nonce term or a non-structural term having no specific structural meaning) for performing the claimed function;
- (B) the term “means” or “step” or the generic placeholder is modified by functional language, typically, but not always linked by the transition word “for” (e.g., “means for”) or another linking word or phrase, such as “configured to” or “so that”; and
- (C) the term “means” or “step” or the generic placeholder is not modified by sufficient structure, material, or acts for performing the claimed function.

Use of the word “means” (or “step”) in a claim with functional language creates a rebuttable presumption that the claim limitation is to be treated in accordance with 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph. The presumption that the claim limitation is interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is rebutted when

the claim limitation recites sufficient structure, material, or acts to entirely perform the recited function.

Absence of the word “means” (or “step”) in a claim creates a rebuttable presumption that the claim limitation is not to be treated in accordance with 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph. The presumption that the claim limitation is not interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is rebutted when the claim limitation recites function without reciting sufficient structure, material or acts to entirely perform the recited function.

Claim limitations in this application that use the word “means” (or “step”) are being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, except as otherwise indicated in an Office action. Conversely, claim limitations in this application that do not use the word “means” (or “step”) are not being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, except as otherwise indicated in an Office action.

15. This application includes one or more claim limitations that do not use the word “means,” but are nonetheless being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, because the claim limitation(s) uses a generic placeholder that is coupled with functional language without reciting sufficient structure to perform the recited function and the generic placeholder is not preceded by a structural modifier. Such claim limitation(s) is/are:

Claim 6: a virtual fabric which *provides a secure communication layer* for at the least one of the plurality of first network applications and the at least one of the plurality of second network applications.

Claim 8: a distributed resource service (DRS) which *controls access to a plurality of resources* by the plurality of first network applications and the plurality of the second network applications upon receiving instructions from the application management portal.

Claim 10: a distributed resource service (DRS) which is *capable of providing at least one service* from a group consisting of: exposing application programming interfaces (APIs) to other applications; configuring and managing platform resources; policy enforcement and authorization of applications access to platform resource and other application's APIs; and policy conflict resolution.

Claim 13: load controller is *adapted to monitor loads* on at least one of the plurality of applications and *effect change in accordance with thresholds* received from the application management portal.

If applicant does not intend to have this/these limitation(s) interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, applicant may: (1) amend the claim limitation(s) to avoid it/them being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph (e.g., by reciting sufficient structure to perform the claimed function); or (2) present a sufficient showing that the claim limitation(s) recite(s) sufficient structure to perform the claimed function so as to avoid it/them being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph.

16. Because this/these claim limitation(s) is/are being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, they are being interpreted to cover the corresponding structure described in the specification as performing the claimed function, and equivalents thereof.

The Specification discloses that various processes of the dSDN may be implemented by appropriately programmed general purpose or special purpose computing devices, wherein processors execute instructions stored on memory devices, to perform the processes [0031]. Therefore, the specification will be evaluated for disclosure of algorithms/processes/steps that perform the claimed functions.

Regarding claim 13, the specification states that the Load Controller in the dRS could be used to monitor the load on the existing VMs [0091]; a load monitoring application could be notified when the CPU load on a particular fxDevice exceeds a certain threshold the load monitoring application could make smart decisions on reducing the load on the CPU of a fxDevice by forcing handoffs of users to neighboring cells fxDevices [0090].

Therefore, Specification discloses “how” the claimed load controller of claim 13 performs the *monitor loads* and *effect change in accordance with thresholds* functions.

Regarding claims 6, 8, 10, the Specification fails to disclose corresponding algorithms or steps to perform the claimed functions of the virtual fabric and distributed resource service, resulting in rejection under 112(a) and 112(b) as set forth below.

Claim Rejections - 35 USC § 112(a), 112(f)

17. The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

(a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

18. **Claims 6, 8, 10 rejected** under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for pre-AIA the inventor(s), at the time the application was filed, had possession of the claimed invention.

As discussed above, in the “Claim Interpretation -112(f)” section, **“virtual fabric” in claim 6, “distributed resource service (dRS) in claims 8 and 10**, invoke 112(f) interpretation.

The Specification discloses that various processes of the dSDN may be implemented by appropriately programmed general purpose or special purpose computing devices, with processors executing instructions stored on memory devices, thereby performing the processes [0031].

However, the Specification fails to disclose an algorithm to perform each of the claimed specific functions in claims 6, 8, 10. Therefore, these claims lack written description because claims define the invention in functional language, but the

specification does not sufficiently describe how the function is performed or the result is achieved. See MPEP 2161.01(I)

When examining computer-implemented functional claims, examiners should determine whether the specification discloses the computer and the algorithm (e.g., the necessary steps and/or flowcharts) that perform the claimed function in sufficient detail such that one of ordinary skill in the art can reasonably conclude that the inventor possessed the claimed subject matter at the time of filing. It is not enough that one skilled in the art could write a program to achieve the claimed function because the specification must explain “how” the inventor intends to achieve the claimed function to satisfy the written description requirement. See MPEP 2163(II)(A).

Regarding claim 6, the specification states that “Virtual Fabric (fxVF) provides an abstraction layer that enables transparent switching of application and system messages of a dApp between the fxCloud and the fxDevice and between different dApps, by using policies and firewall to enforce security and policies” [0060, 0084], but provides no details about *how* the virtual fabric enforces the policies to provide a secure communication layer or how it enables transparent switching of messages.

Regarding claims 8 and 10, the specification states that the distributed Resources Service (dRS) comprises software agents residing in the fxDevice and the fxCloud devices, which manage access to platform resources and inter-app APIs according to policies [0088], but provides no details about *how* the dRS enforces the policies or what steps the dRS uses to manage access to resources.

Claim Rejections - 35 USC § 112(b), 112(f)

The following is a quotation of 35 U.S.C. 112(b):

(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

19. **Limitations in claims 6, 8, 10 as listed above invoke 35 U.S.C. 112(f)** or pre-AIA 35 U.S.C. 112, sixth paragraph. However, the written description fails to disclose the corresponding structure, material, or acts for performing the entire claimed function and to clearly link the structure, material, or acts to the function. Therefore, the claims are indefinite and rejected under 35 U.S.C. 112(b) or pre-AIA 35 U.S.C. 112, second paragraph.

As discussed above, in the “Claim Interpretation -112(f)” section, **“virtual fabric” in claim 6, “distributed resource service (dRS) in claims 8 and 10**, invoke 112(f) interpretation.

The Specification discloses that various processes of the dSDN may be implemented by appropriately programmed general purpose or special purpose computing devices, with processors executing instructions stored on memory devices, thereby performing the processes [0031].

However, the Specification fails to disclose corresponding algorithms to perform each of the claimed specific functions in claims 6, 8, 10. Therefore, the claims are indefinite.

Regarding claim 6, the specification states that “Virtual Fabric (fxVF) provides an abstraction layer that enables transparent switching of application and system messages of a dApp between the fxCloud and the fxDevice and between different dApps, by using policies and firewall to enforce security and policies” [0060, 0084], but provides no details about “how” the virtual fabric enforces the policies or how it enables transparent switching of messages.

Regarding claims 8 and 10, the specification states that the distributed Resources Service (dRS) comprises software agents residing in the fxDevice and the fxCloud devices, which manage access to platform resources and inter-app APIs according to policies [0088], but provides no details about how the dRS enforces the policies or what algorithm the dRS uses to manage access.

Applicant may:

- (a) Amend the claim so that the claim limitation will no longer be interpreted as a limitation under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph;
- (b) Amend the written description of the specification such that it expressly recites what structure, material, or acts perform the entire claimed function, without introducing any new matter (35 U.S.C. 132(a)); or
- (c) Amend the written description of the specification such that it clearly links the structure, material, or acts disclosed therein to the function recited in the claim, without introducing any new matter (35 U.S.C. 132(a)).

If applicant is of the opinion that the written description of the specification already implicitly or inherently discloses the corresponding structure, material, or acts and clearly links them to the function so that one of ordinary skill in the art would recognize what structure, material, or acts perform the claimed function, applicant should clarify the record by either:

- (a) Amending the written description of the specification such that it expressly recites the corresponding structure, material, or acts for performing the claimed function and clearly links or associates the structure, material, or acts to the claimed function, without introducing any new matter (35 U.S.C. 132(a)); or
- (b) Stating on the record what the corresponding structure, material, or acts, which are implicitly or inherently set forth in the written description of the specification, perform the claimed function. For more information, see 37 CFR 1.75(d) and MPEP §§ 608.01(o) and 2181.

Claim Rejections - 35 USC § 112(a)

20. **Claims 1-17 rejected** under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for pre-AIA the inventor(s), at the time the application was filed, had possession of the claimed invention.

According to the MPEP, original claims may lack written description when the claims define the invention in functional language specifying a desired result but the specification does not sufficiently describe how the function is performed or the result is achieved. See MPEP 2161.01(I). Disclosure of a function or result alone is little more than a wish for possession, it does not satisfy the written description requirement. See MPEP 2163(II)(A)(3)(a).

In independent claims 1, 15, 17, regarding the limitation “sandboxing operating system *which facilitates deployment* of the plurality of first and second network applications *and facilitates upgrades of the first and second network applications with substantially no*

interruption to operation of the programmable network device and programmable cloud device”

The limitation recites desired functions of a sandboxed operating system (fxOS). The Specification merely repeats the desired functions in [0054], “the fxOS is configured to the following ... Ninth, it allows hot upgrade of the software and applications on the platform with little to no interruption to the operational aspect of the platform and its applications”. But the disclosure fails to sufficiently identify how the fxOS performs the function of hot upgrade with substantially no interruption.

In independent claims 1, 15, 17, regarding the limitation “the programmable network device *verifies authenticity of the upgrades* to the plurality of first network applications and the programmable cloud device *verifies authenticity* of the upgrades to the plurality of second network applications and wherein the verification is based on unique security keys associated with each of the plurality of first and second network applications”

It recites a desired function of verifying authenticity of applications by the claimed devices, but the disclosure fails to sufficiently identify how the function is performed by the devices.

Instead, Specification in [0098] discloses that fxManager (aka, application management portal) uses a hashing algorithm to calculate signature of an application, and verifies authenticity of the application. The specification does not disclose that the *verify authenticity* function is performed by the claimed devices. That is, the specification does not satisfy the written description requirement for the limitation as claimed.

In independent claims 1, 15, 17, regarding the limitation “an application repository storing *distributed applications which have been tested for installation* in the programmable network device and programmable cloud device”

The limitation appears to recite a desired function of storing applications which are tested for installation in devices. The Specification merely repeats the desired functionality in [0053], “using fxManager, the admin may discover new fxApps from the fxStore (aka repository), which presents all the tested and certified vApps as well as showing the supported fxOS version, support hardware platforms, etc.”

The disclosure fails to sufficiently identify how the system tests distributed applications for installation. Instead, the Specification recites in [0075], “Prior to installation in the live network, the authorized network admin has probably performed rigorous testing of the application in the test network”. That is, the applications are tested by an admin user, and it is improper for the claim language to suggest that the applications have been tested by the claimed system.

In dependent claim 11, regarding the limitation “a distributed content service wherein contents generated by the at least one of the plurality of first network applications may be shared with the at least one of a plurality of second network applications”:

The limitation appears to recite a desired function of the distributed content service, such as, to facilitate sharing of contents generated by one of the first network applications with one of the second network applications.

The Specification merely repeats the desired functionality in [0089], “the distributed Content Service (dCS) allows the developers to seamlessly store and share the contents generated by one application with other applications and its associated application in the cloud; dCS simplifies access to the data and brings in storage virtualization to the applications”, but fails to sufficiently identify how the Applicant intends to achieve the functionality.

In dependent claim 12, regarding the limitation “a distributed notification service wherein notice of a particular event is sent from at least one of the plurality of first network applications to at least one of the plurality of second network applications”:

The limitation appears to recite a desired function of the distributed notification service to facilitate sending of events from one of the first network applications to one of the second network applications.

The Specification merely repeats the desired functionality, “Distributed Notification Service (dNS) by which the applications could be notified of an event to wakeup and/or respond to the event” [0063], “the distributed Notification Service (dNS) is another tool for developers that could wake or ping an application when a particular event has occurred” [0090], but fails to sufficiently identify how the Applicant intends to achieve the functionality.

Claim Rejections - 35 USC § 112(b)

21. **Claim 9 rejected** under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the

subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Regarding claim 9, “the plurality of resources” in line 1 lacks antecedent basis, because this claim as recited depends from claim 1, whereas “plurality of resources” is recited in claim 8.

Claim Rejections - 35 USC § 103

22. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

23. This application currently names joint inventors. In considering patentability of the claims the examiner presumes that the subject matter of the various claims was commonly owned as of the effective filing date of the claimed invention(s) absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and effective filing dates of each claim that was not commonly owned as of the effective filing date of the later invention in order for the examiner to consider the applicability of 35 U.S.C. 102(b)(2)(C) for any potential 35 U.S.C. 102(a)(2) prior art against the later invention.

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

24. **Claims 1, 2, 5-17 is/are rejected** under 35 U.S.C. 103 as being unpatentable over **Pentikousis** et al ("MobileFlow: Toward Software-Defined Mobile Networks" published in IEEE Communications Magazine • July 2013, hereinafter Pentikousis) in view of **Narayanan** et al (US 2013/0223442 hereinafter Narayanan) and **Shatzkamer** (US 2014/0317293).

Regarding claim 1, Pentikousis discloses a system for processing data packets in a network (*MobileFlow: Software Defined Mobile Network (SMDN) architecture, a blueprint for carrier-grade flow-based forwarding [Title, page 1, col. 2 last para]*), the system comprising:

a programmable network device hosting a plurality of first network applications (*MobileFlow forwarding engine MFEE [page 3 col. 2 para3, Fig. 2]; MFEEs are more complex than an OpenFlow switch but much simpler than a router, support virtualized network functions such as DPI [page 4 col. 1 para 2-3]; MFEEs must support carrier-grade functionality such as L3 tunneling and flexible charging [page 4 col. 2 para 1] (i.e. MFEE is similar to a network device such as a router or a switch, and it is programmable depending on the virtualized network functions it hosts)*);

a programmable cloud device hosting a plurality of second network applications (*MobileFlow controller MFC [page 3 col. 2 para3, Fig. 2]; centralized MFCs can steer forwarding in the network [page 4 col. 1 para 3]; mobile network applications running on top of an MFC can function as an MME or the gateway control [page 4 col. 2 para 2] (i.e. the centralized MFC is similar to a cloud device, and it is programmable to host different network functions such as MME or Gateway GW); network function*

virtualization approach: a MobileFlow application implements the control part functionality of each of the EPS elements (e.g., eNodeB-C, SGW-C, PGW-C, S/PGW-C, and GGSN-C). Then each of these applications, which can run in a cloud computing environment interacts with the MFC to manage a respective MFFE [page 6 col1 para 2];

wherein at least one of the plurality of first network applications in the programmable network device and at least one of the plurality of second network applications in the programmable cloud device are in secure communication with each other to form a distributed application (Each MFFE communicates with an MFC through a lightweight protocol that implements the MobileFlow control interface (Smf) [page 5 col. 1 para 1]; MFFE can be based on a stripped-down mobile gateway that can handle network-layer (L3) tunnel processing in the data plane with all other tunnel control processes moved up to the MFC (i.e. distributed network functions) [page 5 col. 1 last para]; the wireless access MFFE with its eNB-C acts as an eNodeB. The MFFE with its associated SGW-C acts as the SGW, and the MFFE with its associated PGW-C acts as the PGW (i.e. distributed applications on network device and cloud devices) [page 6 col.2 para 3]);

But, **Pentikousis** does not explicitly disclose, the programmable network device and programmable cloud device are each powered by a sandboxing operating system which facilitates deployment of the plurality of first and second network applications and facilitates upgrades of the first and second network applications with substantially no interruption to operation of the programmable network device and programmable cloud device.

However, **Narayanan** discloses a similar *software-defined network (SDN) controller 220 and a flow-based switching device 210 [0026, Fig. 2, Fig. 7]*, wherein the *flow-based routing module of the switching device provides a secure sandbox mechanism for separating execution of flow-based routing operations from the rest of the switching device and includes dedicated memory resources and buffering capabilities to facilitate the flow-based network routing [0043]*. That is, Narayanan teaches that network devices can employ sandboxing techniques (aka sandboxing OS) to execute applications in a dedicated and protected environment [0043]. It would be easily apparent that cloud devices such as SDN controllers can also employ sandboxing techniques to reap the same benefits.

The rest of this limitation (“a sandboxing operating system which facilitates deployment of applications with substantially no interruption to operation ...”) cannot be given patentable weight with respect to the claimed system, as explained above in the *Claim Interpretation* sections. However, the Examiner notes that in-service hot-upgrade of software applications is a known benefit of Network Function Virtualization (NFV), as explained in Office actions of the parent application 14/295331 which are inherently incorporated here.

Therefore, it would have been obvious to a person having ordinary skill in the art, before the effective filing date of this application, to modify **Pentikousis** to include sandboxing OS in network and cloud devices, in order to execute applications in a dedicated and protected environment [Narayanan 0043].

But, **Pentikousis** in view of **Narayanan** (hereinafter **Pentikousis-Narayanan**) does not explicitly disclose,

wherein the programmable network device verifies authenticity of the upgrades to the plurality of first network applications and the programmable cloud device verifies authenticity of the upgrades to the plurality of second network applications and wherein the verification is based on unique security keys associated with each of the plurality of first and second network applications;

an application repository storing distributed applications which have been tested for installation in the programmable network device and programmable cloud device; and

an application management portal coupled to the programmable network device, programmable cloud device and the application repository, wherein the application management portal manages usage of the distributed applications on the programmable network device and programmable cloud device.

However, analogous art by **Shatzkamer** discloses *app store portal for deploying virtualized network functions [Title]; support Network Function Virtualization (NFV) [0005] by providing a digital distribution platform or an "app store" (i.e. repository) for deployment of virtual network functions (VNFs) [0019], vendors or third-party developers communicate with the app store to submit VNFs according to prescribed certification requirements (i.e. tested application, and verify authenticity) [0020]; provide a standardized web based application portal (i.e. application management portal) that can provide point-and-click deployment of the third-party VNFs [0021]. Provide a*

coordinated execution of virtualized network services by an by an orchestrator [0023]; the orchestrator includes a service provisioning module and a life-cycle management controller [0028]; for example, for a new evolved packet service (EPS), the orchestrator can allocate a virtualized eNodeB, a virtualized MME, a virtualized SGW, a virtualized PGW, etc. (i.e. manage use of distributed network applications) [0031].

Therefore, it would have been obvious to a person of ordinary skill in the art, before the effective filing date of the claimed invention, to modify **Pentikousis-Narayanan** to include an application marketplace and an application management portal as taught by **Shatzkamer**, because a standardized web-based app store portal enables a "point-and-click" deployment of virtual network functions, thereby automating the complex tasks of commissioning, capacity planning and management of virtualized network services [Shatzkamer 0001,0004],

Claim 15 is another system claim with limitations similar to those in system claim 1.

Claim 15 has additional limitations, namely:

a programmable network device *processing data flows*; and
a programmable cloud device *having a plurality of virtual machines, wherein at least one of the virtual machines has at least one of a plurality of first network applications.*

Pentikousis discloses *MFFEs use the flow rules received from the MFC to encapsulate/decapsulate user traffic and/or forward packets to the transport network (i.e. network device to process data flows) [page 5 col. 1 para 2]; KVM virtual machines*

with different MFCs and applications (i.e. cloud device having VMs running one of the network applications) [page 7 col. 2 para 2]

Shatzkamer also discloses *virtualized infrastructure service provided by hardware resources [0028], to provide execution of the virtualized network function within one or more physical machines [0016].*

It appears that claim 15 does not have any additional features with respect to novelty and inventive steps. Therefore, claim 15 is obvious over **Pentikousis-Narayanan-Shatzkamer**.

Claim 17 is another system claim with limitations similar to those in system claim 1.

Claim 17 has additional limitations, namely:

a programmable cloud device having a plurality of zones, wherein at least one of the plurality of zones has at least one of a plurality of first network applications.

Shatzkamer discloses that *execution of the virtualized services can be implemented in a data center at a single location or distributed among different geographic locations (i.e. zones) and interconnected via a public or private data network [0025].*

It appears that claim 15 does not have any additional features with respect to novelty and inventive steps. Therefore, claim 15 is obvious over **Pentikousis-Narayanan-Shatzkamer**.

Regarding claim 2, Shatzkamer discloses the system of claim 1, wherein each of the programmable network device and programmable cloud device include an access

network interface unit configured to send and receive communications and a processor with a memory associated with the network interface unit *(a physical machine can be configured to execute any of the VNFs ... any one of the physical machines can include a network interface circuit, one or more processor circuits, and a memory circuit [0048])*.

The rationale for combining **Pentikousis-Narayanan** and **Shatzkamer** is the same as that discussed above with respect to claim 1.

Regarding claim 5, Pentikousis discloses the system of claim 1, wherein the programmable network device is a Long Term Evolution (LTE) evolved NodeB (eNB) and the programmable cloud device hosts LTE core network functions in separate virtual machines from the group consisting of: Mobility Management Entity (MME), Serving Gateway (S-GW), and Packet Gateway P-GW) *(An MFFE may include the key functionality of a wireless access node, such as a radio interface to manage radio bearers, wireless access MFFEs can be used in parallel operation with existing eNodeBs [page 4 col.2 last para]; the mobile network applications running on top of an MFC can function as an MME or the gateway control part of a physical box (indicated as GW-C), and thus can interoperate with other legacy MMEs, SGWs, or PGWs [page 4 col. 2 para 2])*.

Claims 16 and 18 are corresponding system claims with limitations similar to those in claim 5. Therefore, claims 16 and 18 are rejected under the same rationale as claim 5.

Regarding claim 6, Pentikousis discloses the system of claim 1, wherein the programmable network device and programmable cloud device further comprise: a virtual fabric which provides a secure communication layer for the at least one of the first network applications and the at least one of the second network applications ().

Regarding claim 7, Pentikousis discloses the system of claim 1, further comprising: a second programmable network device which includes the at least one of the first network applications which is in the first programmable network device (*the MFFE can be fully defined in software, to act as different service enablers (e.g., deep packet inspection [DPI], video caching, and optimization) that can be distributed throughout the mobile network, as shown in Fig. 2 [page 1 3 col. 2 last para]*).

Regarding claim 8, Shatzkamer discloses the system of claim 1, wherein the programmable network device and programmable cloud device further comprise: a distributed resource service (DRS) which controls access to a plurality of resources upon receiving instructions from the application management portal (*the orchestrator receives request from the portal to deploy a virtual network service, which may communicate with a cloud controller API for controlling VNS provided by hardware resources [0024, 0028]*).

Regarding claim 9, Shatzkamer discloses the system of claim [[1]] 8, wherein the resources include at least one of a group consisting of: firewall; data and statistics; storage; compute; load evaluator; general settings; routing engine; virtual machine master controller; power controller; and wireless engine (*the hardware resources include physical server machines, network switching devices and storage devices*

[0028]; NFV can provide a virtualized load balancer [0029]; a life-cycle management controller for starting and suspending VMs, receiving resource statistics [0028]; example services may include Firewall and NAT [0073]).

Regarding claim 10, Shatzkamer discloses the system of claim 1, wherein the programmable network device and programmable cloud device further comprise: a distributed resource service which is capable of providing at least one service from a group consisting of: exposing application programming interfaces (APIs) to other applications; configuring and managing platform resources; policy enforcement and authorization of applications access to platform resource and other application's APIs; and policy conflict resolution (*the orchestrator provides life-cycle management of hardware resources [0028], policy mediation and policy charging [Fig. 7, 0046], enforcement of security policies [0081]; the portal presents a list of authorized VNFs and VNSs [0081]*).

Regarding claim 11, Shatzkamer discloses the system of claim 1, wherein the programmable network device and programmable cloud device further comprise: a distributed content service wherein contents generated by the at least one of the plurality of first network applications may be shared with the at least one of a plurality of second network applications (*different types of virtualized services can be provided such as video conference or streaming video, IP multimedia system session, etc. all of which require sharing of content between the applications [0031]*).

Regarding claim 12, Shatzkamer discloses the system of claim 1, wherein the programmable network device and programmable cloud device further comprise: a distributed notification service wherein notice of a particular event is sent from the at least one of the plurality of first network applications to the at least one of the plurality of second network applications (*The virtual infrastructure manager also can notify the orchestrator of hardware-based capacity issues in either the virtual infrastructure elements or physical hardware resource elements [0031]; the orchestrator can receive an alert from an active VNF container and coordinate the alert among the interdependent active VNF containers across all the applications [0059]*).

Regarding claim 13, Shatzkamer discloses the system of claim 10, wherein the DRS further includes a load controller; and wherein the load controller is adapted to monitor loads on at least one of the plurality of first network applications and at least one of the plurality of second network applications and effect change in accordance with thresholds received from the application management portal (*the orchestrator receives hardware load parameters such as CPU, memory or link utilization [0028]; the orchestrator monitors key performance indicator thresholds [0066]; a Virtual Network Function when distributed over multiple VM can make use of an application level load balancing that shall take account of many of the performance indicators to make full and effective use of the available resources [0062]; the app store portal can specify load balancing policies for distributing traffic across multiple physical/logical boundaries [0087]*). Further, **Li** discloses effecting change in accordance with thresholds (*automatically changing the weight or priority of a queue when traffic counts exceed threshold [page 4, column 2]*).

Regarding claim 14, Shatzkamer discloses the system of claim 1, wherein the programmable network device, at least one of the plurality of first network applications, the programmable cloud device, and the at least one of the plurality of second network applications each have unique identities (*the orchestrator can maintain IP addresses, server ID and other attributes during service creation [0054]; identification of virtual network functions [0057]; assign Virtual Machine identifiers [0064]*).

25. **Claim 4 is rejected under 35 U.S.C. 103** as being unpatentable over **Pentikousis-Narayanan-Shatzkamer** as applied to claim 1, further in view of **Marino** et al (US 2014/0052976 hereinafter **Marino**).

Regarding claim 4, Pentikousis-Narayanan-Shatzkamer does not explicitly disclose the system of claim 1, wherein the at least one of the first network applications is responsible for a plurality of functional capabilities of the programmable network device and is capable of at least one of the group consisting of: updating the firmware of the programmable network device; updating default communication protocols of the programmable network device; initializing programmable network device settings; boot loading the programmable network device; providing security digital certificates; providing operating system "(OS) and kernel upgrades; and upgrading and commissioning agents for upgrades of the at least one of the first network applications and related procedures.

However, **Marino** discloses *systems and methods for remotely updating router firmware [0029]. A wireless router receives a firmware update (i.e. first network*

application) from a remote server, and destructively overwrites router firmware in flash memory (i.e. firmware/OS/kernel update/upgrade) in a chunk-wise manner, and then writes a kernel memory before going live with upgraded firmware.

Therefore, it would have been obvious to a person of ordinary skill in the art, before the effective filing date of the claimed invention, to modify **Pentikousis-Narayanan-Shatzkamer** to include first network applications responsible for updating firmware/OS/kernel upgrade of the flexible network device, as taught by **Marino** in order to facilitate remote upgrade of network elements [Marino, 0038].

26. **Claim 5 is rejected under 35 U.S.C. 103** as being unpatentable over **Li-Pentikousis-Narayanan-Shatzkamer** in view of **Baset** et al (US 2013/0263104 hereinafter **Baset**).

Regarding claim 5, Pentikousis-Narayanan-Shatzkamer does not explicitly disclose the system of claim 1, wherein at least one of the second network applications is responsible for a plurality of functional capabilities of the programmable cloud device and is capable of at least one of the group consisting of: upgrading and commissioning agents for upgrades of the at least one of the second network applications and related procedures; hypervisor upgrades; virtual machine and/or isolated execution environment lifecycle management; security digital certificate management; operating system (OS) and kernel upgrades; and default communication protocols.

