Trials@uspto.gov
Tel: 571-272-7822

Paper 54
Entered: July 29, 2014

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VEEAM SOFTWARE CORPORATION
Petitioner

v.

SYMANTEC CORPORATION
Patent Owner

Case IPR2013-00150
Patent 7,093,086 B1

Before FRANCISCO C. PRATS, THOMAS L. GIANNETTI, and TRENTON A. WARD, Administrative Patent Judges.

WARD, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a); 37 C.F.R. § 42.73

I. INTRODUCTION

A. Background

Veeam Software Corporation ("Petitioner") filed a petition for *inter partes* review of claims 1, 11, 12, and 22 of U.S. Patent 7,093,086 B1 ("the '086 patent"). Paper 2 ("Pet."). Symantec Corporation ("Patent Owner") filed a Preliminary Response. Paper 9 ("Prelim. Resp."). Pursuant to 35 U.S.C. § 314, we instituted *inter partes* review, on August 7, 2013, as to claims 1, 11, 12, and 22 of the '086 patent. Paper 10 ("Dec.).

After institution of trial, Patent Owner filed a Response (Paper 28, "PO Resp.") and Petitioner filed a Reply (Paper 33, "Pet. Reply"). Patent Owner also filed a Motion to Amend Claims (Paper 27, "Mot. to Amend"), which Petitioner opposed (Paper 32, "Opp.") and Patent Owner filed a Reply (Paper 43, "Reply to Mot. to Amend"). Oral hearing was held on May 5, 2014. The hearing transcript has been entered in the record as Paper 53 ("Tr.").

The Board has jurisdiction under 35 U.S.C. § 6(c). This final written decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons discussed below, we determine that Petitioner has shown by a preponderance of the evidence that claims 1, 11, 12, and 22 of the '086 patent are unpatentable. Furthermore, for reasons discussed below, Patent Owner's motion to amend original claims 1, 11, 12, and 22 with proposed substitute claims 31-34 is denied.

B. Related Proceedings

In addition to this petition, we instituted *inter partes* review on August 7, 2013 based on Petitioner's challenges to the patentability of certain claims of

Patent Owner's U.S. Patents 6,931,558 (IPR2013-00141, IPR2013-00142) and 7,191,299 (IPR2013-00143). Our final decisions in those proceedings are being entered concurrently with this decision.

C. The '086 Patent

The '086 patent is titled "Disaster Recovery and Backup Using Virtual Machines" and generally relates to computer systems and methods for backing up virtual machines. Ex. 1001, col. 2, ll. 3-4. The patent describes a computer system that executes one or more virtual machines, having multiple applications. To create a backup, the computer system may capture a state of each virtual machine and backup the state. *Id.* at col. 2, ll. 53-56. The state may include the information in a virtual image created in response to a suspension of the virtual machine. *Id.* at col. 2, ll. 60-62. Figure 1 of the '086 patent is reproduced below:

