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[Continued on next page]

(54) Title: HEALING CLOUD SERVICES DURING UPGRADES

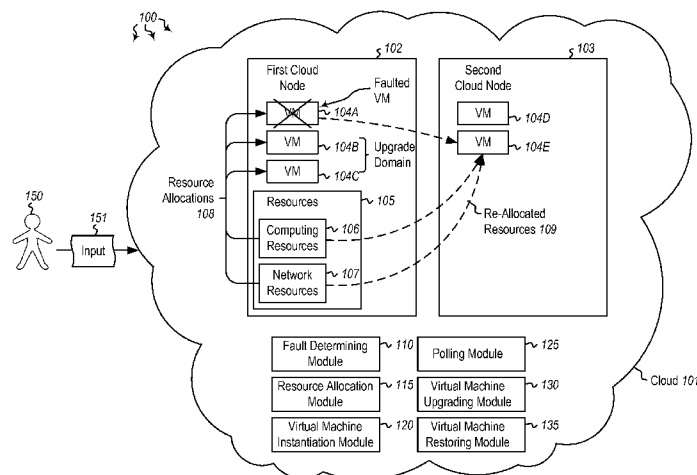


Figure 1

(57) Abstract: Embodiments described herein are directed to migrating affected services away from a faulted cloud node and to handling faults during an upgrade. In one scenario, a computer system determines that virtual machines running on a first cloud node are in a faulted state. The computer system determines which cloud resources on the first cloud node were allocated to the faulted virtual machine, allocates the determined cloud resources of the first cloud node to a second, different cloud node and re-instantiates the faulted virtual machine on the second, different cloud node using the allocated cloud resources.

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TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG). **Published:**

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(88) Date of publication of the international search report:
18 September 2014

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/011365

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06F11/20
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)
G06F

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, WPI Data, INSPEC, COMPENDEX, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2011/035620 A1 (ELYASHEV VITALY [IL] ET AL) 10 February 2011 (2011-02-10)	1-4
Y	paragraphs [0002] - [0004], [0011],	5,9,10
A	[0018] - [0022], [0029] - [0036], [0040] - [0048], [0052] figures 1-3,5	6-8

Y	US 2012/066541 A1 (DOURNOV PAVEL A [US] ET AL) 15 March 2012 (2012-03-15)	5,9,10
A	paragraphs [0009] - [0011], [0019] - [0043] figures 2,3	6-8

X	US 2011/202795 A1 (MARATHE SHAILESH VAMAN [IN] ET AL) 18 August 2011 (2011-08-18)	1,3,4,9
A	paragraphs [0007] - [0010], [0022], [0025] - [0044], [0058] - [0065] figures 1-5	2,5,10

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

20 June 2014

Date of mailing of the international search report

03/07/2014

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/011365

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, 9, 10

Computer system to perform a method for migrating affected services away from a faulted cloud node comprising: an act of determining that one or more virtual machines running on a first cloud node are in a faulted state; an act of determining which cloud resources on the first cloud node were allocated to the faulted virtual machine; an act of allocating the determined cloud resources for the faulted virtual machine on the first cloud node to a second, different cloud node; and an act of re-instantiating the faulted virtual machine on the second, different cloud node using the allocated cloud resources.

2. claims: 6-8

Computer system to perform a method for handling faults during an upgrade comprising: an act of pausing an initiated service upgrade, the service upgrade being configured to upgrade one or more virtual machines from an older service version to a newer service version, the virtual machines being located in one or more different upgrade domains, by upgrading each virtual machine within an upgrade domain before proceeding to the next upgrade domain; an act of determining that a virtual machine instance has faulted; an act of determining whether the faulted virtual machine instance is in an upgrade domain that is currently being upgraded, is in an upgrade domain that has already been upgraded, or is in an upgrade domain that has yet to be upgraded to the newer service version; an act of restoring the faulted virtual machine instance using at least one of the newer service version and the older service version, based on the determination; and an act of resuming the initiated service upgrade.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2014/011365

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2011035620	A1	10-02-2011	NONE

US 2012066541	A1	15-03-2012	AU 2011299337 A1 21-03-2013
			CN 102385541 A 21-03-2012
			EP 2614436 A2 17-07-2013
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			WO 2012033773 A2 15-03-2012

US 2011202795	A1	18-08-2011	NONE