However, **Baset** discloses *a computer software patch is a piece of software that is designed to fix problems with a computer program. For example, the patch may be used to correct security vulnerabilities, correct a programming bug, improve existing functions, or change software behavior of the computer program. Patches may be applied to a hypervisor, an operating system, middleware, and various other computer software applications [0004].*

Therefore, it would have been obvious to a person of ordinary skill in the art, before the effective filing date of the claimed invention, to modify **Pentikousis-Narayanan-Shatzkamer** to include a software or application for upgrading OS/kernel/hypervisor or to manage security issues of a cloud platform as taught by **Baset** in order to facilitate automated patching/upgrading of a computer system in accordance with patch management policies [Baset, Abstract].

Double Patenting

27. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting

provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP §§ 706.02(l)(1) - 706.02(l)(3) for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-1.jsp.

28. **Claims 1-18 rejected** on the ground of nonstatutory double patenting as being unpatentable over claims 1-14, 18, and 19 of U.S. Patent No. US 9843624. Although the claims at issue are not identical, they are not patentably distinct from each other. Claims 1-14, 18, 19 of the '624 patent recite almost exactly the same invention, with minor variations in language, as claims 1-18 of the present invention. Therefore, claims 1-18 of the present invention are obvious over claims 1-14, 18, 19 of Applicants '624 patent. The mapping of claims is given below.

Claims of present application are obvious over	Claims of US 9843624
Independent Claim 1	Independent Claim 1
Dependent Claim 2	Dependent Claim 2
Dependent Claim 3	Dependent Claim 3
Dependent Claim 4	Dependent Claim 4
Dependent Claim 5	Dependent Claim 5
Dependent Claim 6	Dependent Claim 6
Dependent Claim 7	Dependent Claim 7
Dependent Claim 8	Dependent Claim 8
Dependent Claim 9	Dependent Claim 9
Dependent Claim 10	Dependent Claim 11
Dependent Claim 11	Dependent Claim 12

Claims of present application are obvious over	Claims of US 9843624
Dependent Claim 12	Dependent Claim 13
Dependent Claim 13	Dependent Claim 10
Dependent Claim 14	Dependent Claim 14
Independent Claim 15	Independent Claim 18
Dependent Claim 16	Dependent Claim 5
Independent Claim 17	Independent Claim 19
Dependent Claim 18	Dependent Claim 5

Conclusion

29. Any inquiry concerning this communication or earlier communications from the examiner should be directed to RAJESHWARI KRISHNAN whose telephone number is (571)270-5688. The examiner can normally be reached on M-F 8 am - 5 pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wing Chan can be reached on 1-571-272-7493. 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

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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.

/R.K./
Examiner, Art Unit 2441

/WING F CHAN/
Supervisory Patent Examiner, Art Unit 2441

Notice of References Cited	Application/Control No. 15/836,824		Applicant(s)/Patent Under Reexamination Taaghoh et al.	
	Examiner RAJESHWARI KRISHNAN		Art Unit 2441	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20130223442-A1	08-2013	Narayanan; Rajesh	H04L45/64	370/389
*	B	US-20140317293-A1	10-2014	SHATZKAMER; Kevin	G06F9/455	709/226
*	C	US-20130263104-A1	10-2013	Baset; Salman A.	G06F8/68	717/168
*	D	US-20140052976-A1	02-2014	Marino; Joseph P.	G06F21/56	713/2
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

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

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	"MobileFlow - Toward Software Defined Mobile Networks" by Pentikousis et al published in IEEE Communications Magazine • July 2013 (Year: 2013)
	V	Google scholar search results - distributed software defined cellular network (Year: 2019)
	W	Google Scholar search results - network function virtualization eNodeB SGW PGW MME (Year: 2019)
	X	Google scholar search results - Taaghoh Pouya (Year: 2019)

*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.

U.S. Patent and Trademark Office
PTO-892 (Rev. 01-2001)

Notice of References Cited

Part of Paper No. 20190611

<i>Search Notes</i> 	Application/Control No. 15/836,824	Applicant(s)/Patent Under Reexamination Taaghoh et al.
	Examiner RAJESHWARI KRISHNAN	Art Unit 2441

CPC - Searched*		
Symbol	Date	Examiner
H04W24/02-04	06/16/2019	RK
G06F8/60-68	06/16/2019	RK
G06F9/4406,45533-4856	06/16/2019	RK
H04L 41/0806-0893, 45/00-64,67/10	06/16/2019	RK

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Performed Inventor and Assignee searches	06/16/2019	RK
EAST search history attached	06/16/2019	RK
Google scholar search for inventor Taaghoh Pouya	06/16/2019	RK
Google scholar search for "distributed software defined cellular network"	06/16/2019	RK
Google scholar search for "network function virtualization eNB SGW PGW MME"	06/16/2019	RK

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/R.K./ Examiner, Art Unit 2441	
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<i>Search Notes</i> 	Application/Control No. 15/836,824	Applicant(s)/Patent Under Reexamination Taaghol et al.
	Examiner RAJESHWARI KRISHNAN	Art Unit 2441

/R.K./ Examiner, Art Unit 2441	
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PTO/SB/08a (07-09)

Approved for use through 11/30/2020. OMB 0651-0031

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

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Substitute for form 1449/PTO

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**

(Use as many sheets as necessary)

Complete if Known

Sheet 1 of 3

Application Number	
Filing Date	
First Named Inventor	Taaghol
Art Unit	
Examiner Name	
Attorney Docket Number	TAAGCONT1

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code ² (if known)			
		US- 8,528,108	09-2013	Ammer, Gerhard	
		US- 8,756,595	06-2014	Arcilla, Andre	
		US- 9,226,333	12-2015	Steiner, Moritz	
		US- 20090300057	12-2009	Friedman, Nathaniel	
		US- 20140241158	08-2014	Anthony, Jr., Bruce	
		US- 20110075611	03-2011	Choi, Hyung-Nam	
		US- 7,630,706	12-2009	Weigand, David	
		US- 20130007254	01-2013	Fries, Robert	
		US- 20090113327	04-2009	Pogrebinsky, Vladimir	
		US- 20080209491	08-2008	Hasek, Charles	
		US- 20140317293	10-2014	Shatzkamer, Kevin	
		US- 20140254373	09-2014	Varma, Subir	
		US- 20140259012	09-2014	Nandiali, Vishwamitra	
		US- 20150173121	06-2015	Miklos, Gyorgy	
		US- 20070078988	04-2007	Miloushev, Vladimir	
		US- 2009027677	11-2009	Nickolov, Peter	
		US- 20020016954	02-2002	Charities, Dietrich	
		US- 7114021	09-2006	Seshadri	
		US- 8132166	03-2012	DeHaan	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T ⁶
		Country Code ³ -Number ⁴ -Kind Code ⁵ (if known)				

Examiner Signature	/RAJESHWARI KRISHNAN/	Date Considered	06/11/2019
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*EXAMINER: Initial if reference 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 to applicant. ¹ Applicant's unique citation designation number (optional). ² See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ³ Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English language Translation is attached.

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 2 hours 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, 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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Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>		Complete if Known	
		Application Number	
		Filing Date	
		First Named Inventor	Taaghoh
		Art Unit	
		Examiner Name	
		Attorney Docket Number	TAAG001CONT1
Sheet 2	of 3		

[illegible][illegible]

Examiner Signature	/RAJESHWARI KRISHNAN/	Date Considered	06/11/2019
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Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>		Complete if Known	
		Application Number	
		Filing Date	
		First Named Inventor	TAAGHOL
		Art Unit	
		Examiner Name	
Sheet 3	of 3	Attorney Docket Number	TAAG001CONT1

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. ¹	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²
		Bansal, et al., "OpenRadio: A Programmable Wireless Dataplane", published in HotSDN'12, Aug. 13, 2012, Helsinki, Finland	
		Stallings et al., "Software-Defined Networks and Open Flow" published in The Internet Protocol Journal, Vol. 16, No. 1, March 2012	
		Luo et al., "Software Defined Networking across Distributed Datacenters over Cloud" published 2013 IEEE International Conference on Cloud Computing Technology and Science	
		McKeown et al., "OpenFlow: Enabling Innovation in Campus Networks", March 14, 2008.	
		Li et al., "Toward Software-Defined Cellular Networks", March 14, 2008.	
		"Network Functions Visualization", White Paper published Oct. 22-24, 2012, at the "SDN and OpenFlow World Congress", Darmstadt-Germany	
		Yap et al., "OpenRoads: Empowering Research in Mobile Networks" published in 2010 ACM SIGCOMM Computer Communication Review	
		"A Short Introduction To Cloud Platforms " by David Chappell, Aug 2008	

Examiner Signature	/RAJESHWARI KRISHNAN/	Date Considered	06/11/2019
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*EXAMINER: Initial if reference 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 to applicant.

¹ Applicant's unique citation designation number (optional). ² Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 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 2 hours 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, 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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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S308	3	"distributed software defined network"	USPAT	OR	OFF	2019/06/11 08:51
S309	11	"distributed software defined network"	US-PGPUB; USPAT; EPO	OR	OFF	2019/06/11 08:55
S310	3	"distributed software defined network" and (@ad @rlad) <= "20130613"	US-PGPUB; USPAT; EPO	OR	OFF	2019/06/11 09:20
S311	250	sandbox\$3 adj2 ("operating system" OS)	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2019/06/11 09:20
S312	69	sandbox\$3 adj ("operating system" OS)	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2019/06/11 09:21
S313	33	sandbox\$3 adj ("operating system" OS) and (@ad @rlad) <= "20130613"	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2019/06/11 09:21
S316	29	("0000007" "20020016954" "20040107417" "20040237081" "20050246703" "20070078988" "20080209491" "20090007091" "20090027677" "20090113327" "20090300057" "20110075611" "20120300615" "20130007254" "20130160147" "20130263104" "20140062976" "20140241158" "20140254373" "20140259012" "20140317293" "20150173121" "7114021" "8132166" "8528108" "8650299" "8756595" "8843933" "9226333").PN.	US-PGPUB; USPAT	OR	OFF	2019/06/11 16:01
S318	1	("20140062976").PN.	US-PGPUB; USPAT	OR	OFF	2019/06/11 16:09
S328	21	("10069648" "20070053334" "20090228589" "20120204224" "20130054761" "20130094472" "20130139243" "20140341199" "20150124622" "20150200859" "20150382240" "20160085641" "20160100340" "20160127889" "20160156513" "20160182378" "20160301595" "20160315785"	US-PGPUB; USPAT	OR	OFF	2019/06/13 10:12

		"20160381146" "20180248713" "9264944").PN.				
S329	7	("20070115906" "20090094611" "20120106333" "20130054761" "20130297798" "20150055623" "20150124815").PN.	US-PGPUB; USPAT	OR	OFF	2019/06/13 10:14
S330	10	("20120300615" "20130242727" "20130272127" "20130329601" "20140038654" "20140101726" "20140269284" "20140348130" "20150063346" "8521905").PN.	US-PGPUB; USPAT	OR	OFF	2019/06/13 10:16
S331	0	(S328 or S329 S330) and (distributed adj2 software-defined adj2 network\$3)	US-PGPUB; USPAT	OR	OFF	2019/06/13 10:17
S332	18	(S328 or S329 or S330) and ((distributed near5 software-defined adj2 network\$3) OR "virtual network function" OR "network functions virtualization" OR open\$1flow)	US-PGPUB; USPAT	OR	OFF	2019/06/13 10:19
S333	2	("20110044218" "20160150448").pn.	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2019/06/13 10:44
S334	11	13/536838	US-PGPUB; USPAT; USOCR; EPO	OR	OFF	2019/06/13 13:09
S335	68	("2014/0317293").URPN.	USPAT	OR	OFF	2019/06/13 13:12
S337	148	((distributed near5 software-defined adj2 network\$3) OR "virtual network function" OR "network functions virtualization" OR open\$1flow)) and (eNB e\$1NodeB S\$1GW P\$1GW MME) and (@ad @rlad) <= "20130613"	US-PGPUB; USPAT	OR	OFF	2019/06/13 13:18
S338	5	("0000007" "20020016954" "20040107417" "20040237081" "20050246703" "20070078988" "20080209491" "20090007091" "20090027677" "20090113327" "20090300057" "20110075611" "20120300615" "20130007254" "20130160147" "20130263104" "20140062976" "20140241158" "20140254373" "20140259012" "20140317293" "20150173121" "7114021" "8132166" "8528108" "8650299" "8756595" "8843933" "9226333").PN. and (((distributed near5 software-defined adj2 network\$3) OR "virtual network function" OR "network functions virtualization" OR open\$1flow)) and (eNB e\$1NodeB S\$1GW P\$1GW MME)	US-PGPUB; USPAT	OR	OFF	2019/06/13 13:19
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S340	6	("0000007" "20020016954" "20040107417" "20040237081" "20050246703" "20070078988"	US-PGPUB; USPAT	OR	OFF	2019/06/13 13:22

		"20080209491" "20090007091" "20090027677" "20090113327" "20090300057" "20110075611" "20120300615" "20130007254" "20130160147" "20130263104" "20140062976" "20140241158" "20140254373" "20140259012" "20140317293" "20150173121" "7114021" "8132166" "8528108" "8650299" "8756595" "8843933" "9226333" "20140362775").PN. and (((distributed near5 software-defined adj2 network\$3) OR "virtual network function" OR "network functions virtualization" OR open\$1flow)) and (eNB e\$1NodeB S\$1GW P\$1GW MME)				
S341	5	Pentikousis.inv.	US- PGPUB; USPAT	OR	OFF	2019/06/13 14:28
S342	0	Pentikousis.inv. and smdn	US- PGPUB; USPAT	OR	OFF	2019/06/13 14:29
S343	3	Pentikousis.inv. and "software defined"	US- PGPUB; USPAT	OR	OFF	2019/06/13 14:29
S344	79	((Pouya) near2 (Taaghol)).INV.	US- PGPUB; USPAT; USOCR	OR	OFF	2019/06/13 14:38
S345	3	((Vivek) near2 (Ramanna)).INV.	US- PGPUB; USPAT; USOCR	OR	OFF	2019/06/13 14:38
S346	1	S344 and S345	US- PGPUB; USPAT; USOCR	OR	OFF	2019/06/13 14:38
S347	1	MobileFlow and (@ad @rlad) <= "20130613"	US- PGPUB; USPAT; USOCR; EPO	OR	OFF	2019/06/13 14:56
S348	24	("Extensible Messaging and Presence Protocol" or XMPP or Jabber) and ("software defined network" "software defined mobile network" "software defined cellular network") and (@ad @rlad) <= "20130613"	US- PGPUB; USPAT; USOCR; EPO	OR	OFF	2019/06/13 15:03
S349	86	("Extensible Messaging and Presence Protocol" or XMPP or Jabber) and ("software defined network" "software defined mobile network" "software defined cellular network")	US- PGPUB; USPAT; USOCR; EPO	OR	OFF	2019/06/13 15:04
S350	62	(sandbox\$3) and ("software defined network" "software defined mobile network" "software defined cellular network")	US- PGPUB; USPAT; USOCR; EPO	OR	OFF	2019/06/13 16:07
S351	5	(sandbox\$3) and ("software defined network" "software defined mobile network" "software defined cellular network") and (@ad @rlad) <= "20130613"	US- PGPUB; USPAT; USOCR;	OR	OFF	2019/06/13 16:08

EAST Search History

			EPO			
S352	79	((Pouya) near2 (Taaghol)).INV.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/06/16 11:08
S353	3	((Vivek) near2 (Ramanna)).INV.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/06/16 11:08
S354	1	S352 and S353	US-PGPUB; USPAT; USOCR	OR	OFF	2019/06/16 11:08
S355	1	((Pouya) near2 (Taaghol)).INV. and distributed and flexible	USPAT	OR	OFF	2019/06/16 11:08
S356	1	((Pouya) near2 (Taaghol)).INV. and (distributed near9 "software defined" near2 network)	USPAT	OR	OFF	2019/06/16 11:09
S357	1	((Pouya) near2 (Taaghol)).INV. and ("software defined" near2 network)	USPAT	OR	OFF	2019/06/16 11:09

6/16/2019 11:10:34 AM

C:\Users\rkrishnan\Documents\EAST\Workspaces\14295331_15836824 Taaghol
Distributed SW Defined Network.wsp



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/836,824	12/09/2017	Pouya Taaghol	TAAG001CONT1

112449
Roark IP
1438 Dahlia Loop
San Jose, CA 95126

CONFIRMATION NO. 9801
IMPROPER CPOA LETTER



Date Mailed: 01/11/2018

NOTICE REGARDING POWER OF ATTORNEY

This is in response to the power of attorney filed 12/09/2017. The power of attorney in this application is not accepted for the reason(s) listed below:

- The signature(s) of Vivek Ramanna, co-inventor(s) in this application, has/have been omitted. The power of attorney will be entered upon receipt of confirmation signed by said co-inventor(s).

/elbanaybanay/

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

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 15/836,824	
APPLICATION AS FILED - PART I							
(Column 1)		(Column 2)		SMALL ENTITY		OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	70		N/A	
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	300		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A	
TOTAL CLAIMS (37 CFR 1.16(j))	18	minus 20 = *	x 40 =	0.00	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3	minus 3 = *	x 210 =	0.00			
APPLICATION SIZE FEE (37 CFR 1.16(s))	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).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	730		TOTAL	
APPLICATION AS AMENDED - PART II							
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
AMENDMENT A		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	=
	Application Size Fee (37 CFR 1.16(s))						
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	
(Column 1)		(Column 2)		(Column 3)		OTHER THAN SMALL ENTITY	
AMENDMENT B		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	=
	Application Size Fee (37 CFR 1.16(s))						
	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. ** 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 found in the appropriate box in column 1.							



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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO.	TOT CLAIMS	IND CLAIMS
15/836,824	12/09/2017	2425	730	TAAG001CONT1	18	3

CONFIRMATION NO. 9801

FILING RECEIPT



000000098013512

112449
Roark IP
1438 Dahlia Loop
San Jose, CA 95126

Date Mailed: 01/11/2018

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)

Pouya Taaghol, San Jose, CA;
Vivek Ramanna, San Jose, CA;

Applicant(s)

Pouya Taaghol, San Jose, CA;
Vivek Ramanna, San Jose, CA;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 14/295,331 06/04/2014 PAT 9843624
which claims benefit of 61/834,807 06/13/2013

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.

Permission to Access Application via Priority Document Exchange: No

Permission to Access Search Results: No

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 01/10/2018

page 1 of 3

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/836,824**

Projected Publication Date: Request for Non-Publication Acknowledged

Non-Publication Request: Yes

Early Publication Request: No

**** SMALL ENTITY ****

Title

DISTRIBUTED SOFTWARE DEFINED NETWORKING

Preliminary Class

725

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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, 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

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

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.

Electronic Patent Application Fee Transmittal				
Application Number:		15836824		
Filing Date:				
Title of Invention:		DISTRIBUTED SOFTWARE DEFINED NETWORKING		
First Named Inventor/Applicant Name:		Pouya Taaghoul		
Filer:		Christopher James Horgan		
Attorney Docket Number:		TAAG001CONT1		
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
UTILITY FILING FEE (ELECTRONIC FILING)	4011	1	70	70
UTILITY SEARCH FEE	2111	1	300	300
UTILITY EXAMINATION FEE	2311	1	360	360
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				730

Electronic Acknowledgement Receipt	
EFS ID:	31179694
Application Number:	15836824
International Application Number:	
Confirmation Number:	9801
Title of Invention:	DISTRIBUTED SOFTWARE DEFINED NETWORKING
First Named Inventor/Applicant Name:	Pouya Taaghol
Customer Number:	112449
Filer:	Christopher James Horgan
Filer Authorized By:	
Attorney Docket Number:	TAAG001CONT1
Receipt Date:	09-DEC-2017
Filing Date:	
Time Stamp:	19:01:43
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$730
RAM confirmation Number	121117INTEFSW19024500
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Fee Worksheet (SB06)	fee-info.pdf	35295	no	2
			72a3896bb8dee75382af6375d2a416a1786663ec		
Warnings:					
Information:					
Total Files Size (in bytes):			35295		
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. <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. <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. <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.					

Electronic Patent Application Fee Transmittal				
Application Number:		15836824		
Filing Date:				
Title of Invention:		DISTRIBUTED SOFTWARE DEFINED NETWORKING		
First Named Inventor/Applicant Name:		Pouya Taaghoh		
Filer:		Christopher James Horgan		
Attorney Docket Number:		TAAG001CONT1		
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
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UTILITY SEARCH FEE	2111	1	300	300
UTILITY EXAMINATION FEE	2311	1	360	360
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				730

Electronic Acknowledgement Receipt	
EFS ID:	31179304
Application Number:	15836824
International Application Number:	
Confirmation Number:	9801
Title of Invention:	DISTRIBUTED SOFTWARE DEFINED NETWORKING
First Named Inventor/Applicant Name:	Pouya Taaghol
Customer Number:	112449
Filer:	Christopher James Horgan
Filer Authorized By:	
Attorney Docket Number:	TAAG001CONT1
Receipt Date:	09-DEC-2017
Filing Date:	
Time Stamp:	00:39:55
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	Fee Worksheet (SB06)	fee-info.pdf	35295	no	2
			594ac124555e56f507b012c3655444c83bc2bd0f		

Warnings:

Information:	
Total Files Size (in bytes):	35295
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. <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. <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. <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.	

Doc Code: ECOMM.AUTH/ECOMM.WTDW

Doc Description: Internet Communications Authorized/Internet Communications Authorization Withdrawn

PTO/SB/439 (11-15)

AUTHORIZATION FOR INTERNET COMMUNICATIONS IN A PATENT APPLICATION OR REQUEST TO WITHDRAW AUTHORIZATION FOR INTERNET COMMUNICATIONS	Application No.	
	Filing Date	
	First Named Inventor	TAAGHOL
	Art Unit	
	Examiner Name	
	Practitioner Docket No.	TAAG001CONT1

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

I. To authorize permission for Internet Communications.

☒ Recognizing that Internet communications are not secure, I hereby authorize the USPTO to communicate with the undersigned and practitioners in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application via video conferencing, instant messaging, or electronic mail. I understand that a copy of these communications will be made of record in the application file. (MPEP 502.03)

II. To withdraw authorization for Internet Communications.

☐ The authorization given on _____, to the USPTO to communicate with the undersigned and any practitioner in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application via Internet communications such as video conferencing, instant messaging, or electronic mail is hereby withdrawn. I understand that the withdrawal is effective when approved rather than when received.

I am the

☐ applicant.

☒ attorney or agent of record. Registration number 40,394.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/Christopher J. Horgan/
Signature

December 8, 2017
Date

Christopher J. Horgan
Typed or printed name

408-687-8306
Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Juristic entities must be represented by a patent practitioner (see 37 CFR 1.31, which is applicable to any paper filed on or after September 16, 2012, that is presented on behalf of a juristic entity, regardless of application filing date). Submit multiple forms if more than one signature is required, see below*.

☒ * Total of 1 forms are submitted.

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.

NONPUBLICATION REQUEST UNDER 35 U.S.C. 122(b)(2)(B)(i)	First Named Inventor		TAAGHOL
	Title	DISTRIBUTED SOFTWARE DEFINED NETWOF	
	Attorney Docket Number		TAAG001CONT1

I hereby certify that the invention disclosed in the attached application **has not and will not be** the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

I hereby request that the attached application not be published under 35 U.S.C. 122(b).

/Christopher J. Horgan/

December 8, 2017

Signature

Date

Christopher J. Horgan

40,394

Typed or printed name

Registration Number, if applicable

408-687-8306

Telephone Number

This request must be signed in compliance with 37 CFR 1.33(b) and submitted with the application **upon filing**.

Applicant may rescind this nonpublication request at any time. If applicant rescinds a request that an application not be published under 35 U.S.C. 122(b), the application will be scheduled for publication at eighteen months from the earliest claimed filing date for which a benefit is claimed.

If applicant subsequently files an application directed to the invention disclosed in the attached application in another country, or under a multilateral international agreement, that requires publication of applications eighteen months after filing, the applicant **must** notify the United States Patent and Trademark Office of such filing within forty-five (45) days after the date of the filing of such foreign or international application. **Failure to do so will result in abandonment of this application (35 U.S.C. 122(b)(2)(B)(iii)).**

This collection of information is required by 37 CFR 1.213(a). 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 6 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 (1-800-786-9199) and select option 2.

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.

Substitute for form 1449/PTO

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**

(Use as many sheets as necessary)

Complete if Known

Sheet 1

of 3

Application Number

Filing Date

First Named Inventor

Taaghol

Art Unit

Examiner Name

Attorney Docket Number

TAAGCONT1

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code ² (if known)			
		US- 8,528,108	09-2013	Ammer, Gerhard	
		US- 8,756,595	06-2014	Arcilla, Andre	
		US- 9,226,333	12-2015	Steiner, Moritz	
		US- 20090300057	12-2009	Friedman, Nathaniel	
		US- 20140241158	08-2014	Anthony, Jr., Bruce	
		US- 20110075611	03-2011	Choi, Hyung-Nam	
		US- 7,630,706	12-2009	Weigand, David	
		US- 20130007254	01-2013	Fries, Robert	
		US- 20090113327	04-2009	Pogrebinsky, Vladimir	
		US- 20080209491	08-2008	Hasek, Charles	
		US- 20140317293	10-2014	Shatzkamer, Kevin	
		US- 20140254373	09-2014	Varma, Subir	
		US- 20140259012	09-2014	Nandiali, Vishwamitra	
		US- 20150173121	06-2015	Miklos, Gyorgy	
		US- 20070078988	04-2007	Miloushev, Vladimir	
		US- 2009027677	11-2009	Nickolov, Peter	
		US- 20020016954	02-2002	Charities, Dietrich	
		US- 7114021	09-2006	Seshadri	
		US- 8132166	03-2012	DeHaan	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T ⁶
		Country Code ³ -Number ⁴ -Kind Code ⁵ (if known)				

Examiner
SignatureDate
Considered

*EXAMINER: Initial if reference 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 to applicant. ¹ Applicant's unique citation designation number (optional). ² See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ³ Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English language Translation is attached.

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 2 hours 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, 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 (1-800-786-9199) and select option 2.

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.

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.		Complete if Known	
Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)		Application Number	
		Filing Date	
		First Named Inventor	Taaghoh
		Art Unit	
		Examiner Name	
Sheet 2	of 3	Attorney Docket Number	TAAG001CONT1

[illegible][illegible]

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 citation if not in conformance and not considered. Include copy of this form with next communication to applicant. ¹ Applicant's unique citation designation number (optional). ² See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ³ Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English language Translation is attached.

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Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>		Complete if Known	
		Application Number	
		Filing Date	
		First Named Inventor	TAAGHOL
		Art Unit	
		Examiner Name	
Sheet 3		of 3	Attorney Docket Number TAAG001CONT1

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. ¹	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T ²
		Bansal, et al., "OpenRadio: A Programmable Wireless Dataplane", published in HotSDN'12, Aug. 13, 2012, Helsinki, Finland	
		Stallings et al., "Software-Defined Networks and Open Flow" published in The Internet Protocol Journal, Vol. 16, No. 1, March 2012	
		Luo et al., "Software Defined Networking across Distributed Datacenters over Cloud" published 2013 IEEE International Conference on Cloud Computing Technology and Science	
		McKeown et al., "OpenFlow: Enabling Innovation in Campus Networks", March 14, 2008.	
		Li et al., "Toward Software-Defined Cellular Networks", March 14, 2008.	
		"Network Functions Visualization", White Paper published Oct. 22-24, 2012, at the "SDN and OpenFlow World Congress", Darmstadt-Germany	
		Yap et al., "OpenRoads: Empowering Research in Mobile Networks" published in 2010 ACM SIGCOMM Computer Communication Review	
		"A Short Introduction To Cloud Platforms " by David Chappell, Aug 2008	

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 citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ Applicant's unique citation designation number (optional). ² Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 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 2 hours 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, 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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**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)**

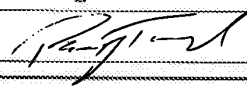
Title of Invention	Distributed Software Defined Networking
As the below named inventor, I hereby declare that: This declaration is directed to: ☒ The attached application, or ☐ United States application or PCT international application number _____ filed on _____ The above-identified application was made or authorized to be made by me. I believe that I am the original inventor or an original joint inventor of a claimed invention in the application. I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both. WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available. LEGAL NAME OF INVENTOR Inventor: Vivek Ramanna Date (Optional) June 2, 2014 Signature:  Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.	

