



US007051147B2

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

(10) **Patent No.:** **US 7,051,147 B2**
(45) **Date of Patent:** ***May 23, 2006**

(54) **STORAGE ROUTER AND METHOD FOR PROVIDING VIRTUAL LOCAL STORAGE**

(75) Inventors: **Geoffrey B. Hoese**, Austin, TX (US);
Jeffrey T. Russell, Cibolo, TX (US)

(73) Assignee: **Crossroads Systems, Inc.**, Austin, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **10/658,163**

(22) Filed: **Sep. 9, 2003**

(65) **Prior Publication Data**

US 2004/0054838 A1 Mar. 18, 2004

Related U.S. Application Data

(63) Continuation of application No. 10/081,110, filed on Feb. 22, 2002, now Pat. No. 6,789,152, which is a continuation of application No. 09/354,682, filed on Jul. 15, 1999, now Pat. No. 6,421,753, which is a continuation of application No. 09/001,799, filed on Dec. 31, 1997, now Pat. No. 5,941,972.

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

(52) **U.S. Cl.** **710/305; 710/11; 709/258**

(58) **Field of Classification Search** 710/1-5, 710/8-13, 22-28, 104-105, 305-306, 325, 710/250, 126-131, 36-38; 709/250, 258; 714/42; 711/112, 113, 110

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,082,406 A 3/1963 Stevens
4,092,732 A 5/1978 Ouchi
4,415,970 A 11/1983 Swenson et al.
4,455,605 A 6/1984 Cormier et al.
4,504,927 A 3/1985 Callan

(Continued)

FOREIGN PATENT DOCUMENTS

EP 0810 530 A2 12/1997

(Continued)

OTHER PUBLICATIONS

DIGITAL StorageWorks, Using Your HSZ70 Array Controller in a SCSI Controller Shelf (DS-BA356-M Series), *User's Guide*, pp. 1-1 through A-5 with index, Jan. 1998.

(Continued)

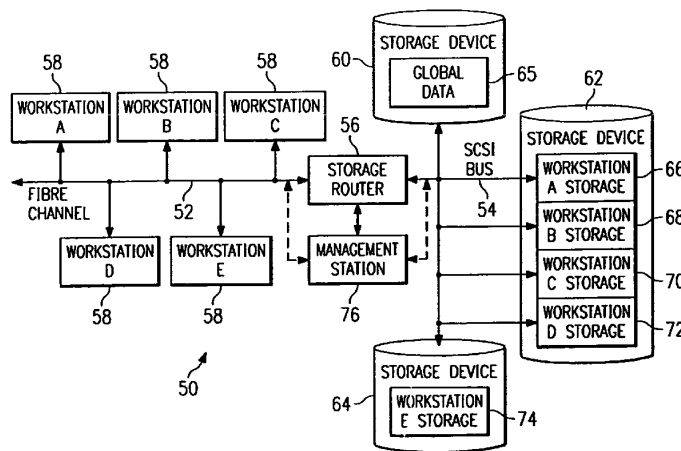
Primary Examiner—Christopher Shin

(74) *Attorney, Agent, or Firm*—Sprinkle IP Law Group

(57) **ABSTRACT**

A storage router and storage network provide virtual local storage on remote storage devices to Fiber Channel devices. A plurality of Fiber Channel devices, such as workstations, are connected to a Fiber Channel transport medium, and a plurality of storage devices are connected to a second Fiber Channel transport medium. The storage router interfaces between the Fiber Channel transport media. The storage router maps between the workstations and the storage devices and implements access controls for storage space on the storage devices. The storage router then allows access from the workstations to the storage devices using native low level, block protocol in accordance with the mapping and the access controls.