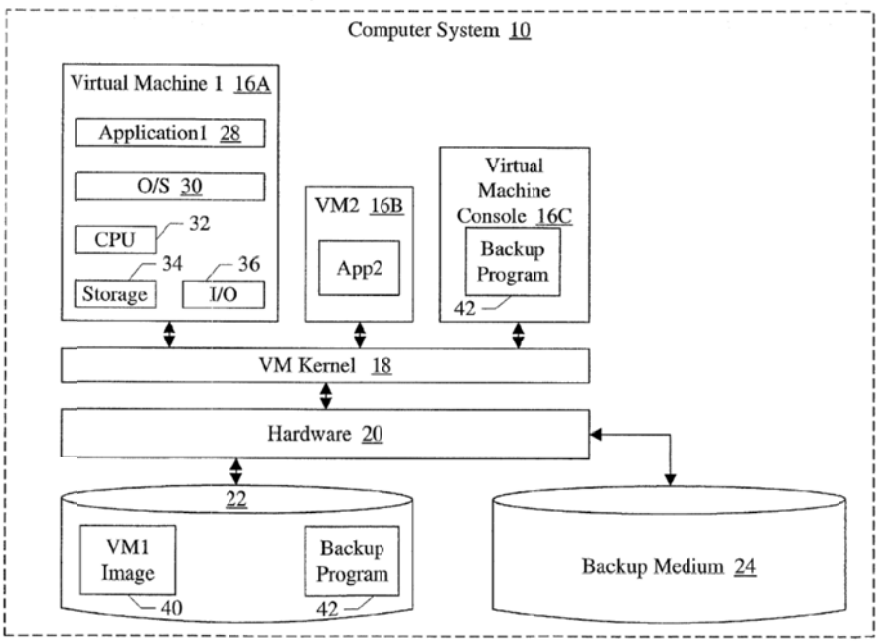


Fig. 1

'086 patent, Figure 1

As illustrated above in Figure 1, the ’086 patent discloses that multiple virtual machines, 16A-C, can be controlled by Virtual Machine (“VM”) Kernel 18, all of which may comprise software and/or data structures executed on the underlying hardware 20 of computer system 10. Ex. 1001, col. 3, ll. 30-37. Figure 1 further illustrates that computer system 10 can include storage device 22 and backup medium 24. Ex. 1001, col. 3, ll. 40-42. Claim 1 illustrates the claimed subject matter and is reproduced below:

> 1. A computer readable medium storing a plurality of instructions comprising instructions which, when executed:
> (i) capture a state of a first virtual machine executing on a first computer system, the state of the first virtual machine corresponding to a point in time in the execution of the first virtual machine, wherein the first virtual machine comprises at least one virtual disk storing at least one file used by at least one application executing in the first virtual machine, and wherein the state of the first virtual machine comprises the at least one file; and
> (ii) copy at least a portion of the state to a destination separate from a storage device to which the first virtual machine is suspendable, wherein suspending the first virtual machine is performed responsive to a suspend command.

D. Claim Construction

Consistent with the statute and the legislative history of the AIA,[1] the Board will interpret claims of an unexpired patent using the broadest reasonable construction in light of the specification of the patent. *See* Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,766 (Aug. 14, 2012); 37 C.F.R. § 42.100(b). Under the broadest reasonable construction standard, claim terms are given their ordinary and customary meaning as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech. Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

1. "state of a virtual machine"

Claims 1 and 12 require capturing the "state of a first virtual machine." In the Decision to Institute, we adopted the prior construction of the District Court for the Northern District of California as the broadest reasonable construction, which construed "'a state of [first] virtual machine' as 'information regarding the [first] virtual machine to permit the virtual machine to resume execution of the application at the point in time the state was captured." Dec. 5-6 (citing *Symantec Corp. v. Veeam Software Corp.*, Case No. 12-cv-00700-SI, Mar. 8, 2013 Claim Construction Order, 9 (Ex. 2005) ("Claim Construction Order") (brackets in original)).

Patent Owner argues that this construction is unreasonably narrow and inconsistent with the specification because the Board's construction does not require capturing all of the state information needed to resume execution of the

[1] Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("AIA").

virtual machine. PO Resp. 17. Patent Owner proposes the "a state of [a] virtual machine" be construed to mean "information regarding [the] virtual machine to resume execution of [the] virtual machine on any computer at the point in time the state was captured." *Id*. at 18 (brackets in original). Petitioner counters that Patent Owner's construction is overly narrow because the claims are not limited to backup and do not require that all of the state information be copied to a destination, but rather claims 1 and 12 expressly recite that "at least a portion of the captured state is copied." Pet. Reply. 5 (quoting claims 1 and 12). We agree and are not persuaded by Patent Owner to modify the construction set forth in the Decision to Institute. *See* Dec. 6. Accordingly, in light of the specification and in the context of the claims, we construe "a state of [first] virtual machine" as "information regarding the [first] virtual machine to permit the virtual machine to resume execution of the application at the point in time the state was captured."

2. "backup program"

Patent Owner contends that claims 1 and 12 require a backup "program" that "performs the two recited steps in order to backup a virtual machine". PO Resp. 20. Petitioner argues that the explicit language of claims 1 and 12 neither recites nor requires a backup program. Pet. Reply 2-3. Petitioner also points out claims 2 and 13 narrow independent claims 1 and 12 by adding the limitation that "the destination is a *backup medium* coupled to the first computer system and used to *backup data* from the first computer system." Pet. Reply 3 (emphasis added). We are not persuaded by Patent Owner's arguments, as claims 1 and 12 do not include the term "backup." Therefore, we do not import the limitation of a "backup program," as urged by Patent Owner, from the specification into the claims.

