NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

CROSSROADS SYSTEMS, INC.,
Appellant

v.

CISCO SYSTEMS, INC., QUANTUM CORP., ORACLE CORPORATION, DOT HILL SYSTEMS CORPORATION,
Appellees

2016-2017, 2016-2026, 2016-2027

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2014-01226, IPR2014-01463, IPR2014-01544, IPR2015-00825, IPR2015-00852, IPR2015-00854.

Decided: June 6, 2017

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Corp. Also represented by DEBRA JANECE MCCOMAS, DAVID L. MCCOMBS; SCOTT T. JARRATT, Richardson, TX; MATTHEW CHRISTOPHER GAUDET, Duane Morris LLP, Atlanta, GA; JOSEPH POWERS, Philadelphia, PA; CLEMENT ROBERTS, Durie Tangri LLP, San Francisco, CA.

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ORION ARMON, Cooley LLP, Broomfield, CO, for appellee Dot Hill Systems Corporation. Also represented by PETER SAUER.

Before REYNA, LINN, and CHEN, *Circuit Judges.*

REYNA, *Circuit Judge.*

Crossroads Systems, Inc. appeals from the Patent Trial and Appeal Board's inter partes review decisions finding all claims reviewed unpatentable as obvious. Because the Board's factual findings are supported by substantial evidence, and because the Board did not err in its obviousness conclusion, we *affirm*.

BACKGROUND

1. The Patents Under Review

These appeals involve three patents: U.S. Patent Nos. 6,425,035, 7,934,041, and 7,051,147, all of which are family members entitled "Storage router and method for providing virtual local storage." The patents teach a system for providing network-based computer storage. Space on an array of storage devices is dedicated to individual client workstations. A storage router sits in between workstations and storage devices, mapping workstations to portions of storage devices. Fibre Channel/Small Computer System Interface ("SCSI") protocols,

standard protocols used in network-attached storage systems, are used to connect the workstations to the storage router and the storage router to the storage devices.

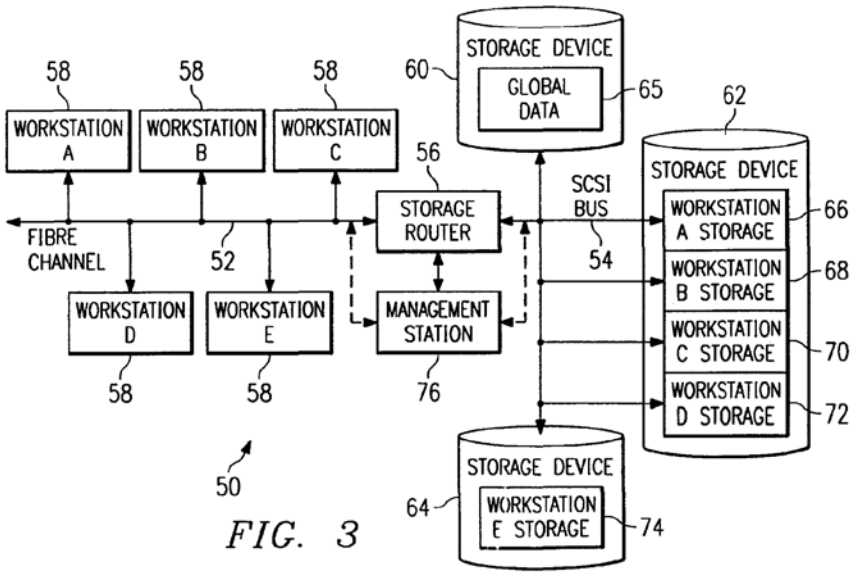


FIG. 3

J.A. 199, 8050, 19696. Figure 3 of the patents illustrates how the storage router (56) is connected to multiple storage devices (62, 64) and multiple workstations (58) and allocates "partitioned subsets" of the space on each storage device to particular workstations (66–72), for example "Workstation A" to "Workstation A Storage." '147 patent, col. 4 ll. 30–40, J.A. 19699. The details of the mapping between workstations and portions of storage devices are a key issue in this appeal.

The following claims are representative for the three patents.

'147 Patent:

28. A method for providing virtual local storage on remote storage devices, comprising:

mapping between a device connected to a first transport medium and a storage device connected to a second transport medium, wherein the first transport medium and the second transport medium operate according to a Fibre Channel protocol;

implementing access controls for storage space on the storage device; and

allowing access from the device connected to the first transport medium to the storage device using native low level, block protocols.

