IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the *Inter Partes* Review of: Trial Number: To Be Assigned

U.S. Patent No. 6,978,346

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Issued: December 20, 2005

Inventor(s): Sung-Hoon Baek, Joong-Bae Kim, Yong-Youn Kim

Assignee: Electronics and Telecommunications Research Institute

Title: Apparatus For Redundant Interconnection Between Multiple Hosts And RAID

Panel: To Be Assigned

Mail Stop *Inter Partes* Review
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION OF DR. RANDY KATZ UNDER 37 C.F.R. § 1.68 IN SUPPORT OF PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 6,978,346

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I, Randy Katz, do hereby declare as follows:

I. INTRODUCTION

1. I have been retained as an expert witness on behalf of International Business Machines Corporation ("IBM") and Oracle America, Inc. ("Oracle") for the above-captioned Petition for *Inter Partes* Review ("IPR") of U.S. Patent No. 6,978,346 ("the '346 Patent"). I am being compensated $750/hour for my time in connection with this IPR. My compensation is not affected by the outcome of this matter.

2. I have been asked to provide my opinions regarding whether Claims 1-9 ("the Challenged Claims") of the '346 Patent are invalid as anticipated by the prior art.

3. The '346 Patent issued on December 20, 2005, from U.S. Patent Appl. No. 09/753,245 ("the '245 Application"), filed on December 29, 2000. (Ex. 1008.) The '245 Application claims priority to Korean Appl. No. 2000-54807, filed on September 9, 2000.

4. The face of the '346 Patent names Sung-Hoon Baek, Joong-Bae Kim, and Yong-Youn Kim as the purported inventors and identifies Electronics and Telecommunications Research Institute ("ETRI") as the purported assignee of the '346 Patent. (Ex. 1004 at Cover, the '346 Patent.) I have reviewed the Patent Office "Assignments on the Web" record for the '346 Patent.

This record indicates that the named inventors originally assigned their interests in the '245 Application, the application that issued as the '346 Patent, to ETRI in or around October 2000.

5. In preparing this Declaration, I have reviewed the '346 Patent, the file history of the '346 Patent, the prior art references identified in the Declaration, and statements made by ETRI and the PTAB regarding the alleged meaning and scope of terms and phrases recited in the Challenged Claims.

6. I understand that claims in an IPR are given their broadest reasonable interpretation in view of the patent specification and the understandings of one having ordinary skill in the relevant art.

7. In forming the opinions expressed in this Declaration, I relied upon my education and experience in the relevant field of the art, and have considered the viewpoint of a person having ordinary skill in the relevant art as of 2000, the effective priority date of the '346 Patent. My opinions are based, at least in part, on the following:

Reference	Date of Public Availability
U.S. Patent No. 6,070,251 to Chong ("Chong US")	Chong US was filed on June 26, 1997, and issued on May 30, 2000, and is attached as Ex. 1005 to the IPR petition.
Japanese Patent No. JPH11120092A	Chong JP was published on April

to Chong ("Chong JP")	30, 1999, and is attached as Ex. 1006 to the IPR petition. A certified translation of Chong JP is attached as Ex. 1007 to the IPR petition.

II. BACKGROUND AND QUALIFICATIONS

8. My name is Randy H. Katz. My work address is Room 465 Soda Hall #1776, University of California, Berkeley, Berkeley, California 94720-1776.

9. I have studied, taught, and practiced computer science and engineering for over thirty years. I earned an *Artium Baccalaureus* degree in Computer Science from Cornell University in May, 1976, and a Master of Science and a *Philosophiæ Doctor* degree in Computer Science from University of California at Berkeley in June, 1978 and June, 1980, respectively.

10. After positions in industry and the University of Wisconsin-Madison, I joined the Berkeley faculty in 1983, where I have been to this day. Since 1996 I have been the United Microelectronics Corporation Distinguished Professor in Electrical Engineering and Computer Science. I am a Fellow of the ACM and the IEEE. I am a member of the National Academy of Engineering and the American Academy of Arts and Sciences. I have published over 250 technical papers, book chapters, and books. I authored the textbook entitled *Contemporary Logic Design* used at over 200 colleges and universities. I have earned several honors, awards, and have been

recognized for my work in the field of Computer Science and Engineering. In particular, the IEEE Reynolds Johnson Storage System Award, which I shared with colleagues at Berkeley in 1999, is the highest professional recognition in the storage systems field.

11. In the late 1980s, with colleagues at Berkeley, I developed the essential framework for describing the tradeoff between reliability and performance in storage systems. This led to the wide-spread concept of Redundant Arrays of Inexpensive Disks (RAID), now a $15 billion per year industry sector. My current research interests are Smart Energy Systems including Smart Grid and Software-Defined Smart Buildings. Prior research interests have included: database management, VLSI CAD, high performance multiprocessor (Snoop cache coherency protocols) and storage (RAID) architectures, transport (Snoop TCP) and mobility protocols spanning heterogeneous wireless networks, converged data and telephony network and service architectures, and Reliable, Adaptive Distributed Systems supported by new services deployed inside the network.

12. My qualifications in the area of Computer Science and Engineering in general, and more specifically in the area of attached storage systems, is set forth more fully in my Curriculum Vitae, Ex. 1002 to the Petition.

III. UNDERSTANDING OF PATENT LAW

13. I understand that prior art to the '346 Patent includes patents and printed publications in the relevant art that predate September 19, 2000, the effective priority date of the '346 Patent.

14. I understand that a claim is invalid if it is anticipated. Anticipation of a claim requires that every element of a claim be disclosed expressly or inherently in a single prior art reference, arranged in the prior art reference as arranged in the claim.

IV. BACKGROUND

A. Background of the Field Relevant to the '346 Patent

15. The '346 patent relates to interconnections between host computers and storage systems. The storage systems referenced in the patent and claims are those known by the acronym RAID, which stands for Redundant Array of Inexpensive (or sometimes, Independent) Disks. I was one of the researchers who coined the term "RAID" in a 1987 paper to describe storage systems comprised of an array of inexpensive drives, enhancing their performance. A number of different RAID configurations have since been developed, including RAID 0 (disk striping), RAID 1 (disk mirroring), and RAID 2 through RAID 6 (various parity protection forms). On review of the '346 patent, I note that it is not specific to any particular type of RAID system. Nor does the '346 patent require specific hardware.

