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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte ABOUBACAR DIARE

Appeal 2015-006667
Application 13/421,060
Technology Center 2100

Before JON M. JURGOVAN, NABEEL U. KHAN, and
AMBER L. HAGY, *Administrative Patent Judges*.

KHAN, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant¹ appeals under 35 U.S.C. § 134(a) from the Final Rejection of claims 1–20. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm-in-part.

¹ Appellant identifies Hewlett-Packard Development Company L.P. as the real party in interest. App. Br. 2.

THE INVENTION

Appellant's invention relates to techniques for generating a recommended change to balance a storage system. Abstract.

Exemplary independent claim 1 is reproduced below.

1. A computer-implemented method comprising;

analyzing, using a computing device, a storage system that includes a plurality of logical unit numbers (LUNs) that support asymmetric logical unit access (ALUA) to determine a current state of the storage system, wherein the current state includes LUN distribution information that corresponds to how the plurality of LUNs are distributed amongst a plurality of controllers and system performance information that corresponds to at least one performance metric associated with the plurality of LUNs;

evaluating the current state, using the computing device, to determine whether the current state is unbalanced based on the LUN distribution information and the system performance information; and

in response to determining that the current state is unbalanced, generating, using the computing device, a recommended change to balance the storage system.

REFERENCES and REJECTION

Claims 1–20 stand rejected under 35 U.S.C. § 103(a) as unpatentable over “HP Enterprise Virtual Array Family with VMware Vsphere 4.0, 4.1 and 5.0 Configuration Best Practices” (hereinafter “HP NPL”) and Rider (US 2012/0297307 A1, Nov. 12, 2012). (Final Act. 3–5.)

ANALYSIS

A. Claim 1

The Examiner finds HP NPL teaches or suggests “analyzing, using a computing device, a storage system . . . to determine a current state of the system . . . to determine whether the state is unbalanced,” as recited in claim 1. Final Act. 3 (citing HP NPL Figs. 14, 15, pp. 42–44, 54–57). Specifically, the Examiner finds Figure 14 of HP NPL teaches an unbalanced system and Figure 15 teaches a better balanced system where Vdisks have been moved and re-assigned between the two controllers. *See* Final Act. 3; *see also* HP NPL pp. 42–44.

Appellant argues that Figures 14 and 15 of HP NPL are “merely describing an example of how better balanced throughput could be achieved” and that this is insufficient to teach the limitations of claim 1, specifically “analyzing, using a computing device,” “determine a current state of the storage system,” and “evaluating the current state, using the computing device.” App. Br. 5–6. Appellant argues “there is no disclosure in HP NPL that there is any determination that the current state is unbalanced. Figure 15 is simply an illustration of a ‘better balanced environment.’” App. Br. 6–7. In the Reply Brief, Appellant explains that “HP NPL does not describe a current state of a storage system that is unbalanced but instead describes I/O requests that are unbalanced.” Reply Br. 2 (citing HP NPL, p. 42).

We are unpersuaded of Examiner error. First, we disagree with Appellant that I/O throughput does not describe a current state of a storage system. We note that the claim language explicitly states that “the current state includes” not just how the LUNs are distributed amongst the controllers

but also “system performance information” (App. Br. 14), and Appellant’s Specification describes system performance information as including throughput (Spec. ¶ 13). Further, the concept of “balance” is described broadly in the Specification:

[T]he term “balance” is implementation-specific and depends upon the desired usage and performance characteristics of the storage system. For example, in some storage systems, balance is achieved when a similar number of LUNs are owned by each controller, *while in other storage systems, balance is achieved when a similar workload is being performed by each controller*, regardless of the number of LUNs that are owned by each controller. In some storage systems, a combination of the above two examples (e.g., balancing workload and the number of LUNs evenly across the controllers) may represent a desired balance in the system. These examples of balance are provided for purposes of explanation, but it should be understood that other examples of balance are also within the scope of this disclosure.

Spec. ¶ 11 (emphasis added). Indeed, the Specification specifically provides an example of balancing a storage system that parallels the description cited by the Examiner in HP NPL. The Specification explains that

the system administrator may estimate an expected I/O traffic level for each of the LUNs (e.g., LUNs associated with data-intensive applications may be projected to have higher I/O traffic than LUNs associated with standard applications), and may distribute the LUNs in an effort to balance the workload between the controllers.

Spec. ¶ 10.

Second, we disagree with Appellant that HP NPL does not teach any determination that the current state is unbalanced. To the contrary, HP NPL explains that to achieve balance “EVA host port throughput” must be monitored. HP NPL p. 42, 44; *see also* Ans. 2–3. By monitoring the EVA host port throughput, a determination is made whether an imbalance exists

between the controllers. Thus, we agree with the Examiner that determining that the I/O throughput between controllers is unbalanced, as described in HP NPL, teaches “determin[ing] whether the current state is unbalanced.”