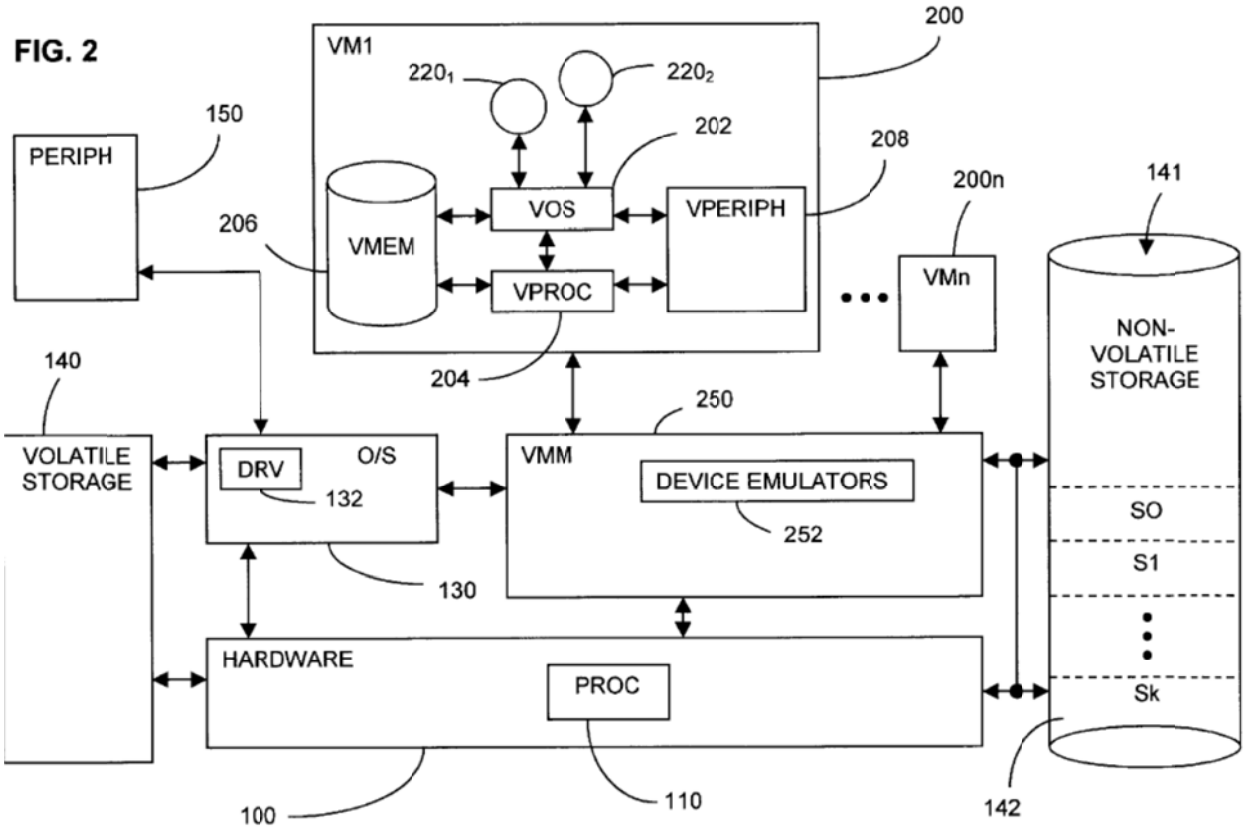
II. ANALYSIS

A. Anticipation by Lim

Petitioner contends that the challenged claims of the ’086 patent are anticipated by Lim. Pet. 7-15. “A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros., Inc. v. Union Oil Co. of Cal.*, 814 F.2d 628, 631 (Fed. Cir. 1987).