39 Claims, 2 Drawing Sheets



U.S. PATENT DOCUMENTS

4,533,996 A	8/1985	Gartung et al.	5,487,077 A	1/1996	Hassner et al.
4,573,152 A	2/1986	Greene et al.	5,491,812 A	2/1996	Pisello et al.
4,603,380 A	7/1986	Easton et al.	5,495,474 A	2/1996	Olnowich et al.
4,620,295 A	10/1986	Aiden, Jr.	5,496,576 A	3/1996	Jeong
4,644,462 A	2/1987	Matsubara et al.	5,504,857 A	4/1996	Baird et al.
4,695,948 A	9/1987	Blevins et al.	5,507,032 A	4/1996	Kimura
4,697,232 A	9/1987	Brunelle et al.	5,511,169 A	4/1996	Suda
4,751,635 A	6/1988	Kret	5,519,695 A	5/1996	Purohit et al.
4,787,028 A	11/1988	Finforek et al.	5,530,845 A	6/1996	Hiatt et al.
4,807,180 A	2/1989	Takeuchi et al.	5,535,352 A	7/1996	Bridges et al.
4,811,278 A	3/1989	Bean et al.	5,537,585 A	7/1996	Blickerstaff et al.
4,821,179 A	4/1989	Jensen et al.	5,544,313 A	8/1996	Shachnai et al.
4,825,406 A	4/1989	Bean et al.	5,548,791 A	8/1996	Casper et al.
4,827,411 A	5/1989	Arrowood et al.	5,564,019 A	10/1996	Beausoleil et al.
4,835,674 A	5/1989	Collins et al.	5,568,648 A	10/1996	Coscarella et al.
4,864,532 A	9/1989	Reeve et al.	5,581,709 A	12/1996	Ito et al.
4,897,874 A	1/1990	Lidensky et al.	5,581,714 A	12/1996	Amini et al.
4,947,367 A	8/1990	Chang et al.	5,581,724 A	12/1996	Belsan et al.
4,961,224 A	10/1990	Yung	5,596,562 A	1/1997	Chen
5,072,378 A	12/1991	Manka	5,596,736 A	1/1997	Kerns
5,077,732 A	12/1991	Fischer et al.	5,598,541 A	1/1997	Malladi
5,077,736 A	12/1991	Dunphy, Jr. et al.	5,613,082 A	3/1997	Brewer et al.
5,124,987 A	6/1992	Milligan et al.	5,621,902 A	4/1997	Cases et al.
5,155,845 A	10/1992	Beal et al.	5,632,012 A	5/1997	Belsan et al.
5,163,131 A	11/1992	Row et al.	5,634,111 A	5/1997	Oeda et al.
5,185,876 A	2/1993	Nguyen et al.	5,638,518 A	6/1997	Malladi
5,193,168 A	3/1993	Corrigan et al.	5,642,515 A	6/1997	Jones et al.
5,193,184 A	3/1993	Belsan et al.	5,659,756 A	8/1997	Hefferon et al.
5,202,856 A	4/1993	Glider et al.	5,664,107 A	9/1997	Chatwani et al.
5,210,866 A	5/1993	Milligan et al.	5,680,556 A	10/1997	Begun et al.
5,212,785 A	5/1993	Powers et al.	5,701,491 A	12/1997	Dunn et al.
5,214,778 A	5/1993	Glider et al.	5,712,976 A	1/1998	Falcon, Jr. et al.
5,226,143 A	7/1993	Baird et al.	5,727,218 A	3/1998	Hotchkin
5,239,632 A	8/1993	Larner	5,729,705 A	3/1998	Weber
5,239,643 A	8/1993	Blount et al.	5,743,847 A	4/1998	Nakamura et al.
5,239,654 A	8/1993	Ing-Simmons	5,748,924 A	5/1998	Llorens et al.
5,247,638 A	9/1993	O'Brien et al.	5,751,975 A	5/1998	Gillespie et al.
5,247,692 A	9/1993	Fujimura	5,768,623 A	6/1998	Judd et al.
5,257,386 A	10/1993	Saito	5,774,683 A	6/1998	Gulick
5,297,262 A	3/1994	Cox et al.	5,781,715 A	7/1998	Sheu
5,301,290 A	4/1994	Tetzlaff et al.	5,802,278 A	9/1998	Isfeld et al.
5,315,657 A	5/1994	Abadi et al.	5,805,816 A	9/1998	Picazo, Jr. et al.
5,317,739 A	5/1994	Elko et al.	5,809,328 A	9/1998	Nogales et al.
5,331,673 A	7/1994	Elko et al.	5,812,754 A	9/1998	Lui et al.
5,347,384 A	9/1994	McReynolds et al.	5,835,496 A	11/1998	Yeung et al.
5,361,347 A	11/1994	Glider et al.	5,845,107 A	12/1998	Fisch et al.
5,367,646 A	11/1994	Pardillos et al.	5,848,251 A	12/1998	Lomelino et al.
5,379,385 A	1/1995	Shomler	5,857,080 A	1/1999	Jander et al.
5,379,398 A	1/1995	Cohn et al.	5,860,137 A	1/1999	Raz et al.
5,388,243 A	2/1995	Glider et al.	5,864,653 A	1/1999	Tavallaei et al.
5,388,246 A	2/1995	Kasai	5,867,648 A	2/1999	Foth et al.
5,394,526 A	2/1995	Crouse et al.	5,884,027 A	3/1999	Garbus et al.
5,396,596 A	3/1995	Hashemi et al.	5,889,952 A	3/1999	Hunnicutt et al.
5,403,639 A	4/1995	Belsan et al.	5,913,045 A	6/1999	Gillespie et al.
5,410,667 A	4/1995	Belsan et al.	5,923,557 A	7/1999	Eidson
5,410,697 A	4/1995	Baird et al.	5,933,824 A	8/1999	DeKoning et al.
5,414,820 A	5/1995	McFarland et al.	5,935,260 A	8/1999	Ofer
5,416,915 A	5/1995	Mattson et al.	5,941,969 A	8/1999	Ram et al.
5,418,909 A	5/1995	Jachowski et al.	5,941,972 A *	8/1999	Hoeser et al. 710/315
5,420,988 A	5/1995	Elliott	5,953,511 A	9/1999	Sescilia et al.
5,423,026 A	6/1995	Cook et al.	5,959,994 A	9/1999	Boggs et al.
5,423,044 A	6/1995	Sutton et al.	5,974,530 A	10/1999	Young
5,426,637 A	6/1995	Derby et al.	5,978,379 A *	11/1999	Chan et al. 370/403
5,430,855 A	7/1995	Wash et al.	5,991,797 A	11/1999	Futral et al.
5,450,570 A	9/1995	Richek et al.	6,000,020 A *	12/1999	Chin et al. 711/162
5,452,421 A	9/1995	Beardsley et al.	6,021,451 A	2/2000	Bell et al.
5,459,857 A	10/1995	Ludlam et al.	6,041,381 A	3/2000	Hoeser
5,463,754 A	10/1995	Beausoleil et al.	6,055,603 A	4/2000	Ofer et al.
5,465,382 A	11/1995	Day, III et al.	6,065,087 A	5/2000	Keaveny et al.
5,469,576 A	11/1995	Dauerer et al.	6,070,253 A	5/2000	Tavallaei et al.
5,471,609 A	11/1995	Yudenfriend	6,073,209 A	6/2000	Bergsten
			6,073,218 A	6/2000	DeKoning et al.
			6,075,863 A	6/2000	Krishnan et al.