Accordingly, we sustain the Examiner’s rejection of independent claim 1. We also sustain the Examiner’s rejections of claims 3, 7–11, 14, and 15 for which Appellant relies upon the same arguments made for claim 1. *See* App. Br. 7 and 9–11.

B. Claim 2

Appellant argues “[t]here is no disclosure” in the cited portions of HP NPL, and specifically in Figure 15 of HP NPL, “that *the current state differs from a stored balanced configuration, or of redistributing the plurality of LUNs according to the stored balanced configuration, as recited in the claim.” App. Br. 7. Pointing out that the Examiner alleges “Fig. 15 *may be considered* the store balanced configuration,” Appellant argues that this is nothing more than hindsight reconstruction. App. Br. 7 (emphasis added).*

We agree with Appellant. The Examiner finds the “configuration shown in Fig. 15 [of HP NPL] may be considered a stored balanced configuration.” Ans. 3. The Examiner reasons that “this configuration may be a current state at some time, then later the state might change to the unbalanced state such as shown in Fig. 14. The state may then be rebalanced back to the state of Fig. 15, thus according to the (previous) stored balanced configuration.” Ans. 3. We agree with Appellant the Examiner’s conclusion that the system configuration *might* be changed back to that of Figure 15 is based on probability and speculation, and not based on any explicit teaching of HP NPL. The Examiner may not resort to speculation, unfounded assumption, or hindsight reconstruction to supply

deficiencies in the factual basis for the rejection. *See In re Warner*, 379 F.2d 1011, 1017 (CCPA 1967). Moreover, even if it is assumed that the state of the system may change back to a prior state, the Examiner has not provided sufficient evidence to establish that this prior state is stored in the system.

Accordingly, we do not sustain the Examiner's rejection of claim 2. We also do not sustain the Examiner's rejection of claim 13 which was rejected on the same basis. *See Final Act. 4.*

C. Claim 4

Appellant contends

the Examiner alleges 'Fig. 15 may be considered . . . the defined acceptable distribution.' Again, this is nothing more than hindsight interpretation There is no disclosure of redistributing the plurality of LUNs such that the distribution of the plurality of LUNs conforms to a defined acceptable distribution, as recited in the claim.

App. Br. 8.

We are unpersuaded by Appellant's argument. The Examiner finds "since the configuration of Fig. 15 is considered balanced, it may be considered a defined acceptable distribution to the extent recited." Ans. 4. HP NPL teaches that vSphere has "the ability to quickly configure a balanced Vdisk environment" such that "Vdisk access may be well-balanced between the two controllers in a particular configuration." HP NPL at 42. Thus, HP NPL teaches distributing the plurality of LUNs so that better balance may be achieved. We find this sufficient in teaching or suggesting to one of ordinary skill in the art that the LUNs may be redistributed so that they conform to a defined acceptable distribution.

Accordingly, we sustain the Examiner's rejection of claim 4. We also sustain the Examiner's rejection of claim 15, for which Appellant presents the same arguments. *See* App. Br. 10–11.

D. Claim 5

Appellant argues

the Examiner cites to Figure 14 and alleges “determination of the states shown in the figures depends upon access path information of the volumes.” Again, this is nothing more than hindsight interpretation of the illustration shown in Figure 14. There is no disclosure of ***evaluating the current state to determine whether the current state is unbalanced is further based on the LUN access path information***, as recited in the claim.

App. Br. 8.

We agree with Appellant. The Examiner finds “the monitoring of the LUNs such as shown in Figs. 14 and 15 requires using the access path information (to access the LUNs therein).” Ans. 4. Figures 14 and 15 and their associated description make no mention of balancing based on access path information. Further, the Examiner has not provided sufficient evidence that the balancing shown in Figures 14 and 15 “requires using the access path information” nor has the Examiner cited to other portions of the reference to support such a finding.

Accordingly, constrained by the record before us, we do not sustain the Examiner's rejection of claim 5. We also do not sustain the Examiner rejection of claim 6, which depends from claim 5. Finally, we do not sustain the Examiner's rejection of claim 12, which was rejected on the same basis. *See* Final Act. 4.

E. Claim 16

Appellant argues that Figures 14 and 15 of HP NPL, which according to Appellant teach how better balanced throughput could be achieved, do not disclose “querying by a storage manager how the plurality of LUNs are distributed across the plurality of controllers,” as recited in claim 16. App. Br. 11.

We agree with Appellant. HP NPL teaches monitoring the Vdisk environment for Vdisk access and throughput. HP NPL at 42–44. The Examiner finds “any means by which the system monitors/determines the distribution as shown in Figs. 14 and 15 may be considered the querying by a storage manager as recited.” Ans. 4. However, the Examiner has not sufficiently established that HP NPL’s monitoring of the Vdisk environment necessarily occurs by querying the system. In other words, the Examiner has not established that querying the system is the only method by which the Vdisk environment can be monitored. And the Examiner has not provided additional evidence from HP NPL, or otherwise, that monitoring a system by issuing queries would have been obvious to one of ordinary skill in the art.