1. Overview of Lim

Lim is titled “mechanism for restoring, porting, replicating, and checkpointing computer systems using state extraction” and discloses a virtual machine monitor on which multiple virtual computer systems are installed whose states can be checkpointed under control of the virtual machine monitor. Ex. 1004, Abstract. The checkpointed virtual machine may be restored into the system at a later time. *Id.* Figure 2 of Lim is reproduced below:



Lim, Figure 2

As shown above in Figure 2, Lim discloses virtual machine ("VM1") 200, including virtual operation system ("VOS") 202, virtual processor ("VPROC") 204, a virtual disk that is virtual memory ("VMEM") 206, and virtual peripheral devices 208, "all of which are implemented in software to emulate the corresponding components of an actual computer." Ex. 1004, col. 14, ll. 27-32. Additionally, as shown in Figure 2, Lim discloses virtual machine monitor 250 in between the virtual machines 200 to 200n and the system hardware. Ex. 1004, col. 15, ll. 26-31. To enable computer system restoration, Lim discloses capturing

the "total machine state" of a computer system, which is "the entire collection of all information that is necessary and sufficient to uniquely determine the status of all hardware and software components at the completion of any given processor instruction." Ex. 1004, col. 10, ll. 26-30. Therefore, if the processor's execution is interrupted,

> The total machine state is then the set of data that, when loaded at any time into the appropriate memory positions (both internal and external to the processor), will cause the processor, and all connected hardware and software components, to continue executing in exactly the same way as if there had been no interruption at all.

Ex. 1004, col. 10, ll. 32-38.

2. Analysis

a. Claims 1 and 12

Petitioner asserts that claims 1 and 12 of the '086 patent are unpatentable under 35 U.S.C. § 102(e) as anticipated by Lim. Pet. 7-15. Patent Owner argues against Petitioner's challenge based on Lim on multiple grounds.

First, Patent Owner argues that Lim fails to anticipate claims 1 and 12 because Lim fails to disclose a separate backup program that performs the capture and copy steps in claims 1 and 12. PO Resp. 25. In particular, Patent Owner argues that Petitioner's expert never refers to Lim as a backup system. PO Resp. 25 (citing Ex. 1002, Declaration of Prashant Shenoy ("Shenoy Decl.") ¶¶ 13-14). Patent Owner's arguments are unavailing, as they are not commensurate with the scope of the claims. Specifically, they are premised on an overly narrow construction of claims 1 and 12, namely, that they require a "backup program." As discussed above, we decline to adopt Patent Owner's narrow construction because

it would import limitations from the specification into the claims, improperly limiting the claims to a preferred embodiment.

Second, Patent Owner argues that Lim does not anticipate claims 1 and 12 because Lim fails to disclose capturing "a state of [a] virtual machine." PO Resp. 29. In particular, Patent Owner contends that Lim does not capture or transmit any configuration information because it is not concerned with capturing sufficient state information for the virtual machine to resume execution of the virtual machine on any computer. *Id*. In its Reply, Petitioner counters that Lim discloses capturing "the state of a virtual machine," which Lim identifies as "the entire collection of all information that is necessary and sufficient to uniquely determine the status of all hardware and software component at the completion of any given processor instruction." Pet. Reply 9 (citing Ex. 1004, col. 10, ll. 27-30). Furthermore, Petitioner argues Patent Owner's expert, Dr. Matthew Green, agreed that Lim describes capturing "the type of hardware" as part of its state and Dr. Green agreed that this hardware information is included in the configuration information of the virtual machine. *Id.* at 9-10 (citing Ex. 1026, 284:4-7, 258:20-25). In view of the cited disclosures from Lim and the testimony, we are not persuaded by Patent Owner that Lim fails to disclose capturing a state of a virtual machine.

Additionally, Patent Owner argues that Lim fails to anticipate claims 1 and 12 because it does not allow the virtual machine to continue executing when its alleged state is captured. PO Resp. 33. Specifically, Patent Owner argues that the capturing step, step (i) of claims 1 and 12, requires that the virtual machine continue executing while its state is captured, i.e., without suspending the virtual machine. *Id*. Petitioner counters this argument by stating that claims 10 and 21,

dependent from claims 1 and 12 respectively, recite "wherein [step] (i) comprises *suspending the first virtual machine*." Pet. Reply. 6 (quoting claims 1 and 12). Thus, Petitioner argues that the independent claims 1 and 12 must be interpreted broadly to encompass embodiments where the virtual machine is suspended during capture. *Id*. We are persuaded by Petitioner's argument that in view of the limitations in dependent claim 10 and 22, claims 1 and 12 must be interpreted to include, at least, suspending the virtual machine during capture. Thus, we are not persuaded by Patent Owner's argument that claims 1 and 12 require capturing while the virtual machine is executing.