6,081,849	A	6/2000	Born et al.	
6,098,149	A	8/2000	Ofer et al.	
6,108,684	A	8/2000	DeKoning et al.	
6,118,766	A	9/2000	Akers	
6,131,119	A	10/2000	Fukui	
6,134,617	A	10/2000	Weber	
6,141,737	A	10/2000	Krantz et al.	
6,145,006	A	11/2000	Vishlitsky et al.	
6,148,004	A	11/2000	Nelson et al.	
6,185,203	B1*	2/2001	Berman	370/351
6,209,023	B1	3/2001	Dimitroff et al.	
6,219,771	B1	4/2001	Kikuchi et al.	
6,223,266	B1	4/2001	Sartore	
6,230,218	B1	5/2001	Casper et al.	
6,260,120	B1	7/2001	Blumenau et al.	
6,330,629	B1	12/2001	Kondo et al.	
6,341,315	B1	1/2002	Arroyo et al.	
6,343,324	B1	1/2002	Hubis et al.	
6,363,462	B1	3/2002	Bergsten	
6,421,753	B1*	7/2002	Hoese et al.	710/305
6,425,035	B1*	7/2002	Hoese et al.	710/105
6,425,036	B1	7/2002	Hoese et al.	
6,484,245	B1	11/2002	Sanada et al.	
6,529,996	B1	3/2003	Nguyen et al.	
6,738,854	B1*	5/2004	Hoese et al.	710/305
6,763,419	B1*	7/2004	Hoese et al.	709/250
6,789,152	B1*	9/2004	Hoese et al.	710/305