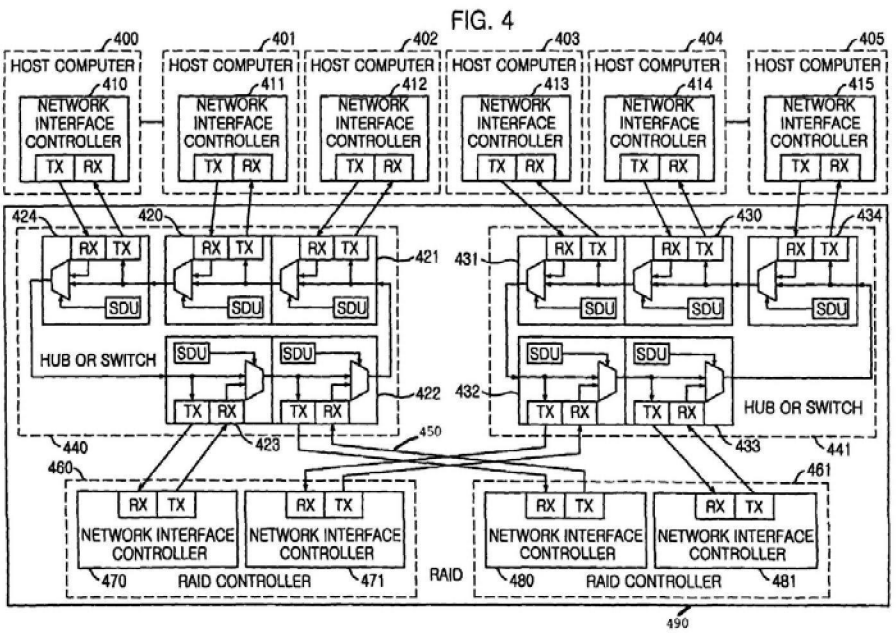
16. Rather, the '346 patent is directed at specific configurations of storage systems, through redundant connections between hosts and storage controllers to ensure fault tolerance (*i.e.*, that functionality is retained even if one storage controller is faulty).

17. The concepts described in the '346 patent were well-known by the time of the '346 patent's effective filing date. Indeed, as described herein, the same system had been previously described in patents assigned to Sun Microsystems, Inc.

B. Summary of the '346 Patent

18. Figure 4 of the '346 patent is reproduced below:

FIG. 4



19. Figure 4 of the '346 Patent is described as one embodiment of the invention showing "a host interface system as an internal installment system between a

RAID and host computers." ('346 patent at 2:46-49.) As shown in Figure 4, the system includes "host computer[s]" (labeled 400-402) connected to a first "hub or switch" (labeled 440), and further connected to a RAID (labeled 490) through network interface controlling unit ports (labeled 470 and 480) in the RAID controllers (labeled 460 and 461). Other "host computers" (labeled 403-405) are connected to a second "hub or switch" (labeled 441), and further connected to the RAID through network interface controlling unit ports (labeled 471 and 481) in the RAID controllers.

20. The '346 patent discloses that "information" can be transmitted between the network controlling units in Figure 4 above, but does not disclose any modifications to the network components that need to be made in order to transmit information between network interface controlling units.

21. The Challenged Claims include two independent claims, claims 1 and 9.

22. Claim 1 of the '346 patent recites the following:

> [1] An apparatus for a redundant interconnection between multiple hosts and a RAID, comprising:
>
> [1a] a first RAID controlling units and a second RAID controlling unit for processing a requirement of numerous host computers,
>
> [1b] the first RAID controlling unit including a first network controlling unit and a second network controlling unit, and
>
> [1c] the second RAID controlling unit including a third network controlling unit and a fourth network controlling unit;

[1d] a plurality of connection units for connecting the first RAID controlling units and the second RAID controlling unit to the numerous host computers,

[1e] wherein the first RAID controlling unit and the second RAID controlling unit directly exchange information with the numerous host computers through the plurality of connecting units,

[1f] and the first network controlling unit exchanges information with the fourth network controlling unit, and

[1g] the second network controlling unit exchanges information with the third network controlling unit.

23. Claim 9 of the '346 patent recites the following:

[9] An apparatus for a redundant interconnection between multiple host computers and a RAID, the apparatus comprising:

[9a] a plurality of connection units for connecting the host computers and the RAID;

[9b] a first and a second RAID controllers, included in the RAID, each of which having a first network interface controller and a second network interface controller for processing requests from the plurality of the host computers connected through the plurality of the connection units,

[9c] wherein the first network interface controller in the first RAID controller supplies data to the host computers connected through the plurality of connection units and processes information transmitted from the second network interface controller in the second RAID controller,

[9d] wherein the first network interface controller in the second RAID controller supplies data to the host computers connected through the plurality of connection units and processes information transmitted from the second network interface controller in the first RAID controller,

[9e] wherein the second network interface controller in the first RAID controller is used for fault tolerance by performing functions of the first network interface controller in the second RAID controller when the second RAID controller is faulty, and

[9f] wherein the second network interface controller in the second RAID controller is used for fault tolerance by performing functions of the first network interface controller in the first RAID controller when the first RAID controller is faulty, and

[9g] wherein the first network controlling unit in the first RAID controlling unit exchanges information with the second network controlling unit in the second RAID controlling unit, and

[9h] the second network controlling unit in the first RAID controlling unit exchanges information with the first network controlling unit in the second RAID controlling unit.

C. Summary of the Prosecution History

24. The '245 Application was initially rejected over US 5,812,754 (hereinafter "Lui"). (Ex. 1008, pgs. 4-9). To overcome this rejection, the applicant made amendments that were substantially undone in the Applicant's response to the next office action. The next office action was a Final Office Action rejecting all claims over Lui (Ex. 1008, pgs. 30-39). In response to the Final Office Action, the Applicant amended claims 1 and 9 and argued that Lui does not teach "two network interface controlling units included in each RAID controller." (Ex. 1008, pgs. 41-49). The Applicant also argued that Lui does not teach "the first network controlling unit exchanges information with the fourth network controlling unit and the second network controlling unit exchanges information with the third network controlling unit." (Ex. 1008, pgs. 48-49). The claims were allowed without reasoning from the Examiner. (Ex. 1008, pgs. 53-56).

V. LEVEL OF ORDINARY SKILL IN THE PERTINENT ART

25. I have been informed that multiple factors are considered in identifying the level of ordinary skill in the pertinent art, including education of those working in the relevant field on the date of the invention, the sophistication of the technology, the type of problems encountered in the art, and the prior art solutions to those problems.

26. Based on my education and extensive experience relating to RAID storage systems and fault-tolerant systems, I believe I am qualified to provide opinions about the understanding and qualifications of a person of ordinary skill in the art of the technology at issue in this proceeding.

