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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte PIETER KRISTIAN BROUWER,
KRISTINA KRAEMER BRENNEMAN, MARC JOHN BROOKER,
JERRY LIN, and MARC STEPHEN OLSON

Appeal 2019-003023
Application 14/754,519
Technology Center 2100

Before JOSEPH L. DIXON, MAHSHID D. SAADAT, and
BRIAN D. RANGE, *Administrative Patent Judges*.

DIXON, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant¹ appeals from the Examiner's decision to reject claims 1–21. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

¹ We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42(a) (2018). Appellant identifies the real party in interest as Amazon Technologies, Inc. Appeal Br. 3.

CLAIMED SUBJECT MATTER

The claims are directed to preserving state of a virtual machine during virtual machine instance migration. Claims 1 and 13, reproduced below, are illustrative of the claimed subject matter:

1. A computer-implemented method, comprising:

obtaining a first lease associating a virtual machine instance with a block storage device, the block storage device provided by the block-level storage service, the first lease specifying a first policy of access to the block storage device by the virtual machine instance and having a first status of active;

receiving an indicator of a start of a migration of the virtual machine instance from a source computing device to a target computing device;

obtaining a second lease associating the virtual machine instance in the target computing device with the block storage device, the second lease specifying a second policy of access to the block storage device by the virtual machine instance, the second lease having a second status of standby;

copying a first set of state information associated with the block storage device from the source computing device to the target computing device;

updating the first status based at least in part on an indicator of progress of the migration;

copying a second set of state information associated with the block storage device from the source computing device to the target computing device, the second set of state information being different from the first set of state information; and

updating the second status to active based at least in part on an indicator of progress of the migration.

13. A non-transitory computer-readable storage medium having stored thereon executable instructions that, as a result of execution by one or more processors of a computer system, cause the computer system to at least:

during a first phase of a migration of a virtual machine instance from a first location to a second location, copy a first set of state information associated with a block storage device from the first location to the second location, the block storage device provided to the virtual machine instance;

detect a critical phase of the migration; and

copy a second set of state information associated with the block storage device, the second set of state information being different from the first set of state information.

REFERENCES

The prior art relied upon by the Examiner is:

Hunt et al.	US 2005/0268298 A1	Dec. 1, 2005
Tulyani	US 2006/0069886 A1	Mar. 30, 2006
Kono et al.	US 2010/0049917 A1	Feb. 25, 2010
	(hereinafter “Kono ’917”).	
Nelson et al.	US 7,865,663 B1	Jan.4, 2011
Kondo et al.	US 2011/0040943 A1	Feb. 17, 2011
Kono et al.	US 2011/0082988 A1	Apr. 7, 2011
	(hereinafter “Kono ’988”).	
Shin et al.	US 2011/0173622 A1	July 14, 2011
Agrawal et al.	US 2011/0219372 A1	Sept. 8, 2011
Chen et al.	US 8,429,346 B1	Apr. 23, 2013
Fujii et al.	US 2013/0111221 A1	May 2, 2013
Kurita	US 2014/0082616 A1	Mar. 20, 2014

REJECTIONS

Claims 1, 2, 5–8, 12–14, 17, 19, and 20 stand rejected under 35 U.S.C. § 103 as being unpatentable over Hunt in view of Shin and Kurita.

Claims 3 and 4 stand rejected under 35 U.S.C. § 103 as being unpatentable over Hunt, Shin, and Kurita as applied to claim 2 above, and further in view of Agrawal and Tulyani.

Claim 9 stands rejected under 35 U.S.C. § 103 as being unpatentable over Hunt, Shin, and Kurita as applied to claim 5 above, and further in view of Chen.

Claim 10 stands rejected under 35 U.S.C. § 103 as being unpatentable over Hunt, Shin, and Kurita as applied to claim 5 above, and further in view of Fuji.

Claim 11 stands rejected under 35 U.S.C. § 103 as being unpatentable over Hunt, Shin, and Kurita as applied to claim 5 above, and further in view of Kono '988.

