(19) World Intellectual Property Organization

International Bureau





(43) International Publication Date 9 November 2006 (09.11,2006)

(10) International Publication Number WO 2006/118926 A3

(51) International Patent Classification: *G06F 17/30* (2006.01) *G06F 3/06* (2006.01)

(21) International Application Number:

PCT/US2006/015917

(22) International Filing Date: 27 April 2006 (27.04.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

11/119,118 29 April 2005 (29.04.2005) US

- (71) Applicant (for all designated States except US): NET-WORK APPLIANCE, INC. [US/US]; 495 East Java Drive, Sunnyvale, California 94089 (US).
- (72) Inventor: JERNIGAN, Richard, P., IV; 1016 Rice Avenue, Ambridge, Pennsylvania 15003 (US).
- (74) Agent: BARBAS, Charles, J.; CESARI AND MCKENNA, LLP, 88 Black Falcon Avenue, Boston, Massachusetts 02210 (US).

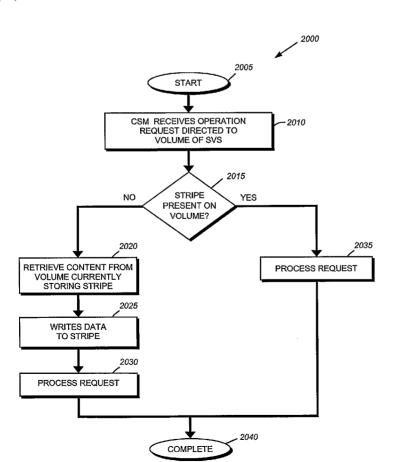
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

with international search report

[Continued on next page]

(54) Title: SYSTEM AND METHOD FOR RESTRIPING DATA ACROSS A PLURALITY OF VOLUMES



(57) Abstract: A system and method re-stripes one or more data containers across a striped volume set (SVS) that has been modified by the addition of one or more volumes. The SVS is associated with an existing set of striping rules that define a stripe algorithm, a stripe width and an ordered list of volumes distributed across a plurality of nodes interconnected as a cluster. Each node of the cluster includes (i) a disk element (D-blade) adapted to service a volume of the SVS and (ii) a network element (N-blade) adapted to redirect a data access request to any D-blade of the cluster. Notably, the content of each data container is apportioned among the volumes of the SVS to thereby improve the effi- ciency of storage service provided by the cluster. To that end, the stripe algorithm specifies the manner in which the data container content is apportioned as stripes across the plurality of volumes, while the stripe width specifies the size/width of each stripe.

WO 2006/118926 A3



 before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

 $\textbf{(88)} \ \ \textbf{Date of publication of the international search report:}$

4 January 2007

INTERNATIONAL SEARCH REPORT

International application No PCT/US2006/015917

A. CLASSIFICATION OF SUBJECT MATTER INV. G06F17/30

ADD. G06F3/06

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

B. FIELDS SEARCHED

 $\begin{array}{ll} \mbox{Minimum documentation searched (classification system followed by classification symbols)} \\ \mbox{G07F} & \mbox{G06F} \end{array}$

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 practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT						
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.				
Χ	US 2002/035668 A1 (NAKANO YASUHIKO [JP] ET AL) 21 March 2002 (2002-03-21)	1–12				
A	paragraph [0106] - paragraph [0122] paragraph [0132] - paragraph [0139]; figures 10,12,16	13–21				
X	WO 02/29807 A2 (EMC CORP [US]) 11 April 2002 (2002-04-11)	1–12				
Α	page 3, line 15 - page 5, line 4 page 7, line 10 - page 12, line 15; figure 7	13–21				
X	US 2004/153479 A1 (MIKESELL PAUL A [US] ET AL) 5 August 2004 (2004-08-05)	13-21				
Α	paragraph [0008] - paragraph [0013] paragraph [0099] - paragraph [0100] paragraph [0203] - paragraph [0218]; figures 1,2,10,12	1–12				
	_/					

X Further documents are listed in the continuation of Box C.	X 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 document 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 19 October 2006	Date of mailing of the international search report $27/10/2006$
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Authorized officer Reino, Bernardo

4

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2006/015917

C(Continua	tion). DOCUMENTS CONSIDERED TO BE RELEVANT	PC1/U32000/U1591/
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 035 373 A (IWATA KUNIO [JP]) 7 March 2000 (2000-03-07) column 2, line 51 - column 3, line 55	1-21
A	US 5 574 851 A (RATHUNDE DALE F [US]) 12 November 1996 (1996-11-12) column 3, line 44 - column 5, line 22	1-21
А	US 5 991 804 A (BOLOSKY WILLIAM J [US] ET AL) 23 November 1999 (1999-11-23) column 1, line 15 - column 2, line 24	1-21
	-	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2006/015917

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
US 2002035668	A1	21-03-2002	JP	2000047831 A	18-02-2000
WO 0229807	A2	11-04-2002	DE GB JP US US	10196687 T0 2383677 A 2004536360 T 2003182505 A1 6546457 B1	28-08-2003 02-07-2003 02-12-2004 25-09-2003 08-04-2003
US 2004153479	A1	05-08-2004	NONE		
US 6035373	Α	07-03-2000	JP JP	3170455 B2 9319528 A	28-05-2001 12-12-1997
US 5574851	Α	12-11-1996	NONE		
US 5991804	Α	23-11-1999	NONE		