27. In my opinion, a person of ordinary skill in the art of the '346 patent, as of 2000, would have had a Bachelor's degree in Electrical Engineering or Computer Science and at least two years of experience in designing storage systems.

28. My opinions below explain how a person of ordinary skill in the art would have understood the '346 patent and cited references around 2000.

VI. BROADEST REASONABLE INTERPRETATION

29. I understand that in an IPR proceeding, the Challenged Claims are given their broadest reasonable meaning as they would be understood by one of ordinary skill in the art, consistent with the specification of the patent.

30. I have reviewed the Board's decision instituting IPR proceedings in another, related, IPR of the '346 patent. The Board's decision instituting IPR proceedings construed certain terms in the '346 patent. For the purposes of my opinions set forth herein, I have used the Board's constructions.

Claim Term	**Construction**
"RAID controlling unit" and "RAID controller"	"A component that controls operation of the RAID"
"RAID"	"Redundant array of inexpensive disks"
"exchange information" / "exchanges information"	"To transmit and receive information reciprocally"
"connection unit"	"a hub or switch"

31. In the related IPR proceeding, the Patent Owner stated that a "'network interface controller' is the part of a RAID controller that allows the RAID controller to communicate with the 'connection units.'" (IPR2013-00635, Paper 14 at 19.) For purposes of this proceeding, I incorporate the the Patent Owner's construction of the claim terms "network interface controller," "network controlling unit," and "network interface controlling unit," as "the part of a RAID controller that allows the RAID controller to communicate with the 'connection units.'"

32. In Case No. IPR2013-00635, the PTAB rejected the notion that "exchanges information" means exchanging information via one or more of the connection units, because the claim language and the specification of the '346 Patent provide no such limitation on the exchange of information. The construction proposed here is consistent with the PTAB's construction in Case No. IPR2013-00635 and is supported by the '346 Patent's specification.

VII. DETAILED INVALIDITY ANALYSIS

33. I have been asked to provide an opinion as to whether the Challenged Claims are invalid in view of the prior art. The discussion below provides a detailed analysis of how the prior art references identified in Section I invalidate the Challenged Claims.

A. Background on Prior Art References

34. Before providing a detailed analysis of how the prior art invalidates the Challenged Claims, I provide a brief summary of the asserted prior art references.

1. Background on Chong US and Chong JP

35. Chong US is titled "Method And Apparatus For High Availability And Caching Data Storage Devices," and is assigned on its face to Sun Microsystems, Inc. Chong JP, similarly titled "Method And Apparatus For High Availability And Caching Of Data Storage Devices," is also assigned

on its face to Sun Microsystems, Inc. Chong JP claims priority to Chong US, and the relevant disclosure in Chong US and Chong JP is substantially identical. I understand that both references are included because Chong JP is prior art under 35 U.S.C. § 102(b). Though Chong US and Chong JP provide separate grounds for invalidating the Challenged Claims, for purposes of efficiency I discuss them together (collectively "the Chong Reference").

36. The Chong Reference is directed to efficient caching operations and fail-over support in data storage controllers and/or data storage devices. (Ex. 1005, 1:7-10; Ex. 1007 at 3, ¶ 1; Ex. 1006). The Chong Reference discloses a system with a RAID configuration. Data is written identically to both storage devices 124 and 125 in the system. (Ex. 1005, 3:30-49, 4:15-28, 4:50-51; Ex. 1007, ¶¶ 9, 12-13). In addition, the configuration in the Chong Reference provides fault tolerance such that as long as one data storage device is functioning, the array continues to operate. (Ex. 1005, 4:52-5:3; Ex. 1007, ¶ 14) This combination of data mirroring and fault tolerance makes the two data storage devices appear as a single, reliable drive to the hosts, or in other words, a RAID.

37. The Chong Reference also discloses that data storage controllers exchange information through a direct communication link between PSOCs (Serial

Optical Converter for PCI bus). (Ex. 1005, 3:50-67; Ex. 1007, ¶ 10). The PSOC is part of the hardware that implements a port on each data controller. Each controller includes a primary port and a secondary port. (Ex. 1005, Fig. 3, 4:15-39; Ex. 1007, Fig. 3, ¶ 12). The primary and secondary ports allow communication between the data storage controllers and facilitate communication between hosts and the data storage devices. (Ex. 1005, 3:34-38; Ex. 1007, ¶ 9).

B. The Challenged Claims are Anticipated by the Chong Reference

38. It is my opinion that Claims 1 through 9 are anticipated by the Chong Reference. The Chong Reference discloses each and every element of Claims 1 through 9, which are arranged in the Chong Reference as arranged in the claims, and thus anticipates the claims.

39. Reproduced below is Fig. 3 of the Chong Reference with annotations pointing out the claimed structures of the '346 patent. The specific limitations of each claim are discussed in detail below.