Claims 15 and 16 stand rejected under 35 U.S.C. § 103 as being unpatentable over Hunt, Shin, and Kurita as applied to claim 13 above, and further in view of Kondo.

Claim 18 stands rejected under 35 U.S.C. § 103 as being unpatentable over Hunt, Shin, and Kurita as applied to claim 17 above, and further in view of Kono '917.

Claim 21 stands rejected under 35 U.S.C. § 103 as being unpatentable over Hunt, Shin, and Kurita as applied to claim 1 above, and further in view of Nelson.

OPINION

35 U.S.C. § 103

With respect to independent claims 1, 5, and 13, Appellant argues the independent claims together. Appeal Br. 9. Based on Appellant’s arguments and our discretion under 37 C.F.R. § 41.37(c)(1)(iv), we select independent claim 13 as the representative claim for the group and will address Appellant’s arguments presented in both the Appeal Brief and Reply Brief. *See* 37 C.F.R. § 41.37(c)(1)(iv). Appellant does not set forth separate arguments for patentability for dependent claims 2–4, 7–12, and 16–21 and they will stand or fall with representative claim 13. Appeal Br. 13. *See* 37 C.F.R. § 41.37(c)(1)(iv). Arguments not made are waived. *See* 37 C.F.R. § 41.37(c)(1)(iv).

Appellant argues that the combination of Hunt, Shin, and Kurita fails to teach or suggest “state information associated with a block storage device.” Appeal Br. 9. We disagree with Appellant and note the combination of prior references teach and fairly suggest the migration of a virtual machine from a source location to destination location and the corresponding updating of state, task, and processing for the virtual machine and its associated block storage memory.

Additionally, we note that Appellant has not identified how the limitation “provided by a block-level storage service” further limits the claimed “method” and “system” recited in the independent claims 1 and 5.²

² Alternatively, we could have selected independent claim 1 as the representative claim because Appellant has not set forth separate arguments for patentability of the independent claims, but independent claim 13 does not include the limitation “provided by the block level storage service” and is the broadest claim in the group.

If Appellant contends that the differentiating characteristic of the claimed invention is the block memory used by the virtual machine is provided by an off-site/remote/cloud-based block memory service which must be accessed by a service contract with credentials rather than a localized physical memory, then Appellant should more clearly distinguish this aspect of the claimed “method” and “system” and how “the block level storage service” differentiates the method steps of the prior art virtual machine migration.³

As we noted above, representative independent claim 13 does not recite “the block level storage service,” and Appellant’s arguments thereto are not commensurate in scope with the claim language and are therefore unpersuasive.

Arguments must be commensurate in scope with the actual claim language. *In re Self*, 671 F.2d 1344, 1348 (CCPA 1982); see *In re Hiniker Co.*, 150 F.3d 1362, 1369 (Fed. Cir. 1998) (“[The] proffered facts . . . are not commensurate with the claim scope and are therefore unpersuasive.”).

“The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference” *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). Instead, the relevant issue is “what the combined teachings of the references would have suggested to those of ordinary skill in the art.” *Id.* “Combining the *teachings* of references does not involve an ability to combine their specific

³ Additionally, we note that the similar tracking of credentials and licenses would be required for all software packages on the virtual machine during any migration because there would be two copies of each of the software package until the migration is completed and the copies at the source location virtual machine are removed, deactivated, or unauthorized.

structures.” *In re Nievelt*, 482 F.2d 965, 968 (CCPA 1973); *see also In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012) (“It is well-established that a determination of obviousness based on teachings from multiple references does not require an actual, physical substitution of elements.”).

Appellant argues that the Office fails to properly apply the broadest reasonable interpretation of the claim term “state information.” Appeal Br. 11. Appellant further contends that the Office has provided different meanings to the same claim term within the obviousness rejection. Appeal Br. 11. Appellant also argues that the Office fails to properly apply the broadest reasonable interpretation to the term “state information” and that the teachings of the prior art references cannot be properly combined. Appeal Br. 12–13. Specifically, Appellant contends that combining Kurita and Shin references in the manner proposed by the Office undermines the intended purpose of *Shin* and requires changing a principle of operation of *Shin*. Appeal Br. 12–13.

