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(54) Title: USING TRANSACTIONS TO COMPUTE AND PROPAGATE NETWORK FORWARDING STATE

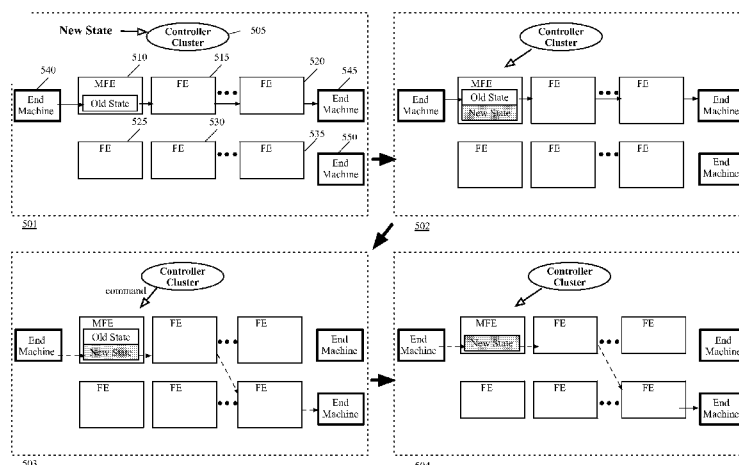


Figure 5

(57) **Abstract:** For a controller for managing a network comprising several managed forwarding elements that forward data in the network, a method for configuring a managed forwarding element is described. The method generates a first set of flow entries for defining forwarding behaviors of the managed forwarding element based on a current network policy for a logical network implemented in the several managed forwarding elements. The method sends the first set of flow entries to the managed forwarding element in order for the managed forwarding element to forward data that the managed forwarding element directly receives from an end machine based on the current network policy. The method generates a second set of flow entries for modifying forwarding behaviors of the managed forwarding element based on a new network policy for the logical network. The method sends the second set of flow entries to the managed forwarding element in order for the managed forwarding element to forward the data based on the new network policy.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/037231

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04L12/751 H04L12/715 H04L12/931
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04L H04W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	"An Architectural Reference Model for Autonomic Networking, Cognitive Networking and Self-Management", ETSI DRAFT; AFI#10-00002V0017-CLEAN-VERSION-MARCH22-2012 LAURENT RANGANAI TAYEB VERSION BEING POLISHED UP, EUROPEAN TELECOMMUNICATIONS STANDARDS INSTITUTE (ETSI), 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS ; FRANCE, no. V0.0.17, 23 March 2012 (2012-03-23), pages 1-179, XP014072554, [retrieved on 2012-03-23] page 54, paragraph Section 9.1 - page 122; figures 56,59,60 page 137, paragraph Section 10.1.3 - page 140 ----- -/-	1-5



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

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Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/037231

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2011/305167 A1 (KOIDE TOSHIO [JP]) 15 December 2011 (2011-12-15)	21-27
A	paragraph [0007] - paragraph [0009]; figures 2,3,13 paragraph [0045] - paragraph [0049] paragraph [0052] - paragraph [0054] paragraph [0069] - paragraph [0074] paragraph [0128] -----	6-20
A	US 2011/261825 A1 (ICHINO KIYOHISA [JP]) 27 October 2011 (2011-10-27) paragraph [0032] - paragraph [0037]; figure 1 -----	1-27
A	EP 1 653 688 A1 (LUCENT TECHNOLOGIES INC [US]) 3 May 2006 (2006-05-03) paragraph [0023] - paragraph [0032]; figures 4,5 -----	1-27
A	US 2010/257263 A1 (CASADO MARTIN [US] ET AL) 7 October 2010 (2010-10-07) paragraph [0020] - paragraph [0026] paragraph [0037] - paragraph [0048] -----	1-27

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/037231

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-5

Method for updating the forwarding state of a managed forwarding element (after the network configuration has changed) by a controller

2. claims: 6-20

Method for create a nested transaction structure

3. claims: 21-27

Method for converging computations

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2013/037231

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2011305167 A1	15-12-2011	CN 102687465 A EP 2521308 A1 RU 2012132449 A US 2011305167 A1 WO 2011080870 A1	19-09-2012 07-11-2012 10-02-2014 15-12-2011 07-07-2011
US 2011261825 A1	27-10-2011	CN 102349268 A EP 2408155 A1 JP 5408243 B2 US 2011261825 A1 WO 2010103909 A1	08-02-2012 18-01-2012 05-02-2014 27-10-2011 16-09-2010
EP 1653688 A1	03-05-2006	CN 1783841 A EP 1653688 A1 JP 4790376 B2 JP 2006135975 A KR 20060092977 A US 2006092940 A1 US 2012281520 A1	07-06-2006 03-05-2006 12-10-2011 25-05-2006 23-08-2006 04-05-2006 08-11-2012
US 2010257263 A1	07-10-2010	AU 2010232526 A1 CA 2756289 A1 CN 102726007 A EP 2415221 A2 JP 2012525017 A KR 20120016080 A US 2010257263 A1 WO 2010115060 A2	13-10-2011 07-10-2010 10-10-2012 08-02-2012 18-10-2012 22-02-2012 07-10-2010 07-10-2010