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute 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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**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)**

Title of Invention	Distributed Software Defined Networking
As the below named inventor, I hereby declare that: This declaration is directed to: ☒ The attached application, or ☐ United States application or PCT international application number _____ filed on _____ The above-identified application was made or authorized to be made by me. I believe that I am the original inventor or an original joint inventor of a claimed invention in the application. I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both. WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available. LEGAL NAME OF INVENTOR Inventor: Pouya Taaghoh Date (Optional): June 2, 2014 Signature:  Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.	

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute 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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Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		DISTRIBUTED SOFTWARE DEFINED NETWORKING		
First Named Inventor/Applicant Name:		Pouya Taaghoh		
Filer:		Christopher James Horgan		
Attorney Docket Number:		TAAG001CONT1		
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
UTILITY FILING FEE (ELECTRONIC FILING)	4011	1	70	70
UTILITY SEARCH FEE	2111	1	300	300
UTILITY EXAMINATION FEE	2311	1	360	360
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				730

Electronic Acknowledgement Receipt	
EFS ID:	31179296
Application Number:	15836824
International Application Number:	
Confirmation Number:	9801
Title of Invention:	DISTRIBUTED SOFTWARE DEFINED NETWORKING
First Named Inventor/Applicant Name:	Pouya Taaghol
Customer Number:	112449
Filer:	Christopher James Horgan
Filer Authorized By:	
Attorney Docket Number:	TAAG001CONT1
Receipt Date:	09-DEC-2017
Filing Date:	
Time Stamp:	00:23:05
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	Specification	TAAG001CONT1_SPECIFICATIO N.pdf	879587 9a28fd793d2f110c3d32126fbd49fd58868182b	no	61

Warnings:

Information:					
2	Drawings-only black and white line drawings	TAAG001CONT1_DRAWINGS.pdf	1280529	no	18
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Warnings:					
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Information:					
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4	Power of Attorney	TAAG001CONT1_POA.pdf	1016501	no	2
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Information:					
5	Internet Communications Authorized	TAAG001CONT1_INT_COMM.pdf	78889	no	2
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Information:					
6	Nonpublication request from applicant	TAAG001CONT1_NON_PUB.pdf	121599	no	1
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Total Files Size (in bytes):			12311737		
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DISTRIBUTED SOFTWARE DEFINED NETWORKING

CROSS-REFERENCE TO RELATED PATENT APPLICATIONS

[0001] The present invention claims priority from U.S. Patent Application Ser. No. 14/295,331, filed June 4, 2014; which claims priority from U.S. Provisional Patent Application Serial No. 61/834,807, filed June 13, 2013; both of these disclosures are herein specifically incorporated by reference in their entirety.

FIELD OF THE INVENTION

[0002] This invention relates to a network architecture that facilitates secure and flexible programmability between a user device and across a network with full lifecycle management of services and infrastructure applications.

BACKGROUND

[0003] Existing network solutions are built on proprietary hardware and software. Network Operators & Information Technology (NOIT) can only configure the proprietary network infrastructure provided by vendors and are unable to add new and customized features or capabilities. As a result, the NOIT can only add new desired features by making such requests to their infrastructure vendors or pursuing standardization processes. But these existing approaches are time consuming and resourceintensive.

SUMMARY OF THE INVENTION

[0004] An aspect of the disclosure herein is a plurality of network elements in a packet system, said network elements comprising: a flexible network device adapted to process data flows in the packet system having at least one fxDeviceApp; a flexible cloud platform having at least one fxCloudApp, wherein the at least one fxDeviceApp and at least one fxCloudApp are in secure communication to form a distributed application; and an application management portal which manages life cycle of the distributed applications.

[0005] Another aspect of the disclosure is a plurality of network elements in a packet system, said network elements comprising: a flexible cloud platform having a plurality of virtual machines, wherein each of the virtual machines has at least one fxCloudApp; and a flexible network device adapted to process data flows in the packet system having at least one fxDeviceApp, wherein the at least one fxDeviceApp and fxCloudApp are in secure communication to form a distributed application.

[0006] Another aspect of the disclosure is a plurality of network elements in a packet system, said network elements comprising: a flexible cloud platform having a plurality of zones, wherein each of the plurality of zones has at least one fxCloudApp; and a flexible network device adapted to process data flows in the packet system having at least one fxDeviceApp, wherein the at least one fxDeviceApp and fxCloudApp are in secure communication to form a distributed application.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] Figure 1 demonstrates the network architecture of a 4G system.

[0008] Figure 2 illustrates a network element (or system) upon which the Distributed Software Defined Network operates.

[0009] Figure 3 illustrates a Distributed Software Defined Network in accordance with the present disclosure.

[0010] Figure 4 is an exemplary view of the software layers in the Flexible Operation System (fxOS) Architecture.

[0011] Figure 5 illustrates the FastPath architecture.

[0012] Figure 6 presents a potential software layer of the fxOS co-existing alongside a general purpose OS.

[0013] Figure 7 is an exemplary view of the fxStore Portal.

[0014] Figure 8 demonstrates a shared fxCloud deployment.

[0015] Figure 9 demonstrates a Zoned Deployment.

[0016] Figure 10 demonstrates another deployment option as applied to cellular networks (especially Long Term Evolution (LTE)).

[0017] Figure 11 shows an example of a signaling flow chart for the fxDevice Commissioning Procedure.

[0018] Figure 12 shows an example procedure for Application Provisioning.

[0019] Figure 13 presents the state machine for the application upgrade process.

[0020] Figures 14A-14C are examples of the Distributed Switch Controller during Upgrade.

[0021] Figure 15 shows how fxVF in the fxCloud and fxDevice.

[0022] Figure 16 demonstrates the logical interfaces between the platform resources and applications.

[0023] Figures 17A and 17B demonstrate example procedures for cloud breathing procedures.

DETAILED DESCRIPTION

[0024] The Distributed Software Defined Network (dSDN) disclosed herein is an architecture that enables secure and flexible programmability across a network with full lifecycle management of services and infrastructure applications (fxDeviceApp). The dSDN also harmonizes application deployment across the network independent of the hardware vendor. As a result, the dSDN simplifies the network deployment lifecycle from concept to design to implementation to decommissioning.

DEFINITIONS, ACRONYMS & ABBREVIATIONS

[0025] The following terms, acronyms, abbreviations and descriptions are explained below and are used throughout the detailed description of the dSDN:

TERM	DESCRIPTION
2G	2 nd Generation Cellular Technology
3G	3 rd Generation Cellular Technology
4G	4 th Generation Cellular Technology
AP	WiFi Access Point
API	Application Programming Interface

AR	Application Repository
ASIC	Application Specification Integrated Circuit
AuC	Authentication Center
BS	Base Station
BSC	Base Station Controller
BTS	Base Station
CDN	Content Distribution Network
CN	Core Network
CNIE	Core Network Internet Edge
CPU	Central Processing Unit
dAP	Distributed Application Package
dApp	Distributed App
dCP	Distributed Content Service
dNS	Distributed Notification Service
DNS	Domain Name System
DPDK	Data Plane Development Kit
DPI	Deep Packet Inspection
dRS	Distributed Resource Service
DSCP	Differentiated Service Code Point (QoS)
E-UTRAN	Evolved UMTS Terrestrial Radio Access Network
EIR	Equipment Identity Register
eNB	Enhanced Node B (4G)
FIB	Flow Information Base
FQDN	Fully Qualified Domain Name
fxApp	Flexible Application, which has a fxDeviceApp and fxCloudApp component. fxDeviceApp and fxCloudApp of one application represent fxApp.
fxDeviceApp	Flexible Application which runs on fxDevice
fxBS	Flexible Base Station that is a BS that is powered by fxOS (an example of an fxDevice)

fxCloud	FleXible Cloud that interacts with fxDevice and on other network elements on the northbound Interface
fxCloudApp	FleXible Cloud Application that is the application that runs on fxCloud and can be associated to one or more fxDeviceApp in fxDevice
fxManager	FleXible Manager that manager the fxOS lifecycle (provisioning, usage, de-provisioning)
fxOS	FleXible Operation System which run on the fxDevice as the OS and firmware
fxSDK:	FleXible Software Development Kit
fxSimulator	FleXible Simulator
fxStore	FleXible Store that presents fxApp to the network
administratorsGERAN	GPRS Edge Radio Access Network
GGSN	Gateway GPRS Support Node (used in core network of 2G/3G systems)uhu
GMSC	Gateway Mobile Switching Center
GPRS	General Packet Radio Service
GPS	Global Positioning System
GTP	GPRS Tunneling Protocol
GW	Gateway
HAL	Hardware Abstraction Layer
HD	High Definition
HLR	Home Location Register
HSS	Home Subscriber Server
IAC	Inter Application Communication

IMS	IP Multimedia Sub-system
IMSI	International Mobile Subscriber Identifier
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
JVM	Java Virtual Machine
LA	Location Area
LAN	Local Area Network
LSP	Label Switching Protocol
M2M	Machine to Machine
MAC	Medium Access Control
MCP	Multi Chip Packaging
MIMO	Multi Input Multi Output
MME	Mobility Management Entity (used in core network of LTE)
MNO	Mobile Operator Network
MPLS	Multi Protocol Label Switching
MSC	Mobile Switching Center
MSISDN	Mobile Station
NAS	Non-Access Stratum
NB	Node B (3G)
NFC	Near Field Communication
NFV	Network Function Virtualization
NOIT	Network Operations & Information Technology; this term network broadly includes carriers, service providers, enterprise networks, and designated/contacted 3 rd party administrators.

OS	Operating System
OTT	Over the Top
P-GW	Packet Gateway
PaaS	Platform-as-a-Service
PBX	Private Branch exchange (telephony)
PDG	Packet Data Gateway
PDN	Packet Data Network
PHY	Physical Layer
PLMN	Public Land Mobile Network
PnP	Plug and Play
PP	Packet Processor
PR	Platform Resources
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RA	Routing Area
RAN	Radio Access Network of cellular networks
RAPI	Resources API
RFID	Radio Frequency Identifier
RNC	Radio Network Controller
S-GW	Serving Gateway
S1-AP	S1 Interface Application Protocol (an LTE protocol between MME and eNodeB)
SaaS	Software-as-a-Software
SDK	Software Development Kit
SDN	Software Defined Network
SGSN	Serving GPRS Support Node (used in core

	network of 2G/3G systems)
SIM	Subscriber Identity Module
SiP	System in a Package
SMS	Short Message Service
SoC	System on a Chip
SON	Self-Optimizing Network
SSDP	Simple Service Discovery Protocol
TA	Target Area
TNE	Test Network Environment
TTM	Time to Market
UMTS	Universal Mobile Telecommunication System
UPnP	Universal Plug and Play
URA	UMTS Routing Area
URI	Uniform Resource Identifier
UTRAN	UMTS Terrestrial Radio Access Network
VLR	Visitor Location Register
VM	Virtual Machine
VPN	Virtual Private Network
WAN	Wide Area Network
WLAN	Wireless Local Area Network
WLAN	Wireless Local Area Network
XMPP	Extensible Messaging and Presence Protocol

[0026] Database. One or more large structured sets of persistent data maintained upon a computer system organized and structured according to a software system defining rules for organization as well as responding to queries to read, write, or modify data as well as provide statistical information regarding the contained data. As used in this disclosure in describing the dSDN, a database may be either a single unified system or a distributed system wherein certain database elements are located upon different systems or servers which may be in different physical locations, acting in harmony to appear as one unified database. Where databases are described, it will be understood by one of ordinary skill in the art that (i) alternative database structures to those described may be readily employed, and (ii) other memory structures besides databases may be readily employed. Any illustrations or descriptions of any sample databases presented herein are illustrative arrangements for stored representations of information. The database formats may include relational databases, object-based models and/or distributed databases which could be used to store and manipulate the data types described herein. Likewise, object methods or behaviors of a database can be used to implement various processes, such as the described herein. In addition, the databases may, in a known manner, be stored locally or remotely from a device which accesses data in such a database.

[0027] The term "determining" and grammatical variants thereof (e.g., to determine a price, determining a value, determine an object which meets a certain criterion) is used in an extremely broad sense. The term "determining" encompasses a wide variety of actions and therefore "determining" can include calculating, computing, processing, deriving, investigating, looking up (e.g., looking up in a table, a database or another data structure), ascertaining and the like. Also, "determining" can include receiving (e.g., receiving information), accessing (e.g., accessing data in a memory) and the like. Also, "determining" can include resolving, selecting, choosing, establishing, and the like. The term "determining" does not imply certainty or absolute precision, and therefore "determining" can include estimating, extrapolating, predicting, guessing and the like. The term "determining" does not imply that mathematical processing must be performed, and does not imply that numerical methods must be used, and does not imply that an algorithm or process is used.

[0028] The functionality and/or the features of a single device that is described may be alternatively embodied by one or more other devices which are described but are not explicitly described as having such functionality/features. Thus, other embodiments need not include the described device itself, but rather can include the one or more other devices which would, in those other embodiments, have such functionality/features.

[0029] Devices that are described as in “communication” with each other or “coupled” to each other need not be in continuous communication with each other or in direct physical contact, unless expressly specified otherwise. On the contrary, such devices need only transmit to each other as necessary or desirable, and may actually refrain from exchanging data most of the time. For example, a machine in communication with or coupled with another machine via the Internet may not transmit data to the other machine for long period of time (e.g. weeks at a time). In addition, devices that are in communication with or coupled with each other may communicate directly or indirectly through one or more intermediaries.

[0030] Although process (or method) steps may be described or claimed in a particular sequential order, such processes may be configured to work in different orders. Further, some steps may be performed simultaneously despite being described or implied as occurring non-simultaneously (e.g., because one step is described after the other step) unless specifically indicated. Moreover, the illustration of a process by its depiction in a drawing does not imply that the illustrated process is exclusive of other variations and modifications thereto, does not imply that the illustrated process or any of its steps are necessary to the embodiment(s), and does not imply that the illustrated process is preferred. Where a process is described in an embodiment the process may operate without any user intervention.

[0031] It will be readily apparent to one of ordinary skill in the art that the various processes of the dSDN described herein may be implemented by, e.g., appropriately programmed general purpose computer(s), special purpose computer(s) and computing device(s). Typically a processor (e.g., one or more microprocessors, one or more microcontrollers, one or more digital signal processors) will receive instructions (e.g., from a memory or like device), and execute those instructions,

thereby performing one or more processes defined by those instructions.

Instructions may be embodied in, e.g., one or more computer programs, one or more scripts.

[0032] A "processor" means one or more microprocessors, central processing units (CPUs), computing devices, controllers, microcontrollers, digital signal processors, or like devices or any combination thereof, regardless of the architecture (e.g., chip-level multiprocessing/multi-core, Reduced Instruction Set Computer (RISC), Complex Instruction Set Computer (CISC), Microprocessor without Interlocked Pipeline Stages, pipelining configuration, or simultaneous multithreading).

[0033] Further, programs that implement methods described herein may be stored and transmitted using a variety of media (e.g., computer readable media) in a number of manners. In some embodiments, hard-wired circuitry or custom hardware may be used in place of, or in combination with, some or all of the software instructions that can implement the processes of various embodiments. Thus, various combinations of hardware and software may be used instead of software only to implement the embodiments.

[0034] The term "non-transitory computer readable medium" in this disclosure refers to any medium, a plurality of the same, or a combination of different media, that participate in providing data (e.g., instructions, data structures) which may be read by a computer, a processor or a like device. Such a medium may take many forms, including but not limited to, non-volatile media, volatile media, and transmission media. Non-volatile media may include, for example, optical or magnetic disks and other persistent memory. Volatile media may include dynamic random access memory (DRAM), which typically constitutes the main memory. Transmission media may include coaxial cables, copper wire and fiber optics, including the wires that comprise a system bus coupled to the processor. Transmission media may include or convey acoustic waves, light waves and electromagnetic emissions, such as those generated during radio frequency (RF) and infrared (IR) data communications. Common forms of non-transitory computer-readable media in which the dSDN may be implemented include, for example, a floppy disk, a flexible disk, hard disk, magnetic tape, any other magnetic medium, a CD-ROM, DVD, any other optical medium, punch cards, paper

tape, any other physical medium with patterns of holes, a Random Access Memory (RAM), a programmable read only memory (PROM), an erasable programmable read only memory (EPROM), a flash electrically erasable programmable read only memory (FLASH-EEPROM), any other memory chip or cartridge, a carrier wave as described hereinafter, or any other medium from which a computer can read.

[0035] Various forms of computer readable media in this disclosure may be involved in carrying data (e.g. sequences of instructions) to a processor. For example, data may be (i) delivered from RAM to a processor; (ii) carried over a wireless transmission medium; (iii) formatted and/or transmitted according to numerous formats, standards or protocols, such as Ethernet (or IEEE 802.3), Bluetooth, and Transmission Control Protocol/Internet Protocol ("TCP/IP"), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), and 2G/3G; and/or (iv) encrypted to ensure privacy or prevent fraud in any of a variety of ways well known in the art.

[0036] Thus in some embodiments in this disclosure a description of a process may be a description of a non-transitory computer-readable medium storing a program for performing the process. The computer readable medium may store (in any appropriate format) those program elements which are appropriate to perform the method.

[0037] In an embodiment, a server computer, network element or centralized authority may not be necessary or desirable. For example, an embodiment may be practiced on one or more devices without a central authority. In such an embodiment, any functions described herein as performed by the server computer or data described as stored on the server computer may instead be performed by or stored on one or more such devices.

[0038] In interpreting the present application (which includes the claims), one of ordinary skill in the art shall refer to the prosecution history of the present application, but not to the prosecution history of any other patent or patent application, regardless of whether there are other patent applications that are considered related to the present application, and regardless of whether there are other patent applications that share a claim of priority with the present application.

[0039] Numerous embodiments are described in the present application, and are presented for illustrative purposes only. The described embodiments are not, and are not intended to be, limiting in any sense. One of ordinary skill in the art will recognize that the disclosed embodiment(s) may be practiced with various modifications and alterations, such as structural, logical, software, and electrical modifications. Although particular features of the disclosed invention(s) may be described with reference to one or more particular embodiments and/or drawings, it should be understood that such features are not limited to usage in the one or more particular embodiments or drawings with reference to which they are described, unless expressly specified otherwise.

[0040] The present disclosure is not a literal description of all embodiments of the invention(s). Also, the present disclosure is not a listing of features of the invention(s) which must be present in all embodiments. A description of an embodiment with several components or features does not imply that all or even any of such components/features are required. On the contrary, a variety of optional components are described to illustrate the wide variety of possible embodiments of the present invention(s).

[0041] The following description has been presented for purposes of illustration and description and is not intended to be exhaustive or to limit the embodiments to the precise form disclosed. Many modifications and variations are possible in light of the teachings disclosed herein.

[0042] The embodiments were chosen and described to explain principles of operation and their practical applications. However, the scope of the invention is to be defined by the claims.

[0043] The major technical reason for inflexibility in network infrastructure has been related mostly to the proprietary hardware and rigid software architecture in the existing network elements (routers, switches, gateways, cellular base-stations, WiFi access points, etc.). With recent advancements in semiconductor device manufacturing, there is no longer a cost barrier to add computing power to many electronics in the market including networking infrastructure. The addition of such compute capabilities would open up new opportunities for programmable platforms in the network and ultimately creating more flexible network architecture

and business models.

[0044] The Distributed Software Defined Network (dSDN) disclosed herein is an end-to-end architecture that enables secure and flexible programmability across a network with full lifecycle management of services and applications (fxApp). The dSDN also harmonizes fxApp deployment across the network independent of the hardware vendor. As a result, the dSDN simplifies the network deployment lifecycle from concept to design to implementation to decommissioning. In this disclosure, the dSDN is applied to the wireless networks as an exemplary embodiment. However, the dSDN is not limited to wireless networks embodiments and it could be applied to many other network types including enterprise, wireline service providers, data centers, and Internet of Things (IoT).

[0045] Figure 1 demonstrates the network architecture of a 4G system 100. (In alternative embodiments, the system and method disclosed may also be implemented in a 2G/3G network as well). In a cellular network, the base station or BS (denoted as BTS in 2G, NodeB or NB in 3G, and eNodeB or eNB in 4G systems) is responsible for termination of a wireless link (air-interface) to the mobile device (also known as the User Equipment (UE)). The BS then transports the user data to the core network and communicates control-signaling messages with the core network. In a typical cellular network, there are thousands of BS's covering nations. Each BS covers an area known as a cell. As the demand for mobile Internet expands, the mobile network operator (MNO) needs to deploy smaller cells so it can reuse the frequency more often.

[0046] A BS is made up of the following main functional blocks: 1) radio frequency (RF) front end; 2) clock; 3) baseband; 4) power manager; and 5) central processing unit (CPU). Some BS's also have a dedicated packet processor (PP) to accelerate packet processing in hardware. BS vendors may also use custom or merchant System-on-a-Chip (SoC) or Multi-Chip-Packaging (MCP) solutions to combine various functions into a single chip (e.g., PP, CPU, and baseband).

[0047] Even though there has been attempts to open up various interfaces in the BS (such as the Open BS Architecture Initiative that defines interfaces between these functional modules in the BS), there has been very little to no efforts to unify the

programmability of the BS itself. As a result, the MNOs suffer from the following difficulties. First, the core network Internet edge (CNIE), Packet Data Gateway (PDG) and the surrounding functions are becoming extremely complicated, non-scalable, and expensive. Second, each MNO needs certain customization and feature sets. Currently, they depend on their vendors for these customizations, which could cost the MNO tremendously both financially and in regards to time-to-market (TTM); hence, hindering innovation. In addition, usually these features are put into standards or in the vendor's feature set, thus eliminating the MNO differentiation against the other MNOs. Third, if the MNO is multi-vendor in their CNIE, coordinating all the vendors to implement the same features is usually a difficult and a time-consuming effort. As a result, more add-on network appliances are introduced into the CNIE which adds to the network management complexity. Fourth, as a BS becomes Internet Protocol (IP) based, there is more visibility into the user traffic types and new innovative opportunities are missed for creative traffic shaping features, backhaul bandwidth optimization, prioritization at radio edge, power management algorithms, etc. Fifth, many features implemented in CNIE present suboptimal performance. For example, the filtering enforcement at CNIE is fundamentally inefficient since the packets have to travel all the way through the expensive air-interface, the backhaul, various other core network elements and transport networks to get to the CNIE. Sixth, the Radio Access Network (RAN) deployments are a very expensive endeavor for MNOs. The current rigid BS designs limit innovation and force the MNOs to undergo major upgrades every few years.

[0048] The problems stated above apply to many different types of networks even though here they are presented in cellular networks as a focus. In the present disclosure, the dSDN exhibits a new paradigm in the software programmability of networks that would address the problems above and enable many more advanced features.

[0049] The dSDN may be located at a network element (or system) 200 which is shown in detail in Figure 2 or in alternative embodiments the functions of the dSDN may be divided among a plurality of network elements (or systems) which are similar in structure to network element 200. Each network element 200 may comprise one or

more system control logic 202 coupled with at least one or a plurality of processor(s) 204, system memory 206, a network interface 208 (including a transceiver 208a), and input/output (I/O) devices 210. The processor(s) 204 may include one or more single-core or multi-core processors. The processor(s) 204 may include any combination of general-purpose processors and dedicated processors (e.g., graphics processors, application processors, baseband processors, etc.). System control logic 202 for one embodiment may include any suitable interface controllers to provide for any suitable interface to at least one of the processor(s) 204 and/or to any suitable device or component in a packet network in communication with system control logic 202. System control logic 202 for one embodiment may include one or more memory controller(s) to provide an interface to system memory 206. System memory 206 may be used to load and store data and/or instructions, for example, for network element 200. System memory 206 for one embodiment may include any suitable volatile memory, such as suitable dynamic random access memory (DRAM), for example. System memory 206 may also include non-volatile memory including one or more tangible, non-transitory computer-readable media used to store data and/or instructions, for example, such as the embodiments described herein with regard to the dSDN. The non-volatile memory may include flash memory, for example, and/or may include any suitable non-volatile storage device(s), such as one or more hard disk drive(s) (HDD(s)), one or more compact disk (CD) drive(s), and/or one or more digital versatile disk (DVD) drive(s). The system memory 206 may include a storage resource physically part of a device on which the network element 200 is installed or it may be accessible by, but not necessarily a part of, the device. For example, the system memory 206 may be accessed over a network via the network interface 208 and/or over Input/Output (I/O) devices 210. Network interface 208 may include a transceiver 208a to provide a radio interface for network element 200 to communicate over one or more network(s) and/or with any other suitable device. Network interface 208 may include any suitable hardware and/or firmware. The network interface 208 may include a plurality of antennas to provide a multiple input, multiple output radio interface. Network interface 208 for one embodiment may include, for example, a wired network adapter, a wireless network adapter, a telephone modem, and/or a wireless modem. For one

embodiment, at least one of the processor(s) 204 may be packaged together with logic for one or more controller(s) of system control logic 202. For one embodiment, at least one of the processor(s) 204 may be integrated on the same die with logic for one or more controller(s) of system control logic 202. In various embodiments, the I/O devices 210 may include user interfaces designed to enable user interaction with the network element or system 200, peripheral component interfaces designed to enable peripheral component interaction with the network element or system 200, and/or sensors designed to determine environmental conditions and/or location information related to the network element or system 200. In various embodiments, the peripheral component interfaces may include, but are not limited to, a non-volatile memory port, a universal serial bus (USB) port, an audio jack, and a power supply interface.

dSDN Architecture

[0050] In the dSDN architecture, the network features are virtualized and may be distributed across separate network elements that cooperate together to create an advanced, programmable, and scalable network. In an alternative embodiment, the network features may be located at a single network element. A high-level overview of a dSDN system 300 is depicted in Figure 3. The dSDN system 300 consists of a flexible network device (fxDevice) 302, a flexible cloud platform (fxCloud) 304, an application management portal (fxManager) 306, and an infrastructure application market place (fxStore) 308. The fxDevice 302 is a network device that is powered by a sandboxing operating system named flexible operating system (fxOS) 302a. The sandboxing operating system ensures each application runs as a dedicated process in sure isolation from the other applications. The fxOS 302a may be built based on an existing sandboxed operating system (OS) (e.g., Android®) by extending several aspects of such an OS with routing/networking layers and supports for operating as the wireless infrastructure. The fxDevice 302 may host several independent and securely isolated applications (on top of fxOS 302a) named here fxDeviceApp 302b.

[0051] In the dSDN system, fxDeviceApp 302b may have a sister app in the backend cloud infrastructure (i.e., flexible cloud platform 304) referenced here as fxCloudApp 304a. The fxCloudApp 304a in the cloud is paired with its fxDeviceApp 302b in the fxDevice 302. The fxCloudApp 304a and the fxDeviceApp 302b

collectively form a distributed application (dApp or fxApp). In this description, when fxDeviceApp is referenced it shall mean any application that may have software components in the fxDevice, fxCloud, or both. In general, an fxApp package may include the following software components:

- fxDeviceApp binary;
- fxCloudApp binary;
- Manifest files; and
- Signatures.

[0052] It is important to note that the fxDeviceApp 302b and fxCloudApp 304a could use any protocol to communicate with each other and there is no need for standardizing this communication allowing for ultimate freedom for the developers. This allows for the system to operate in a loosely coupled autonomous fashion allowing for asynchronous communication in a distributed fashion.