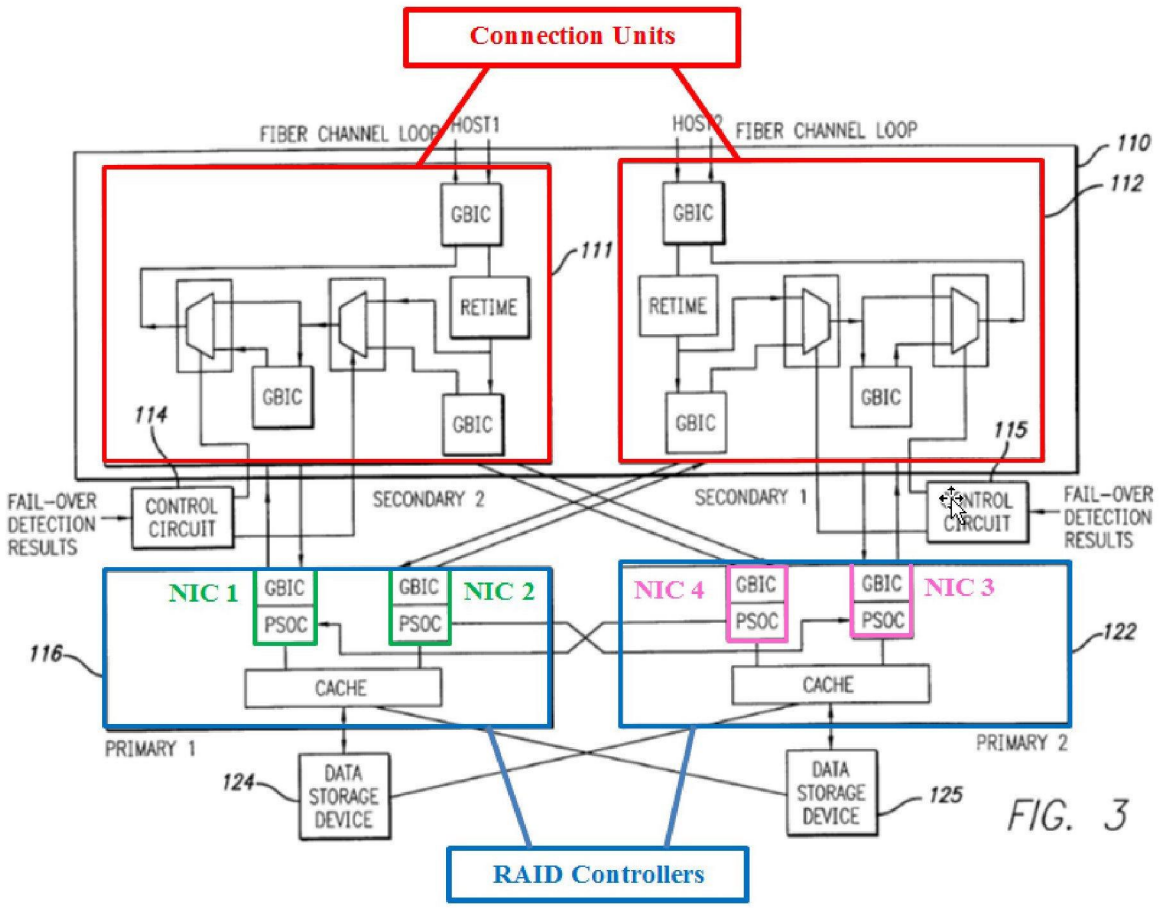


FIG. 3

1. Claim 1

(1) The Chong Reference discloses "an apparatus for a redundant interconnection between multiple hosts and a RAID"

40. The Chong Reference discloses a system having multiple hosts connected redundantly to a set of data storage devices. (Ex. 1005, Fig. 3, 4:15-42; Ex. 1007, Fig. 3, ¶ 12). As explained above in ¶ 36, the Chong Reference discloses a RAID configuration. The multiple hosts have multiple connections to the data storage devices through the switching circuits. (Ex.

1005, Fig. 3, 4:15-42; Ex. 1007, Fig. 3, ¶ 12). These multiple connections provide redundancy in the event of a controller or data storage device failure. (Ex. 1005, 4:52-67; Ex, 1007, ¶ 14).

41. Additional evidence supporting my opinion that the Chong Reference discloses the preamble is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

(2) The Chong Reference discloses "a first RAID controlling units and a second RAID controlling unit for processing a requirement of numerous host computers"

42. The Chong Reference discloses a first controller 116 (first RAID controlling unit) and a second controller 122 (second RAID controlling unit). (Ex. 1005, Fig. 3, 4:15-22; Ex. 1007, ¶ 12). Each controller is coupled to a data storage device in a RAID configuration. (Ex. 1005, Fig. 3, 4:15-22, 4:50-51; Ex. 1007, ¶¶ 12-13). Each controller, therefore, is a RAID controlling unit. Further, the Chong Reference discloses that controllers 116 and 122 allow numerous hosts to communicate with data storage devices 124 and 125. (Ex. 1005, Fig. 3, 4:15-22, 4:50-51; Ex. 1007, Fig. 3, ¶¶ 12-13).

43. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

(3) The Chong Reference discloses "the first RAID controlling unit including a first network controlling unit and a second network controlling unit"

44. The Chong Reference discloses that controller 116 includes two ports, Primary 1 (first network controlling unit[1]) and Secondary 2 (second network controlling unit). Each port includes includes "a GBIC 56 [and] a PSOC . . . 62." (Ex. 1005, Fig. 3, 2:67-3:3, 4:26-28; Ex. 1007, ¶ 8, 12). A GBIC is a Gigabit Interface Converter, and a PSOC is a Serial Optical Converter for PCI Bus. (Ex. 1005, 2:64-3:1; Ex. 1007, ¶ 8). The GBIC and PSOC are used to process commands from the hosts and communicate over the network via the switching circuits 111 and 112. (Ex. 1005, 3:16-22, 3:31-38; Ex. 1007, ¶ 8-9). The ports in each controller allow it to communicate with the switching circuits, and thus meet the "network interface controller" and "network controlling unit" limitations. Thus, the Chong Reference discloses this limitation.

[1] Claim 1 recites a "network controlling unit." Claims dependent on claim 1 recite a "network interface controlling unit," and claim 9 recites a "network interface controller." It appears the patent uses these terms interchangeably. When I refer to a "network controlling unit," I am referring to a "network controlling unit," a "network interface controlling unit," and a "network interface controller" as recited by the claims of the '346 Patent.

45. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

(4) The Chong Reference discloses "and the second RAID controlling unit including a third network controlling unit and a fourth network controlling unit"

46. The Chong Reference discloses that controller 122 includes two ports, Primary 2 (third network controlling unit) and Secondary 1 (fourth network controlling unit). Each port includes "a GBIC 56 [and] a PSOC . . . 62." (Ex. 1005, Fig. 3, 2:67-3:3, 4:26-28; Ex. 1007, Fig. 3, ¶ 8, 12). A GBIC is a Gigabit Interface Converter, and a PSOC is a Serial Optical Converter for PCI Bus. (Ex. 1005, 2:64-3:1; Ex. 1007, ¶ 8). The GBIC and PSOC are used to process commands from the hosts and communicate over the network. (Ex. 1005, 3:16-22, 3:31-38; Ex. 1007, ¶ 8-9). The ports in each controller allow it to communicate with the switching circuits, and thus meet the "network interface controller" and "network controlling unit" limitations. Thus, the Chong Reference discloses this limitation.

47. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

(5) The Chong Reference discloses "a plurality of connection units for connecting the first RAID controlling units and the second RAID controlling unit to the numerous host computers"

48. The Chong Reference discloses that switching circuits 111 and 112 (connection units) connect controllers 116 and 122 to multiple hosts. Fig. 3 shows a configuration in which "two hosts, host 1 and host 2, are communicating with data storage devices 124 and 125 via switching circuit set 110 and controllers 116 and 122 on two fiber channel loops." (Ex. 1005, 4:15-21; Ex. 1007, ¶ 12). Switching circuit set 110 includes "two switching circuits 111 and 112." (Ex. 1005, 4:23-24; Ex. 1007, ¶ 12). Each of these switching circuits 111 and 112 comprises a connection unit.

49. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

(6) The Chong Reference discloses "wherein the first RAID controlling unit and the second RAID controlling unit directly exchange information with the numerous host computers through the plurality of connecting units"

50. The Chong Reference discloses that controllers 116 and 122 directly exchange data with the hosts through switching circuits 111 and 112. The Chong Reference Fig. 3 shows direct connections between controllers 116 and 122 and switching circuits 111 and 112. The Chong Reference also

discloses that hosts 1 and 2 communicate with data storage devices 124 and 124 through switching circuits 111 and 112 and controllers 116 and 122. (Ex. 1005, 4:15-21; Ex. 1007, ¶ 12).

51. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

(7) The Chong Reference discloses "and the first network controlling unit exchanges information with the fourth network controlling unit"

52. The Chong Reference discloses that Primary 1 (first network controlling unit) in controller 116 exchanges information with Secondary 1 (fourth network controlling unit) in controller 122 for synchronization purposes. The Chong Reference Fig. 3 shows a direct connection between a PSOC in Primary 1 (first network controlling unit) of controller 116 and a PSOC in Secondary 1 (fourth network controlling unit) of controller 122. The Chong Reference discloses that this direct connection is used for data synchronization between the PSOCs. (Ex. 1005, 3:50-67, 4:15-28, 4:50-51; Ex. 1007, ¶¶ 10, 12-13). This exchange of information is reciprocal, as the PSOCs send data and commands back and forth. (Ex. 1005, 3:50-67, 4:15-28, 4:50-51; Ex. 1007, ¶¶ 10, 12-13).

53. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

(8) The Chong Reference discloses "and the second network controlling unit exchanges information with the third network controlling unit"

54. The Chong Reference discloses that Secondary 2 (second network controlling unit) exchanges information with Primary 2 (third network controlling unit). The Chong Reference Fig. 3 shows a direct connection between a PSOC in Primary 2 (third network controlling unit) in controller 122 and a PSOC in Secondary 2 (second network controlling unit) in controller 116. The Chong Reference discloses that this direct connection is used for data synchronization between the PSOCs. (Ex. 1005, 3:50-67, 4:15-28, 4:50-51; Ex. 1007, ¶¶ 10, 12-13). This exchange of information is reciprocal, as the PSOCs send data and commands back and forth. (Ex. 1005, 3:50-67, 4:15-28, 4:50-51; Ex. 1007, ¶¶ 10, 12-13).

55. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

2. Claim 2

(1) The Chong Reference discloses "the apparatus as recited in claim 1, wherein said respective RAID controlling units are connected to the plurality of individual connecting units."

56. As discussed above in ¶¶ 40-55, the Chong Reference discloses each and every element of claim 1.

57. The Chong Reference further discloses that controllers 116 and 122 (the first and second RAID controlling units) are each connected to switching circuits 111 and 112 (the connection units). Fig. 3 of the Chong Reference shows that controller 116 has a direct connection to both switching circuits 111 and 112. (Ex. 1005, Fig. 3, 4:15-28, 4:50-51; Ex. 1007, Fig. 3, ¶¶ 12-13). Likewise, controller 122 also has direct connections to switching circuits 111 and 112. (Ex. 1005, Fig. 3, 4:15-28, 4:50-51; Ex. 1007, Fig. 3, ¶¶ 12-13).

58. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

3. Claim 3

(1) The Chong Reference discloses "the apparatus as recited in claim 2, wherein the first network interface controlling unit is coupled to the connecting unit of one side and the second network interface controlling unit is coupled to the connecting unit of another side."

59. As discussed above in ¶ 57, the Chong Reference discloses the apparatus as recited in claim 2.

60. The Chong Reference discloses the additional limitation of claim 3 because it teaches that controller 116 is connected to both switching circuits 111 and 112 (connection units). (Ex. 1005, Fig. 3, 4:15-28, 5:50-51; Ex. 1007, ¶¶ 12-13). Primary 1 (first network controlling unit) of controller 116 is connected to switching circuit 111, and Secondary 2 (second network controlling unit) of controller 116 is connected to switching circuit 112. (Ex. 1005, Fig. 3, 4:15-28, 5:50-51; Ex. 1007, ¶¶ 12-13).

61. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

4. Claim 4

(1) The Chong Reference discloses "the apparatus as recited in claim 3, wherein the first network interface controlling unit and the third network interface controlling unit process the requirement of the numerous host computers; and"

62. As discussed above in ¶ 60, the Chong Reference discloses the apparatus as recited in claim 3.

63. The Chong Reference also discloses this additional limitation of claim 4. The Chong reference teaches that Primary 1 (first network controlling unit) of controller 116 and Primary 2 (third network controlling unit) of controller 122 are used to communicate with host 1 and host 2 respectively. (Ex. 1005, 4:15-19, 4:34-51; Ex. 1007, ¶¶ 12-13). Primary 1 of controller 116 and Primary 2 of controller 122 respond to commands from and return status information to host 1 and host 2 respectively. (Ex. 1005, 3:30-38 ("Fiber channel frames supplied from the host are sent to primary controller 16, which then responds on the loop by returning status information."), 3:57-67, 4:15-51; Ex. 1007, ¶¶ 9-10, 12-13).

64. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

(2) The Chong Reference discloses "the second network interface controlling unit and the fourth network controlling unit are used for communication between the first RAID controlling unit and the second RAID controlling unit when the first and second RAID controlling units are not faulty and the second network interface controlling unit and the fourth network controlling unit are used for executing a function of the first network interface controlling unit and the third network controlling unit when one of the first RAID controlling unit and the second RAID controlling unit is faulty"

65. The Chong Reference discloses that second and fourth network interface controlling units exchange information and are used for communication between the controllers when there are no faults. The Chong Reference teaches that, in normal operation, Secondary 2 of controller 116 (second network controller), and Secondary 1 of controller 122 (fourth network interface controller) are used for communication with Primary 2 of controller 122 and Primary 1 of controller 116, respectively, for synchronization when there are no faults. (Ex. 1005, ¶¶ 3:50-67, 4:15-51; Ex. 1007, ¶¶ 10, 12-13). The secondary ports of controllers 116 and 122 (second and fourth network interface controllers) send requests to the primary ports and receive data in return. (Ex. 1005, ¶¶ 3:50-67, 4:15-51; Ex. 1007, ¶¶ 10, 12-13). This functionality implements the data mirroring feature of a RAID configuration, which is the configuration disclosed by the Chong Reference.