'147 Patent, J.A. 19703 col. 12 ll. 27–38.

'041 Patent:

1. A storage router for providing virtual local storage on remote storage devices, comprising:

a first controller operable to interface with a first transport medium, wherein the first medium is a serial transport media; and

a processing device coupled to the first controller, wherein the processing device is configured to:

maintain a map to allocate storage space on the remote storage devices to devices connected to the first transport medium by associating representations of the devices connected to the first transport medium with representations of storage space on the remote storage devices, wherein each representation of a device connected to the first transport medium is associated with one or more representations of storage space on the remote storage devices;

control access from the devices connected to the first transport medium to the storage space on

the remote storage devices in accordance with the map; and

allow access from devices connected to the first transport medium to the remote storage devices using native low level block protocol.

'041 patent, J.A. 8056 col. 9 ll. 35–56.

'035 Patent:

11. A method for providing virtual local storage on remote storage devices connected to one transport medium to devices connected to another transport medium, comprising:

interfacing with a first transport medium;

interfacing with a second transport medium;

mapping between devices connected to the first transport medium and the storage devices and that implements access controls for storage space on the storage devices; and

allowing access from devices connected to the first transport medium to the storage devices using native low level, block protocols.

'035 patent, J.A. 205 col. 10 ll. 41–53.

2. The CRD 5500 User's Manual

The primary prior art reference at issue is the CMD Technology, Inc., *CRD-5500 SCSI RAID Controller User's Manual*. *See* J.A. 438–529. This manual describes a Redundant Array of Independent Disks ("RAID") controller which connects numerous redundant disk drives to one or more hosts. J.A. 446. This controller "provides high-performance, high-availability access to SCSI disk array subsystems along a Fast/Wide SCSI bus." *Id.* The array of disk drives can be grouped into RAID sets, which the manual also terms "redundancy groups." For example, in

the following image, the CRD-5500 is connected to a single host and to 49 disks, which are logically assigned to various redundancy groups:

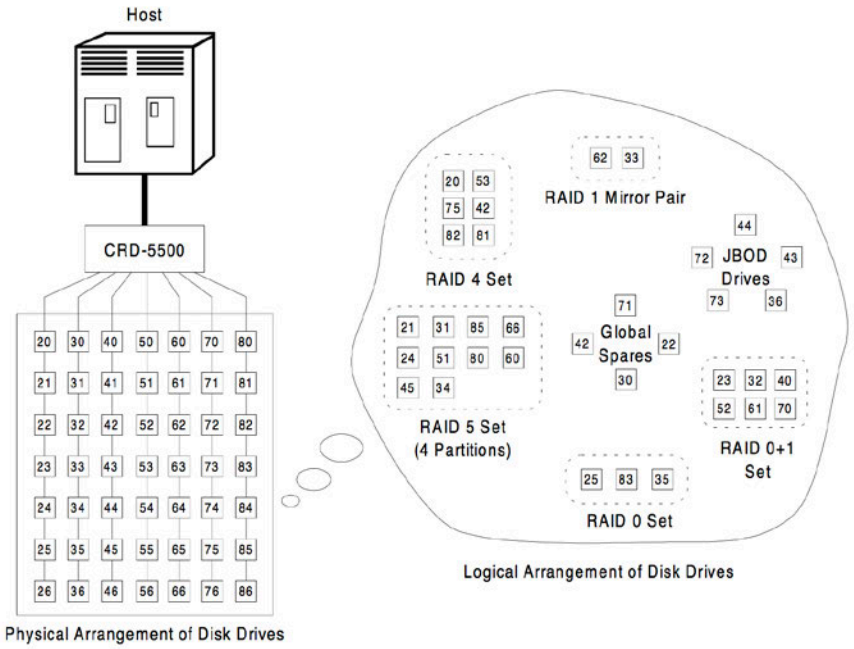


Figure 1-1: How the controller views RAID sets

J.A. 447.