[0053] The fxApps lifecycle is managed via fxManager 306. The fxManager 306 presents a user-friendly portal to the network administrator (admin) to discover, test prior to deployment, provision, and deprovision dApps. Using fxManager 306, the admin may discover new fxApps from the fxStore 308, which presents all the tested and certified vApps as well as showing the supported fxOS version, support hardware platforms, and other information such as reviews and number of commercial deployments by all NOIT customers.

fxOS

[0054] fxDevice 302 is defined as any networking equipment embedded with a special flexible operating system (fxOS) 302a. The purpose of fxOS 302a is to enable a carrier-class programmable platform. The fxOS 302a is configured to do, but is not limited to, the following. First, since fxOS 302a is designed for network equipment, it allows for efficient execution and running all the time. A plurality of power save modes may be implemented to ensure energy saving schemes without hindering the functionality of the fxDevice 302. Second, it enables simultaneous execution of several flexible applications (fxDeviceApp 302b) on the fxDevice 302. Third, it allows for application of a legacy compiled binary or byte-code of another language (for example, Java or Android®) in addition to fxDeviceApps 302b. Fourth, it allows

FastPath processing for data plane packets. The packet forwarding in this case separated from the control plane operations. The FastPath engine allows integration with specialized hardware accelerators or packet processors (PP). The packet forwarding may be implemented with software/kernel enhancements all in software. Another FastPath implementation may use both software/kernel enhancement and hardware packet processors (PP). Fifth, the fxOS 302a is capable of Deep Packet Inspection (DPI) and identifying all the flows and their related protocols, services and present this information in a format useful to application developers. The fxOS 302a can act on the data flows as the directed by the application developer. Sixth, applications are securely isolated from each other and to communicate with them is completely configurable by policies defined by the admin. Seventh, resource utilization of each application is policed such that an application may not be able to exceed its usage. For example, an application is pre-allocated the memory size, cache/storage space, and CPU cycles. Eighth, the applications may be signed with unique certificate security keys. The security keys and certificates may be allocated and/or signed by a certificate authority. The fxDevice 302 may be protected by validating signed applications to run or to install in the device. Ninth, it allows hot upgrade of the software and applications on the platform with little to no interruption to the operational aspect of the platform and its applications. Tenth, the fxOS 302a may boot by using the secure code from the network servers (cloud-booting). This would ensure tamper-proof software foundation for the fxDevice 302. Eleventh, there may be a secure and programmable firewall in the fxOS 302a. This embedded firewall protects against attacks to the fxDevice 302 and network attached to the network. The fxOS 302a firewall may be configured by the developer and it does allow replacing of attack detection algorithms (e.g., man-in-the-middle detection algorithm). The fxOS 302a may allow secure caching of user data, webpages, and media files (video and audio) in the fxDevice 302. The secure connections to the cloud (fxCloud 304) can enable sharing and control of the caching between the fxCloud 304, fxDevice 302, or the rest of the network. Twelfth, the fxOS 302a can support multi-threading and multi-core CPUs. This feature may dynamically distribute the threads to various CPU core without developers assistance.

[0055] The fxOS 302a allows secure connection to the fxCloud 304. This secure connection allows communication between fxDeviceApps 302b in the fxDevice 302 and fxCloudApp 304a in the fxCloud 304. The fxOS 302a controls the access of applications to platform APIs. An application is categorized into an Access Level (AL) based on which the fxOS 302a decides that the application does not exceed its AL and access APIs that it is not authorized. The fxCloud 304 and the fxOS 302a create a virtual fabric (fxVF) for messaging between applications. The actual message can travel directly between two fxDevices or it may traverse the fxCloud 304. The messaging complexity may be abstract for the developer.

[0056] Figure 4 demonstrates an exemplary view of the software layers in the fxOS 302a. Each layer of this software stack is modified and redefined to optimize for embedded networking equipment of wireless and wireline nature. Starting from the bottom of the stack, the kernel also connects to the hardware resources via the device drivers. Examples of such resources are wireless baseband SoC 402, hardware packet processor 404, Wide Area Network (WAN) uplink interface 406, cache and storage 408, and multi-core CPU 410. The OS kernel 412 is enhanced with the FastPath function 414 to accelerate packet processing (by help of hardware features such as Intel's Data Plane Development Kit (DPDK) or pure software enhancements) and other related data path functions. The enhanced kernel with FastPath 412, 414 would enable visibility into the data flows, sniffing the Non-Access Stratum (NAS) signaling (which is the signaling between the UE and the Core Network and the RAN is supposed to be transparent to), policy enforcements, regular packet forwarding functions, collection of flow statistics into Flow Information Base (FIB), and encryption/decryption functions.

[0057] Above the kernel, there are several tools 416, native daemons 418, native libraries 420 and Hardware Abstraction Layers (HAL) 422. These tools abstract out the hardware dependencies for the upper layers and programmers. The Runtime 424 is an embedded virtual machine capable of securely isolating and executing the applications. System Services 426 are a set of services always running and available to the developers (e.g., timing and messaging services).

[0058] fx-Framework Library 428 consists of several Frameworks. The new

frameworks are the library extensions introduced explicitly for the dSDN framework. Each of these frameworks adds a set of methods of (functions) and data structures for the following examples:

Wireless Manager 428a: manipulation, monitoring, and configuration of the wireless interfaces;

System Manager 428b: configuration, provisioning, and changing major settings of the fxDevice 302;

Flow Controller 428c: allows for manipulation of data path, tunneling, switching, and optionally coordinate this activity with fxCloud 304;

Energy Management 428d: enables fine-grained control over various elements in the fxDevice 302 that could be moved into various power states, for example: ON, OFF, SLEEP, SUSPEND;

Big Data Manager 428e: manipulation, processing, and organization of data collected from various elements. This framework could enable close coordination between the fxDevice 302 and the fxCloud 304;

Content Manager 428f: for data sharing (database sharing) between the applications within the fxDevice 302 or the fxCloud 304 and between applications in fxDevice 302 and fxCloud 304. The Content Manager 428f may use URI to address the contents to be shared. The Content Manager 428f allows access to the application data according to the policy settings and permissions;

Policy Manager 428g: responsible for execution and implementation of policies set up by the admin. The application developers could use this framework to perform queries about the permissions, limitations, and rules;

Security Manager 428h: allows for access to the security protocol libraries and rewriting some of security algorithms such as the man-in-the-middle detection algorithm;

General Framework: general compute and logic building that may be

inherited from existing general OS frameworks.

[0059] Using the frameworks, there are potentially at least two types of application types that are possible. First, the System Native Applications 430 that are provided as the initial application load into the platform. These applications could be used by other applications by links or API. Second, the fxDeviceApps 302b that are written by third party developers or the NOIT.

[0060] Figure 5 further details the FastPath 414 architecture. In this approach, the FastPath 414 is divided into the Virtual Switch (data-plane) 502 and the Switch Controller (control-plane) 504. Such separation makes possible flexible deployment wherein the function of the Switch Controller 504 could move to the fxCloud 304 by an admin decision or by the dSDN system intelligence for example in the case of failure, redundancy, stateful reboot, or Hot Upgrade. The Virtual Switch 502 may include several functions and may interact with the Switch Controller 504 in the following exemplary ways:

Firewall 502a: implements the policies given to it by the firewall logic 504a in the fxOS Daemons.

Flow/NAS Discover 502b: continuously monitors data packets and discovers new flows and NAS signaling. It would then report it to the DPI Logic 504b where the flow intelligence resides and matching to meta-data happens. DPI Logic 504b in turn updates the Flow Information Base Information (FIB) 502c of the Virtual Switch 502.

FastPath & DPI Processing 502d: forwards, routes packets, and performs DPI functions as instructed by the FIB 502c. It also collects statistics of packets and reports them to the Monitoring Logic 504c.

Policy Enforcement 502e: this function enforces various policies on the traffic such as QoS marking according to the policies received from the Policy Logic 504d.

Shaper 502f: this function could shape (queue) the traffic according to the available bandwidth on the uplink or WAN interface.

Virtual Fabric (fxVF) 504e: enables transparent switching of application and system messages of a dApp between the fxCloud 304 and the fxDevice 302 and between different dApps. The fxVF 504e is an abstraction layer that hides most of the complexities of messaging from the developers. The fxVF 504e uses the policies and firewall rules to enforce security and policies.

[0061] The fxOS 302a is mostly used for networking applications. There are some potential use cases where there is a need for a general purpose OS to run the legacy software applications with no need of recompilation. An example of a double OS situation may be where a digital signage (using a general purpose OS such as Android®) in a shopping mall also acts as a smart small-cell (using the fxOS 302a). In such a solution, any existing Android® application (for example) could be loaded in the fxDevice 302 and in parallel networking applications (fxDeviceApps 302b) could run on the same fxDevice 302.

[0062] Figure 6 presents a potential software layer of the fxOS 302a co-existing alongside a General Purpose OS 602. Another implementation may be a standalone fxOS without the company of another general OS. It is important to note that the shown co-existence allows reuse of the kernel so there would be no need to re-port the drivers of hardware resources twice.

fxCloud

[0063] The fxCloud 304 is an integral part of the dSDN framework. The fxCloud 304 connects to various parts of the fxDevice 302 to form a single virtual view of the system. Examples of the main fxCloud 304 responsibilities include the following. First, it interacts and manages all applications, firmware, and fxOS 302a in the fxDevice 302. Second, it secures isolation environments for distributed apps. Third, it directs the Virtual Machine lifecycle management including load-linked VM creations and destruction (Cloud Breathing). Fourth, the fxCloud 304 executes instructions defined by the fxManager 306. Fifth, it implements uniform policy (including security) distribution and execution across dSDN 300 (including the fxDevice 302, fxDeviceApps 302b, fxCloudApps 304a, and dApps). Sixth, Plug-and-Play commissioning of the fxDevice 302 introduction

and network expansion. Seventh, Distributed Resource Service (dRS) by which distributed applications can seamlessly communicate and message to each other using published APIs or proprietary methods within the pre-defined policies. Eighth, security violation discovery and alert system. Ninth, translation and/or exposure of Resources APIs (RAPI) to the systems outside the dSDN 300 within pre-defined policies. Tenth, fxCloud 304 in coordination with the fxDevice 302 creates a Distributed Notification Service (dNS) across the dSDN 300 by which the applications could be notified of an event to wakeup and/or respond to the event. Eleventh, fxCloud 304 in coordination with the fxDevice 302 creates a Distributed Content Management Service (dCMP) which provides a virtualized and distributed database system for applications to share application-specific or system-specific information with the pre-defined policies. Twelfth, the Switch Controller 504 function in the fxCloud 304 could take control of the controller function of the fxOS 302a in the fxDevice 302. This would allow controller switching from local to remote and back. Examples of such a configuration is a temporary reason where the fxOS Switch Controller 504 may not be available during reboot or software upgrade.

[0064] In the discussion below, these services and features are expanded upon.

fxDeviceApp-0 & fxCloudApp-0

[0065] The fxDevice 302 and fxCloud 304 have embedded System Applications categorized as fxDeviceApp-0 and fxCloudApp-0, respectively. The fxDeviceApp-0 is responsible for all default and core functional capabilities of the fxDevice 302 as listed below:

- Firmware of the fxDevice;

- Default communication protocols (e.g. LTE S1-AP, baseband software, security protocols, GTP, DNS, tunneling protocols);

- Message communication protocol between the fxDevice and fxCloud;

- Initial fxDevice settings;

Boot Loader;

fxDevice X.509 digital certificate;

OS and Kernel upgrades;

Upgrade and commissioning agents for the fxDeviceApp-0 upgrades and related procedures;

Establishing and initiating the message communication protocol between the fxDevice and fxCloud;

General fxDeviceApp install and upgrades;

Access to fxDevice hardware and software information.

The fxCloudApp-0 is responsible for all default and core functional capabilities of the fxCloud 304 such as:

Upgrade and commissioning agents for the fxCloudApp-0 upgrades and related procedures;

Hypervisor upgrades;

Virtual Machine lifecycle management (e.g. creation, suspension, destruction);

fxCloud X.509 digital certificate management;

OS and kernel upgrades;

General fxCloudApp install and upgrades;

Default communication protocols (e.g. security protocols, DNS, tunneling protocols).

Each software component can be managed and updated individually. To simplify the management of these software components, each software components can be sub-numbered such as fxDeviceApp-0.1, fxDeviceApp-0.2, fxCloudApp-0.1, fxCloudApp-0.2, etc.

fxManager

[0066] The network administrator may use the fxManager 306 to control much of the dSDN system 300. The fxManager portal could use HTML5, for example, as

a frontend technology. The major functions of the fxManager 306 may include the following.

fxDevice Management:

Commissioning (plug-and-play), de-commissioning,
firmware/OS upgrading/downgrading;

Suspend/resume functions;

Unification of zones and partitions for example in case of network
merger;

Detailed management of fxDevices (remote secure login) where the
administrator may zoom into a particular or a group of fxDevices to
monitor and set management alarms;

Security policy setting.

Application lifecycle management: fxManager 306 may work, coordinate,
and/or perform these tasks in conjunctions with fxCloud 304 for:

Provisioning, de-provisioning, upgrade/downgrade applications.

Some applications may only have a fxDevice component (Device-
Centric Apps), may only have fxCloud component (Cloud-Centric
Apps), or may have both fxDevice and fxCloud components (Hybrid
Apps);

Creating a Test Network Environment (TNE) where the administrator
can test certain configuration and applications without impacting the
production networks;

Uploading applications developed by the NOIT or their partners into
the Application Repository (AR). The AR is placeholder where the
application packages are downloaded and stored for testing and
verification prior to installation into the live dSDN system. An
application could have several components (e.g. fxDeviceApp
binaries, fxCloudApp signatures, manifest files, signatures) bundled
together to form the Distributed Application Package (dAP);

Browsing through the certified applications in the fxStore and downloading them to the AR;

Application license accounting services by which a secure and accurate accounting of the installed applications are performed regularly. This inventory management function allows the administrator and the 3rd party ISV to account for live and active instances of the software in the network;

Application review tool where the network admin could use to review feedbacks and comments of other NOIT (maybe anonymous reviews) and could input his/her reviews for others (maybe anonymous reviews).

fxCloud Management:

Zoning and partitioning the network for administrative purposes. Zones and partitions could optionally put into different Virtual Machine (VM);

VM load management and Cloud Breathing policies;

The configuration conflict resolutions. Some configurations applied to the resources may conflict with each other (e.g., one firewall rule may state drop Netflix packets explicitly and another rule may state allowing Netflix explicitly). The fxCloud resource manager could monitor these configurations and discover the conflicts and signal those to the network administrator.

Security Management:

Security policy setting;

Inter-App communication setting;

Security of communication between fxDevice and fxCloud;

API Access Level (AL) definitions and (re-)assignment to the applications (permissions);

Risk Analysis of the applications;

Certificate and signature verification of the applications;

Content sharing between applications and associated policies.

[0067] An fxManager Portal per the above description may have an “Account” button which can be used to create admin users and their privileges. The fxManager Portal could also include a geographical map illustrating locations of fxDevices and their status. The fxManager 306 functions could be integrated into other network management tools. The fxManager 306 could potentially build the inventory of the network devices (fxDevices) showing all the available devices and statistics. As described above, the network administrator could optionally procure the applications a third party hosted application store (fxStore). The fxStore 308 could potentially categorize the applications several groups (as shown in Figure 7 which is an example view of the fxStore portal). The fxStore 308 could also show the reviews of the advertised applications. In order to maintain quality, the third party fxStore 308 may perform rigorous testing of the applications and accompany those results with the advertised application.

fxSDK

[0068] The flexible Software Development Kit (fxSDK) may include a development environment and other tools to facilitate development, testing, debugging and verifications of applications for dSDN environments. The fxSDK is unique in several aspects exemplified as follows. First, since the dSDN applications may have a device component (fxDevice 302) and cloud component (fxCloud 304), the fxSDK allows the developer to develop the components together to simplify the development and testing. Second, the dRMS offers various system level APIs with remote accessibility. In other words, the APIs in the fxDevice 302 could be accessed via the applications in the fxCloud (fxCloudApps) and vice versa. The fxSDK simplifies the usage system created APIs and application created APIs. Third, it is essential for the dSDN to ensure quality and security of applications in the network. The fxSDK may be accompanied with an extensive Risk Analysis Utility (RAU) which verifies all the APIs that are being used by the application and based on its potential danger to the

network, it would show the risk analysis and may make specific suggestions to reduce the risk. Once completed, the risk analysis result is included in the dAP for posting to the fxStore and consumed by the fxManager user (the admin). Fourth, the fxSDK would also ensure that the applications do not exceed their planned memory and resource usage. Fifth, the Integrated Development Environment (IDE) may provide various tools to actively demonstrate errors, defined APIs, security dangers, and excessive resource usage. Sixth, the IDE could also provide a flexible Simulator (fxSimulator) for the developer test the application in a network setup in presence of other network elements.

Deployment Examples

[0069] The dSDN 300 offers flexible deployment options. In this section, a few exemplary embodiments are presented.

[0070] Figure 8 demonstrates a shared cloud deployment where several NOITs (802, 804, 806) share an fxCloud 808. In order to ensure complete isolations, each NOIT may be assigned a separate Virtual Machine (VM) 802a, 804a, 806a. A good example of this deployment option may be when multiple service providers outsource their fxCloud deployment to a third party vendor that offers a SaaS/PaaS solution. It is important to note that in this option, each NOIT should have its own secure instance of the whole system. This option could potentially create a full outsourcing model for network operations including possibilities of seamless merging of networks of two or more NOITs.

[0071] Another deployment option may be a Zoned Deployment as shown in Figure 9. In this option, a large NOIT may partition their network into a plurality of zones (Zone #1, Zone #2, ... Zone #n) for administrative, software compatibility grouping, or other reason. For example, it is possible that in a large network deployment, there would be different versions of fxOS with varying capabilities in the network (the older hardware may not support newer fxOS version). In this case, the service provider may decide to group the fxDevices per fxOS versions for management simplifications.

[0072] Figure 10 is another embodiment deployed in a Programmable & Virtualized Cellular Network. In this example, the dSDN is applied to the cellular

networks (e.g., LTE). As shown, the fxDevice 1002 here is the LTE eNB (4G base-station) and the fxCloud 1004 hosts the LTE core network (EPC) functions such as MME, S-GW, and P-GW in separate VMs. Within each EPC function, new features could be added using the dSDN framework. For example, a new application to optimize signaling for Machine-2-Machine (M2M) devices could be loaded into the fxDevice 1002 and the MME function in the fxCloud 1004.

PRINCIPAL PROCEDURES & SERVICES

[0073] The dSDN framework could offer extensive services and capabilities that would simplify the programmability of the network. In this section below, a set of main procedures and services are presented as further exemplary embodiments.

fxDevice Commissioning Provisioning

[0074] Figure 11 illustrates a signaling flow chart for a fxDevice Plug-and-Play Commissioning Procedure. This procedure enables fxDevice commissioning and initial setup to provide a seamless and Plug-and-Play (PnP) deployment. The fxDevice relies on the fxDeviceApp-0 and the fxCloudApp-0 to connect to the backend management system and perform the commissioning procedure. In step 1101, the fxDevice 1120 tries to discover the fxManager 1130 using the fxManager Fully Qualified Domain Name (FQDN). The fxDevice 1120 is configured to always look for the same FQDN. If the NOIT has a private cloud deployment, the DNS server in the NOIT will be configured to point to its own fxManager IP address. If the cloud is shared, the NOIT will configure their DNS server to point to the shared cloud IP address. In step 1102, the fxDevice 1120 receives the IP address of the fxManager 1130. In step 1103, the mutual authentication may be performed where the fxDevice 1120 authenticates the fxManager 1130 and vice versa. In step 1104, a secure tunnel may be created between the fxDevice 1120 and the fxManager 1130. In step 1105, the fxDevice 1120 may optionally request for the latest firmware/OS version. In this phase, the fxDevice 1120 informs the fxManager 1130 of its hardware information (e.g. vendor, model number, CPU model/speed, memory/cache size) and software information (e.g., current firmware version, current OS version, fxDeviceApp-0 version package stating versions of fxDeviceApp-0 components). In step 1106, the fxManager 1120 may send the latest firmware/OS version (or point

the fxDevice to the right URL to download the latest load). In step 1107, if a new firmware/OS load is downloaded and verified, the fxDevice 1120 installs it. In step 1108, the fxDevice 1120 requests the default settings and the default application package (the initial applications that the NOIT admin would like to install in fxDevice 1120 prior to other applications). In step 1109, the fxManager 1130 prepares the fxCloud 1140 for the new fxDevice 1120 integration into the network. In step 1110, once completed, the fxCloud 1140 informs the fxManager 1130 of its readiness. In step 1111, the fxManager 1120 sends all the default settings and the default application package to the fxDevice 1120. In step 1112, the fxDevice 1120 then sets up a secure connection to the fxCloud 1140 (more precisely the fxCloudApp-0). In step 1113, a commissioning completion message is set from the fxCloud 1140 to the fxManager 1130. In step 1114, the fxManager 1130 signal to the fxDevice 1120 the completion of the commissioning and starts th regular operation of the fxDevice 1120. At this phase, fxManager 1130 can optionally modify the settings in the security connections between fxDeviceApp-0 and fx-CloudApp-0 and between fxDeviceApp-0 and fxManager 1130.

Application Provisioning Procedure

[0075] The Application Provisioning Procedure enables provisioning and de-provisioning of applications across the dSDN system. For simplicity, the term provisioning in this disclosure is used to present all similar procedures of provisioning and de-provisioning. The application provisioning procedures are usually triggered by the network administrator and are orchestrated by the fxManager, which works in collaboration with the fxDeviceApp-0 and fxCloudApp-0.

[0076] Figure 12 shows an example procedure for Application (dApp) Provisioning. In step 1201, the network admin identifies the applications that would need to be installed in the dSDN system. These applications are already downloaded (from the fxStore or other sources) into the Application Repository (AR). Prior to installation in the live network, the authorized network admin 1220 has probably performed rigorous testing of the application in the test network. In step 1202, the fxManager 1230 performs a detailed analysis on the potential risks that this application may

create on various parts of the network and other applications. The analysis tool uses the secure manifest file and other information to discover, for example, all the APIs used by the application, the required access-level authorization level for each of those APIs, requirements on the fxVF (inter-app, intra-app communication needs), and usage of platform resources including conflict discovery and resolutions. In step 1203, the admin defines the deployment scope that the application would be applied. Examples of deployment scopes could be a given zip code, a city, an administrative domain (zone), a shopping mall, an office building, or manual handpicking of sites or fxDevices 1240. The fxManager 1230 verifies compatibility of the OS version and resources requirements of the application and the fxDevices 1240. If the fxManager 1230 discovers incompatibility, it informs the admin and request adjustment to the deployment scope or proposes upgrading incompatible fxDevice if possible. In step 1204, the admin 1220 initiates the installation process. In step 1205, the fxManager 1230 unpacks the dApp and if there is fxDeviceApp component, it would prepare it for submission to the fxDeviceApp-0 of fxDevices in the deployment scope. In step 1206, installation commands are sent to the fxDeviceApp-0s in a secure connection already set up as part of the fxDevice Commissioning. In step 1207, the fxDevice 1240 verifies the fxDeviceApp package and performs necessary integrity checks of the received software package. Once verified, the fxDeviceApp is installed and re-verified. In step 1208, the completion of successful install is sent to the fxManager 1230 by the fxDevice 1240. In step 1209, the fxManager 1230 prepares the fxCloudApp component of the dApp (if any). In step 1210, installation commands are sent to the fxCloudApp-0s in an existing secure connection. In step 1211, the fxCloud 1250 verifies the fxCloudApp package and performs necessary integrity checks of the received software package. Once verified, the fxCloudApp is installed and re-verified. In step 1212, the completion of successful install is sent to the fxManager 1230 by the fxCloud 1250. In step 1213, the fxManager 1230 informs the admin 1220 of the successful installation process.

Hot Upgrade Procedure

[0077] The Hot Upgrade refers to a procedure by which the software upgrades

on the system have no or minimal implication on the functionalities offered by the software component subject to the upgrade process. Herein are presented two types of software upgrades. For simplicity, the use of the term upgraded in this disclosure represents both upgrade and downgrade since they both use identical processes. First, upgrade of applications on the fxDevice (i.e., fxDeviceApp) and fxCloud (i.e., fxCloudApp). Second, upgrade of core functions in the fxDevice (aka fxDeviceApp-0) or fxCloud (aka fxCloudApp-0).

[0078] The upgrade procedures for fxDevice and fxCloud are similar. Here, the focus is on the fxDevice upgrade process since it is technically more challenging due to stricter resource limitations in the fxDevice.

General Application Upgrade

[0079] The applications could be upgraded automatically or manually by the network admin. In either case, the installation of the upgrade follows a similar procedure as the Application Provisioning Procedure. Figure 13 presents the state of the machine for the application upgrade process. In state 1301, the old version of the application is still running. In Load state 1302: the new version of the application is downloaded in the local storage while the old version is still running. In Install state 1303: the new version is installed (in the memory) while the old version is still running. In Run state 1304: the new version is activated taking charge of all the related data and application state and the old version is deactivated while still remaining in the local storage. In Commit state 1305: the old version is fully removed after ensuring the new version is running properly as expected.

fxDeviceApp-0 Upgrade

[0080] The fxDeviceApp-0 is a collection of software components that perform the core functionalities of the fxDevice. As a result, this hot upgrade is quite challenging. The most important thing is to ensure that major functionalities of the fxDevice (such as packet forwarding) remain

intact during the upgrade process. The fxDeviceApp-0 upgrades may be categorized as:

- No OS Kernel upgrade; or
- OS Kernel upgrade.

No Kernel Upgrade

[0081] As described earlier, the packet forwarding function could be broken into the Virtual Switch and the Switch Controller. In order to maintain, the packet forwarding function, the Switch Controller function could be performed by another device or a second processor in the same device while the fxDevice is being upgraded. Figures 14A-14C demonstrate a few examples of distributed Switch Controller function during the upgrade. In some cases, it may be possible for the fxCloud to take over the Switch Controller function (Figure 14A), or a neighboring fxDevice (Figure 14B), or second CPU in the same fxDevice (Figure 14C). The actual software upgrade procedure would be similar to Application Provisioning Procedure and the state machines are the same as the one shown in Figure 13.

Kernel Upgrade

[0082] In this case, the packet forwarding process is mostly unavailable. Therefore, one potential solution might be for the fxDevice to redirect the entire bit stream to a neighboring fxDevice. In other words, the fxDevice would have just a bare minimum routing function working and the rest of the function would be performed by a neighboring fxDevice.

[0083] All the other upgrade procedures and state machines are similar to the ones performed for the No Kernel Upgrade process.

Virtual Fabric Service

[0084] The Virtual Fabric (fxVF) provides an abstraction layer for application to communicate with each other whether they are in the fxDevice or fxCloud. Various frameworks and services may use the fxVF service. Figure 15 illustrates fxVF 1502a, 1503a, 1504a in the fxDevices 1502 and 1503 and fxCloud 1504. The fxVF 1502a,

1503a, 1504a may use Extensible Messaging and Presence Protocol (XMPP) for this messaging as the default protocol. It is important that the developers may use their own communication protocols between the fxDeviceApps 1502b, 1503b and the associated fxCloudApp 1504b. fxVF 1502a, 1503a, 1504a provide a secure routing mechanism.

Intra-App Messaging

[0085] This is an example of where one application in the fxDevice communicates with the same instance of the app in another instance of the same application in another fxDevice. The actual messages could go directly between the fxDevice or via the fxCloud. As an example, in the case of mobile networks, this messaging could be used to transfer user specific context from one eNB to another as a user hands off to a new eNB. In LTE, Private Messages on X2 interface could be used for messaging between the eNBs that act as the fxDevices.