66. The Chong Reference also discloses that the second and fourth network interface controlling units are used for executing functions of the first or third network interface controlling units when there is a fault. The Chong Reference teaches that secondary ports 1 and 2 (second and fourth network controlling units) can perform the functions of primary ports 1 and 2 (first and third network controlling units) when there is a fault in either controller or data storage device. (Ex. 1005, Figs. 3 and 4, 2:67-3:11, 4:26-28, 4:34-42, 4:50-51, 4:53-5:3; Ex. 1007, ¶¶ 8, 12-14). Fault tolerance is achieved through fail-over software in the controllers and control circuits 114 and 115. (Ex. 1005, Fig. 4, 4:43-5:3; Ex. 1007, ¶¶ 13-14).

67. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

5. Claim 5

(1) The Chong Reference discloses "the apparatus as recited in claim 1, wherein said plurality of connecting units have at least three connection ports"

68. As discussed above in ¶¶ 40-55, the Chong Reference discloses the apparatus of claim 1.

69. The Chong Reference further discloses that switching circuits 111 and 112 (connection units) each have at least three GBICs. (Ex. 1005, Fig. 3, Ex.

1007, Fig. 3). A GBIC is hardware used to implement a port. (Ex. 1005, 3:11-14; Ex. 1007, ¶ 8).

70. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

(2) The Chong Reference discloses "two of the at least three connection ports is coupled to one of the first network interface controlling unit and the third network controlling unit"

71. The Chong Reference discloses that Primary 1 (first network controlling unit) of controller 116 is connected to switching circuit 111, and Primary 2 (third network controlling unit) of controller 122 is connected to switching circuit 112. (Ex. 1005, Fig. 3 (annotated), Ex. 1007, Fig. 3).

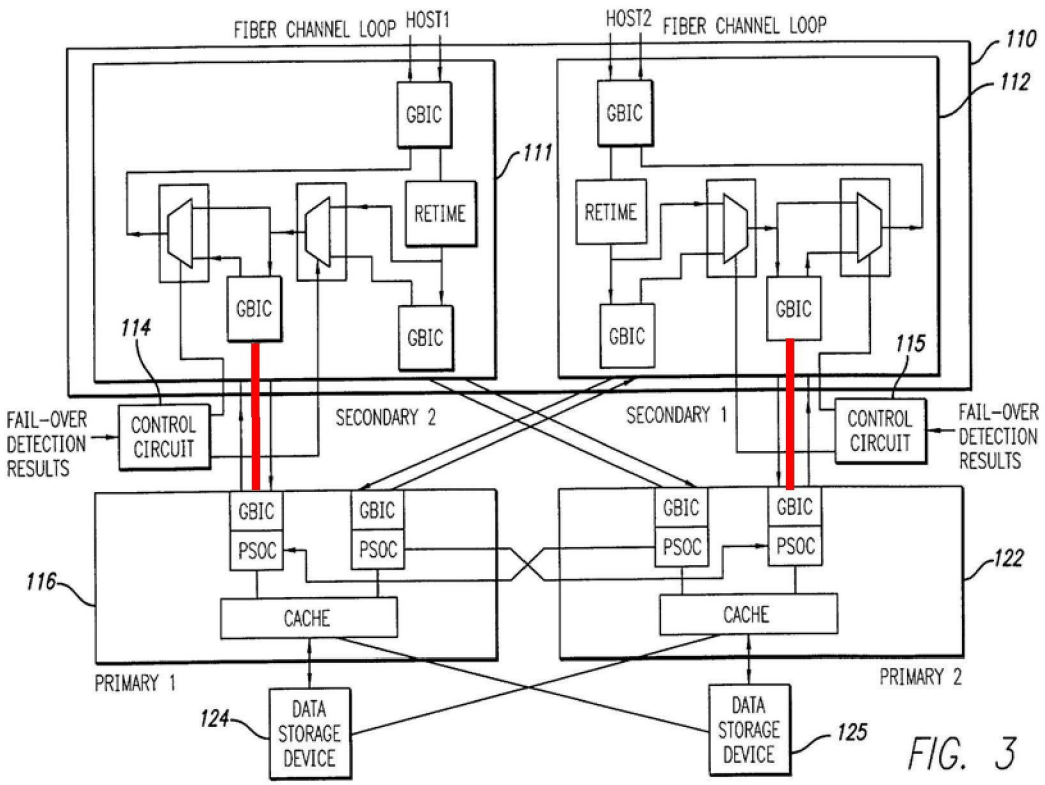


FIG. 3

72. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

(3) The Chong Reference discloses "and the rest of the connection ports being provided as a hub equipment connected with the numerous host computers."

73. The Chong Reference discloses two switching circuits 111 and 112, where the switching circuits are connected with host 1 and host 2. Four of the connection ports in switching circuits 111 and 112 (connecting units) are connected to controllers 116 and 122. (Ex. 1005, Fig. 3; Ex. 1007, Fig. 3).

The remaining connection ports are connected to host 1 and host 2. (Ex. 1005, Fig. 3). Switching circuits 111 and 112 act as a hub because they connect multiple devices together to act as a single network. Thus, the rest of the connection ports provided by switching circuits 111 and 112 are provided as hub equipment connected with the numerous host computers.

74. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

6. Claim 6

(1) The Chong Reference discloses "the apparatus as recited in claim 1, wherein said plurality of connecting units have at least three connection ports"

75. This claim element is identical to the corresponding element in claim 5, as discussed above in ¶¶ 69-70.

(2) The Chong Reference discloses "two of the at least three connection ports are coupled to one of the first network interface controlling unit and the third network controlling unit"

76. This claim element is identical to the corresponding element in claim 5, as discussed above in ¶¶ 71-72.

(3) The Chong Reference discloses "and the rest of the connection ports being provided as a network switch equipment connected with the numerous host computers"

77. The Chong Reference discloses two switching circuits 111 and 112, where the switching circuits are connected with host 1 and host 2. Four of the connection ports in switching circuits 111 and 112 (connecting units) are connected to controllers 116 and 122. (Ex. 1005, Fig. 3; Ex. 1007, Fig. 3). The remaining connection ports are connected to host 1 and host 2. (Ex. 1005, Fig. 3; Ex. 1007, Fig. 3). Switching circuits 111 and 112 are switches, therefore the connection ports are provided as network switch equipment.

78. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

7. Claim 7

(1) The Chong Reference discloses "the apparatus as recited in claim 1, wherein said plurality of connecting units have at least five connection ports"

79. As discussed above in ¶¶ 40-55, the Chong Reference discloses the apparatus of claim 1.

80. The Chong Reference further discloses two switching circuits 111 and 112 (connecting units). (Ex. 1005, Fig. 3; Ex. 1007, Fig. 3). Each switching circuit has at least three GBICs. (Ex. 1005, Fig. 3, 2:63-65; Ex. 1007, Fig. 3, ¶ 8). A GBIC is hardware used to implement a port. Since each switching

circuit has at least three GBICs, the plurality of switching circuits has at least six connection ports.

81. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

(2) The Chong Reference discloses "four of the at least five connection ports is coupled to one of the first network interface controlling unit and the third network controlling unit"

82. As shown below in annotated Fig. 3, the Chong Reference discloses that one GBIC in switching circuit 111 (connecting unit) is directly connected to primary port 1 (first network controlling unit) in controller 116, while another GBIC in switching circuit 111 is coupled to primary port 1 in controller 116 through secondary port 1 in controller 122. Similarly, the Chong Reference teaches that one GBIC in switching circuit 112 (connecting unit) is directly connected to Primary 2 (third network controlling unit) in controller 122, while another GBIC in switching circuit 112 is coupled to Primary 2 in controller 122 through Secondary 2 in controller 116. (Ex. 1005, Fig. 3 (annotated); Ex. 1007, Fig. 3):

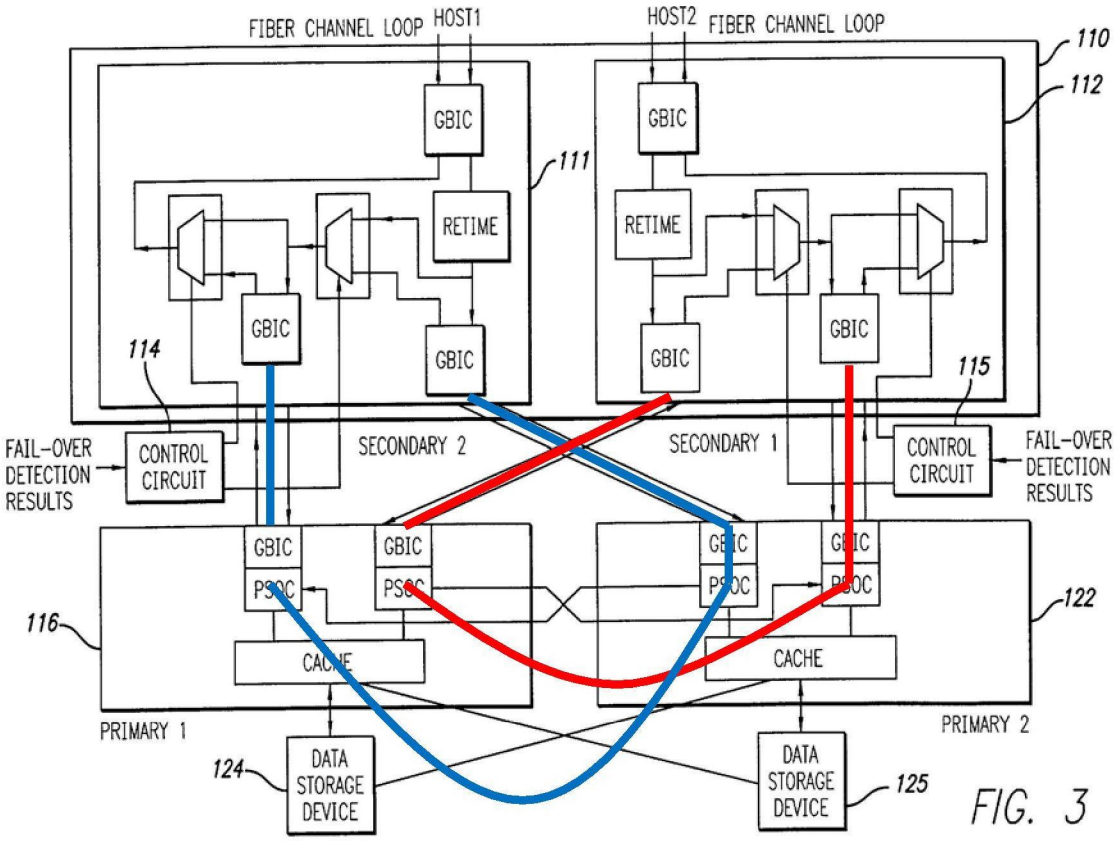


FIG. 3

83. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

(3) The Chong Reference discloses "and the rest of the connection ports being provided as a switch connected with the numerous host computers"

84. This element is similar to claim 6, discussed above in ¶¶ 77-78. For the same reasons, the Chong Reference discloses this limitation.

85. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

8. Claim 8

(1) The Chong Reference discloses "the apparatus as recited in claim 1, wherein the first network interface controlling unit of the first RAID controlling unit being connected to a first connecting unit, the second network interface controlling unit of said first RAID controlling unit being connected to a second connecting unit, the third network interface controlling unit of the second RAID controlling unit being connected to the second connecting unit, and the fourth network interface controlling unit of the second RAID controlling unit being connected to the first connecting unit"

86. As discussed above in ¶¶ 40-55, the Chong Reference discloses the apparatus of claim 1.

87. The Chong Reference further discloses Primary 1 (first network controlling unit) of controller 116 connected to switching circuit 111 (first connecting unit) and Secondary 2 (second network controlling unit) of controller 116 connected to switching circuit 112 (second connecting unit). (Ex. 1005, Fig. 3; Ex. 1007, Fig. 3). Similarly, the Chong Reference Fig. 3 shows Primary 2 (third network controlling unit) of controller 122 connected to switching circuit 112 (second connecting unit) and Secondary 1 (fourth network

controlling unit) of controller 122 connected to switching circuit 111 (first connecting unit).

88. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

9. Claim 9

(1) The Chong Reference discloses "an apparatus for a redundant interconnection between multiple host computers and a RAID, the apparatus comprising:"

89. This claim element is identical to the corresponding element in claim 1. Thus, as discussed above in ¶¶ 40-41, the Chong Reference discloses "an apparatus for a redundant interconnection between multiple hosts and a RAID."

(2) The Chong Reference discloses "a plurality of connection units for connecting the host computers and the RAID"

90. This claim element is similar to an element in claim 1 that recites: "a plurality of connection units for connecting the first RAID controlling units and the second RAID controlling unit to the numerous host computers." Thus, as discussed above in ¶¶ 48-49, the Chong Reference discloses "a plurality of connection units for connecting the host computers and the RAID."