In addition, the CRD-5500 may be shared by multiple hosts. The manual explains how a user "can connect as many as four hosts to the CRD-5500." J.A. 447. "The controller's Host [Logical Unit Number (LUN)] Mapping feature makes it possible to map RAID sets differently to each host." *Id.* at 446. A user can "make the same redundancy group show up on different LUNs to different hosts, or make a redundancy group visible to one host but not to another." *Id.* Further, a user "can assign redundancy groups to a particular host." *Id.* at 447. Thus, one set of disk drives could be assigned to store data from one host and another set of disk drives assigned to store data from another host. In the following diagram, four hosts, assigned channel number 0, 1, 2, and 3, are each connect-

ed by the CRD-5500 to a subset of the array of disks depicted at the bottom of the image:

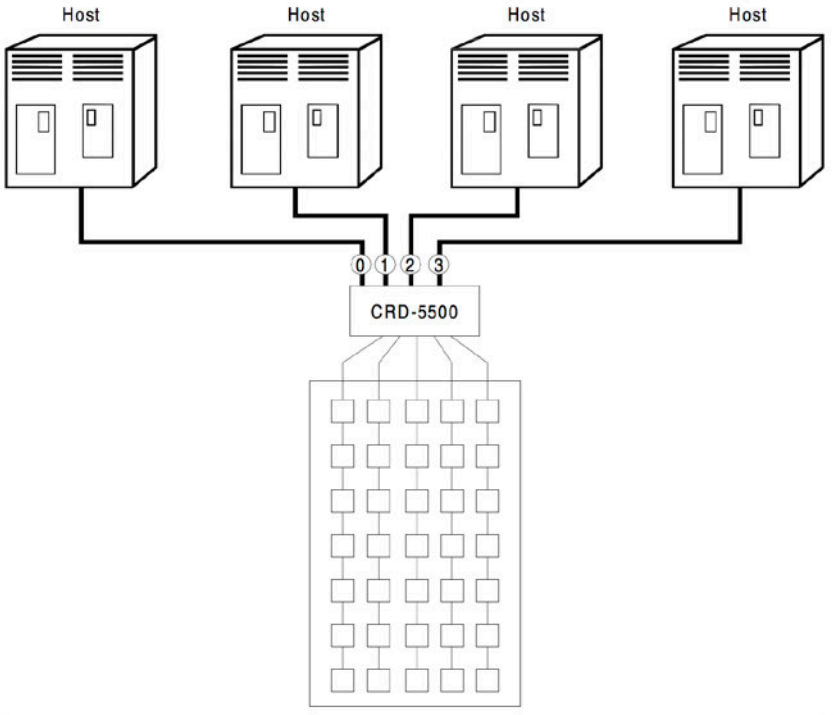
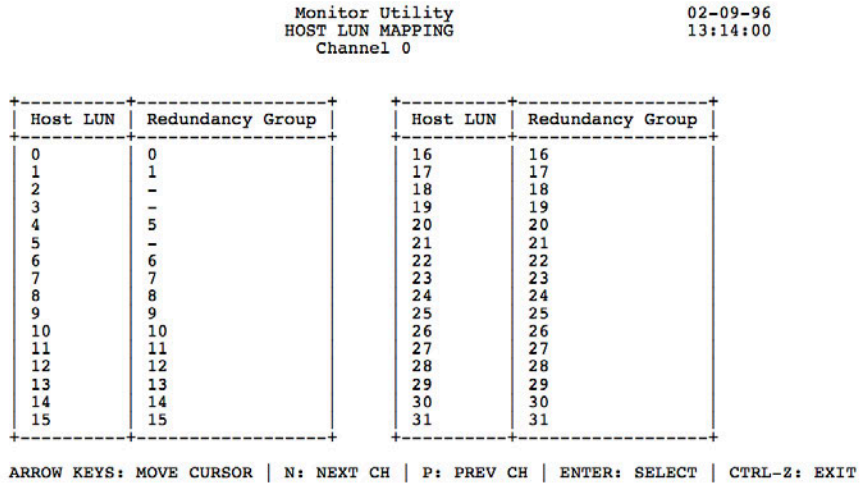


Figure 1-2: A multi-hosting example

J.A. 448.

This mapping of redundancy groups to particular host channels is accomplished through the "Host LUN Mapping" screen in the CRD-5500 configuration utility, which provides a table of redundancy groups accessible through a particular channel:



Monitor Utility 02-09-96
HOST LUN MAPPING 13:14:00
Channel 0

Host LUN	Redundancy Group	Host LUN	Redundancy Group
0	0	16	16
1	1	17	17
2	-	18	18
3	-	19	19
4	5	20	20
5	-	21	21
6	6	22	22
7	7	23	23
8	8	24	24
9	9	25	25
10	10	26	26
11	11	27	27
12	12	28	28
13	13	29	29
14	14	30	30
15	15	31	31

ARROW KEYS: MOVE CURSOR | N: NEXT CH | P: PREV CH | ENTER: SELECT | CTRL-Z: EXIT

J.A. 481. In the example shown, redundancy groups 1 and 5 are accessible from the host connected to channel 0 through host LUN 1 and 4 respectively. But if a redundancy group 2 or 3 exists, it is not accessible to the host connected to channel 0 because those redundancy groups are not mapped to any host LUN for channel 0.