For the foregoing reasons, we conclude that Petitioner has demonstrated by a preponderance of the evidence that claims 1 and 12 are anticipated by Lim.

b. Claims 11 and 22

Patent Owner argues that Lim fails to anticipate dependent claims 11 and 22 because Lim discloses conventional Copy-On-Write ("COW") files and memories, and "not the 'new log of uncommitted updates' or the new 'memory area' which are specifically created during the capture step (i) according to the claims." PO Resp. 40. More particularly, Patent Owner argues that claims 11 and 22 require the "new log of uncommitted updates" and the new "memory area" to be created as the virtual machine *continues execution* during the capture step (i). *Id*.

Petitioner responds that Lim explicitly discloses creating a "new log of uncommitted updates" and a "memory area" in describing the use of copy-on-write techniques to capture the contents of memory and disk. Pet. Reply 11 (citing Ex. 1030 ¶¶ 19-22). Specifically, Dr. Shenoy states that Lim discloses creating a log of uncommitted updates for keeping track of changes and that the log of changes can

be stored in a memory area. Ex. 1030 ¶¶ 19-22 (citing Ex. 1004, col. 11, l. 67 – col. 12, l. 3; col. 19, ll. 51-55; col. 23, ll. 52-55). In fact, Lim discloses "to keep a log of changes" and that "complete state vector" can be stored in "a dedicated memory partition." Ex. 1004, col. 11, l. 67 – col. 12, l. 3; col. 19, ll. 51-55. Therefore, we agree with Petitioner that Lim discloses creating "a new log of uncommitted updates" and "a memory area."

Patent Owner additionally argues that Lim fails to disclose a virtual machine that is capable of continuing to execute during both the capture and copy steps. PO Resp. at 41. We are not persuaded by Patent Owner's arguments as they not commensurate with the scope of the claims. Contrary to Patent Owner's arguments, claims 11 and 22 recite "creating a memory area to capture writes to a memory of the first virtual machine, such that the first virtual machine can *continue executing during (ii)*." Claims 11 and 22 (emphasis added). Therefore, the limitation regarding continued execution is directed to the copy step (ii), not the capture step (i). Accordingly, claims 11 and 22 do not require that the virtual machine is capable of continuing to execute during both the capture and copy steps.

For the foregoing reasons, we conclude that Petitioner has demonstrated by a preponderance of the evidence that claims 11 and 22 are anticipated by Lim.

B. Anticipation by VMware ESX of claims 1, 11, 12, and 22

Overview of VMware ESX VMware ESX provides a user's manual for installing and configuring the VMware ESX Server, including how to create and provision virtual machines and how to manage virtual machines. Ex. 1005, 18. VMware ESX discloses that a virtual machine can be suspended at any desired point in its operation and then later resumed at that same state. Ex. 1005, 97. In

order to capture the state of a virtual machine, VMware ESX discloses storing information in two files: (1) an .std file, which "contains the entire state of the virtual machine," and (2) a redo-log file (.redo file) used to save changes while the virtual machine is operation. Ex. 1005, 58, 97-98, 149. Furthermore, VMware ESX describes that the .std file and the .redo file can be stored locally or remotely. *See* Ex. 1005, 97, 106.

VMware ESX discloses the creation of a redo log (.redo file), which "contains the incremental changes to the disk image." Ex. 1005, 106. Furthermore, VMware ESX discloses that the ESX server captures changes during a working session in redo log and "continually adds changes to the redo log until you remove the redo-log file or commit the changes using the commit command." Ex. 1005, 39.

1. Analysis

a. Claims 1 and 12

Petitioner asserts that claims 1 and 12 of the '086 patent are unpatentable under 35 U.S.C. § 102(a) as anticipated by VMware ESX. Pet. 15-22. Patent Owner argues against Petitioner's challenge based on VMware ESX on multiple grounds.

First, Patent Owner counters that VMware ESX does not disclose a separate backup program that captures and copies state. PO Resp. 23. As discussed above, Patent Owner's arguments regarding a "backup program" are unavailing because we decline to adopt Patent Owner's narrow construction that claims 1 and 12 require a backup program.