(3) The Chong Reference discloses "a first and a second RAID controllers, included in the RAID, each of which having a first network interface controller and a second network interface controller for processing requests from the plurality of the host computers connected through the plurality of the connection units"

91. This claim element is similar to language in claim 1 that recites: "a first RAID controlling units and a second RAID controlling unit for processing a requirement of numerous host computers, the first RAID controlling unit including a first network interface controlling unit and a second network interface controlling unit, and the second RAID controlling unit including a third network controlling unit and a fourth network controlling unit; and a plurality of connection units for connecting the first RAID controlling units and the second RAID controlling unit to the numerous host computers."

92. Thus, as discussed above in ¶¶ 42-47, the Chong Reference discloses first and second RAID controllers, included in the RAID, each of which has a first network interface controlling unit and a second network interface controlling unit for processing requests from the plurality of the host computers connected through the plurality of connection units.

(4) The Chong Reference discloses "wherein the first network interface controller in the first RAID controller supplies data to the host computers connected through the plurality of connection units and processes information transmitted from the second network interface controller in the second RAID controller"

93. The Chong Reference discloses that "hosts, host 1 and host 2, [communicate] with data storage devices 124 and 125 via switching circuit set 110 and controllers 116 and 122 on two fiber channel loops." (Ex. 1005, 4:15-19; Ex. 1007, ¶ 12). The Chong Reference further discloses that Primary 1 (first network controlling unit) of controller 116 (first RAID controller) functions as a primary controller for host 1. (Ex. 1005, 4:34-39, Ex. 1007, ¶ 12). In addition to processing requests from host 1, Primary 1 of controller 116 also synchronizes data with Secondary 1 (second network controlling unit) of controller 122 (second RAID controller). (Ex. 1005, 3:50-67, 4:26-28; Ex. 1007, ¶¶ 10, 12).

94. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

(5) The Chong Reference discloses "wherein the first network interface controller in the second RAID controller supplies data to the host computers connected through the plurality of connection units and processes information transmitted from the second network interface controller in the first RAID controller"

95. The Chong Reference discloses that "hosts, host 1 and host 2, [communicate] with data storage devices 124 and 125 via switching circuit set 110 and controllers 116 and 122 on two fiber channel loops." (Ex. 1005, 4:15-19; Ex. 1007, ¶ 12). The Chong Reference further discloses that Primary 2 (first network controlling unit) of controller 122 (second RAID controller) functions as a primary controller for host 2. (Ex. 1005, 4:34-39; Ex. 1007, ¶ 12). In addition to processing requests from host 2, Primary 2 of controller 122 also synchronizes data with Secondary 2 (second network controlling unit) of controller 116 (first RAID controller). (Ex. 1005, 3:50-67, 4:26-28; Ex. 1007, ¶¶ 10, 12).

96. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

(6) The Chong Reference discloses "wherein the second network interface controller in the first RAID controller is used for fault tolerance by performing functions of the first network interface controller in the second RAID controller when the second RAID controller is faulty"

97. The Chong Reference discloses that fail-over software in each controller detects faults in the controllers and data storage devices. (Ex. 1005, 3:3-9, 4:15-28; 4:52-5:3; Ex. 1007, 8, 12, 14). When the fail-over software detects a fault, "fail-over detection results are sent to control circuits." (Ex. 1005, 4:53-56; Ex. 1007, ¶ 14). The control circuits ensure that a fully operational controller takes over for the faulty controller. (Ex. 1005, 4:56-62, Ex. 1007, ¶ 14). For example, the Chong Reference discloses that Secondary 2 (second network controlling unit) in controller 116 (first RAID controller) performs functions for Primary 2 (first network controlling unit) in controller 122 (second RAID controller) when there is a failure or fault. (Ex. 1005, 4:52-67; Ex. 1007, ¶ 14).

98. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

(7) The Chong Reference discloses "and wherein the second network interface controller in the second RAID controller is used for fault tolerance by performing functions of the first network interface controller in the first RAID controller when the first RAID controller is faulty"

99. The Chong Reference discloses that fail-over software in each controller detects faults in the controllers and data storage devices. (Ex. 1005, 3:3-9, 4:15-28; 4:52-5:3; Ex. 1007, 8, 12, 14). When the fail-over software detects a fault, "fail-over detection results are sent to control circuits." (Ex. 1005, 4:53-56; Ex. 1007, ¶ 14). The control circuits ensure that a fully operational controller takes over for the faulty controller. (Ex. 1005, 4:56-62, Ex. 1007, ¶ 14). For example, the Chong Reference discloses that Secondary 1 (second network controlling unit) in controller 122 (second RAID controller) performs functions for Primary 1 (first network controlling unit) in controller 116 (first RAID controller) when there is a failure or fault. (Ex. 1005, 4:52-67; Ex. 1007, ¶ 14).

100. Additional evidence supporting my opinion that the Chong Reference discloses this limitation is found in the claim charts for Grounds 1 & 2 included in the body of the Petition for IPR.

(8) The Chong Reference discloses "and wherein the first network controlling unit in the first RAID controlling unit exchanges information with the second network controlling unit in the second RAID controlling unit"

101. This claim element is similar to language in claim 1 that recites: "the first network controlling unit exchanges information with the fourth network controlling unit, and the second network controlling unit exchanges information with the third network controlling unit." Thus, as discussed above in ¶¶ 52-55, the Chong Reference discloses this element.

(9) The Chong Reference discloses "and the second network controlling unit in the first RAID controlling unit exchanges information with the first network controlling unit in the second RAID controlling unit"

102. This claim element is similar to language in claim 1 that recites: "the first network controlling unit exchanges information with the fourth network controlling unit, and the second network controlling unit exchanges information with the third network controlling unit." Thus, as discussed above in ¶¶ 52-55, the Chong Reference discloses this element.

VIII. CONCLUSION

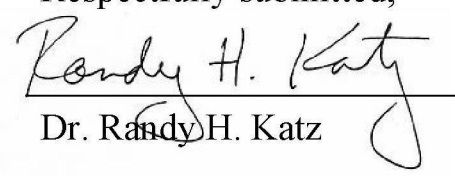
103. For the foregoing reasons, it is my opinion that both Chong US and Chong JP individually disclose each and every limitation of claims 1 through 9 of the '346 patent, and thus anticipate those claims.

104. I hereby declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct, and that all statements

made of my own knowledge are true and that all statements made on information and belief are believed to be true. I understand that willful false statements are punishable by fine or imprisonment or both. *See* 18 U.S.C. § 1001.

Date: June 18, 2014

Respectfully submitted,



Dr. Randy H. Katz