Inter-App Messaging

[0086] In some cases, different applications may need to communicate with each other via their published APIs. In this case, the security policies set up by the network administrator determines which applications could communicate with each other for what purpose. The fxVF follows the security policies determined by the network administrator for inter-application communications.

distributed Resources Service (dRS)

[0087] The resources could be platform resources or APIs offered by the applications. The fxCloud and fxDevice resources could include (as examples):

- Firewall;
- Data and statistics;
- Storage (usually abundant at fxCloud);
- Compute (usually abundant at fxCloud);
- Load evaluator;
- General settings;

Routing engine (usually relevant to the fxDevice);
Virtual Machine master controller (usually relevant to the fxCloud);
Power controller (usually relevant to the fxDevice); and
Wireless engine (usually relevant to the fxDevice).

[0088] An app (fxDeviceApp or fxCloudApp) could expose APIs to be used by the other apps. The inter-app communication is enabled by the fxVF where the policy and security provisions are enforced. The APIs exposed may be RESTful (representational state transfer) and could travel across physical network elements. Since the fxManager defines fxVF policies, the administrator could ultimately specify which APIs between which apps could communicate with each other. Figure 16 demonstrates the logical interfaces between the platform resources and applications. As shown in Figure 16, the distributed Resources Service (dRS) 1602, 1603 comprises software agents residing in the fxDevice 1604 and the fxCloud 1606. These dRS agents manage the access to the platform resolutions (including potential configuration conflict resolution) as well as facilitating inter-app APIs. The dRS 1602, 1603 allows or disallows access to platform resource or inter-app communication according to the policies defined by the network administrator using the fxManager. In summary, the dRS 1602, 1603 provides services to application developers for:

Exposing APIs to other applications;
Configuring and managing platform resource;
Policy enforcement and authorization of applications access to platform resource and other app's APIs; and
Policy conflict resolution.

distributed Content Service(dCS)

[0089] The distributed Content Service (dCS) allows the developers to seamlessly store and share the contents generated by one application with other applications and its associated application in the cloud. The dCS simplifies access to the data and brings in storage virtualization to the applications. In other words, the developers no longer would need to know where the data is actually stored (in

the cloud or on the device) and would be able to access them easily. The dCS implementation may use Virtual Fabric (fxVF) and distributed Resources Service (dRS).

distributed Notification Service (dNS)

[0090] The distributed Notification Service (dNS) is another potential tool for developers that could wake or ping an application when a particular event has occurred. For example, a load monitoring application could be notified when the CPU load on a particular fxDevice (or a target area) exceeds a certain threshold. In turn, such an exemplary application could make smart decisions on reducing the load on the CPU by forcing handoffs of users to neighboring cells (i.e. fxDevices). The dCS implementation may use Virtual Fabric (fxVF), distributed Resources Service (dRS) and distributed Content Service (dCS).

Cloud Breathing Procedures

[0091] In general, resources (compute, storage) at the cloud are more abundant. However, software licensing costs and other limitation may require smart management of resources. The Cloud Breathing, here, is defined as a mechanism where the cloud resources are automatically expanded as load increases on the system or reduced as the load decreases. This creates an automatic elasticity in the cloud dimensions. Figures 17A and 17B demonstrate procedures for the cloud breathing. Figure 17A is expansion and Figure 17B is reduction. The Load Controller in the dRS 1602, 1603 could be used to monitor the load (step 1702) on the existing VMs (e.g. CPU or memory utilization loads). The VM Master of the fxCloudApp-0 1608 could effectively act on the decisions made by the dRS's Load Controller. Again, the network administrator via the fxManager defines the policies and thresholds for such decisions.

Security Aspects

[0092] The security aspects of this solution are of outmost importance in order to ensure quality in the product networks.

Identity

[0093] To create a security model, the dSDN network elements should have unique identities. The following identities may be defined:

fxDevice Identity (DID): this identity is unique globally and may be allocated at manufacturing and included in the X.509 digital certificate of the fxDevice;

fxCloud Identity (CID): this identity is unique to the NOIT domain and may be allocated by the network administrator and included in the X.509 digital certificate of the fxCloud;

fxDeviceApp Identity (DAID): this identity may be globally unique and may be allocated by the fxSDK at the point of code creation by a globally accessible server;

fxCloudApp Identity (CAID): this identity may be globally unique and may be allocated by the fxSDK at the point of code creation by a globally accessible server;

dApp Identity (AID): This identity may be globally unique and may be constructed by concatenation of DAID and CAID together;

Application Developer Identity (ADID): this is a globally unique identity allocated by a globally accessible server and may be included in the developer's X.509 digital certificate and is used to sign the final developed applications.

[0094] For addressability purposes, the identities may be presented in a URI format using the FQDN of the NOIT.

Access Level

[0095] The applications are given different access levels. The AL is used by the dRS to determine which APIs or class of APIs an application can access (e.g., a fxDeviceApp running on fxDevice should not be able normally to reboot the fxDevice). The required AL is generated by the fxSDK and included in the manifest files. It may also be published in the fxStore for that give application. A preset of ALs could be defined to categorize the applications security risks.

Software Security Verification

[0096] It is important for the target network element to verify the authenticity and integrity loaded software prior to install. The uniquely defined security keys of the application developers sign the applications. The following rules may be followed to ensure software security verification:

Only the verified OS/Firmware software can install on verified hardware;

Only the verified OS/Firmware software can run on verified hardware (continuous verification of essential parts of the software);

Only the verified fxDeviceApp software can install on verified hardware;

Only the verified fxDeviceApp software can run on verified hardware (continuous verification of essential parts of the software).

[0097] Each fxDeviceApp is accompanied by a manifest that is generated by the Integrated Device Electronics (IDE) at the time of compilation of the fxDeviceApp. The manifest file specifies which libraries and frameworks the fxDeviceApp uses. The fxManager uses this information to determine the security risk of the fxDeviceApp as well as the required Access Level (AL) to run this fxDeviceApp. In order to ensure that manifest file is actually genuine manifestation of the fxDeviceApp and its integrity remains intact, a hashing algorithm could be used to generate a signature. An example is shown below:

Signature = HMAC-SHA256(K, Message);

where

Message = fxDeviceApp + Manifest

K = shared secret key between fxStore and fxManager.

[0098] The signature is generated by the IDE/fxSDK at the compile/build phase and is packaged with application binary and the manifest file. Once the distributed application package (dAP) is downloaded into the fxManager (Application Repository), the components of the signature, application binary, and manifest file are unpackaged. The fxManager then uses the same hashing algorithm to calculate

the signature as above using the pre-shared key (K). If the calculated signature and the unpackaged signature match, it would prove the authenticity of the manifest file and the integrity of both manifest file and the fxDeviceApp.

[0099] Code Generation Process (Compilation):

fxDeviceApp compiled → Manifest file generation → Signature

calculation → Create fxDeviceApp Package

[0100] Install Process (Consumption):

Un-package fxDeviceApp → Signature calculation → Signature comparison

[0101] This model works if the key K can be shared with two trusted parties (fxManager and fxStore). The manifest file that is generated by the fxSDK shall be secured by integrity checks to ensure it remains intact throughout the transaction (i.e. from compilation to consumption).

Communication Security

[0102] Security mechanisms built into the fxDeviceApp-0 and fxCloudApp-0 forces the fxDevice to only use the configured fxCloud servers for Software Security Verification, fxDeviceApp downloads, and fxDeviceApp-fxCloud communication. Optionally, the fxDeviceApp-fxCloud communication can be customized per application requirements. One implementation of this interface could use SPDY Protocol or per-application VPN.

[0103] For the purpose of inter-App communication, an Inter-App Communication (IAC) policy template is applied to an fxDeviceApp that defined the communication policies between the fxDeviceApps and fxCloudApps. The network administrator may use one of the pre-configured IAC policy templates (exemplified below):

Isolated: this type of applications cannot communicate with any other application in the same fxDevice and does not have any associated fxCloudApp;

Isolated-Extended: this type of fxDeviceApps cannot communicate with any other fxDeviceApps in the same fxDevice but could communicate with its associated fxCloudApp;

Private: a private fxDeviceApp in one fxDevice could communicate with same private fxDeviceApps in other fxDevice but does not have any associated fxCloudApp;

Private-Extended: a Private fxDeviceApps in one fxDevice could communicate with same private fxDeviceApp in other fxDevice and has its associated fxCloudApp;

Community: a group of fxDeviceApps that belong to the same community can communicate with each other;

Promiscuous: a Promiscuous app could communicate with any other Promiscuous application and Community application;

Custom: the network administrator could create custom IAC Policy templates and could include (as examples):

Template name;

Inherited pre-configured template if any;

The protocols allowed to use for communication;

The maximum data rate allowed for inter-app communication between a pair of fxDeviceApps or between an fxDeviceApps and an fxCloudApp;

Policies related to the other fxDeviceApps in the same fxDevice, in other fxDevice, associated fxCloudApp and unassociated fxCloudApps;

Policies related to direct fxDeviceApp to fxDeviceApp communication or relayed via fxCloud communication.

Secure Boot

[0104] The secure boot refers to a capability where the main boot code is in the fxCloud with the following exemplary procedure:

The Boot Loader (BL) in the fxDeviceApp-0 of the fxDevice looks for a particular DNS (DNSSEC) name of the fxCloud. The network administrator should define the DNS entry in their network. If there is a private fxCloud, the resolved domain name points to the fxCloud. If using shared cloud, the resolved

domain name points to the cloud point of presence;

A secure tunnel (TLS) is created between the BL in fxDevice and the fxCloud using pre-burned X.509 certificate;

BL identify itself to the fxCloud and include System Information;

fxCloud determines the appropriate boot file and points the BL to the exact address of the boot file in the fxCloud;

BL downloads the correct boot file;

BL runs Software Security Verification;

BL reboots the fxDevice and the system will be ready for operation.

Frameworks

[0105] The following describes an example of the API Framework for the dSDN. Some APIs are purely local to the fxDevice or the fxCloud and some may be extended from the fxDevice all the way to the fxCloud using dRS.

General Framework

[0106] This framework refers to general libraries and APIs inherited from the legacy OS. An example of the legacy OS may be Embedded Android®. This framework allows for general processing and may be used for algorithmic applications.

Wireless Framework

[0107] The Wireless Framework adds a set up functions related to managing and controlling the wireless module. Table 1 highlights some examples of methods/functions that may be available in the Wireless Framework.

Table 1: Wireless Framework	
Method	Description
discoverNeighbors	Discovers wireless neighbors and returns their identities
retrieveNeighborInfo	Retrieves detail information of neighboring BS/AP information. This method may transparently call cloud servers to gather more information
measureInterference	Measures wireless interference observed on a frequency or a set of frequency channels
setWirelessConfig	Sets various parameters in the wireless module such as power, frequency channels, Multiple Input/Multiple Output (MIMO) antenna configuration, etc.
definePHYReceiverAlgorithm	Defines the physical layer receiver algorithm
connectedDevice	Returns details about the connected mobile devices (length of connection, data tx/rx) to a given wireless interface (channel, band, sector)
forceOffload	Offloads connected mobile devices to other access technologies (e.g. from cellular to WiFi)
homeAreaNetworking	Control of home automation wireless technologies such as ZigBee or Z-Wave
setNeighborCells	Sets neighboring cells information
forceHandoff	Handoffs connected mobile devices to the same access technology but different channel or frequency
topMovers	Identifies the mobile devices with highest degree of mobility

positionDevice	Accurate positioning of mobile devices which may include geo-fencing data
borrowSpectrum	Allows one BS to borrow spectrum from another
configureMACScheduler	Configures the MAC scheduler (for example prioritize a particular user)
loadBalance	Enables load balancing across radio channels
defineMACScheduler	Defines the MAC scheduler algorithm

Security Framework

[0108] The Security Framework allows the developers to use a specialized security functions/methods. Some of these new methods may use the legacy OS frameworks. Table 2 highlights some examples of methods/functions that may be available in the Security Framework.

Table 2: Security Framework

Method	Description
setDOSDetect	Detects DOS attacks on user plane as requested
configureFirewall	Provides firewall functions such as traffic filtering, permissions (this may use dRS)
defineDOSDetectAlgorithm	Allows replacing and redefining the DOS algorithm
encryptTraffic	Encrypts the content of a message or a class of traffic as requested
authenticateUser	Authenticate users as requested
integrityCheckContent	Verifies authenticity of a message using its checksum information
configuresIPS	Configures IPS functions on the user plane

FastPath Framework

[0109] The FastPath Framework allows the developers to identify and manipulate the data path with a DPI capability. Table 3 highlights some

examples of methods/functions that may be available in the FastPath framework.

Table 3: FastPath Framework	
Method	Description
matchTraffic	Identifies and matches the traffic type requested by the developer
detectCongestion	Detects if there is congestion on the data path
identifyTopURLs	Identifies the most visited URLs by the users
detectLocalConversation	Detect conversations and packet routing between the end user on the same fxDevice
detectDevice	Detects traffic of a given mobile user device
redirectTraffic	Redirect data traffic to a given network element. The traffic may be identified with a user or a class of traffic
connectedDevices	Returns all the connected mobile devices to a given fxDevice
assignAddress	Allocates a particular IP address to the mobile device
setPriority	Set traffic priority to a class of traffic
markTraffic	Marks the user traffic with the desired QoS tags
setupTunnel	Sets up data tunnel from fxDevice to a destination
Adscript	Adds a JavaScript to an active transiting web page
detectIdenticalFlows	Identifies the identical flows coming from the WAN/uplink interface on the fxDevice
aggregateFlows	Enables aggregation of flows to save WAN/uplink utilization
routeTunnel	Routes a packet or a class of traffic onto an established tunnel
identifyTopDevices	Identifies users that generate most traffic load

Messaging Framework

[0110] The Messaging Framework allows the developers to send messaging between the applications residing in the fxDevice and fxCloud. Table 4 highlights some examples of methods/functions that may be available in the Messaging Framework.

Table 4: Messaging Framework	
Method	Description
sendIntraApp	Sends an Intra-App message from one fxDevice to another
sendInterApp	Sends an InterApp message from one application to another
sendfxCloud	Sends a message to the fxCloud
sendSMS	Sends an SMS to the user of choice

Caching Framework

[0111] The Caching Framework allows the developers to cache particular contents or files that are accessed frequently in the caching engine. The caching can be done locally in the fxDevice, clustered cache (shared amongst a few fxDevice), or cloud caching. Table 5 highlights some examples of methods/functions that may be available in the Caching Framework.

Table 5: Caching Framework

Method	Description
storeForward	Enables Store and forward model for a target class of traffic where the target traffic is matched and stored upon a condition and forwarded the condition is relieved
cacheWebSite	Caches the most visited web sites
cacheVideo	Caches the most viewed videos
cacheCloud	Caches the requested content or traffic type in the cloud storage in fxCloud

Management Framework

[0112] The Management Framework enables the developers to manage the BS platforms and perform administrative procedures. Table 6 highlights some examples of methods/functions that may be available in the Management Framework.

Table 6: Management Framework

Method	Description
upgradeFirmware	Started and executes the firmware upgrade procedure on the fxDevice
upgradeOS	Started and executes the operating system upgrade procedure on the fxDevice
remoteBootup	Performs remote boot up process where the fxDevice works closely with the fxCloud to perform the bootup
remotePower	Allows fxCloudApps to remotely turn on and off a fxDevice or elements in the fxDevice (e.g. the wireless)
gatherStatistics	Instructs fxDevice to gather specific statistics. Various commands may be consolidated for gathering statistics. Number of active users Stats of time spent by users in the cell Stats of quality perceived by the users Neighboring cell info Overall traffic passed through the system Total number of connected devices per frequency, per carrier, per site, per location Handover failure statistics Cloud aggregated data processing and full report Total traffic passed Applications used (meta-data correlated) Bandwidth consumed User's mobility pattern

setMonitoring	Allows the developer to get reports and statistics of the fxDevice traffics, errors, and neighboring environment. The reporting criteria could be set up as: 1) Period, 2) Event based (reports only if a threshold is passed; a threshold could be based on absolute numbers or deltas), 3) One-time (i.e. the information is pulled once). The exact parameters to get report on may use the same data structures used by the method "getStatistics".
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getSystemInfo	Retrieves static and dynamic system info such as: • Hardware info: vendor, model number, capability profile. GPS, Cellular, WAN interfaces, RFID/NFC • Heat temperature • Vendor Specific Information • Software info: OS version, firmware information • CPU load, per-application load (CPU, memory, accelerators) • Loaded apps and status • Memory utilization • Storage utilization • Interface status & utilization (RF, backhaul, management...)
getfxDeviceLocation	Retrieves location of the fxDevice • Location would be presented in GPS coordinates and civil address • Location enhancement: Cloud, map data, and neighbor discovery could help more accurate positioning
getPowerConsumptionRate	Retrieves current power consumption rate of the fxDevice
configureWAN	Configures the WAN settings
retrieveNeighborInfo	Retrieves neighbor information from the fxCloud
getRFIDInfo	Returns the RFID/NFC information of the fxDevice
setRFIDInfo	Sets the RFID/NFC information of the fxDevice

Extensible API Framework

[0113] This framework allows the developer to create custom APIs and make it accessible for other applications (in the fxDevice or in the fxCloud). In turn, the fxCloud could present these APIs using e.g. REST technologies (via the fxCloud

Northbound Interface) to the developer outside the dSND system. There might be limits put on the APIs exposed through the cloud to avoid potential misuse or security threats. The dRS enforces the security policies defined by the admin (via fxManager). The applications take a role of Client Application (CA) or Server Application Role (SA). The CA and SA could be distributed in the fxDevice or fxCloud. The CA makes requests and SA serves the requests.

[0114] The Extensible APIs could be categorized (as examples) into:

Read-Only Data: this type of APIs allows a CA to read data from SAs without the ability to change or request any particular action from the SAs

Read-Write Data: this type of APIs allows CA application to read data from SAs with the ability to change some of their data but no option for requesting any particular action from SAs;

Procedural: this type of APIs allows CAs to execute a particular procedure in SAs. The rights to change any data still depends on whether the API allows Read-Only Data or Read-Write Data types.

Cloud Management Framework

[0115] The Cloud Management Framework presents a collection of methods enables management of the cloud services and resource. Table 7 highlights some examples of methods/functions that may be available in the Cloud Management Framework.

Table 7: Cloud Management Framework

Method	Description
detectCloudCongestion	Detects congestions on a particular VM
deleteVM	Deletes an active VM permanently
suspendVM	Suspends an active VM but doesn't remove it
activateVM	Activates an already created VM
createVM	Creates a new VM but doesn't activate it

EXAMPLES OF DAPPS

[0116] The dSDN create an end-to-end programming platform and the possibilities of vApps are only limited by the developers' imagination. An example list of potential vApps are presented in Table 8 below.

Table 8 highlights examples of use cases possible by the Distributed Software Defined Network (dSDN)

Use	Description	Framework {Methods} used
1	Distributed SON: For example, the WiFi AP could search for the least crowded channel to minimize the interference.	Wireless {discoverNeighbor, retrieveNeighborInfo, measureNterference, setWirelessConfig, loadBalance}, General Framework, Messaging {sendIntraApp}
2	BS Hot Firmware Upgrade without impact to the basic functions of the BS.	Management {upgradeFirmware}
3	BS Hot infOS Upgrade without impact to the basic functions of the BS. For this function to support full hot upgrade without operational impact, the full platform should have dual processor.	Management {upgradeOS}
4	Secure network---based booting. This allows to keep the code securely in the cloud to avoid tampering by the ODM/CM or Man---in---the---Middle attacks.	Management {remoteBoot}
5	Turning on or off APs if nobody is in the office. Sensors in the building send information to fxCloudApp which in turn orders power control of the Aps.	Management {remotePower}
6	Store and forward model for low priority M2M applications where the target traffic is matched and stored in the case of network congestion and forwarded once the network congestion is relieved.	DataPath {matchTraffic, detectCongestion}, Cache {storeForward}
7	Replacing MAC Scheduler	Wireless {defineMacScheduler}
8	Replacing Receiver Algorithms	Wireless {definePHYReceiverAlgorithm}
9	Caching most visited website or video clip in the enterprise	DataPath {identifyTopURL}, Cache {cacheWebSite}
10	The most viewed videos and webcasts are cached in the wireless edge.	DataPath {identifyTopVideos}, Cache {cacheVideo}
11	Local Routing: data and voice sessions between two parties on the same cell are routed within the same cell bypassing the core Network.	DataPath {detectLocalConversation, RouteLocal}
12	Local Routing: data and voice sessions between two parties on the nearby cells are routed locally bypassing the core network.	DataPath {detectConversationDetect, routeLocal}
13	Temporary redirection of a data flow for monitoring and security reasons. In this use case, a particular user's traffic is tracked by redirection to a monitoring station. If user is mobile, such profile of tracking and associated redirection is transferred from fxDevice to fxDevice either directly or via the fxCloud.	DataPath {detectDevice, matchTraffic, redirectTraffic}
14	Power Calendar: On---demand coverage (triggered by passing traffic thresholds in certain cells or by calendaring): Operators need to design their network for peak usage rates at high costs, leaving their network underutilized most of the time.	DataPath {detectCongestion}, Management {remotePower}
15	DOS attack recognition and action could be blocking the user, the app, and/or notifying the user via an SMS message.	Security {setDOSDetect, configureFirewall}, Messaging {sendfxCloud}
16	Applying certain ACLs to the BS. For example, the students in the class can only access Facebook between the breaks and access to Facebook is blocked during the class.	Security {configureFirewall}
17	Forced offloading of some cellular users (users that have attached to the same cell for a while) to WiFi by changing "something" in the cellular connection to force WiFi connection (Heterogeneous).	Wireless {identifyConnectedDevice, forceOffload}
18	Service continuity and anchoring at eNB for WiFi using the same LTE IP address (Heterogeneous).	DataPath {identifyConnectedDevices, assignAddress}
19	Graphic/general processing for special use cases such as City BS	General Frameworks
20	Application filtering/throttling (secondary conditions: time---based, location---based, subscriber---type, none).	DataPath {matchTraffic}, Security {configureFirewall}
21	Local Services: The enterprise user can discover Bonjour or UPnP devices and services (e.g. printer) even when connected to LTE/3G small---cell in the enterprise. In this case, the small cell or fxDevice pro---actively listens to Bonjour and UPnP discovery and advertisement messages (SSDP) and cache the available services until a device request for such information. In the case of Bonjour, fxDevice could listen to Multicast DNS (mDNS) messages sent over cellular connection (LTE/3G) and multicast them on the LAN or WLAN interfaces.	DataPath {matchTraffic, routeLocal}
22	Local Services: The premise---owner (e.g. airport, hotel) can provide ads under the browser for sponsored WiFi or cellular (3G/LTE) access over multi---mode small cell. The premise owner could use this service to advertise special offers or third party ads. This technique uses HTML <script> for example to add special content to the bottom of the page.	DataPath {matchTraffic, addScript}

23	Distributed Content Distribution Network (CDN). In this use case, the fxDevices function as CDN that bring the content closer to the end users.	DataPath {matchTraffic}, Cache {cacheVideo}
24	In case of national security, the service provider may limit the access to the network so only the law enforcement can use the cellular network. In this case, the admin defines a Target Area (TA) using an fxCloudApp in the fxCloud where the emergency lockdown needs to be applied. The IMSI/MSISDN number of law enforcement mobile devices are sent to the fxDevice in the TA which in turn enforce the policy. The policy may allow the public to just sent SMS while the law enforcement could have full access and priority to the system.	DataPath {matchTraffic, setPriority}, Security {configureFirewall}
25	Emails and web browsing monitored by the cloud services assisted by the agent in the dSDN network. In this case, the fxDevice detects certain traffic (email or web in this case) and redirects them to a cloud service for security cleansing.	DataPath {matchTraffic, redirectTraffic}
26	Analytics pre-analysis: The data collected from M2M devices could be processed (noise could be filtered out) and packaged (compressed) for consumption by cloud services.	DataPath {matchTraffic}, General Framework, Messaging {sendfxCloud}
27	Certain traffic could be marked with QoS DSCP codes for further processing in the network.	DataPath {matchTraffic, markTraffic}
28	Proprietary SP services and applications that run purely between the phone and the BS. For example, the SP may implement a certain application for the law enforcement to get direct feed of surveillance cameras in a target area (TA).	DataPath {matchTraffic}, Security {configureFirewall}, General Framework
29	IP-PBX implementation in the small-cell or WiFi AP for enterprise use. This would allow a simple out of a box solution. The VoIP phones connect to the fxDevice via the LAN connections. The WAN connection could connect to an fxCloudApp for PSTN calls.	DataPath {matchTraffic}, General Framework
30	Network management system can add its own agent/probe to collect and consolidate data and transmit it to its cloud element using any protocol.	Management {gatherStatistics, getSystemInfo, control}, General Framework
31	Application based performance monitoring on the wireless link (number of packets sent in idle mode, retransmit rate...). Such information could be shared with the app developer to optimize its application.	Management {gatherStatistics}, General Framework
32	Seamless network sharing and mergers. This is the case where two Network Operators would like to share or merge their network. Using dSDN's infManager, the network administrators could merge the network administration control. This process may include setting up the desirable default fxApp packages of the network operator.	fxManager Portal Service
33	Following a user to understand where it faces coverage issues or call drops. Once discovered, the system could send a message to the user acknowledging an issue and that the SP is trying to fix this. The information is uploaded to the cloud for further analysis.	Management {gatherStatistics}, General Framework, Messaging {sendSMS}
34	Reporting: This allows the developer to get reports and statistics of the fxDevice traffics, errors, and neighboring environment. The reporting criteria could be set up as: 1) Period, 2) Event based (reports only if a threshold is passed; a threshold could be based on absolute numbers or deltas), 3) One-time (i.e. the information).	Management {setMonitoring}, General Framework
35	Proprietary security protocol between the application in the mobile device and the BS in enterprise deployment. This would allow SP to create enterprise-class LTE for indoor using small cells.	Security {encryptContent, authenticateUser, Integrity, configureFirewall}, DataPath {RouteLocal}, General Framework
36	The femto cell at home that can't scan neighboring cells, gets a list of neighboring cells from the fxCloud or neighbors to broadcast to improve outbound handoffs.	Wireless {discoverNeighbors, retrieveNeighborInfo, setNeighborCells}, Management {retrieveNeighborInfo}
37	IMS-capable femto enabling various SP services to initiate or transferred between home network and mobile devices.	Messaging {sendfxCloud}, General Framework
38	Integrated smart home with multi-mode femto/WiFi router. For example, the application in the smart home router (fxDevice) allows for coordination of home physical security service (such as ADT services). With the fxCloudApp, the user could control the security status of his/her home and remotely control the setting.	Wireless {homeAreaNetworking}, Messaging {fxCloud}, General Framework
39	Home CCTV DVR implementation in an integrated home router. The camera feeds are recorded on the same router caching engine.	Cache {cacheVideo}, Messaging {sendfxCloud}, General Framework
40	Enterprise CCTV DVR implementation in an integrated router with cloud backup. The camera feeds are recorded in the cloud.	Cache {CacheVideo, CacheCloud}, Messaging {fxCloud}, General Framework
41	User traffic separation into various MPLS/LSP (integrating VPN and BS). In this case, users are classified into groups and each group is tunneled to the core network. For example, law enforcement use the encrypted tunnel while the other users use the defaulttunnel.	DataPath {Match, SetupTunnel, RouteTunnel}
42	Dynamic spectrum allocation where a BS borrows unused spectrum from the neighboring BS in case of temporary congestions.	DataPath {detectCongestion}, Wireless {discoverNeighbors, setWirelessConfig}, Management {retrieveNeighborInfo, borrowCarrier}, Messaging {fxCloud}