FOREIGN PATENT DOCUMENTS

EP	0827059	A2	3/1998
GB	2296798	A	7/1996
GB	2297636	A	8/1996
GB	2341715		3/2000
JP	6301607		10/1994
JP	8-230895		9/1996
WO	WO 98/36357		8/1998
WO	WO 99/34297	A1	7/1999

OTHER PUBLICATIONS

DIGITAL StorageWorks, HSZ70 Array Controller HSOFF Version 7.0 (EK-HSZ70-CG.A01), *Configuration Manual*, pp. 1-2 through G15 with index, Jul. 1997.

DIGITAL StorageWorks, HSZ70 Array Controller HSOFF Version 7.0, *CLI Reference Manual*, pp. 1-156, Jul. 1997.

Decision Returning Petition mailed Feb. 28, 2005.

Block-Based Distributed File Systems, Anthony J. McGregor, Jul. 1997.

Compaq StorageWorks HSG80 Array Controller ACS Version 8.3 (Maintenance and Service Guide) Nov. 1998.

Compaq StorageWorks HSG80 Array Controller ACS Version 8.3 (Configuration and CLI Reference Guide) Nov. 1998.

CRD-5500 SCSI RAID Controller User's Manual CMD Technology, Inc. pp. 1-1 to 6-25, revised Nov. 21, 1996.

DIGITAL Storage Works, HSZ70 Array Controller, HSOFF Version 7.0 EK-HSZ70-CG. A01, Digital Equipment Corporation, Maynard, Massachusetts.

DIGITAL StorageWorks HSZ70 Array Controller HSOFF Version 7.0 EK-HSZ270-RM. A01 CLI Reference Manual.

DIGITAL StorageWorks HSZ70 Array Controller HSOFF Version 7.0 EK-HSZ70-SV. A01, 1997.

DIGITAL StorageWorks HSG80 Array Controller ACS Version 8.0 (User's Guide Jan. 1998).

DP5380 Asynchronous SCSI Interface, National Semiconductor Corporation, Arlington, TX, May 1989, pp. 1-32.

Emerson, "Ancor Communications: Performance evaluation of switched fibre channel I/O system using—FCP for SCSI" Feb. 1, 1995, IEEE, pp. 479-484.

Fibre Channel and ATM: The Physical Layers, Jerry Quam WESCON/94, published Sep. 27-29, 1994. pp. 648-652.

Fiber Channel storage interface for video-on-demand servers by Anazaloni, et al, Jun. 15, 1905.

Gen5 S-Series XL System Guide Revision 1.01 by Chen, Jun. 18, 1905.

Graphical User Interface for MAXSTRAT Gen5/Gen-S Servers User's guide 1.1, Jun. 11, 1996.

High Performance Data transfers Using Network-Attached Peripherals at the national Storage Laboratory by Hyer, Feb. 26, 1993.

IFT-3000 SCSI to SCSI Disk array Controller Instruction Manual Revision 2.0 by Infotrend Technologies, Inc., 1995.

Implementing a Fibre Channel SCSI transport by Snively, 1994.

"InfoServer 150—Installation and Owner's Guide", EK-INFSV-OM-001, Digital Equipment Corporation, Maynard, Massachusetts 1991, Chapters 1 and 2.

InforsServer 150VXT Photograph.

Infoserver 100 System Operations Guide, First Edition Digital Equipment Corporation, 1990.

Johnson, D.B., et al., "The Peregrine High Performance RPC System", *Software-Practice and Experience*, 23(2):201-221, Feb. 1993.

Local-Area networks for the IBM PC by Haugdahl.

Misc. Reference Manual Pages, SunOS 5.09.

New serial I/Os speed storage subsystems by Bursky, Feb. 6, 1995.

Petal: Distributed Virtual Disks, Edward K. Lee and Chandramohan A. Thekkath, *ACM SIGPLAN Notices*, vol. 31, Issue 9, Sep. 1996, pp. 84-92.

Pictures of internal components of the InfoServer 150, taken from <http://bindarydinosaurs.couk/Museum/Digital/infoserver/infoserver.php> in Nov. 2004.

Raidtec FibreArray and Raidtec FlexArray UltraRAID Systems, Windows IT PRO Article, Oct. 1997.

