

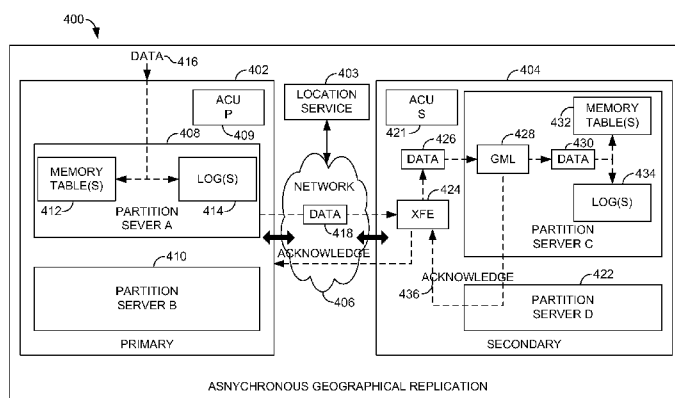


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- (81) **Designated States** (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
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[Continued on next page]

(54) **Title:** ASYNCHRONOUS REPLICATION IN A DISTRIBUTED STORAGE ENVIRONMENT**FIG. 4.**

(57) **Abstract:** Embodiments of the present invention relate to asynchronously replicating data in a distributed computing environment. To achieve asynchronous replication, data received at a primary data store may be annotated with information, such as an identifier of the data. The annotated data may then be communicated to a secondary data store, which may then write the data and annotated information to one or more logs for eventual replay and committal at the secondary data store. The primary data store may communicate an acknowledgment of success in committing the data at the primary data store as well as of success in writing the data to the secondary data store. Additional embodiments may include committing the data at the secondary data store in response to receiving an instruction that authorizes committal of data through a identifier.

**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))*
- *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))*

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**A. CLASSIFICATION OF SUBJECT MATTER****G06F 15/16(2006.01)i, G06F 12/16(2006.01)i**

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 15/16; G06F 12/16; G06F 12/00

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) &amp; Keywords: distributed computing system, asynchronous geo replicating data, primary data store, secondary data store, logs, annotated data, message, identifier

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                            | Relevant to claim No. |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| A         | US 2005-0091391 A1 (DAVID BURTON et al.) 28 April 2005<br>See paragraphs [0038]-[0039], [0048]-[0050], [0054]-[0056], [0061], claims 1,18,24, and figures 2-5 | 1-10                  |
| A         | US 2010-0082540 A1 (ISAACSON CORY M. et al.) 01 April 2010<br>See paragraphs [0021],[0036], claims 1,10, and figure 2A                                        | 1-10                  |
| A         | US 2008-0016300 A1 (WAI C. YIM et al.) 17 January 2008<br>See paragraphs [0025]-[0026], claims 1,14, and figure 2                                             | 1-10                  |
| A         | US 7647449 B1 (ROY SUBHOJIT et al.) 12 January 2010<br>See claims 1-4,9-10, and figure 1                                                                      | 1-10                  |



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

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"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

"&amp;" document member of the same patent family

Date of the actual completion of the international search

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**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/US2012/038651**

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s)                                                                                                                            | Publication<br>date                                                                                          |
|-------------------------------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| US 2005-0091391 A1                        | 28.04.2005          | EP 1683052 A2<br>EP 1683052 A4<br>US 2007-0011213 A1<br>US 7143122 B2<br>US 7685176 B2<br>WO 2005-045606 A2<br>WO 2005-045606 A3<br>WO 2005-045606 A3 | 26.07.2006<br>27.12.2006<br>11.01.2007<br>28.11.2006<br>23.03.2010<br>19.05.2005<br>11.05.2006<br>19.05.2005 |
| US 2010-0082540 A1                        | 01.04.2010          | WO 2010-037065 A2<br>WO 2010-037065 A3<br>WO 2010-037065 A3                                                                                           | 01.04.2010<br>19.08.2010<br>01.04.2010                                                                       |
| US 2008-0016300 A1                        | 17.01.2008          | None                                                                                                                                                  |                                                                                                              |
| US 7647449 B1                             | 12.01.2010          | None                                                                                                                                                  |                                                                                                              |