43	Proxy ANDSF (Access Network Discovery and Control Function) in the BS. When the UE tries to access the ANDSF, the Proxy ANDSF fxDeviceApp in the BS intercept the ANDSF messages and replies on behalf of the ANDSF. This would speed up the WiFi network discovery for example.	DataPath {matchTraffic}, General Framework, Messaging {sendfxCloud}
44	HD Audio calling: audio codecs in BS allows the phones with the right capabilities to communicate with HD Audio quality calling. If one of the mobile devices can't handle the HD quality audio, the BS performs the transcoding of the audio.	DataPath {matchTraffic}, General Framework
45	Enabling mobility on White Space Spectrum: The latest white space database will be downloaded. The mobile devices with special software applications make requests to the BS to retrieve the local available white space frequencies. This would allow the mobile device to handoff seamless between BS using the white space spectrum. The BS would advertise such a capability to the UEs. The secure communication allows peer-to-peer communication between the UE and the BS for certain applications such as White Space Channel lookup or site acquisition tools for field engineering and RF planning.	Messaging {sendfxCloud}, General Framework
46	Site acquisition tool where the technician uses a software tool on his mobile phone to interact with BSs to determine the best place to deploy the new BS. The phone app interests with fxDeviceApps in BSs and fxCloudApp. For example, fxDeviceApp performs air interface quality and gives a priority to traffic generated.	Messaging {sendfxCloud}, General Framework, DataPath {matchTraffic, setPriority}
47	DNS caching at BS to accelerate DNS lookup for subsequent users. This would improve the user experience by reducing response delays.	DataPath {matchTraffic}, General Framework
48	Continuous SLA monitor for certain protocols, applications or general link quality for jitter, delays, bandwidth.	DataPath {matchTraffic}, Management {gatherStatistics}, General Framework
49	Enterprise users can use the small cell deployed in their enterprise free of charge. The DPI engine in fxDevice classifies the traffic and identifies the enterprise private data and they would be routed locally and charging records are generated by the BS (the SP decides how to bill the enterprise user and it may decide to make such usage).	DataPath {matchTraffic, routeLocal}
50	On-premise small-cell aggregation where on fxDevice takes the responsibility of aggregating multiple small-cells on the premise and presenting them as a single BS/Node-B/eNodeB to the core network. In this case the aggregating fxDevice (AfxE) may take responsibility of local radio resource manager (RRM) or self-optimizing network (SON) server. AfxE can also implement and enforce policies concerning local service access on the premise (enterprise) as well as enable seamless handover between cellular technologies and on-premise (enterprise) local area network (LAN) for example using WiFi technology.	General Frameworks, Wireless {discoverNeighbors, retrieveNeighborInfo, setNeighborCells, setWirelessConfig}, Messaging {sendIntraApp}
51	Self adjusting fxCloud compute resources: The fxCloud creates and tears down virtual machines (VMs) based on the traffic load measured by itself or the packet processing and data plane engine. It is also possible that the VM adjustments are made based on the rush hour or pre-configured hours of the day or manually by the administrator.	CloudManagement {removeVM, createVM, detectCloudCongestion, activateVM, suspendVM}
52	Core Network Function Virtualization (cNFV) using distributed Software Defined Networking (SDN): In the case, once an fxDevice is commissioned, its fxDeviceApp0 (i.e. firmware) uses predefined DNS names to discover the rest of the core network (e.g. MME, S-GW, etc.). The core network elements could be created.	General Frameworks, Messaging {sendInterApp, sendIntraApp}, CloudManagement {deleteVM, suspendVM, createVM, activateVM, detectCloudCongestion}
53	Smart display and digital signage as wireless base stations: this use case allows combining the capabilities of a base station and the smart display in shopping malls, airports, and enterprises. There is a already electric power and connectivity for the smart display that the base station function could use.	General Frameworks
54	Tracking a mobile user at base station level even if the UE is in the idle mode. Currently in the idle mode, the MME, SGSN, or VLR/MSC can only know the location of the UE in with a accuracy of LA/RA/URA which is a very large area. The administrator uses the fxCloudApp and requests tracking of the user/UE (the admin may provide target area where the user/UE may be located; e.g. zip code or town name). The fxCloudApp contacts its fxDeviceApp in the fxDevices in the target area (TA) requesting information of a particular IMSI/MSISD/TMSI. Once an fxDevice responds indicating knowledge of the user location, the fxCloudApp directs that serving fxDevice to inform the fxDeviceApp in the next fxDevice of the instructions to track the user and contact fxCloudApp when they user hands off to due to its mobility. fxCloud could create user friendly interfaces and presentations to show for example the direction the user is moving, predict next location of the user, and estimate arrival of the user to a certain location.	DataPath {matchTraffic}, Messaging {sendIntraApp, sendfxCloud}
55	In case of emergency, fxDevices in a target area block all public traffic and only allow law enforcement sessions using specially encryption and authentication between the UE and the fxDevice or fxCloud (depending on the requirements).	DataPath {matchTraffic, setPriority}, Security {configureFirewall, encryptTraffic, authenticateUser}, General Framework

56	SON triggered by the data traffic consumption. In this case, the mobile cell configuration is adjusted based on the current traffic of the cell. It could for example force handoff some users (high users or users moving fast) to neighboring cells.	DataPath {identifyTopDevices}, Wireless {forceHandoff}
57	Time based QoS and policy. In this use case, the infManager pushes certain policies in target area (TA). Such policies could be turning on extra capacity (frequency channels) or QoS policies and traffic prioritization on the WAN like.	DataPath {matchTraffic, setPriority}, Wireless {discoverNeighbors, setWirelessConfig}
58	Fast moving users detection: in this use case, the application in the BS measures the speed of the user (based on the time was handed off to this cell until it was handed over to the next cell). This information could be used by the fxDevice or fxCloud to force handoff the mobile user to a larger cell to reduce handoff rates.	General Frameworks, Wireless {identifyTopMovers, forceHandoff}
59	Emergency broadcast of information and live camera feeds. In case of emergency, the enterprise network administrator temporarily block all traffic and only allow emergency related traffic across the target area in the enterprise network. For example, the network admin broadcasts the camera feeds and alerts over the WiFi access points using multicast IP techniques. The client devices and digital sinages can listen to that particular multicast and show the camera feeds and emergency alerts.	DataPath {matchTraffic, setPriority}, Security {configureFirewall}, General Framework
60	Dynamic advertising in shopping malls. The shopper would use an app from the shopping mall. When the shopper brings up or refreshes the app, the dSDN allows the shopping mall to pinpoint the exact indoor/outdoor location of the user (e.g. the shop the shopper is in) and send special coupon and ads for that store to the shopper.	General Frameworks, Wireless {positionDevice}, Messaging {sendIntraApp, sendfxCloud}, Security {configureFirewall}, DataPath {matchTraffic, redirectTraffic}
61	Smart tour guide. The tourist would use an app from the tourism board or museum. When the user brings up or refreshes the app, the dSDN allows to pinpoint the exact location of the tourist (e.g. the painting he/she is looking at) and send tour guide information (e.g. audio, video, hypertext). dSDN allows to localize the positioning.	General Frameworks, Wireless {positionDevice}, Messaging {sendIntraApp, sendfxCloud}, Security {configureFirewall}, DataPath {matchTraffic, redirectTraffic}
62	General hotspot landing page	DataPath {matchTraffic, redirectTraffic}, Security {authenticateUser}
63	Proprietary wireless mesh implementation	Wireless {discoverNeighbor, retrieveNeighborInfo, measureInterference, setWirelessConfig}, General Framework, Messaging {sendIntraApp}
64	Power and energy consumption map of the network. A real-time fxCloudApp pulls the power consumption details from each fxDevice periodically or on demand. The pulled data then are combined with the location information and correlated into a map to present a viewable consumption map.	Management {getfxDeviceLocation, getPowerConsumptionRate}
65	Network deployment optimization. This application allows network operator to get advice for best optimal reconfiguration and/or redeployment of the network. For example, the network admin could get suggestion that based on the power consumptions and coverage perceived and spectrum utilization, it might be better to replace a particular group of smaller cells with a single macro-cell. This app could also pull information from larger OEMs based on the subject deployment scenario (the OEMs either provide this information statically to the tool or provide network APIs for use by this app e.g. using REST protocol).	Management {getfxDeviceLocation, getPowerConsumptionRate, gatherStatistics}
66	High availability. This app allows two or more fxDevice to form a redundancy cluster where they participate in statueful redundancy and load-balancing.	Messaging {sendIntraApp}, General Framework
67	Bandwidth Bursting. This feature enables the dynamic adjustment of backhaul or WAN link bandwidth as the demands change in the enterprise or public wireless deployments. In this case, the fxDeviceApp in the fxDevice monitors the WAN link utilization, once a preset threshold percentage has reached, it messages its sister fxCloudApp which in turn would send a request to the fxDeviceApp to increase or decrease the WAN bandwidth. If additional backend reconfiguration is needed, the fxCloudApp performs those additional changes prior to informing the fxDeviceApp of the bandwidth.	Management {getStatistics, configureWAN}
68	Wireless link quality measurement by the small-cell or WiFi AP: The wireless SoC in the small-cell or WiFi AP continuously monitors the link quality for power adjustment and handover reasons. Such information could be exposed to the app developers to create cell-level analytics and reports without the need to have test-drives or field testing of service quality.	Management {gatherStatistics}, General Framework
69	Data Path Consolidation: An application on the fxDevice discovers identical data feeds from a cloud server to two or more users. The fxDeviceApp in the fxDevice can discover this potential duplicate flows at the session establishment (via a proxy function) and it would consolidate those sessions into one on the uplink towards the cloud server. A good example of this use case is the web-based desktop sharing where different many users in the same office site get the same feed from the cloud server.	FastPath {detectIdenticalFlows, aggregateFlows}

[0117] The following references are herein specifically incorporated by reference in their entirety into this disclosure:

- [1] 3GPP TS 23.002, "Network Architecture";
- [2] 3GPP TS 23.402, "Architecture enhancements for non-3GPP accesses";
- [3] 3GPP TS 23.401, "General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access";
- [4] Open Base Station Architecture Initiative (OBSAI); and
- [5] SPDY Protocol (<http://datatracker.ietf.org/doc/draft-mbelshe-httpbis-spdy/>).

CLAIMS

1. A system for processing data packets in a network, the system comprising:
 - a programmable network device hosting a plurality of first network applications;
 - a programmable cloud device hosting a plurality of second network applications;
 - wherein at least one of the plurality of first network applications in the programmable network device and at least one of the plurality of second network applications in the programmable cloud device are in secure communication with each other to form a distributed application;
 - the programmable network device and programmable cloud device are each powered by a sandboxing operating system which facilitates deployment of the plurality of first and second network applications and facilitates upgrades of the first and second network applications with substantially no interruption to operation of the programmable network device and programmable cloud device;
 - wherein the programmable network device verifies authenticity of the upgrades to the plurality of first network applications and the programmable cloud device verifies authenticity of the upgrades to the plurality of second network applications and wherein the verification is based on unique security keys associated with each of the plurality of first and second network applications;
 - an application repository storing distributed applications which have been tested for installation in the programmable network device and programmable cloud device;
 - and
 - an application management portal coupled to the programmable network device, programmable cloud device and the application repository, wherein the application management portal manages usage of the distributed applications on the programmable network device and programmable cloud device.
2. The system of claim 1, wherein each of the programmable network device and programmable cloud device include an access network interface unit to send and receive communications and a processor with a memory associated with the network interface unit.

3. The system of claim 1, wherein the at least one of the first network applications is responsible for a plurality of functional capabilities of the programmable network device and is capable of at least one of the group consisting of: updating the firmware of the programmable network device; updating default communication protocols of the programmable network device; initializing programmable network device settings; boot loading the programmable network device; providing security digital certificates; providing operating system (OS) and kernel upgrades; and upgrading and commissioning agents for upgrades of the at least one of the first network applications.

4. The system of claim 1, wherein at least one of the second network applications is responsible for a plurality of functional capabilities of the programmable cloud device and is capable of at least one of the group consisting of: upgrading and commissioning agents for upgrades of the at least one of the second network applications and related procedures; hypervisor upgrades; virtual machine and isolated execution environment lifecycle management; security digital certificate management; operating system (OS) and kernel upgrades; and default communication protocols.

5. The system of claim 1, wherein the programmable network device is a Long Term Evolution (LTE) evolved NodeB (eNB) and the programmable cloud device hosts LTE core network functions in separate virtual machines, the network functions consisting of: Mobility Management Entity (MME), Serving Gateway (S-GW), and Packet Gateway (P-GW).

6. The system of claim 1, wherein the programmable network device and programmable cloud device further comprise:

a virtual fabric which provides a secure communication layer for at the least one of the plurality of first network applications and the at least one of the plurality of second network applications.

7. The system of claim 1, further comprising:

a second programmable network device which includes the at least one of the

plurality of first network applications which is in the first programmable network device.

8. The system of claim 1, wherein the programmable network device and programmable cloud device further comprise:

a distributed resource service (DRS) which controls access to a plurality of resources by the plurality of first network applications and the plurality of the second network applications upon receiving instructions from the application management portal.

9. The system of claim 1, wherein the plurality of resources include at least one of a group consisting of: a firewall; data and statistics; storage; compute; load evaluator; general settings; routing engine; virtual machine master controller; power controller; and wireless engine.

10. The system of claim 1, wherein the programmable network device and programmable cloud device further comprise:

a distributed resource service (DRS) which is capable of providing at least one service from a group consisting of: exposing application programming interfaces (APIs) to other applications; configuring and managing platform resources; policy enforcement and authorization of applications access to platform resource and other application's APIs; and policy conflict resolution.

11. The system of claim 1, wherein the programmable network device and programmable cloud device further comprise:

a distributed content service wherein contents generated by the at least one of the plurality of first network applications may be shared with the at least one of a plurality of second network applications.

12. The system of claim 1, wherein the programmable network device and programmable cloud device further comprise:

a distributed notification service wherein notice of a particular event is sent from at least one of the plurality of first network applications to at least one of the plurality of

second network applications.

13. The system of claim 10, wherein the DRS further includes a load controller; and wherein the load controller is adapted to monitor loads on at least one of the plurality of first network applications and at least one of the plurality of second network applications and effect change in accordance with thresholds received from the application management portal.

14. The system of claim 1, wherein the programmable network device, at least one of the plurality of first network applications, the programmable cloud device, and at least one of the plurality of second network applications each have unique identities.

15. A system for processing data packets, the system comprising:

- a programmable network device processing data flows hosting at least one of a plurality of first network applications;

- a programmable cloud device having a plurality of virtual machines wherein at least one of the virtual machines hosts at least one of a plurality of second network applications;

- wherein the at least one of the plurality of first and the at least one of the plurality of second network applications are in secure communication to form a distributed application;

- the programmable network device and programmable cloud device are each powered by a sandboxing operation system which facilitates deployment of the plurality of first and second network applications and facilitates upgrade of the plurality of first and second network applications with substantially no interruption to operation of the programmable network device and programmable cloud device;

- wherein the programmable network device verifies authenticity of the upgrades to the plurality of first network applications and the programmable cloud device verifies the authenticity of the upgrades to the plurality of second network applications and wherein the verification is based on unique security keys associated with each of the plurality of first and second network applications;

- an application repository storing distributed applications which have been tested

for installation in the programmable network device and programmable cloud device;
and

an application management portal coupled to the programmable network device, programmable cloud device and the application repository, wherein the application management portal manages provisioning, usage and de-provisioning of the distributed applications on the programmable network device and programmable cloud device.

16. The system of claim 15, wherein the programmable network device is a Long Term Evolution (LTE) evolved NodeB (eNB) and the programmable cloud device hosts LTE core network functions in separate virtual machines, the network functions consisting of: Mobility Management Entity (MME), Serving Gateway (S-GW), and Packet Gateway (P-GW).

17. A system for processing data packets in a network, the system comprising:-

a programmable network device processing data flows, hosting at least one of a plurality of first network applications;

a programmable cloud device partitioned into a plurality of zones, wherein at least one of the plurality of zones hosts at least one of a plurality of ~~first~~ second network applications;

wherein the at least one of the plurality of first network applications and at least one of the plurality of second network applications are in secure communication to form a distributed application;

the programmable network device and programmable cloud device are each powered by a sandboxing operation system which facilitates deployment of the plurality of first and second network applications and facilitates upgrade of the plurality of first and second network applications with substantially no interruption to operation of the programmable network device and programmable cloud device;

wherein the programmable network device verifies authenticity and integrity of upgrades to the plurality of first network applications and the programmable cloud device verifies the authenticity of the upgrades to the plurality of second network applications and wherein the verification is based on unique security keys associated with each of the plurality of first and second network applications;

an application repository storing distributed applications which have been tested for installation in the programmable network device and programmable cloud device;
and

an application management portal coupled to the programmable network device, programmable cloud device and the application repository, wherein the application management portal manages usage of the distributed applications on the programmable network device and programmable cloud device.

18. The system of claim 17, wherein the programmable network device is a Long Term Evolution (LTE) evolved NodeB (eNB) and the programmable cloud device hosts LTE core network functions in separate virtual machines, the network functions consisting of: Mobility Management Entity (MME), Serving Gateway (S-GW), and Packet Gateway (P-GW).

ABSTRACT

The Distributed Software Defined Network (dSDN) disclosed herein is an end-to-end architecture that enables secure and flexible programmability across a network with full lifecycle management of services and infrastructure applications (fxDeviceApp). The dSDN also harmonizes application deployment across the network independent of the hardware vendor. As a result, the dSDN simplifies the network deployment lifecycle from concept to design to implementation to decommissioning.

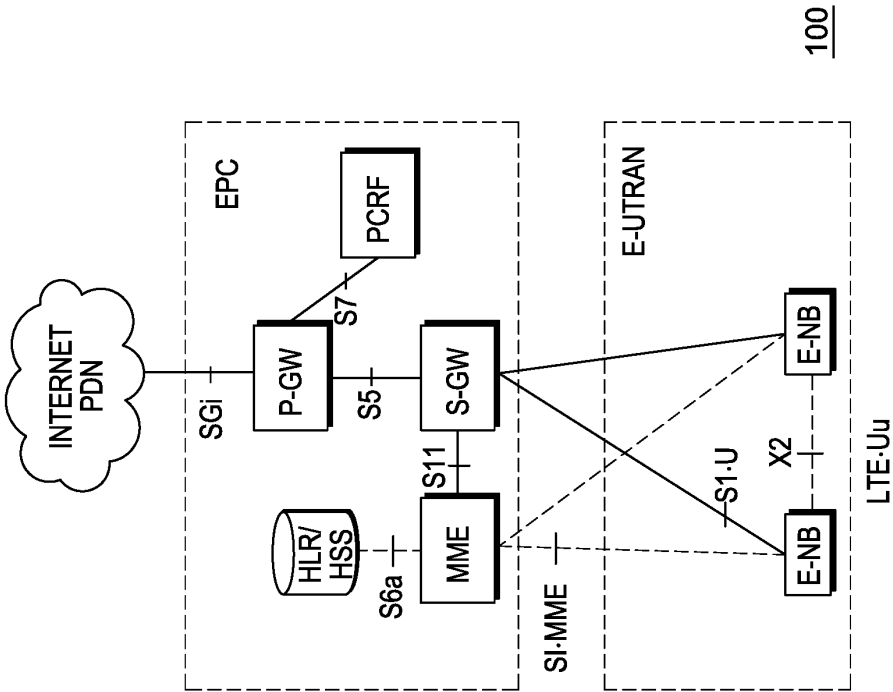


FIG. 1

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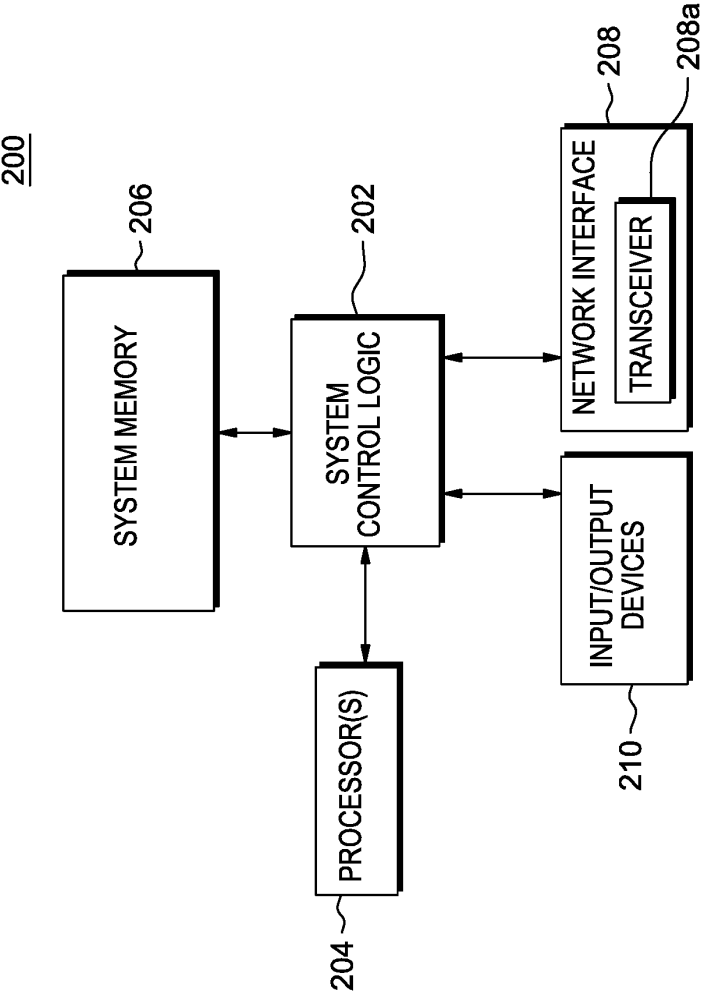


FIG. 2

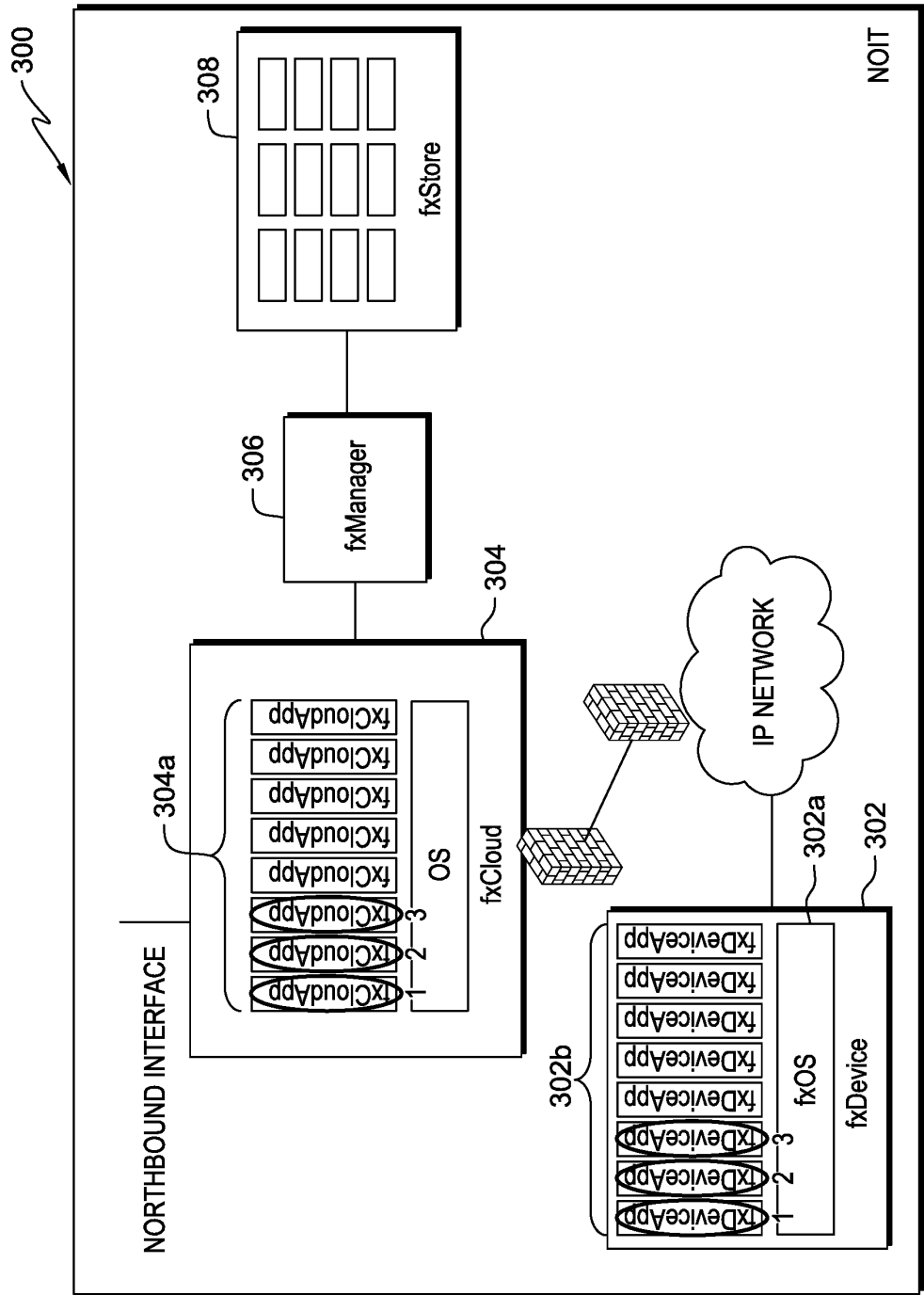
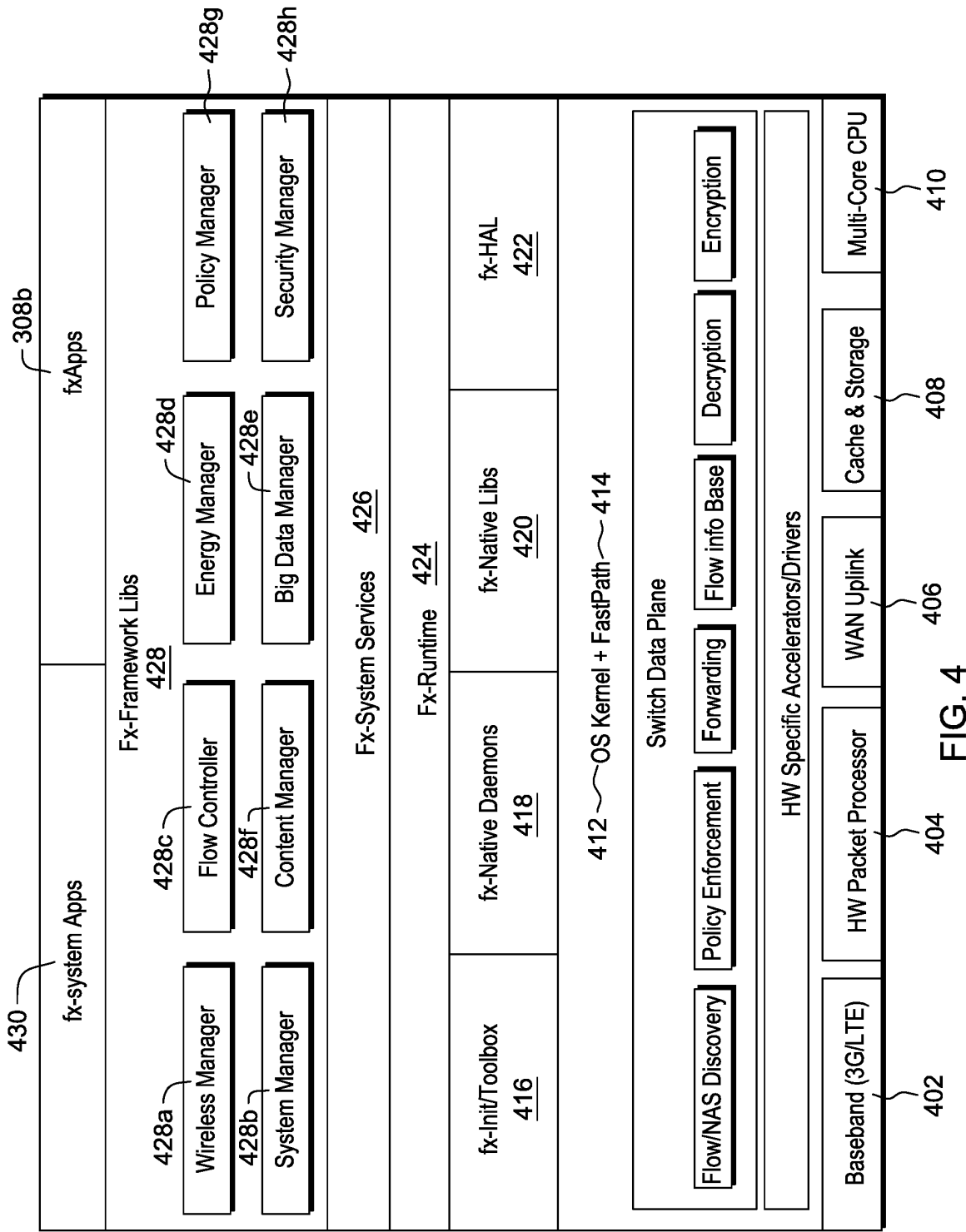