S.P. Joshi, "Ethernet controller chip interfaces with variety of 16-bit processors," *electronic Design*, Hayden Publishing Co., Inc., Rochelle Part, NJ, Oct. 14, 1982. pp. 193-200.

Simplest Migration to Fibre Channel Technology Article, Digital Equipment Corporation, Nov. 10, 1997, published on PR Newswire.

Systems Architectures Using Fibre Channel, Roger Cummings, Twelfth IEEE Symposium on Mass Storage Systems, Copyright 1993 IEEE. pp. 251-256.

Dot Hill's Request to Exceed Page Limit in Motion for Summary Judgment filed Jun. 29, 2005. Case No. A-03-CV-754 (SS).

Request for Ex Parte Reexamination for 6,425,035. Third Party Requester: William A. Blake.

Request for Ex Parte Reexamination for 6,425,035. Third Party Requester: Natu J. Patel.

Office Action dated Jan. 21, 2003 for 10/174,720 (CROSS1120-8).

Office Action dated Feb. 27, 2001 for 09/354,682 (CROSS1120-1).

Office Action dated Aug. 11, 2000 for 09/354,682 (CROSS1120-1).

Office Action dated Dec. 16, 1999 for 09/354,682 (CROSS1120-1).

Office Action dated Nov. 6, 2002 for 10/023,786 (CROSS1120-4).

Office Action dated Jan. 21, 2003 for 10/081,110 (CROSS1120-5).

