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(12) **United States Patent**
Jewett et al.

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(54) **NETWORK-BASED STORAGE SYSTEM CAPABLE OF ALLOCATING STORAGE PARTITIONS TO HOSTS**

(52) **U.S. Cl.** 709/214; 709/215; 711/114
(58) **Field of Classification Search** 709/223-231, 709/212-217, 239; 711/114

See application file for complete search history.

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(56) **References Cited**

U.S. PATENT DOCUMENTS

5,127,097	A	6/1992	Mizuta	
5,129,077	A *	7/1992	Hillis	712/13
5,485,627	A *	1/1996	Hillis	712/13
5,548,770	A *	8/1996	Bridges	1/1
5,628,005	A *	5/1997	Hurvig	1/1
5,712,975	A *	1/1998	Ooe	709/219
5,721,779	A *	2/1998	Funk	713/155
5,754,830	A	5/1998	Butts et al.	
5,787,463	A	7/1998	Gajjar	

(Continued)

(73) Assignee: **Summit Data Systems LLC**, Frisco, TX (US)

OTHER PUBLICATIONS

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 401 days.

Carlson, M., S., Merhar, M., Monia, C., Rajagopal, M., "A Framework for IP Based Storage," Internet Draft Document printed from ietf.org web site, Nov. 17, 2000, pp. 1-36 (of-record in parent and/or grandparent application).

This patent is subject to a terminal disclaimer.

(Continued)

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Assistant Examiner — Sargon Nano

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(74) *Attorney, Agent, or Firm* — Greenblum & Bernstein, P.L.C.

Related U.S. Application Data

(57) **ABSTRACT**

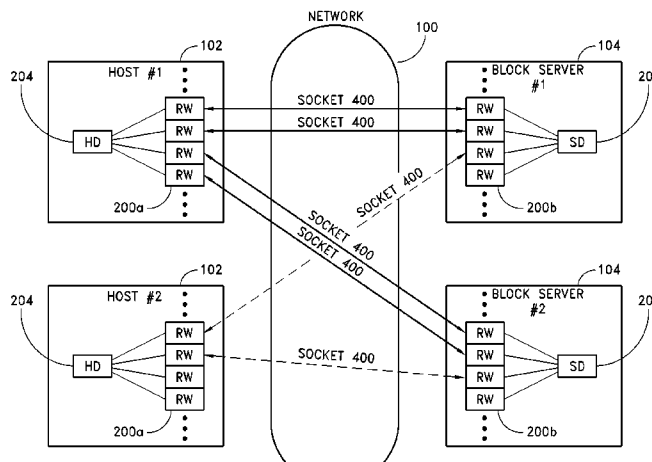
(60) Division of application No. 11/683,944, filed on Mar. 8, 2007, now Pat. No. 7,428,581, which is a continuation of application No. 09/927,894, filed on Aug. 10, 2001, now Pat. No. 7,392,291.

A network-based storage system comprises one or more block-level storage servers that connect to, and provide disk storage for, one or more host computers. In one embodiment, the system is capable of subdividing the storage space of an array of disk drives into multiple storage partitions, and allocating the partitions to host computers on a network. A storage partition allocated to a particular host computer may appear as local disk drive storage to user-level processes running on the host computer.

(60) Provisional application No. 60/244,664, filed on Aug. 11, 2000.

(51) **Int. Cl.**
G06F 15/167 (2006.01)
G06F 13/00 (2006.01)