FIG. 3



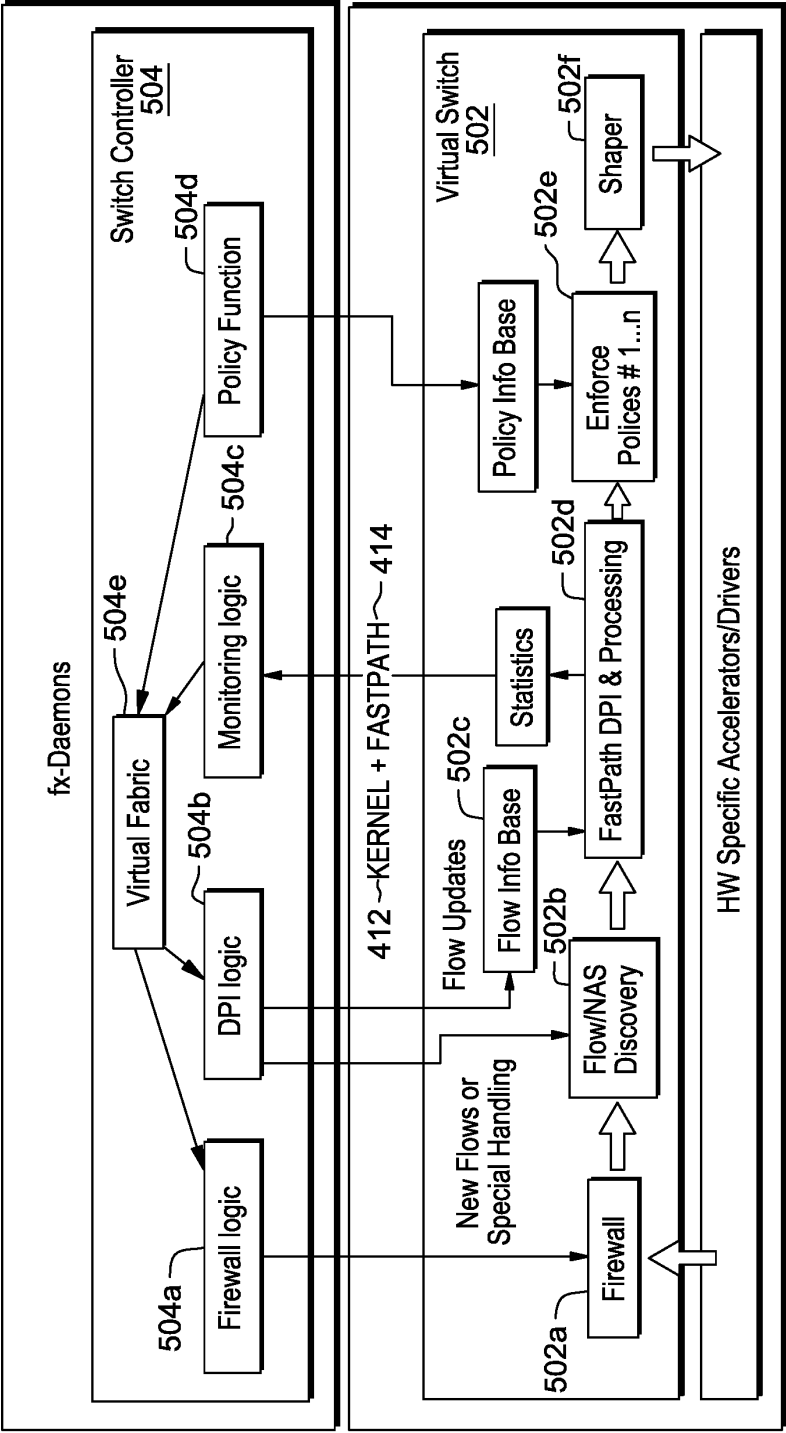


FIG. 5

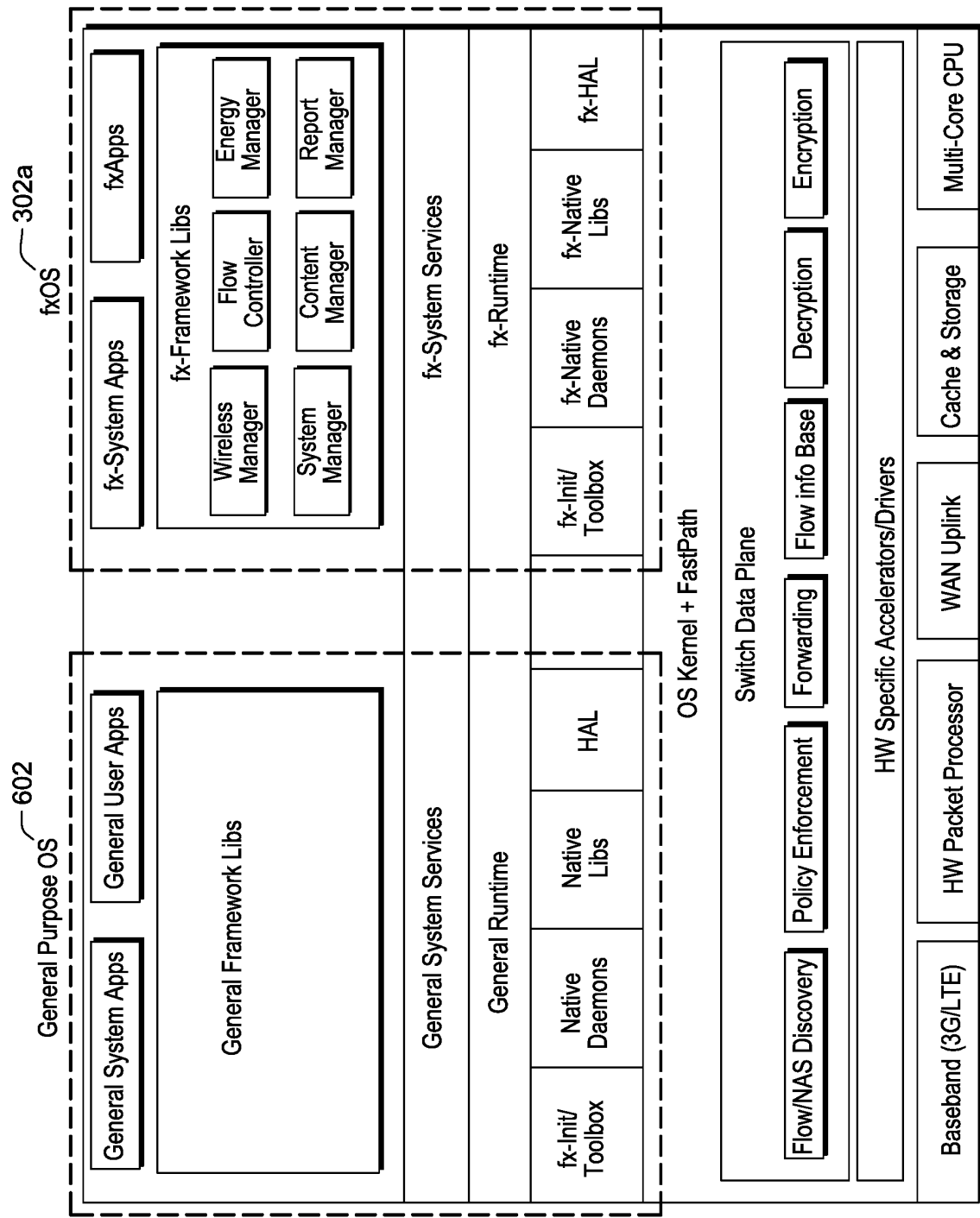


FIG. 6

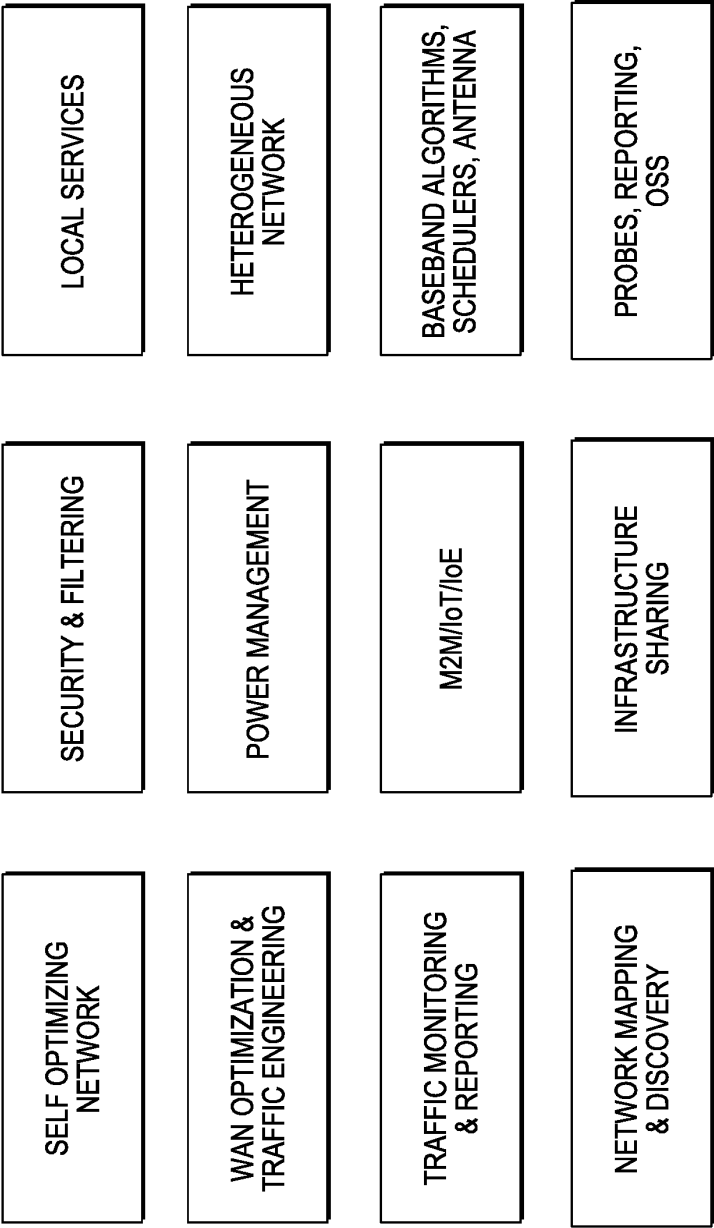


FIG. 7

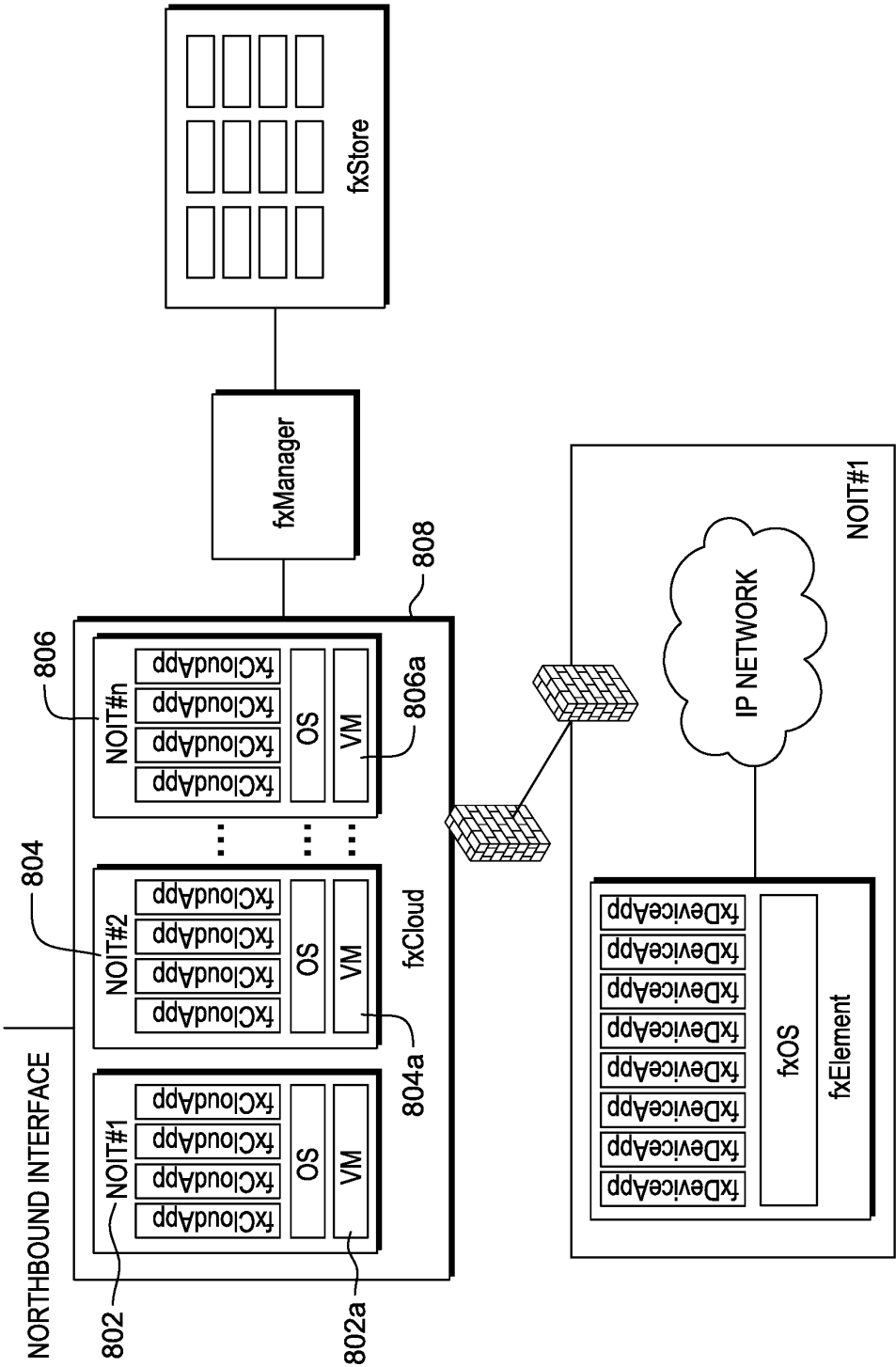


FIG. 8

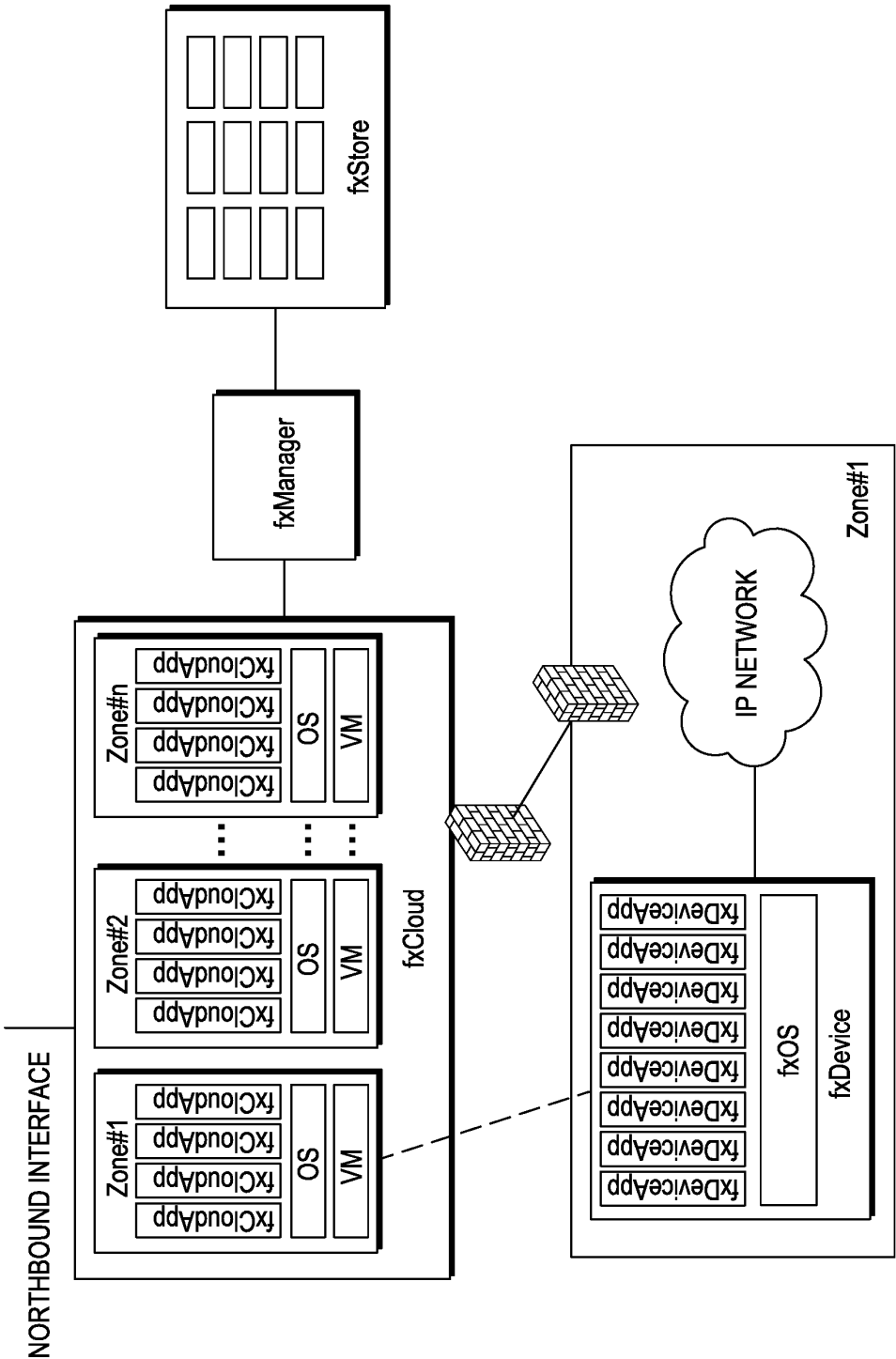


FIG. 9

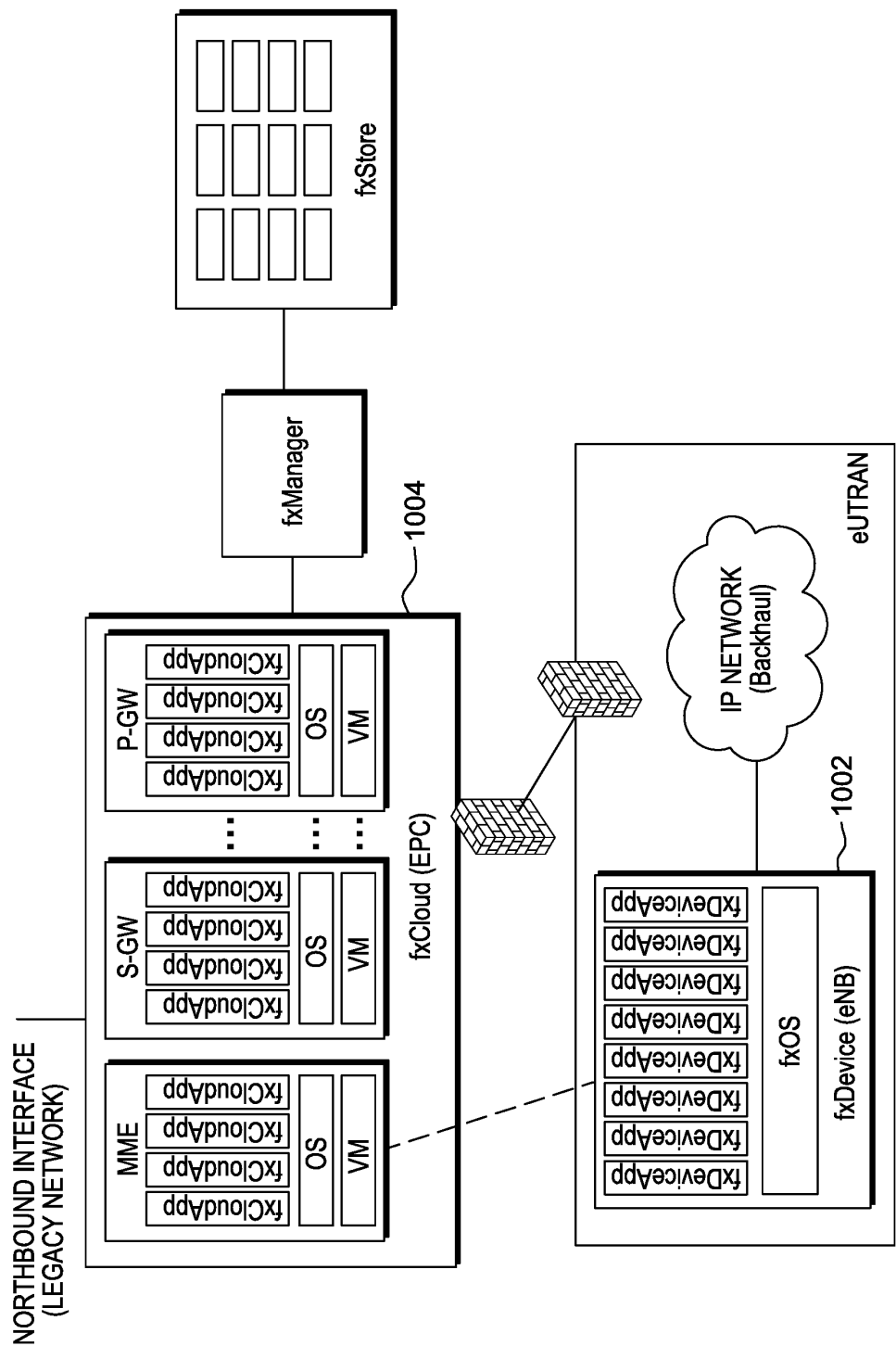


FIG. 10

11/18

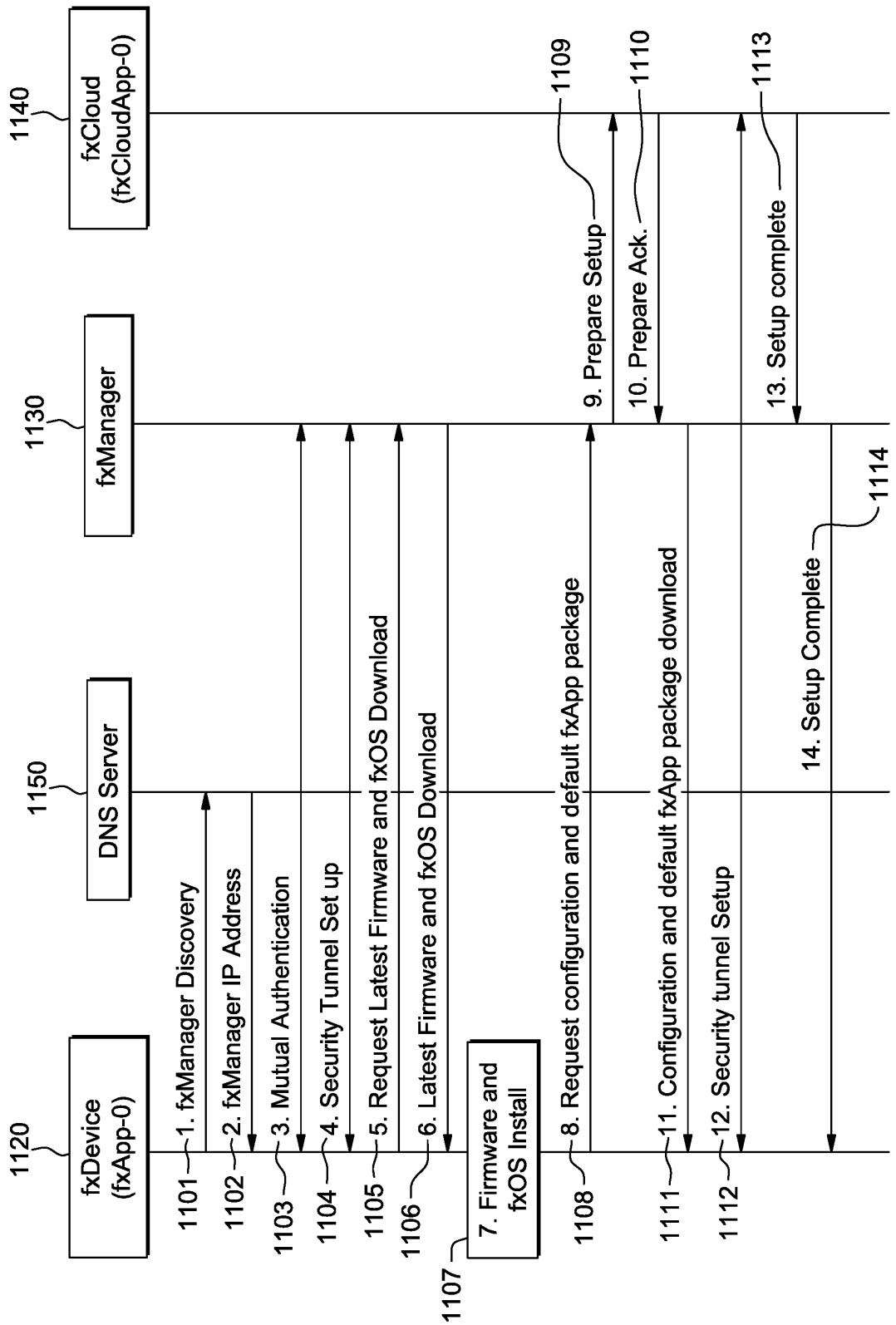


FIG. 11

12/18

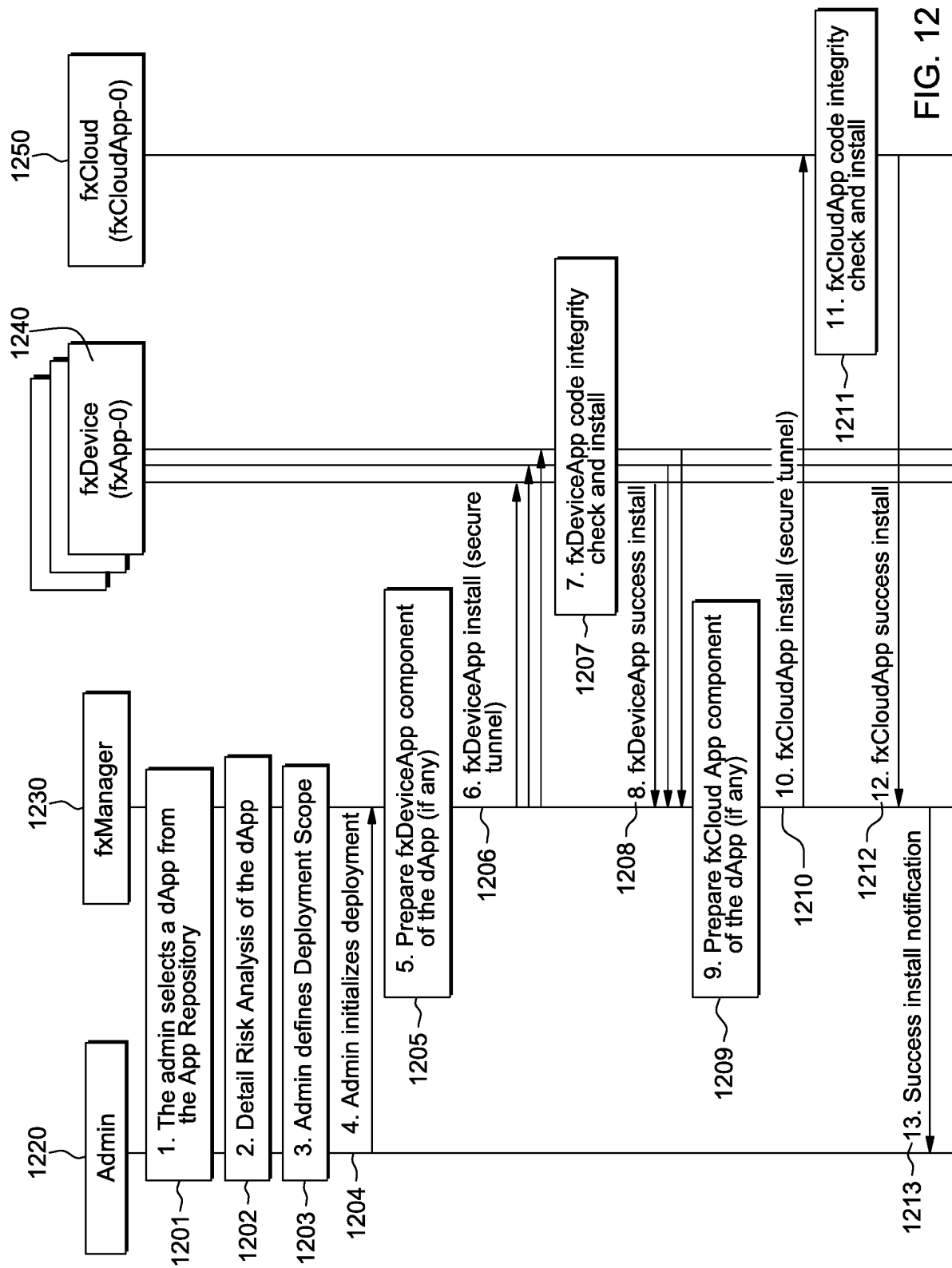


FIG. 12

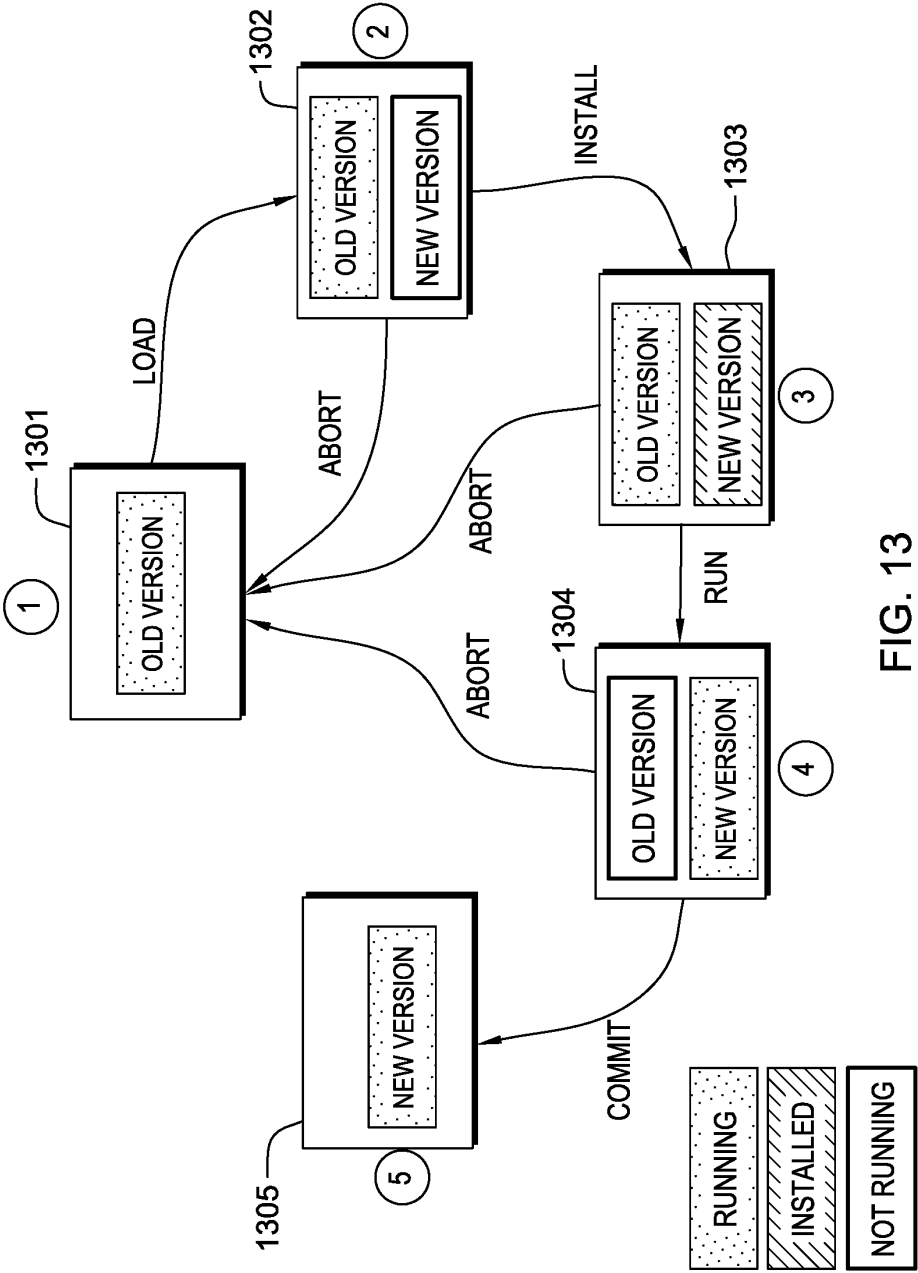


FIG. 13

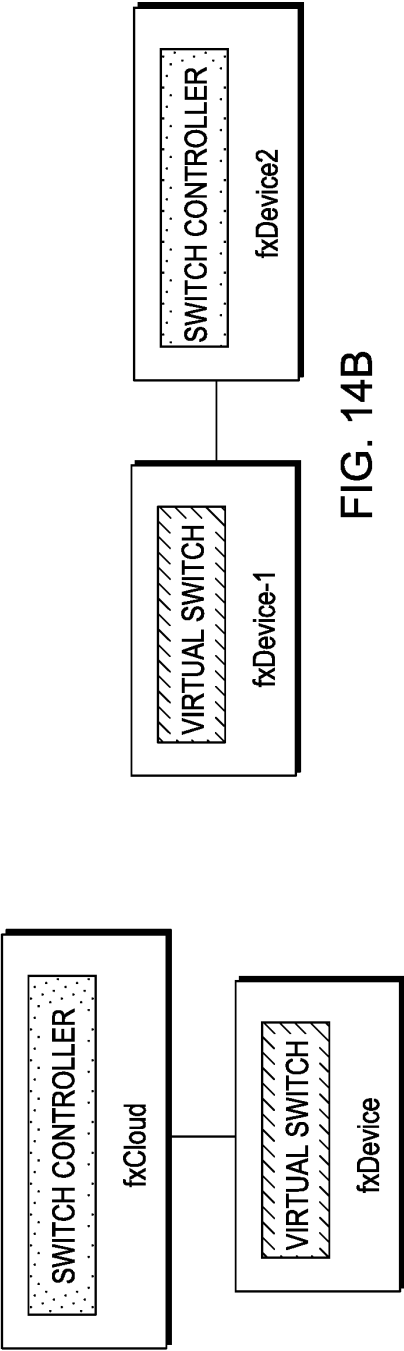


FIG. 14B

FIG. 14A

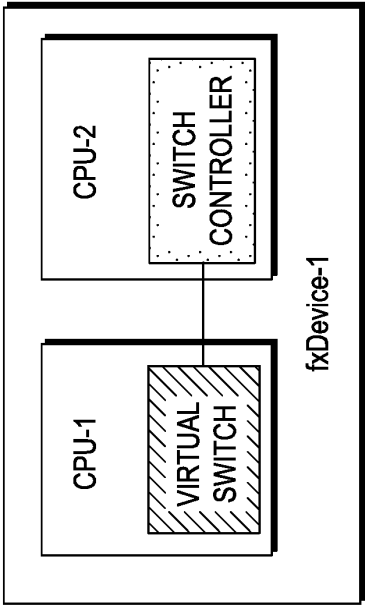


FIG. 14C

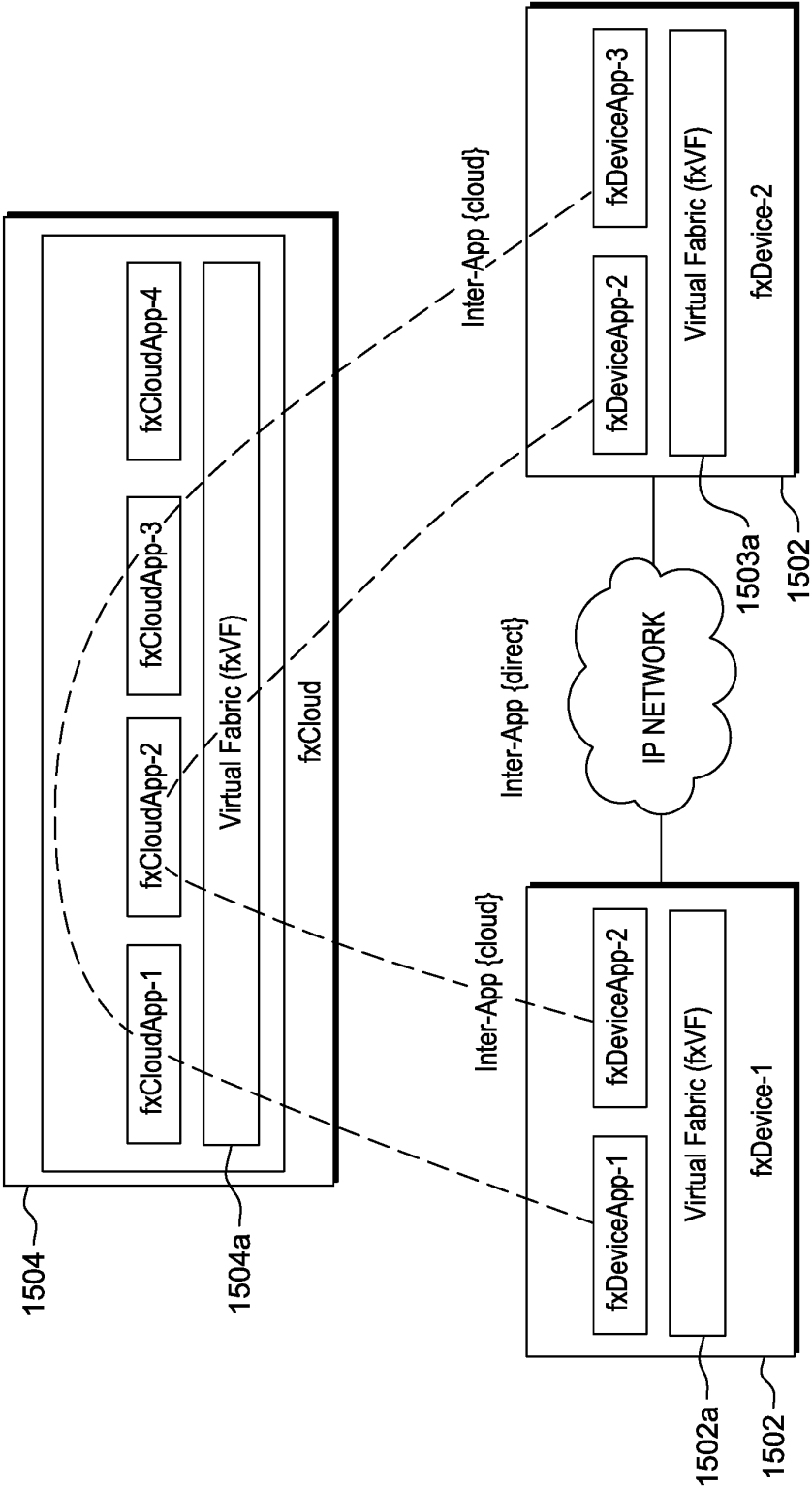
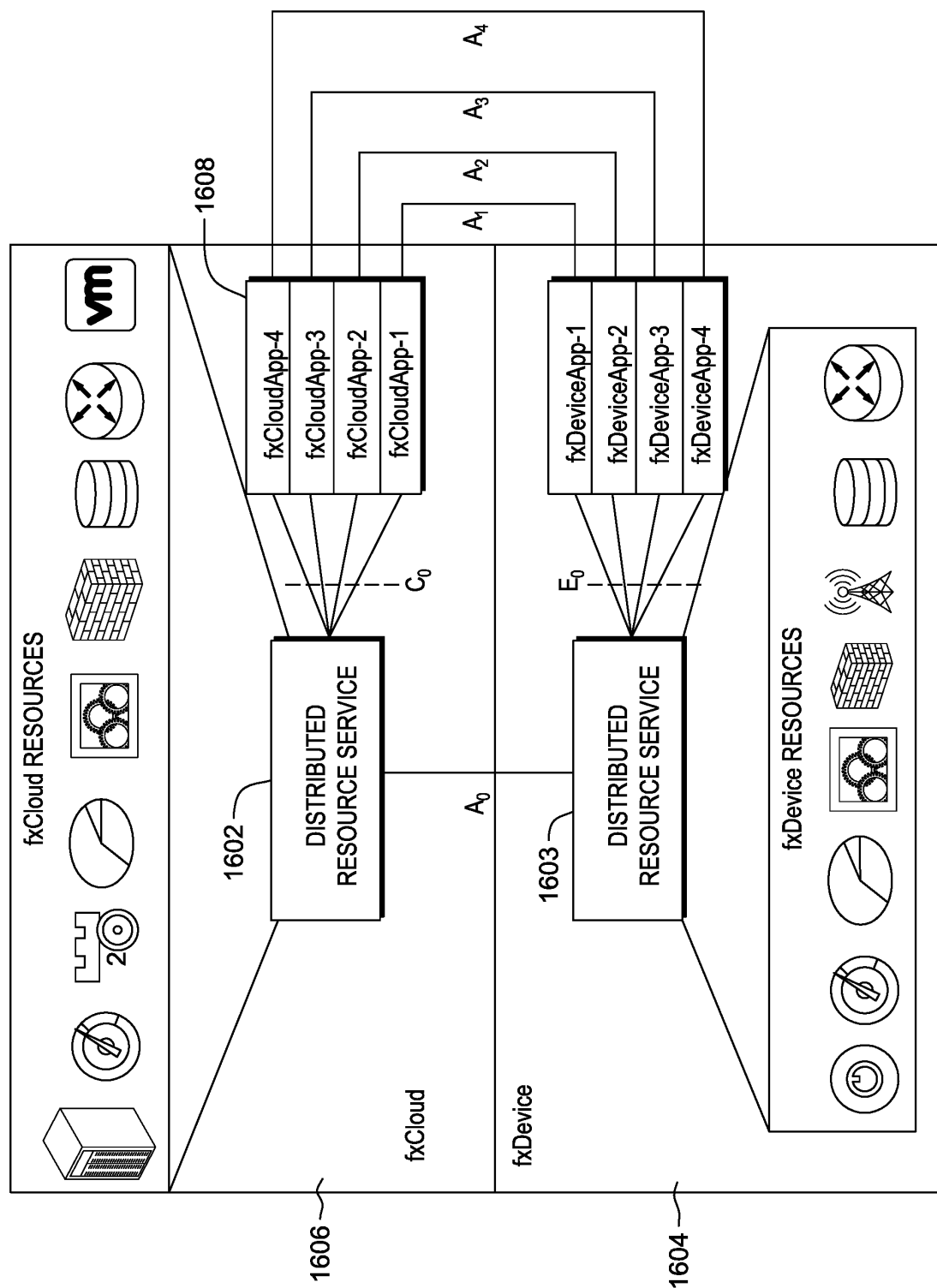
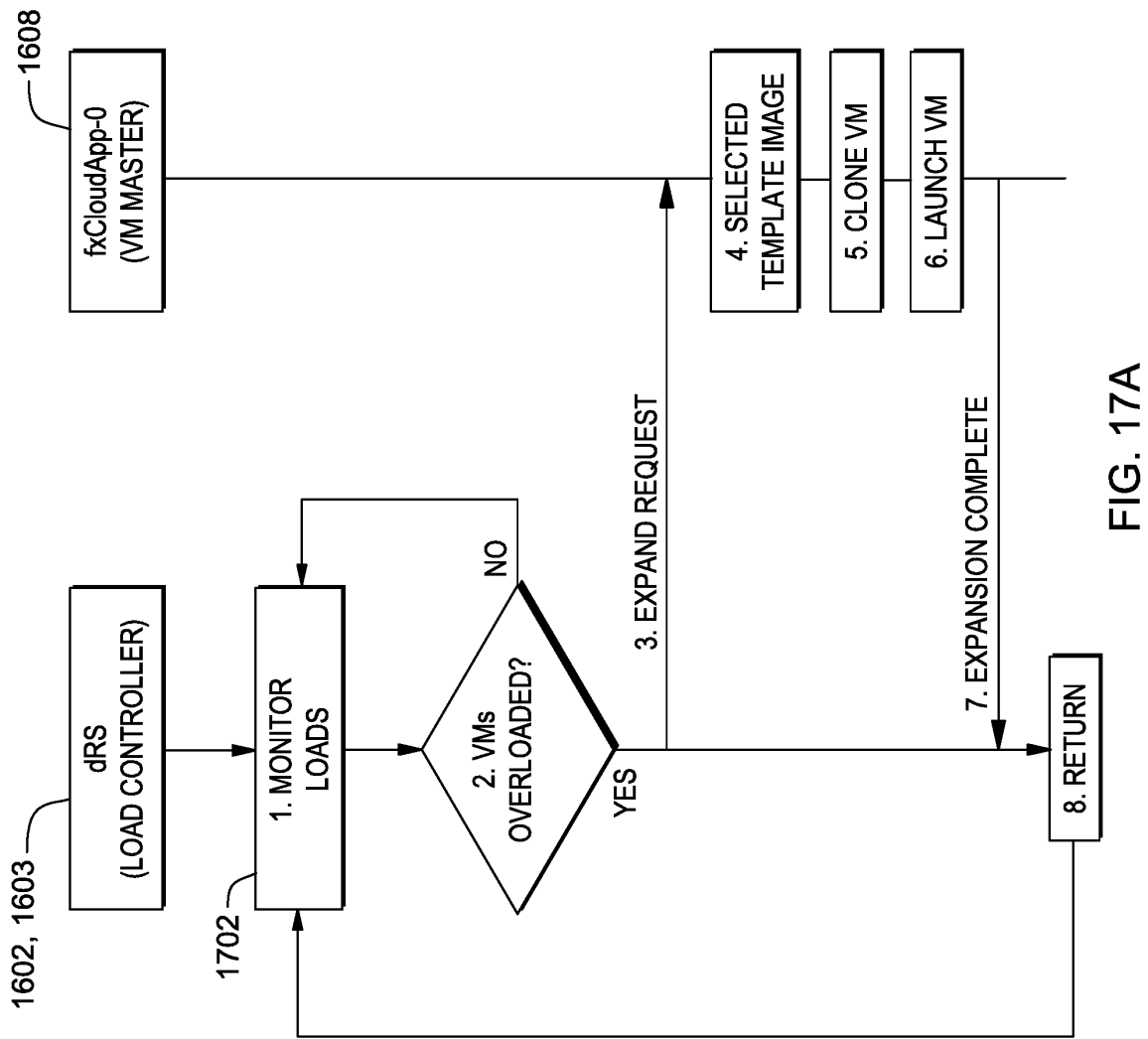


FIG. 15





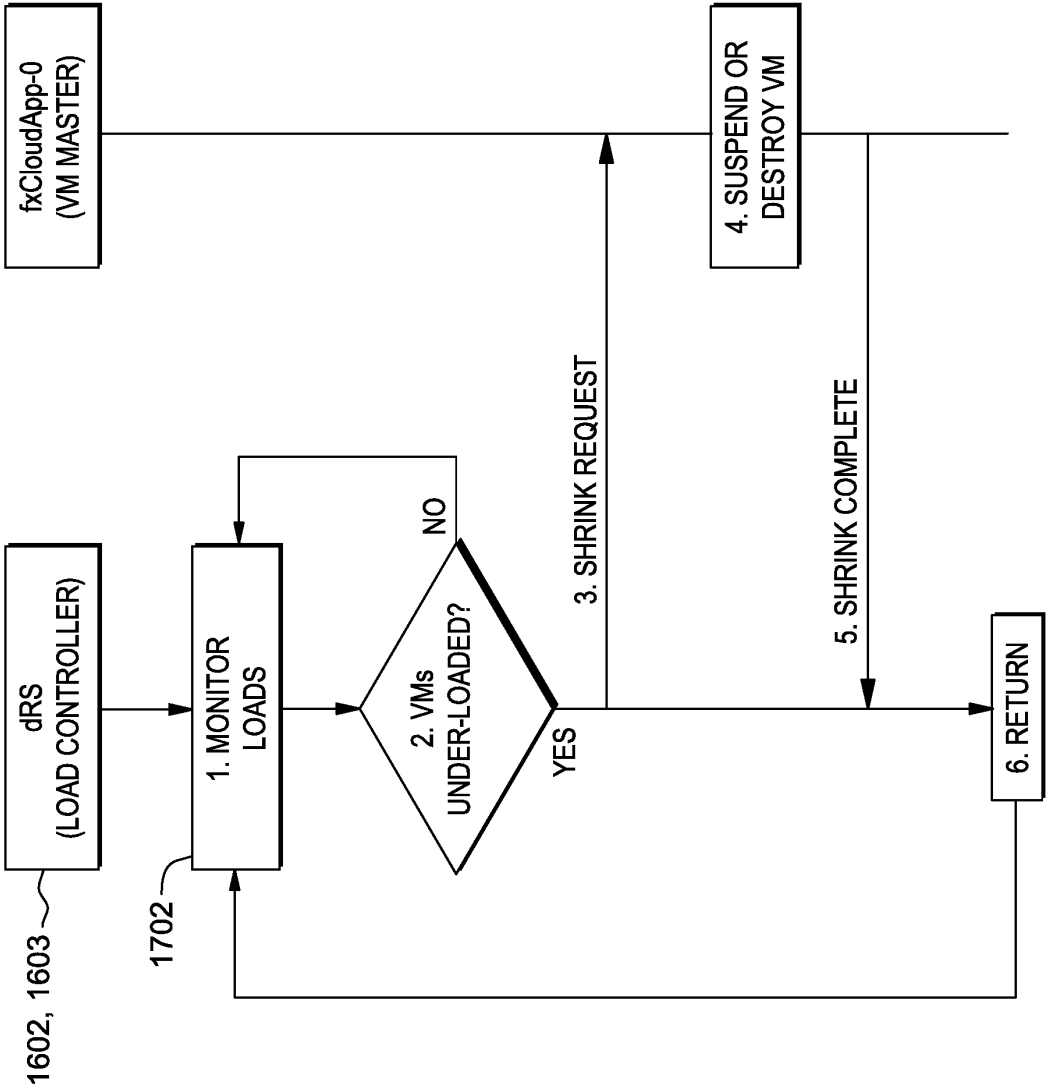


FIG. 17B

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	TAAG001CONT1
		Application Number	
Title of Invention	Distributed Software Defined Networking		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--------------------------	---

Inventor Information:

Inventor 1					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Pouya		Taaghoh		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	San Jose	State/Province	CA	Country of Residence	US
Mailing Address of Inventor:					
Address 1		1260 Trestlewood Lane			
Address 2					
City	San Jose	State/Province	CA		
Postal Code	95138	Country	US		
Inventor 2					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Vivek		Ramanna		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	San Jose	State/Province	CA	Country of Residence	US
Mailing Address of Inventor:					
Address 1		549 Manhattan Place			
Address 2					
City	San Jose	State/Province	CA		
Postal Code	95136	Country	US		
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.					

Correspondence Information:

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	TAAG001CONT1
		Application Number	
Title of Invention	Distributed Software Defined Networking		

☐ An Address is being provided for the correspondence information of this application.

Customer Number	112449		
Email Address	chris.horgan@roarkip.com	Add Email	Remove Email

Application Information:

Title of the Invention	Distributed Software Defined Networking		
Attorney Docket Number	TAAG001CONT1	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	5	Suggested Figure for Publication (if any)	1

Publication Information:
☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☒ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.
Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative information during processing.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	112449		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Continuation of	14295331	2014-06-04
Prior Application Status	Expired	Remove	

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	TAAG001CONT1
		Application Number	
Title of Invention	Distributed Software Defined Networking		
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
14295331	non provisional of	61834807	2013-06-13
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)¹ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

			Remove
Application Number	Country ¹	Filing Date (YYYY-MM-DD)	Access Code ¹ (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			

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

This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

☐ NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Authorization to Permit Access:

☐ Authorization to Permit Access to the Instant Application by the Participating Offices

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	TAAG001CONT1
		Application Number	
Title of Invention	Distributed Software Defined Networking		

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.				
Applicant 1				
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.				
Clear				