- Office Action in Ex Parte Reexamination 90/007,127, mailed Feb. 7, 2005.
- Reply to Office Action Under Ex Parte Reexamination Dated Feb. 2, 2007 for 90/007,127 filed on Apr. 6, 2005.
- Reply to Office Action Under Ex Parte Reexamination Dated Feb. 2, 2007 for 90/007,125 and 90/007,317 filed on Apr. 6, 2005.
- Office Action in Ex Parte Reexamination 90/007,126, mailed Feb. 7, 2005.
- Reply to Office Action Under Ex Parte Reexamination Dated Feb. 2, 2007 for 90/007,126 filed on Apr. 6, 2005.
- Office Action in Ex Parte Reexamination 90/007,124, mailed Feb. 7, 2005.
- Office Action in Ex Parte Reexamination 90/007,123, mailed Feb. 7, 2005.
- Reply to Office Action Under Ex Parte Reexamination Dated Feb. 2, 2007 for 90/007,123 filed on Apr. 5, 2005.
- European Office Action issued Apr. 1, 2004 in Application No. 98966104.6-2413.
- Fiber Channel (FCS)/ATM Interworking: A Design Solution by Anzaloni, et al.
- Copies of the following are on the attached CD-Rom.
- Defendant's First Supplemental Trial Exhibit List, Crossroads Systems, Inc., v. Chaparral Network Storage, Inc., C.A. No. A-00CA-217-SS (W.D. Tex. 2001). (CD-Rom).
- Defendant's Third Supplemental Trial Exhibit List, Crossroads Systems, Inc. v. Pathlight Technology, Inc., C.A. No. A-00CA-248-SS (W.D. Tex. 2001) (CD-Rom).
- Defendant Chaparral Network Storage, Inc.'s First Supplemental Trial Exhibit List (D1 through D271) (CD-ROM Chaparral Exhibits ExList_Def), Sep. 2, 2001.
- Plaintiff's Fourth Amended Trial Exhibit List, Crossroads Systems, Inc. v. Chaparral Network Storage, Inc, C.A. No. A-00CA-217-SS (W.D. Tex. 2001) (CD-Rom), Sep. 11, 2001.
- Trail Transcripts, Crossroads Systems, Inc. v. Chaparral Network Storage, Inc., C.A. No. A-00CA-217-SS (W.D. Tex. 2001). (CD-Rom).
- Trail Transcripts, Crossroads Systems, Inc. v. Pathlight Technology, Inc., C.A. No. A-00CA-248-SS (W.D. Tex. 2001). (CD-Rom).
- Datasheet for CrossPoint 4100 Fibre Channel to SCSI Router (Dedek Ex 41 (ANCT 117-120)) (CD-ROM Chaparral Exhibits D012).
- Symbios Logic- Software Interface Specification Series 3 SCSI RAID Controller Software Release 02.xx (Engelbrecht Ex 2 (LSI 1421-1658)) (CD-ROM Chaparral Exhibits D013), Dec. 3, 1997.
- Press Release- Symbios Logic to Demonstrate Strong Support for Fibre Channel at Fall Comdex (Engelbrecht 12 (LSI 2785-86)) (CD-ROM Chaparral Exhibits D016), Nov. 13, 1996.
- OEM Datasheet on the 3701 Controller (Engelbrecht 13 (LSI 01837-38)) (CD-ROM Chaparral Exhibits D017), Jun. 17, 1905.
- Nondisclosure Agreement Between Adaptec and Crossroads Dated Oct. 17, 1996 (Quisenberry Ex 25 (CRDS 8196)) (CD-ROM Chaparral Exhibits D020).
- Organizational Presentation on the External Storage Group (Lavan Ex 1 (CNS 182242-255)) (CD-ROM Chaparral Exhibits D021), Apr. 11, 1996.
- Bridge. C, Bridge Between SCSI-2 and SCSI-3 FCP (Fibre Channel Protocol) (CD-ROM Chaparral Exhibits P214).