Second, Patent Owner argues that the '086 patent discloses backing up machines automatically and periodically, while VMware ESX requires the user to

perform commands manually each time the user intends to capture the state of the virtual machine. We are not persuaded by this argument because Patent Owner fails to direct us to any limitations in claims 1 and 12 that prohibit user interaction. Furthermore, as Petitioner notes, Patent Owner's argument is contradicted by an embodiment in the '086 patent that explains that "[v]arious operations have been assigned to the backup program… in other embodiments, various ones of these operations *may be performed manually by a user*." Pet. Reply 8 (quoting Ex. 1001, col. 14, ll. 7-11) (emphasis added).

Third, Patent Owner further argues that that VMware ESX does not disclose capturing "the state of a virtual machine" because VMware ESX does not save configuration information and the VMware ESX redo log only saves changes to the virtual disk. PO Resp. 26-27. Patent Owner also argues that the information recorded in VMware ESX would not be sufficient to resume execution of the virtual machine. *Id.* at 27 (citing Ex. 2016, Declaration of Matthew Green ("Green Decl.") ¶¶ 73-76). Petitioner counters that Patent Owner's argument is premised on an impermissibly narrow construction that the "state of a virtual machine" must include virtual machine configuration information. Pet. Reply 9. We agree with Petitioner because, as discussed above, we do not construe the "state of a virtual machine" to require configuration information. Petitioner additionally asserts that Patent Owner's argument that the redo logs do not "permit the virtual machine to resume execution of the application" is incorrect because redo logs can contain such information. *Id.* at 10 (citing Ex. 1030 ¶ 26). Dr. Shenoy states that VMware ESX discloses that that the redo log includes any modification to the virtual disk made during the execution of the virtual machine. Ex. 1030 ¶ 26 (citing Ex. 1005, 39, 94 (describing the various modes of virtual disk operation, including persistent,

nonpersistent, undoable, and append)). In view of the cited disclosures and supporting testimony, we agree with Petitioner that VMware ESX discloses the claimed step of capturing the "state of a virtual machine."

Fourth, Patent Owner repeats its argument that claims 1 and 12 require that the state is captured while the virtual machine is executing and active. PO Resp. 31. As discussed above, we do not interpret claims 1 and 12 to require continued execution during capturing. Thus, we are not persuaded by Patent Owner's argument that VMware ESX fails to disclose this limitation.

For the foregoing reasons, we conclude that Petitioner has demonstrated by a preponderance of the evidence that claims 1 and 12 are anticipated by VMware ESX.

b. Claims 11 and 22

Patent Owner argues that Petitioner's challenge of anticipation of claims 11 and 22 by VMware ESX fails because VMware ESX does not disclose a "new log of uncommitted updates," as recited in the claims. PO Resp. 34. In particular, Patent Owner argues that because VMware ESX requires the virtual machine be suspended in order to capture its alleged state, it does not need to create a new log since there are no updates being made to the disk. *Id.* at 35.

Patent Owner further argues that the '086 patent discloses one log for storing uncommitted disk updates for non-persistent disks and a "different 'new log'" to capture disk so that backup can be performed without actually suspending the virtual machines. *Id*. 34-35 (citing Ex. 1001, col. 7, l. 60 – col. 8, l. 3; col. 11, ll. 31-44). Patent Owner fails to identify, however, the limitations in claims 11 and 22 that require two different logs. Furthermore, Patent Owner does not dispute that

the redo log disclosed in VMware ESX provides a log of uncommitted updates. *See* PO Resp. 34. As Petitioner points out, claims 11 and 22 only require one log of uncommitted updates. Pet. Reply 12-13; *see also* claims 11 and 22 ("creating a new log of uncommitted updates for each virtual disk."). Accordingly, we are not persuaded by Patent Owner's arguments that VMware ESX does not disclose a "new log of uncommitted updates," as recited in claims 11 and 22.

For the foregoing reasons, we conclude that Petitioner has demonstrated by a preponderance of the evidence that claims 11 and 22 are anticipated by VMware ESX.

C. Anticipation by VMware GSG of claims 1, 11, 12, and 22

1. Overview of VMware GSG

Like VMware ESX, VMware GSG provides a user guide related to the VMware software for implementing virtual machines. Ex. 1006, 1-1. VMware GSG is titled "Getting Started Guide – Vmware 2.0 for Linux" and describes how to install, configure, and manage VMware 2.0 on computer systems executing the Linux operating system. Ex. 1006, 1-1. Similar to VMware ESX described above, VMware GSG discloses the ability to suspend and store virtual machines. Ex. 1006, 2-5 ("Using Suspend and Instant Restore . . . [y]ou can save the current state of your virtual machine."). Specifically, VMware GSG discloses that "[s]uspend to disk allows you to save the current state of a virtual machine across reboots of your host operating system" so that without having to wait for the virtual machine to boot "you can quickly pick up work right where you stopped, with all the applications and documents you were working on open and ready for use." Ex. 1006, 3-25.