The manual explains that a redundancy group can be made available only to a single host:

> This screen may be used to map LUNs on each host channel to a particular redundancy group. Or you may prevent a redundancy group from appearing on a host channel. Thus, for example, you may map redundancy group 1 to LUN 5 on host channel 0 and the same redundancy group to LUN 12 on host channel 1. Or you may make redundancy group 8 available on LUN 4 on host channel 0 and block access to it on host channel 1.

J.A. 481.

DISCUSSION

1. Standard of Review

Obviousness is a question of law based on factual inquiries relating to the scope and content of the prior art, differences between the prior art and the claims at issue, the level of ordinary skill in the pertinent art, and any objective indicia of non-obviousness. *Ivera Med. Corp. v. Hospira, Inc.*, 801 F.3d 1336, 1344 (Fed. Cir. 2015) (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966)).

The Board's ultimate determination of obviousness is a legal question we review de novo. *In re Mouttet*, 686 F.3d 1322, 1330–31 (Fed. Cir. 2012). We review the Board's factual findings for substantial evidence. *In re Gleave*, 560 F.3d 1331, 1335 (Fed. Cir. 2009). Substantial evidence is "such relevant evidence as a reasonable mind might accept as adequate to support a conclusion." *In re Gartside*, 203 F.3d 1305, 1312 (Fed. Cir. 2000) (quoting *Consol. Edison Co. v. NLRB*, 305 U.S. 197, 229 (1938)).

2. "Maps Between Devices" Limitation

The Board found all claims of the three patents at issue obvious over a combination of the CRD-5500 Manual and secondary references called *HP Journal*, *Fibre Channel Standard*, and *QLogic Data Sheet*. Relying only on the CRD-5500 Manual, the Board found that the prior art disclosed a map between host devices and storage devices. Each independent claim recites such a map.

In its analysis, the Board addressed the construction of "map." The Board was "not persuaded that the broadest reasonable interpretation of the 'map' limitations mandates mapping directly or immutably to a host device itself, or excludes mapping to devices using intermediate identifiers." J.A. 10, 49, 89. Rather, the Board adopted the following construction:

> To create a path from a device on one side of the storage router to a device on the other side of the router. A "map" contains a representation of devices on each side of the storage router, so that when a device on one side of the storage router wants to communicate with a device on the other side of the storage router, the storage router can connect the devices.

Id. at 10, 49, 89–90.

On appeal, Crossroads maintains that the Board's interpretation of the "maps between devices" limitation was erroneous. Crossroads argues that the CRD-5500 Manual maps storage devices to one of four numbered *channels*, not *host devices*, and that the no reasonable construction of "maps between devices" could include *channel-oriented* mapping.

In an inter partes review, a patent claim is given "its broadest reasonable construction in light of the specification of the patent in which it appears." *Cuozzo Speed Techs., LLC v. Lee,* 136 S. Ct. 2131, 2142 (2016) (quoting 37 C.F.R. § 42.100(b)). Applying the broadest reasonable interpretation, we agree with the Board that a map between storage devices and hosts, where each host is represented by a unique channel number, can still be a "map between devices."

In the CRD-5500 Manual, a host and a channel number are functionally the same thing. Every implementation of the CRD-5500 depicted in the manual gives each host device its own "host channel," and the channel number uniquely identifies the host. The name of the system for assigning redundancy groups of storage devices to *channels* is the "*Host* LUN Mapping" utility. This name further makes clear that it is a mapping of storage devices to *hosts*.

The Board correctly found that the channel number is merely an intermediate identifier for a host device, and that the ultimate logical mapping performed by the CRD-5500 is from a storage device to a host. The disclosures in the CRD-5500 Manual are substantial evidence to support the Board's finding that the manual discloses maps between devices as claimed by these patents.

Crossroads does not challenge other aspects of the Board's obviousness analysis. Because the Board's obviousness-related findings with respect to the CRD-5500 Manual are supported by substantial evidence, and because those findings are sufficient to support its ultimate legal conclusion of obviousness, we affirm the Board's finding that the independent claims are obvious.