- Bridge Phase II Architecture Presentation (Lavan Ex 2 (CNS 182287-295)) (CD-ROM Chaparral Exhibits D022), Apr. 12, 1996.
- Attendees/Action Items from Apr. 12, 1996 Meeting at BTC (Lavan Ex 3 (CNS 182241)) (CD-ROM Chaparral Exhibits D023), Apr. 12, 1996.
- Brooklyn Hardware Engineering Requirements Documents, Revision 1.4 (Lavan Ex 4 (CNS 178188-211)) (CD-ROM Chaparral Exhibits D024) by Pecone, May 26, 1996.
- Brooklyn Single-Ended SCSI RAID Bridge Controller Hardware OEM Manual, Revision 2.1 (Lavan EX 5 (CNS 177169-191)) (CD-ROM Chaparral Exhibits D025), Mar. 21, 1996.
- Coronado Hardware Engineering Requirements Document, Revision 0.0 (Lavan Ex 7 (CNS 176917-932)) (CD-ROM Chaparral Exhibits D027) by O'Dell, Sep. 30, 1996.
- ESS/FPG Organization (Lavan Ex 8 (CNS 178639-652)) (CD-ROM Chaparral Exhibits D028), Dec. 6, 1996.
- Adaptec MCS ESS Presents: Intelligent External I/O Raid Controllers "Bridge" Strategy (Lavan Ex 9 (CNS 178606-638)). (CD-ROM Chaparral Exhibits D029), Feb. 6, 1996.
- AEC-7313 Fibre Channel Daughter Board (for Brooklyn) Engineering Specification, Revision 1.0 (Lavan Ex 10 (CNS 176830-850)) (CD-ROM Chaparral Exhibits D030), Feb. 27, 1997.
- Bill of Material (Lavan Ex 14 (CNS 177211-214)) (CD-ROM Chaparral Exhibits D034), Jul. 24, 1997.
- AEC-. 4412B, AEC-7412/B2 External RAID Controller Hardware OEM Manual, Revision 2.0 (Lavan Ex 15 (CNS 177082-123)) (CD-ROM Chaparral Exhibits D035), Jun. 27, 1997.
- Coronado II, AEC-7312A Fibre Channel Daughter (for Brooklyn) Hardware Specification, Revision 1.2 (Lavan Ex 16 (CNS 177192-210)) (CD-ROM Chaparral Exhibits D036) by Tom Yang, Jul. 18, 1997.
- AEC-4412B, AEC7412/3B External RAID Controller Hardware OEM Manual, Revision 3.0. (Lavan Ex 17 (CNS 177124-165)) (CD-ROM Chaparral Exhibits D037), Aug. 25, 1997.
- Memo Dated Aug. 15, 1997 to AEC-7312A Evaluation Unit Customers re: B001 Release Notes (Lavan Ex 18 (CNS 182878-879)) (CD-ROM Chaparral Exhibits D038).
- Brooklyn Main Board (AES-0302) MES Schedule (Lavan Ex 19 (CNS 177759-763)) (CD-ROM Chaparral Exhibits D039), Feb. 11, 1997.
- News Release-Adaptec Adds Fibre Channel Option to its External RAID Controller Family (Lavan Ex 20 (CNS 182932-934)) (CD-ROM Chaparral Exhibits D040), May 6, 1997.
- AEC-4412B/7412B User's Guide, Rev. A (Lavan Ex 21) (CD-ROM Chaparral Exhibits D041), Jun. 19, 1905.
- Data Book- AIC-7895 PCI Bus Master Single Chip SCSI Host Adapter (Davies Ex 1 (CNS 182944-64)) (CD-ROM Chaparral Exhibits D046), May 21, 1996.
- Data Book- AIC-1160 Fibre Channel Host Adapter ASIC (Davies Ex 2 (CNS 181800-825)) (CD-ROM Chaparral Exhibits D047), Jun. 18, 1905.
- Viking RAID Software (Davies Ex 3 (CNS 180969-181026)) (CD-ROM Chaparral Exhibits D048), Jun. 18, 1905.
- Header File with Structure Definitions (Davies Ex 4 (CNS 180009-018)) (CD-ROM Chaparral Exhibits D049), Aug. 8, 1996.