16 Claims, 9 Drawing Sheets



U.S. PATENT DOCUMENTS

5,809,279	A *	9/1998	Oeda et al.	711/153
5,867,491	A	2/1999	Derango et al.	
5,867,723	A *	2/1999	Chin et al.	712/11
5,907,621	A	5/1999	Bachman	
5,931,918	A	8/1999	Row et al.	
5,931,947	A	8/1999	Burns et al.	
5,974,532	A	10/1999	McLain et al.	
5,996,014	A	11/1999	Uchihori et al.	
6,003,045	A *	12/1999	Freitas et al.	1/1
6,076,142	A	6/2000	Corrington et al.	
6,098,114	A	8/2000	McDonald et al.	
6,137,796	A	10/2000	Derango et al.	
6,151,297	A *	11/2000	Congdon et al.	370/216
6,161,165	A	12/2000	Solomon et al.	
6,185,316	B1	2/2001	Buffam	
6,339,785	B1	1/2002	Feigenbaum	
6,378,036	B2 *	4/2002	Lerman et al.	711/112
6,393,026	B1	5/2002	Irwin	
6,421,711	B1	7/2002	Blumenau et al.	
6,421,753	B1 *	7/2002	Hoese et al.	710/315
6,487,581	B1	11/2002	Spence et al.	
6,502,205	B1 *	12/2002	Yanai et al.	714/7
6,529,994	B1 *	3/2003	Bleidt et al.	711/114
6,539,482	B1	3/2003	Blanco et al.	
6,564,252	B1	5/2003	Hickman et al.	
6,618,757	B1	9/2003	Babbitt et al.	
6,618,798	B1	9/2003	Burton et al.	
6,633,909	B1 *	10/2003	Barrett et al.	709/224
6,654,752	B2 *	11/2003	Ofek	1/1
6,662,268	B1 *	12/2003	McBrearty et al.	711/114
6,671,776	B1	12/2003	DeKoning	
6,714,968	B1	3/2004	Prust	
6,725,456	B1 *	4/2004	Bruno et al.	718/102
6,772,347	B1	8/2004	Xie et al.	
6,807,559	B1 *	10/2004	Budhiraja	709/203
6,834,326	B1 *	12/2004	Wang et al.	711/114
6,912,668	B1 *	6/2005	Brown et al.	714/6
6,955,956	B2	10/2005	Tanaka et al.	
6,970,869	B1	11/2005	Slaughter et al.	
6,983,330	B1 *	1/2006	Oliveira et al.	709/239
7,392,291	B2	6/2008	Jewett et al.	
7,428,581	B2	9/2008	Jewett et al.	
7,543,184	B2 *	6/2009	Dean et al.	714/32
2001/0044863	A1 *	11/2001	Oeda et al.	710/104
2002/0059539	A1 *	5/2002	Anderson	714/6
2002/0077177	A1 *	6/2002	Elliott	463/40
2002/0104041	A1 *	8/2002	Jibbe	714/37
2003/0097504	A1 *	5/2003	Oeda et al.	710/104
2003/0188059	A1 *	10/2003	Zack	710/74
2004/0230698	A1 *	11/2004	Oeda et al.	709/245
2008/0313187	A1	12/2008	Jewett et al.	

OTHER PUBLICATIONS

Gibson, G., Nagle, D., Amini, K., Chang, F., Feinberg, E., Gobioff, H., Lee, C., Ozceri, B., Riedel, E., and Rochberg, D., "A Case for Network-Attached Secure Disks," Technical Report, CMU-CS-96-142, Department of Electrical and Computer Engineering, Carnegie-Mellon University, Sep. 26, 1996, pp. 1-19 (of-record in parent and/or grandparent application).

Hotz, S., Van Meter, R., and Finn, G., "Internet Protocols for Network-Attached Peripherals," Proc. Sixth NASA Goddard Conference on Mass Storage Systems and Technologies in cooperation with Fifteenth IEEE Symposium on Mass Storage Systems, Mar. 1998, pp. 1-15 (of-record in parent and/or grandparent application).

Lee, E., and Thekkath, C., "Petal: Distributed Virtual Disks," ACM Seventh International Conference on Architectural Support for Programming Languages and Operating Systems, ACM Digital Library, Oct. 1996, pp. 84-92 (of-record in parent and/or grandparent application).

Perkins, C., and Harjono, H., "Resource Discovery Protocol for Mobile Computing," Mobile Networks and Applications, vol. 1,

Tiemey, B., Johnston, W., Herzog, H., Hoo, Guojun, J., Lee, J., Chen, L., and Rotem, D., "Distributed Parallel Data Storage Systems: A Scalable Approach to High Speed Image Servers," Proceedings of the Second ACM International Conference on Multimedia, Oct. 1994, pp. 399-405 (of-record in parent and/or grandparent application).

Van Meter, R., Finn, G., and Hotz, S., "VISA: Netstation's Virtual Internet SCSI Adapter," Proceedings of the Eighth International Conference on Architectural Support for Programming Languages and Operating Systems, Oct. 1998, pp. 71-80 (of-record in parent and/or grandparent application).

Complaint filed in *Summit Data Systems, L.L.C., v. Adaptec, Inc. et al.*, filed Sep. 1, 2010 in the United States District Court for the District of Delaware, Case No. 1:10-cv-00749-UNA.