VMware GSG further discloses that the "state of a virtual machine can be saved to disk or memory." Ex. 1006, 3-25. "If you suspend to memory, the saved state of the virtual machine is available as long as the virtual machine is powered on," and "[i]f you suspend a virtual machine to disk, you may power off after suspending." Ex. 1006, 3- 25.

2. Analysis

a. Claims 1 and 12

Petitioner asserts that claims 1 and 12 of the '086 patent are unpatentable under 35 U.S.C. § 102(b) as anticipated by VMware GSG. Pet. 22-28. Patent Owner reasserts many of the arguments asserted against VMware ESX to counter the challenge of claims 1 and 12 based on VMware GSG. *See* PO Resp. 22-34. Specifically, Patent Owner argues that (1) VMware GSG does not disclose a "backup program," (2) does not disclose capturing the "state of a virtual machine," and (3) does not disclose capturing the state while the virtual machine is executing. *Id*. We find these arguments deficient for the same reasons discussed above with respect to these arguments against VMware ESX.

In addition to the similar arguments raised against VMware ESX, Patent Owner argues that VMware GSG fails to anticipate claims 1 and 12 because VMware GSG fails to disclose "copy[ing] at least a portion of the state" to a separate destination. PO Resp. 42. Patent Owner argues that the portion of VMware GSG relied upon by Petitioner for copying to a separate destination merely teaches that a user can pre-specify where the redo log can be stored and fails to teach moving the log from one location to another. *Id*. Furthermore, Patent Owner argues that VMware GSG fails to disclose a "separate copy step" but

suggests that the claimed capture and copy steps both occur simultaneously. *Id*. at 43.

Petitioner counters that VMware GSG discloses that the virtual machine can be suspended to memory, which is a separate device from a disk that stores the redo logs. Pet. Reply 14 (citing Ex. 1006, 3-25 ("The state of a virtual machine can be saved to disk or memory.")). Furthermore, Dr. Shenoy describes VMware GSG as disclosing that "[a]ll writes to an undoable disk issued by software running inside the virtual machines appear to be written to the disk, but are in fact stored in a temporary file (.REDO)." Ex. 1030 ¶ 33 (quoting Ex. 1006, 4-2)). Dr. Shenoy states that if the capturing and copying step were done simultaneously it would defeat the purpose of redirecting writes to the redo log as the data would already reside on the disk. Ex. 1030 ¶ 34. Thus, Dr. Shenoy opines that, in accordance with the disclosure in VMware GSG, writes intended for the disk are first stored in memory (RAM or processor register memory) and then copied into the redo log file. *Id*. at ¶¶ 34-35. We are persuaded by the cited disclosure, and the supporting testimony from Dr. Shenoy, that VMware GSG discloses the claimed step of "copy[ing] at least a portion of the state" to a separate destination.

For the foregoing reasons, we conclude that Petitioner has demonstrated by a preponderance of the evidence that claims 1 and 12 are anticipated by VMware GSG.

b. Claims 11 and 22

Patent Owner argues that Petitioner's challenge of anticipation of claims 11 and 22 by VMware GSG fails because VMware GSG does not disclose a "new log of uncommitted updates" and does not disclose creating a "memory area to capture