- C++ SourceCode for the SCSI Command Handler (Davies Ex 5 (CNS 179136-168)) (CD-ROM Chaparral Exhibits D050), Aug. 8, 1996.
- Header File Data Structure (Davies Ex 6 (CNS 179997-180008)) (CD-ROM Chaparral Exhibits D051), Jan. 2, 1997.
- SCSI Command Handler (Davies Ex 7 (CNS 179676-719)) (CD-ROM Chaparral Exhibits D052), Jan. 2, 1997.
- Coronado: Fibre Channel to SCSI Intelligent RAID Controller Product Brief (Kalwitz Ex 1 (CNS 182804-805)) (CD-ROM Chaparral Exhibits D053).
- Bill of Material (Kalwitz Ex 2 (CNS 181632-633)) (CD-ROM Chaparral Exhibits D054), Mar. 17, 1997.
- Emails Dated Jan. 13-Mar. 31, 1997 from P. Collins to Moore: Status Reports (Kalwitz Ex 3 (CNS 182501-511)) (CD-ROM Chaparral Exhibits D055).
- Hardware Schematics for the Fibre Channel Daughtercard Coronado (Kalwitz Ex 4 (CNS 181639-648)) (CD-ROM Chaparral Exhibits D056).
- Adaptec Schematics re AAC-340 (Kalwitz Ex 14 (CNS 177215-251)) (CD-ROM Chaparral Exhibits D057).
- Bridge Product Line Review (Manzanares Ex 3 (CNS 177307-336)) (CD-ROM Chaparral Exhibits D058).
- AEC Bridge Series Products-Adaptec External Controller RAID Products Pre-Release Draft, v.6 (Manzanares Ex 4 (CNS 174632-653)). (CD-ROM Chaparral Exhibits D059), Oct. 28, 1997.
- Hewlett-Packard Roseville Site Property Pass for Brian Smith (Dunning Ex 14 (HP 489)) (CD-ROM Chaparral Exhibits D078), Nov. 7, 1996.
- Distribution Agreement Between Hewlett-Packard and Crossroads (Dunning Ex 15 (HP 326-33)) (CD-ROM Chaparral Exhibits D079).
- HPFC-5000 Tachyon User's Manuel, First Edition (PTI 172419-839) (CD-ROM Chaparral Exhibits D084), May 1, 1996.
- X3T10 994D—(Draft) Information Technology: SCSI-3 Architecture Model, Rev. 1.8 (PTI 165977) (CD-ROM Chaparral Exhibits D087).
- X3T10 Project 1047D: Information Technology- SCSI-3 Controller Commands (SCC), Rev. 6c (PTI 166400-546) (CD-ROM Chaparral Exhibits D088), Sep. 3, 1996.
- X3T10 995D- (Draft) SCSI-3 Primary Commands, Rev. 11 (Wanamaker Ex 5 (PTI 166050-229)) (CD-ROM Chaparral Exhibits D089), Nov. 13, 1996.
- VBAR Volume Backup and Restore (CRDS 12200-202) (CD-ROM Chaparral Exhibits D099).
- Preliminary Product Literature for Infinity Commstor's Fibre Channel to SCSI Protocol Bridge (Smith Ex 11; Quisenberry Ex 31 (SPLO 428-30)) (CD-ROM Chaparral Exhibits D143), Aug. 19, 1996.
- Letter dated Jul. 12, 1996 from J. Boykin to B. Smith re: Purchase Order for Evaluation Units from Crossroads (Smith Ex 24) CRDS 8556-57) (CD-ROM Chaparral Exhibits D144), Jul. 12, 1996.
- CrossPoint 4100 Fibre Channel to SCSI Router Preliminary Datasheet (Hulsey Ex 9 (CRDS 16129-130)) (CD-ROM Chaparral Exhibits D145), Nov. 1, 1996.
- CrossPoint 4400 Fibre Channel to SCSI Router Preliminary Datasheet (Bardach Ex. 9 Quisenberry Ex 33 (CRDS 25606-607)) (CD-ROM Chaparral Exhibits D153), Nov. 1, 1996.
- Fax Dated Jul. 22, 1996 from L. Petti to B. Smith re: Purchase Order from Data General for FC2S Fibre to Channel SCSI Protocol Bridge Model 11 (Smith Ex 25; Quisenberry Ex 23; Bardach Ex 11 (CRDS 8552-55;8558)) (CD-ROM Chaparral Exhibits D155).
- Email Dated Dec. 20, 1996 from J. Boykin to B. Smith re: Purchase Order for Betas in Feb. and Mar. (Hoese Ex 16, Quisenberry Ex 25; Bardach Ex 12 (CRDS 13644-650)) (CD-ROM Chaparral Exhibits D156).
- Infinity Commstor Fibre Channel Demo for Fall Comdex, 1996 (Hoese Ex 15, Bardach Ex 13 (CRDS 27415)) (CD-ROM Chaparral Exhibits D157).
- Fax Dated Dec. 19, 1996 from B. Bardach to T. Rarich re: Purchase Order Information (Bardach Ex. 14; Smith Ex 16 (CRDS 4460)) (CD-ROM Chaparral Exhibits D158).
- Miscellaneous Documents Regarding Comdex (Quisenberry Ex 2 (CRDS 27415-465)) (CD-ROM Chaparral Exhibits D165).
- CrossPoint 4100 Fibre Channel to SCSI Router Preliminary Datasheet (Quisenberry) Ex 3 (CRDS 4933-34) (CD-ROM Chaparral Exhibits D166) (CD-ROM Chaparral Exhibits D166).
- CrossPoint 4400 Fibre to Channel to SCSI Router Preliminary Datasheet; Crossroads Company and Product Overview (Quisenberry Ex 4 (CRDS 25606; 16136)) (CD-ROM Chaparral Exhibits D167).
- Crossroads Purchase Order Log (Quisenberry Ex 9 (CRDS 14061-062)) (CD-ROM Chaparral Exhibits D172).
- RAID Manager 5 with RDAC 5 for UNIX V.4 User's Guide (LSI-01854) (CD-ROM Chaparral Exhibits P062), Sep. 1, 1996.
- Letter dated May 12, 1997 from Alan G. Leal to Barbara Bardach enclosing the original OEM License and Purchase Agreement between Hewlett-Packard Company and Crossroads Systems, Inc. (CRDS 02057) (CD-ROM Chaparral Exhibits P130).
- CR4x00 Product Specification (CRDS 43929) (CD-ROM Chaparral Exhibits P267), Jun. 1, 1998.
- Symbios Logic—Hardware Function Specification for the Symbios Logic Series 3 Fibre Channel Disk Array Controller Model 3701 (Engelbrecht Ex 3 (LSI-1659-1733)) (CD-ROM Pathlight Exhibits D074).
- Report of the Working Group on Storage I/O for Large Scale Computing; Department of Computer Science Duke University: CS-1996-21 (PTI 173330-347). (CD-ROM Pathlight Exhibits D098).
- Brian Allison's 1999 Third Quarter Sales Plan (PDX 38) CNS 022120-132)) (CD-ROM Pathlight Exhibits D201), Jun. 5, 2001.
- Brooklyn SCSI-SCSI Intellegent External RAID Bridge Definition Phase External Documentation (CD-ROM Pathlight Exhibits D129).

* cited by examiner

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.