International Search Report in International Appl. No. PCT/US01/25256, mailing date of Dec. 14, 2001.

Office Action in U.S. Appl. No. 12/195,244, mailing date of Dec. 27, 2010.

Office Action in U.S. Appl. No. 12/195,244, mailing date of Oct. 11, 2011.

"Final Joint Claim Chart," dated Oct. 3, 2011, filed in *Summit Data Systems, LLC v. EMC Corp. et al.*, Civil Action No. 1:10-cv-00749-GMS (D. Del. 2010).

"Defendants' Opening Claim Construction Brief" including Tabs A-B, dated Oct. 26, 2011, filed in *Summit Data Systems, LLC v. EMC Corp. et al.*, Civil Action No. 1:10-cv-00749-GMS (D. Del. 2010).

"Declaration of Todd M. Simpson in Support of Defendant's Opening Claim Construction Brief," dated Oct. 26, 2011, filed in *Summit Data Systems, LLC v. EMC Corp. et al.*, Civil Action No. 1:10-cv-00749-GMS (D. Del. 2010).

Microsoft Computer Dictionary, Microsoft Press, Fourth Edition, pp. 115, 285, 290, and 359, copyright 1999, cited as Exhibit 1 in "Declaration of Todd M. Simpson in Support of Defendant's Opening Claim Construction Brief," filed in *Summit Data Systems, LLC v. EMC Corp. et al.*, Civil Action No. 1:10-cv-00749-GMS (D. Del. 2010), dated Oct. 26, 2011).

The Authoritative Dictionary of IEEE Standards Terms, Standards Information Network IEEE Press, Seventh Edition, pp. 52 and 107, copyright 2000 cited as Exhibit 2 in "Declaration of Todd M. Simpson in Support of Defendant's Opening Claim Construction Brief," filed in *Summit Data Systems, LLC v. EMC Corp. et al.*, Civil Action No. 1:10-cv-00749-GMS (D. Del. 2010), dated Oct. 26, 2011).

Pfaffenberger, Bryan, Webster's New World Dictionary of Computer Terms, Macmillan Publishing, Seventh Edition, pp. 160 and 169, copyright 2000 cited as Exhibit 3 in "Declaration of Todd M. Simpson in Support of Defendant's Opening Claim Construction Brief," filed in *Summit Data Systems, LLC v. EMC Corp. et al.*, Civil Action No. 1:10-cv-00749-GMS (D. Del. 2010), dated Oct. 26, 2011).

Merriam-Webster's Collegiate Dictionary, Merriam-Webster, Inc., Tenth Edition, pp. 239, 840, and 894, copyright 2000 cited as Exhibit 4 in "Declaration of Todd M. Simpson in Support of Defendant's Opening Claim Construction Brief," filed in *Summit Data Systems, LLC v. EMC Corp. et al.*, Civil Action No. 1:10-cv-00749-GMS (D. Del. 2010), dated Oct. 26, 2011).

Margolis, Philip E., Random House Webster's Computer & Internet Dictionary, Random House, Third Edition, p. 516, copyright 1999 cited as Exhibit 5 in "Declaration of Todd M. Simpson in Support of Defendant's Opening Claim Construction Brief," filed in *Summit Data Systems, LLC v. EMC Corp. et al.*, Civil Action No. 1:10-cv-00749-GMS (D. Del. 2010), dated Oct. 26, 2011).

"Plaintiff Summit Data Systems LLC's Memorandum of Law in Support of its Proposed Claim Construction," including Exhibits 1 and 2, dated Oct. 26, 2011, filed in *Summit Data Systems, LLC v. EMC Corp. et al.*, Civil Action No. 1:10-cv00749-GMS (D. Del. 2010).

"Declaration of Myron Zimmerman in Support of Plaintiff Summit Data Solutions LLC's Proposed Claim Constructions," dated Oct. 26, 2011, cited as Exhibit 3 in "Plaintiff Summit Data Systems LLC's Memorandum of Law in Support of its Proposed Claim Construction," filed in *Summit Data Systems, LLC v. EMC Corp. et al.*, Civil

“Defendants’ Answering Claim Construction Brief,” including Tab A, dated Nov. 21, 2011, filed in *Summit Data Systems, LLC v. EMC Corp. et al.*, Civil Action No. 1:10-cv-00749-GMS (D. Del. 2010).