☐ Assignee	☐ Legal Representative under 35 U.S.C. 117	☐ Joint Inventor		
☐ Person to whom the inventor is obligated to assign.	☐ Person who shows sufficient proprietary interest			
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:				
Name of the Deceased or Legally Incapacitated Inventor :				
If the Applicant is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	TAAG001CONT1
		Application Number	
Title of Invention	Distributed Software Defined Networking		
Mailing Address Information For Applicant:			
Address 1			
Address 2			
City		State/Province	
Country		Postal Code	
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button.			

Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.				
Assignee 1				
Complete this section only if non-applicant assignee information is desired to be included on the patent application publication in accordance with 37 CFR 1.215(b). Do not include in this section an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest), as the patent application publication will include the name of the applicant(s).				
If the Assignee is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee Data may be generated within this form by selecting the Add button.				

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	TAAG001CONT1
		Application Number	
Title of Invention	Distributed Software Defined Networking		

Signature:

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications.					
Signature	/Christopher J. Horgan/		Date (YYYY-MM-DD)	2017-12-08	
First Name	Christopher	Last Name	Horgan	Registration Number	40394
Additional Signature may be generated within this form by selecting the Add button.					

This collection of information is required by 37 CFR 1.76. 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 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet 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.**

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA/82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	
Filing Date	
First Named Inventor	Pouya Taaghol
Title	Distributed Software Defined Networking
Art Unit	
Examiner Name	
Attorney Docket Number	TAAG001

SIGNATURE of Applicant or Patent Practitioner			
Signature	/Christopher J. Horgan/	Date (Optional)	June 2, 2014
Name	Christopher J. Horgan	Registration Number	40,394
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			
NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.			
☒	*Total of 1 forms are submitted.		

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. 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 3 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.

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/52A.)

- ☒ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/52A) or identified above: 112449
- OR
- ☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/52C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/52A) or identified above. (Note: Complete form PTO/AIA/52C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

- ☒ The address associated with the above-mentioned Customer Number
- OR

- ☐ The address associated with Customer Number:

OR

Firm or Individual Name			
Address			
City	State	Zip	
Country			
Telephone	Email		

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

--

- ☐ Inventor or Joint Inventor (title not required below)
- ☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
- ☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
- ☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	<u>[Signature]</u>	Date (Optional)	
Name	<u>POUYA TAAGHOL</u>		
Title	<u>Inventor</u>		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

- ☒ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. 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 5 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 FILES 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.