Accordingly, constrained by the record before us, we do not sustain the Examiner’s rejection of claim 16.

F. Claim 17

Appellant argues Figures 14 and 15 do not teach or suggest “automatically balancing the storage system by switching a PREF bit to align preferred access paths with a managing controller.”

We agree with Appellant. The Examiner finds since no further detail is required of the PREF bit, one must only consider any bit that is switched to align (i.e., change) access

paths. It is required that at least one or more bits must have switched to change the Vdisk locations, and thus the access paths, in the transition from Fig. 14 to 15.

Ans. 4–5. Figures 14 and 15 and their associated description make no mention of a PREF bit, nor of any other bits, used to align a preferred access path with a controller. The Examiner provides insufficient evidence or reasoning why such a bit would be required or that access paths are being aligned with the disclosed controllers.

Accordingly, we do not sustain the Examiner’s rejection of claim 17.

G. Claim 18

Appellant argues Figures 14 and 15 of HP NPL do not teach or suggest “detecting an imbalance in the storage system based on a combination of parameters, and wherein the recommended change is an aggregated recommended change comprising a combination of recommended changes associated with a type of imbalance detected.” App. Br. 12.

We are unpersuaded of Examiner error. The Examiner finds the system of HP detects the virtual disks distribution, and the I/O throughput, these considered a combination of parameters. Additionally, HP can clearly balance and rebalance the system any number of times, in response to Vdisk imbalance and/or I/O throughput, thus disclosing a combination of changes associated with type of imbalance.

Ans. 5. We agree with the Examiner’s findings. As indicated by the Examiner, HP NPL teaches both balancing based on Vdisk distribution and I/O throughput. We find this sufficient to teach or suggest to one of skill in the art detecting an imbalance based on a combination of parameters and recommending changes accounting for this combination of parameters.

Accordingly, we sustain the Examiner's rejection of claim 18.

H. Claim 19

Appellant argues Figures 14 and 15 of HP NPL do not teach or suggest "automatically restoring a previously saved system configuration without user interaction in response to the storage system becoming unbalanced based on a rule defining circumstances when automatic application of the recommended change is permitted," as recited in claim 19. App. Br. 12.

We agree with Appellant. The Examiner finds that Rider teaches background rebalancing. Ans. 5. We note that the Examiner has not cited to any specific portion of Rider in either the Final Rejection or the Answer. Moreover, the Examiner has not sufficiently established that such automatic background rebalancing would restore a previously saved system configuration.

Accordingly, we do not sustain the Examiner's rejection of claim 19.

I. Claim 20

Appellant argues Figures 14 and 15 of HP NPL do not teach or suggest "wherein the system is only considered balanced if both workload and distribution of LUNs are both balanced," as recited in claim 20. App. Br. 12–13.

We are unpersuaded by Appellant's argument. The Examiner finds "the description that the I/O throughput as well as the Vdisks be balanced equates to workload and LUN distribution as recited." Ans. 5. We agree with the Examiner's finding. As explained above, HP NPL teaches balancing at least based on Vdisk access and I/O throughput. HP NPL at

42–44. This is sufficient to teach or suggest to one of ordinary skill in the art that balancing based on both those factors and considering a system balanced only if both those factors were balanced.

Accordingly, we sustain the Examiner’s rejection of claim 20.

CONCLUSION

For the reasons stated above, we sustain the Examiner’s rejections of claims 1, 3, 4, 7–11, 14, 15, 18, and 20. We do not sustain the Examiner’s rejections of claims 2, 5, 6, 12, 13, 16, 17, and 19. We note, however, in an *ex parte* appeal, the Board “is basically a board of review—we review . . . rejections made by patent examiners.” *Ex parte Gambogi*, 62 USPQ2d 1209, 1211 (BPAI 2001). The Board’s primary role is to make our decision based on the findings and conclusions presented by the Examiner. *See* 37 C.F.R. § 41.50(a)(1). We express no opinion as to the obviousness of the pending claims in view of additional explanation and/or evidence. Although the Board has authority to reject claims under 37 C.F.R. § 41.50(b), no inference should be drawn when the Board elects not to do so. *See Manual of Patent Examining Procedure* (MPEP) § 1213.02.

DECISION

The Examiner’s rejections of claims 1, 3, 4, 7–11, 14, 15, 18, and 20 are affirmed.

The Examiner’s rejections of claims 2, 5, 6, 12, 13, 16, 17, and 19 are reversed.

No time period for taking any subsequent action in connection with this appeal may be extended. *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED-IN-PART