“Plaintiff Summit Data Systems LLC’s Answering Memorandum of Law in Support of its Proposed Claim Constructions,” dated Nov. 21, 2011, filed in *Summit Data Systems, LLC v. EMC Corp. et al.*, Civil Action No. 1:10-cv-00749-GMS (D. Del. 2010).

“Joint Appendix of Intrinsic Evidence,” dated Nov. 21, 2011, filed in *Summit Data Systems, LLC v. EMC Corp. et al.*, Civil Action No. 1:10-cv-00749-GMS (D. Del. 2010).

Office Action dated Jun. 7, 2012 issued with respect to U.S. Appl. No. 12/195,244.

* cited by examiner

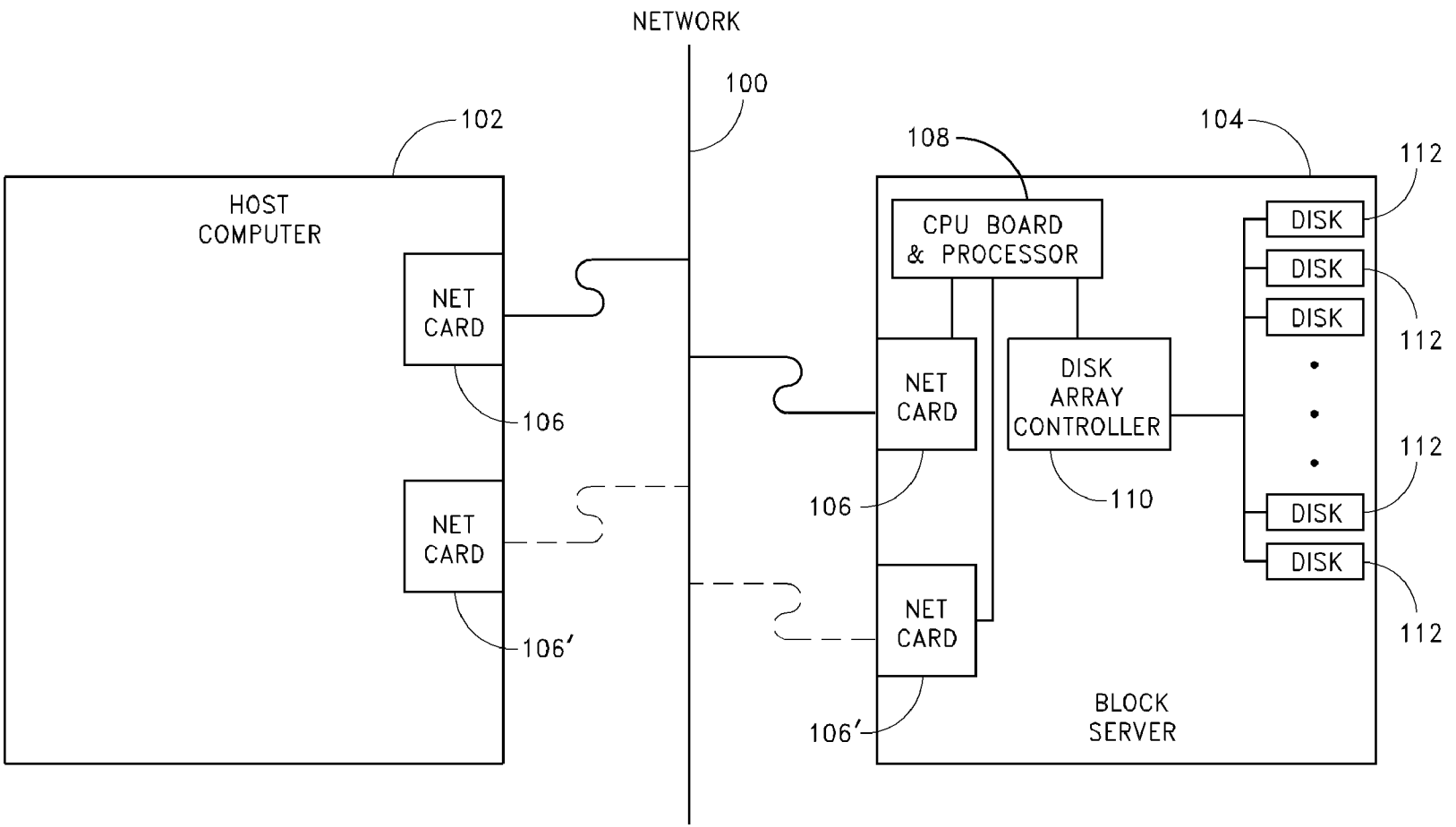


FIG. 1

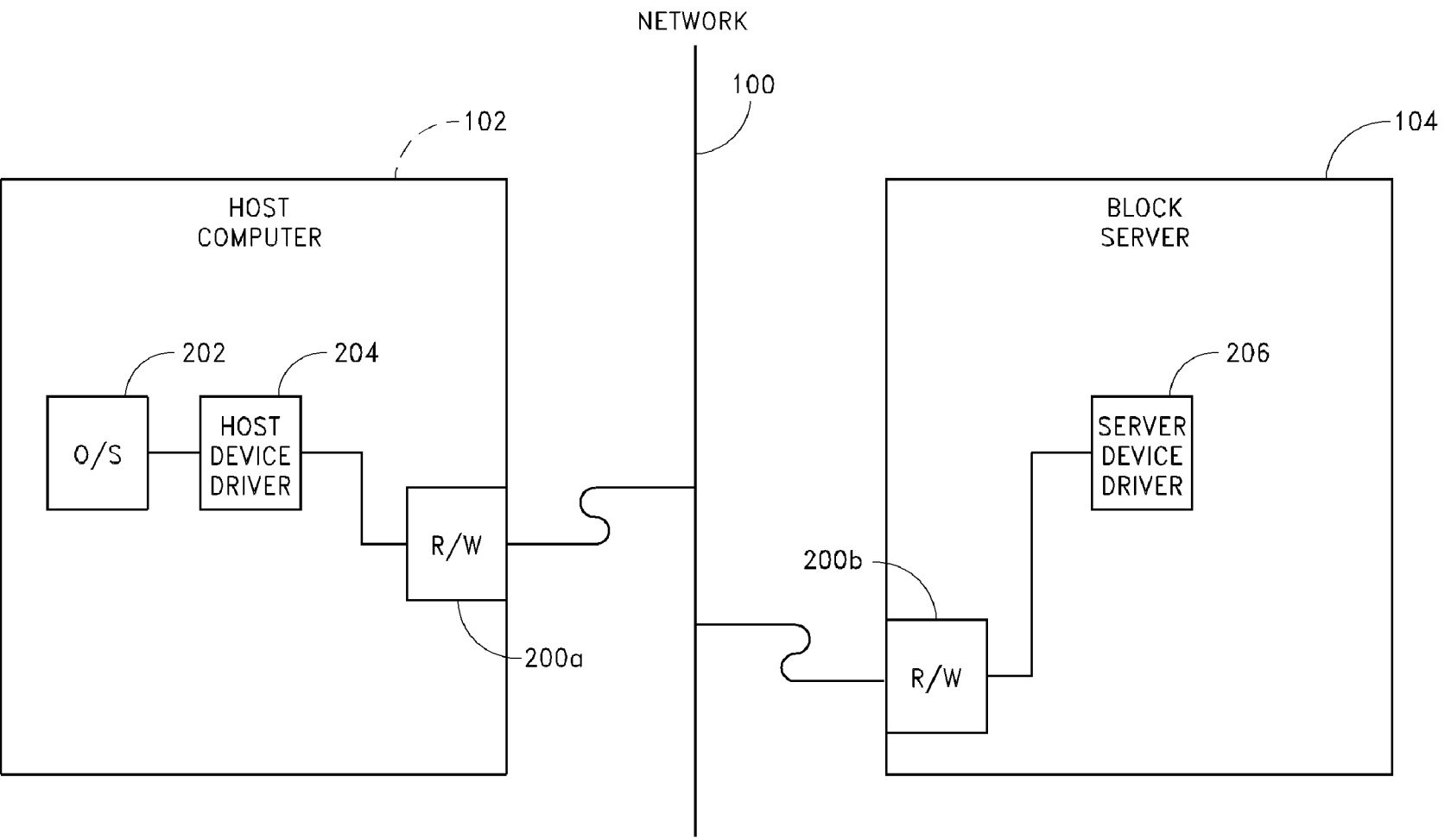


FIG. 2

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