We disagree with Appellant and note that the Examiner has identified how the specific teachings of the three prior art references teach and suggest the use of some “state information” with respect to each of the specific fields of endeavors addressed by each of the three separate prior art references. Ans. 3–6. We further find Appellant is addressing the individual teachings as a bodily incorporation of each of the prior art references with regards to the combination rather than what the prior art references would have taught or suggested to one of ordinary skill in the art at the time of the invention regarding computer migration and storage of “state information” which may vary from specific machine to specific machine.

We also note that Appellant has not identified any specific definition of the claimed “state information” in the Specification. The Summary of the Claimed Subject Matter merely identifies paragraphs 31 and 61 of the Specification which sets forth an exemplary embodiment as an indicator of the progress of the migration.⁴ *See generally* Appeal Br. 3–7.

⁴ The Specification discloses:

The block-level storage device may update the status of the first lease 810 based at least in part on a migration progress indicator (also referred to herein as an “indicator of progress of the migration”). When the migration reaches a critical state and the state information of the source is not rapidly changing (e.g., when the source and/or the target are pauses), the block-level storage service may copy 812 a final set of state information from the source location to the target location so that when the virtual machine instance in the target location is resumed, a consistent state of the block storage device is maintained. When the migration completes (i.e., when the critical phase completes), the block-level storage service may finally update the status of the second lease 814 based at least in part on a migration progress indicator so that, for example, the second lease becomes the active lease.

Spec. ¶ 61. The Specification also discloses:

The state information of the block storage device *may include* state information including, *but not limited to*, the location of the block storage device, which block-level storage service may be hosting the block storage device, and the existence of one or more leases associated with the block storage device. Such state information *may* be stored with a virtual machine instance, *may* be stored at a source or target location, or *may* be stored in a separate location. The state information of the block storage device *may also include* customer facing state information such as, for example, customer facing performance metrics including, but not limited to, input-output operations per second (“IOPS”), bandwidth, bytes read, bytes written, read operations per second,

The Examiner finds that the DRAM and associated state information for the source and destination processing nodes in Shin are “well-known to be equivalent to the source and target computing devices.” Ans. 3–4. The Examiner further finds that based upon the broadest reasonable interpretation of the claimed “state information,” Shin discloses that state information associated with tasks is stored and migrated using the DRAM and Shin does make obvious the limitation which recites, “copy a first set of state information associated with a block storage device from the first location to the second location” because the broadest reasonable interpretation of the claim language merely requires that the “state information” be in some manner “associated with the block storage device.”

write operations per second, and/or time spent idle. Additionally, the state information of the block storage device *may include* internal performance metrics (i.e., metrics not provided to a user or customer) such as, *for example*, a device health measurement, periods of device error, *and/or any of the previously described metrics*. Other state information of the block storage device *may include* information related to security processes (e.g., cryptographic keys), policies, permissions, performance throttling parameters (e.g., a throttling percentage that specifies a percentage of available bandwidth that may be provided to the virtual machine instance to access the block storage device), *or other such state information*. As may be contemplated, the types of state information of the block storage device described herein *are illustrative examples* and, as such, other types of state information of the block storage device may be considered as within the scope of the present disclosure.

Spec. ¶ 31 (emphases added). If Appellant desires to more clearly recite limitations to a two-stage migration process where the status of the migration and the associated access state is modified, then the claim should be modified to further emphasize this feature.

Ans. 4. Furthermore, the Examiner finds that “the broadest reasonable . . . does not necessitate that the ‘state information’ be a state of the ‘block storage device’ itself, but rather only that the ‘state information’ be in some manner ‘associated with the block storage device.’” Ans. 4. We agree with the Examiner that the broadest reasonable interpretation merely requires information “associated with the block storage device.”

