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[Continued on next page]

(54) Title: APPARATUS, SYSTEM, AND METHOD FOR SERVICING OBJECT REQUESTS WITHIN A STORAGE CONTROLLER

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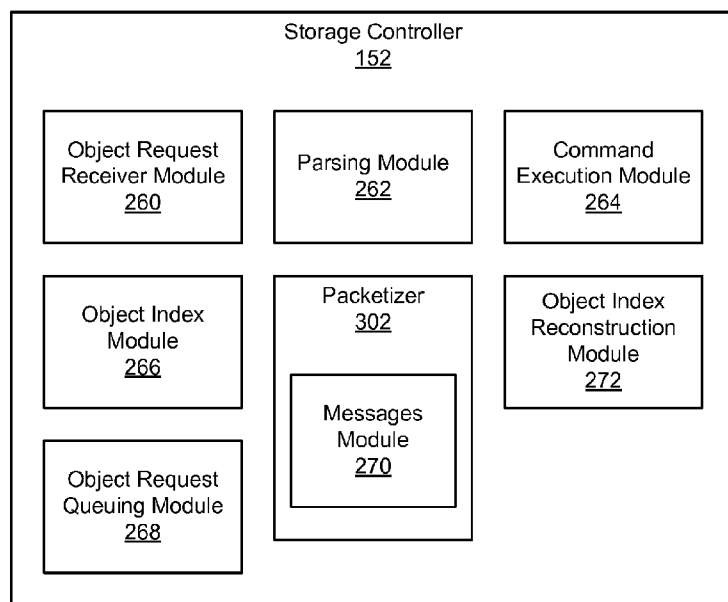


FIG. 2A

(57) Abstract: Servicing object requests within a storage controller (150). An object request receiver module (260) is included that receives an object request from a requesting device (155). The object request is received by the storage controller (152) and directed at a data segment of an object managed by the storage controller (152). The storage controller (152) stores the data segment in a data storage device (154) coupled to the storage controller (152). A parsing module (262) is included that parses at least one command from the object request. A command execution module (264) is included that executes the at least one command parsed from the object request. An object index module (266) is included that creates an object entry in an object index in response to the storage controller (152) storing the data segment of the object. The object entry includes a mapping between a logical identifier of the object and one or more physical addresses corresponding to where the storage controller (152) stored one or more data packets created

from one or more data segments of the object and metadata packets created from object attributes of the object.

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MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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A. CLASSIFICATION OF SUBJECT MATTER INV. G06F3/06 G06F17/30 G06F12/02 G11C16/06				
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 G11C				
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.		
X	ANSI: "SCSI Object-Based Storage Device Commands (OSD)" ISO/IEC 14776-391, [Online] 30 July 2004 (2004-07-30), pages 1-171, XP002474837 New York, USA Retrieved from the Internet: URL: http://www.t10.org/ftp/t10/drafts/osd/osd-r10.pdf [retrieved on 2008-04-02] page 15, paragraph 4.3 page 15; figure 2 pages 17-19, paragraph 4.6 page 74, paragraph 5.2.7 pages 75-76, paragraph 6.1 pages 79-80, paragraph 6.3 pages 105-106, paragraph 6.17	1, 2, 5, 9-12, 18-20, 24-29		
Y	----- -/--	3, 6-8, 13-17		
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.				
* Special categories of cited documents:				
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; vertical-align: top;"> "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 </td> <td style="width: 50%; border: none; vertical-align: top;"> "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. "d" document member of the same patent family </td> </tr> </table>			"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. "d" document member of the same patent family
"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. "d" document member of the same patent family			
Date of the actual completion of the international search <p style="text-align: center; font-weight: bold;">29 August 2008</p>		Date of mailing of the international search report <p style="text-align: center; font-weight: bold;">05/09/2008</p>		
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 <p style="text-align: center; font-weight: bold;">De Ceulaer, Bart</p>		

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2007/086687

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GANGER G R ET AL: "Storage area networking - Object-based storage" IEEE COMMUNICATIONS MAGAZINE, IEEE SERVICE CENTER, PISCATAWAY, US, [Online] vol. 41, no. 8, August 2003 (2003-08), pages 84-90, XP011099971 ISSN: 0163-6804 page 86, left-hand column, line 4 - page 88, left-hand column, line 5 page 86; figure 3	1,27,29
A	US 2005/262150 A1 (KRISHNASWAMY ANAND [IN]) 24 November 2005 (2005-11-24) paragraph [0018] figure 1 paragraphs [0028] - [0037] figures 3,4	1,27,29
Y	EP 0 747 822 A (HITACHI LTD [JP]) 11 December 1996 (1996-12-11) column 5, lines 29-44 figure 1 column 7, lines 11-23 figure 2 abstract	3,6-8, 13-17
A	US 2002/133743 A1 (OLDFIELD BARRY J [US] ET AL) 19 September 2002 (2002-09-19) paragraphs [0031] - [0038] figure 1	1,3,6-8, 13-17
X	US 2006/136779 A1 (LEE SANG-MIN [KR] ET AL) 22 June 2006 (2006-06-22) paragraphs [0002] - [0004] paragraphs [0019] - [0021] figure 1	1,21-23, 27,29

INTERNATIONAL SEARCH REPORT

International application No.
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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 allsearchable 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.:
1-3, 5-29
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: 1,2,5,9-12,18-20,24-29

Providing a request to add data in front of previously stored data.

2. claims: 3,6-8,13-17

Storing data segments using multiple storage controllers.

3. claim: 4

Queuing object requests.

4. claims: 21-23

Providing DMA operations.

INTERNATIONAL SEARCH REPORT

 International application No
 PCT/US2007/086687

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2005262150	A1	24-11-2005	NONE
EP 0747822	A	11-12-1996	DE 69615611 D1 08-11-2001 DE 69615611 T2 29-05-2002 JP 3732869 B2 11-01-2006 JP 8335144 A 17-12-1996 US 5720028 A 17-02-1998
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