3. "Unique Identifier," "World Wide Name," and "Host Device ID" Dependent Claims

In addition to challenging the "maps between devices" limitation found in all claims of all three patents, Crossroads challenges the Board's obviousness findings for the limitations of the following three dependent claims:

> 14. The storage router of claim 1, wherein the representations of devices connected to the first transport medium are unique identifiers.
>
> 15. The storage router of claim 14, wherein the unique identifiers are world wide names.

'041 patent col. 10 ll. 36–40, J.A. 8056

> 24. The system of claim 21, wherein the access control device is further operable to maintain a configuration including the map, wherein the map provides a mapping from a host device ID to a virtual LUN.

'147 patent col. 12 ll. 10–15, J.A. 19703.

Crossroads contends that these claims contain limitations that are not disclosed by the CRD-5500 Manual because they require that devices be represented by a "unique identifier," "world wide name," or "host device ID." Crossroads argues that these limitations expressly require that the map identify connected devices using specific technologies and not some intermediary part of the system like a channel. We disagree.

For "unique identifier," the Board found that the channel numbers in the CRD-5500 manual uniquely identify the host. J.A. 65. Contrary to Crossroads' argument that the manual's channel numbers cannot provide device-to-device mapping, the manual explicitly teaches device-to-device mapping: "By using the controller's Host LUN Mapping feature, you can assign redundancy groups to a particular host." J.A. 447. Crossroads fails to explain how storage can be assigned to a "particular host" if the channel number in the mapping table does not uniquely identify that host. Even Crossroads' own patent specification uses identifiers in its map which uniquely identify a device. For example, the AL_PA identifier described in the Crossroads patents identifies a *port* on an arbitrated loop to which a host device is connected. '147 patent col. 8 ll. 1–10, J.A. 19701. This port number is analogous to the channel number used in the CRD-5500 manual. The diagram in Figure 1-2 of the manual shows a separate channel number assigned to each host. J.A. 448. Because each host has a separate channel number that can be used to communicate with that particular host, that channel number uniquely identifies that host. The identification is unique because the channel number is not assigned to any other host. This disclosure from the CRD-5500 manual is substantial evidence that supports the Board's finding.

The Board also noted that "unique identifiers" were disclosed by the HP Journal prior art reference. J.A. 66. Even if Crossroads were correct in asserting that the

CRD-5500 manual did not disclose "unique identifiers," Crossroads makes no arguments concerning the HP Journal reference.

The same reasoning applies to "host device ID." The Board found that the channel numbers in the CRD-5500 manual are host device IDs. J.A. 102–03. Crossroads argues that the manual's channel numbers "do not identify devices in any respect." However, the manual explicitly discloses using a channel number to make specific host devices to specific storage devices: "By using the controller's Host LUN Mapping feature, you can assign redundancy groups to a particular host." J.A. 447. Crossroads fails to explain how storage can be assigned to a "particular host" if this channel number in the mapping table is not a host device ID. Even Crossroads' own patent specification uses identifiers in its map which indirectly identify a device. For example, the AL_PA identifier described in the Crossroads patents identifies a *port* on an arbitrated loop to which a host device is connected. '147 patent col. 8 ll. 1–10, J.A. 19701. This port number is analogous to the channel number used in the CRD-5500 manual. The diagram in Figure 1-2 of the manual shows a separate channel number assigned to each host. J.A. 448. Because each host device has a separate channel number that can be used to identify a particular host, device, that channel number is a host device ID. This disclosure from the CRD-5500 manual is substantial evidence that supports the Board's finding.

Finally, the Board found that the "world wide name" limitation is taught by the combination of the CRD-5500 manual, the HP Journal reference, and the Fibre Channel standard. J.A. 68–70. As described above, the channel numbers in the CRD-5500 manual uniquely identify hosts attached to the channels. The Board found that based on the petitioners' observation that the Fibre Channel standard discloses using world wide names in heterogeneous systems like the combination of the CRD-5500 manu-

al and the HP Journal, there is a reason to combine the references' disclosures by using world wide names as unique identifiers. Given the Fibre Channel standard's disclosure of replacing simple channel numbers with world wide names, a person of ordinary skill in the art would have thought to replace the channel numbers in the CRD-5500 system with world wide names as well.

The Board also found that Crossroads' arguments attacked the CRD-5500 manual individually, without reference to this combination. The Board's conclusion is therefore supported by substantial evidence.

CONCLUSION

Because the Board made sufficient factual findings to support its obviousness conclusions and because those findings are supported by substantial evidence, we *affirm* the Board's decisions.

AFFIRMED

COSTS

No costs.