The Examiner further clarifies what each of the prior art references was specifically relied upon in the grounds of the rejection. Ans. 5. Kurita was cited to provide an explicit teaching showing that it would have been obvious to transfer first and second sets of different state information, pertaining to a block storage device, from a migration source to a migration destination, and Shin was cited to provide a teaching showing that it would have been obvious to copy a first set of state information associated with a block storage device from a source to a target computing device. Ans. 5. The Examiner clarifies that the “state information” disclosed in Kurita was not to be interpreted as being used in conjunction with the DRAM disclosed in Shin, but rather Kurita was cited for purposes of providing an explicit teaching showing that it would have been obvious to transfer first and second sets of different state information, pertaining to a block storage device, from a migration source to a migration destination. Ans. 5–6. The Examiner further clarifies that Shin was cited for purposes of demonstrating that the general process of transferring state information from a migration source to a migration destination was well-known. Ans. 5–6. The Examiner further explains that paragraph 62 of the Shin reference teaches configuration data and task state information, may also be migrated for purposes of configuring the task migration destination to properly execute

the migrated task. Ans. 7. The Examiner further states the motivation for including the additional state information disclosed in Kurita would be for the purpose of assisting in the management of the task migration process in Shin and help to ensure that the migration destination node performs as expected. Ans. 7.

In the Reply Brief, Appellant contends that the Examiner has not rebutted Appellant's arguments in the Appeal Brief, and the Examiner's statements with respect to the Shin reference DRAM are improper because the Examiner has not relied upon "official notice." Reply Br. 3-4. Appellant further contends that the Office has not pointed to any disclosure of Shin to support that using "DRAM" to execute a "task" imparts the "state" of that task (disclosed to possible states of "active," "inactive," "sleeping," and "running") to the DRAM itself. Reply Br. 4. Appellant argues that the Examiner's Answer fails to properly apply a broadest reasonable interpretation to the claim term "state information." Reply Br. 4. Appellant also contends that the "different sets of state information" in Kurita are not the types of state information that could actually "be[] used in conjunction with the DRAM disclosed in Shin," then Kurita not only cannot be said to teach the claim features for which it was cited, but there is also no motivation to combine Kurita with Hunt in view of Shin as proposed. Reply Br. 5. Appellant submits that the Office has failed to show that Appellant's claimed "state information" can be reasonably interpreted to be simultaneously a state of a "block storage device" (e.g., "task") of *Shin* and "CPU Speed and/or Virtual NIC Speed" and "measured bandwidth" of a "block storage device" of Kurita. *Id.* Appellant further argues that the Examiner fails to properly apply a broadest reasonable interpretation to the

claim term “block storage device” as found in independent claims 1 and 5.
Reply Br. 5–6.

Appellant provides a citation to WebopediaTM in 2015 regarding a comparison of “block-level storage v. file level storage,” but Appellant does not provide a definition of the term “block-level storage service” so as to further limit the method and system of independent claims 1 and 5. Moreover, we note that representative independent claim 13 does not contain the term “block level storage” and the claimed invention does not refer to any “storage area network.”⁵ See Reply Br. 6. Appellant also argues that the Examiner’s Answer improperly relies on facts not in the record regarding the statement that “**DRAM** is well-known to store data in block units,” but Appellant’s claims recite that “the block storage device [is] provided by [a] block-level storage service.” Reply Br. 6–7.

We find that Appellant has not identified how the proffered evidence regarding “block storage device” and “block-level storage service” further limits the claimed method, or system, of independent claims 1 and 5, but not present in the non-transitory computer readable storage medium (representative claim 13). Reply Br. 6–7. Consequently, Appellant’s argument is unpersuasive of error and is not commensurate in scope with representative claim 13. Additionally, we note that Appellant did not

⁵ Furthermore, if the claims did refer to a storage area network, we find that it would have been readily apparent to those skilled in the art to apply the same basic idea of a two-stage migration of a virtual machine with an initial communication of state information at the beginning of the migration and a final communication of state information at the conclusion of a migration. Moreover, if cloud-based memory were to be involved then some access and coordination of the cloud-based memory would have been required in addition to the virtual machine migration.

previously argue the location for type of block storage device in the Appeal Brief and has not provided a showing of good cause why the arguments could not have been made in the Appeal Brief. Therefore, the argument thereto is waived. *See* 37 C.F.R. § 41.37(c)(1)(iv).

We note that the Reply Brief may respond to new arguments by the Examiner, but should not “substitute” for the principal brief. In the absence of a showing of good cause by Appellant, arguments that could have been made in the Appeal Brief and are not responsive to any new evidence or finding set forth by the Examiner in the Answer are deemed untimely and are waived. 37 C.F.R. § 41.41(b)(2) (2017); *see also Ex parte Nakashima*, 93 USPQ2d 1834, 1837 (BPAI 2010) (explaining that arguments and evidence not presented timely in the principal brief will not be considered when filed in a reply brief, absent a showing of good cause explaining why the argument could not have been presented in the principal brief); *Ex parte Borden*, 93 USPQ2d 1473, 1474 (BPAI 2010) (informative) (“[T]he reply brief [is not] an opportunity to make arguments that could have been made in the principal brief on appeal to rebut the Examiner’s rejections, but were not.”).

Finally, Appellant argues that the prior art references cannot be properly combined and that the Examiner’s identification of paragraph 62 of the Shin reference improperly introduces a New Ground of Rejection. Reply Br. 7–8.

We disagree with Appellant and find the Examiner has provided an appropriate discussion of the teachings of the prior art references and a reasoned motivation for the combination. We find the Examiner’s discussion of “state information” is addressed with regards to each of the

specific fields of endeavor of each of the Shin and Kurita references, and the Examiner has not applied different interpretations of “state information,” but has explained “state information” with regards to the specific fields of endeavor of each of the prior references. Consequently, the Examiner has not provided an improper broadest reasonable interpretation of the claim language. *See generally* Ans. 4–5. Moreover, we find Appellant is arguing a bodily incorporation of the specific teachings and suggestions of each of the prior references with regards to the “state information.”

We also find Appellant’s argument regarding a New Ground of Rejection to be unavailing because Appellant did not file a petition the Technology Center Director. Consequently, we review the rejection as set forth by the Examiner and the reliance upon paragraph 62 of the Shin reference. The Examiner has cited to various additional paragraphs including paragraphs 34, 37, and 66 discussing Figure 1 and Figure 4 (discussing multiple reconfigurable processors (RP) systems) where paragraph 62 discusses one of the various disclosed RP systems with a scratch pad memory of Figure 3. We find Appellant’s argument does not evidence a change in the Examiner’s thrust of the rejection and merely discloses an additional embellishment of the Examiner’s line of reasoning, and Appellant has had a fair opportunity to respond to the new citation in the Reply Brief.

As a result, Appellant has not shown error in the Examiner’s factual findings or conclusion of obviousness of representative claim 13 and independent claims 1 and 5, and dependent claims 2–4, 7–12, and 16–21 not separately argued. Appeal Br. 13.

CONCLUSION

The Examiner's obviousness rejections are affirmed.

DECISION SUMMARY

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1, 2, 5-8, 12-14, 17, 19, 20	103	Hunt, Shin, Kurita	1, 2, 5-8, 12-14, 17, 19, 20	
3, 4	103	Hunt, Shin, Kurita, Agrawal, Tulyani	3, 4	
9	103	Hunt, Shin, Kurita, Chen	9	
10	103	Hunt, Shin, Kurita, Fiji	10	
11	103	Hunt, Shin, Kurita, Kono '988	11	
15, 16	103	Hunt, Shin, Kurita, Kondo	15, 16	
18	103	Hunt, Shin, Kurita, Kono '917	18	
21	103	Hunt, Shin, Kurita, Nelson	21	
Overall Outcome			1-21	

TIME PERIOD FOR RESPONSE

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

Appeal 2019-003023
Application 14/754,519

AFFIRMED