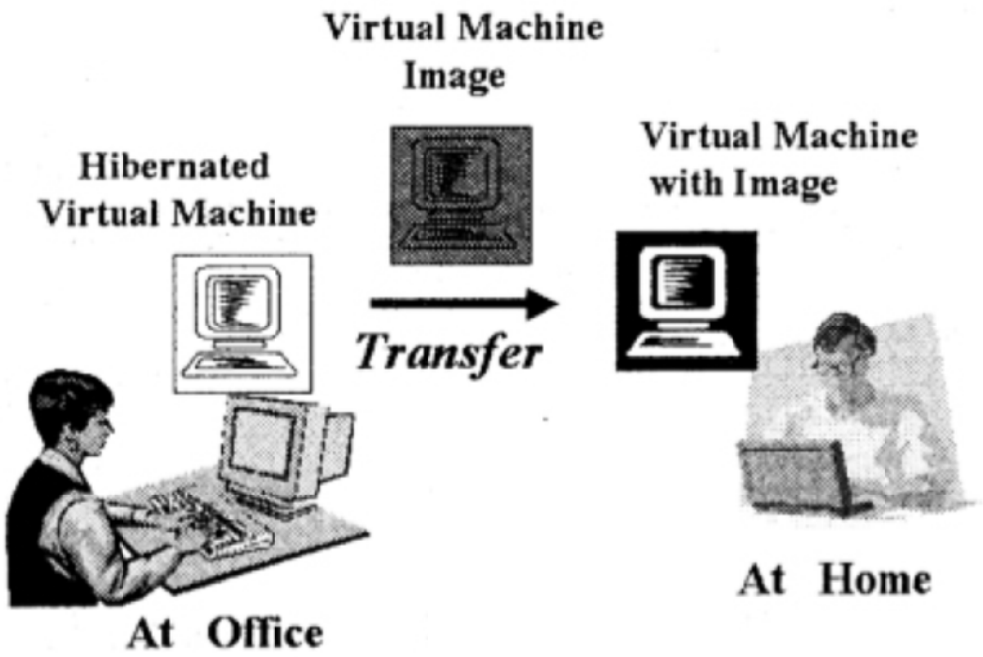
writes to memory," as required by claims 11 and 22. PO Resp. 38-39. Patent Owner's arguments are similar to those advanced against the challenge of claims 1 and 12 based on VMware ESX. *See* PO Resp. 38-40. We find these arguments deficient for the same reasons discussed above with respect to these arguments against VMware ESX.

For the foregoing reasons, we conclude that Petitioner has demonstrated by a preponderance of the evidence that claims 11 and 22 are anticipated by VMware GSG.

D. Anticipation by Suzaki of claims 1 and 12

1. Overview of Suzaki

Suzaki is titled "Checkpoint for Network Transferable Computer," and it describes a system that enables the transfer of the running OS image (Snapshot) to another machine through the use of a virtual machine. Ex. 1008, 1. Suzaki discloses that the prior art systems had to stop the virtual machine to get the snapshot because the snapshot was taken in hibernation, but the "new version enables the taking of the snapshot without stopping the virtual machine." Ex. 1008, 1. Suzaki discloses that "'Network transferable computer' [1] is a system that makes it possible to continue working at home without physically bringing a computer from your office." Ex. 1008, 2. Figure 1 of Suzaki is reproduced below:



Suzaki Figure 1

As seen in Figure 1, Suzaki discloses taking a "snapshot" of "your office computer and recreating what you were doing on it on your home computer based on the executable image." Ex. 1008, 2. For example, Suzaki discloses that "[i]t is possible to pause a QuickTime movie on an X Window machine and continue to play it on another machine." Ex. 1008, 2. Figure 3 of Suzaki is reproduced below:

Suzaki Figure 3

Figure 3 of Suzuki illustrates an example of a movie playback process. Suzaki discloses that its system makes it "possible to pause a QuickTime movie played by XAnim on a desktop computer, transfer the execution image via network or a PC card to a notebook computer, and resume the movie (FIG. 3)." Ex. 1008, 5.

Additionally, Suzaki discloses that the "[c]heckpoint function makes it possible to save current state information without stopping the execution of the process." Ex. 1008, 5. Furthermore, Suzaki discloses that the "'[n]etwork transferable computer' not only transfers a disk image but can also recreate the same OS environment on another computer." Ex. 1008, 3.

2. Analysis

Petitioner asserts that claims 1 and 12 of the '086 patent are unpatentable under 35 U.S.C. § 102(a) as anticipated by Suzaki. Pet. 29-33. Patent Owner argues against Petitioner's challenge based on Suzaki on multiple grounds.

First, Patent Owner contends that Suzaki does not disclose a backup program. PO Resp. 45. In particular, Patent Owner argues that Suzaki does not use a VM kernel, let alone a separate backup program that interfaces with such a kernel in order to capture the state of a virtual machine. *Id.* As discussed above, claims 1 and 12 do not require a backup program. Additionally, as applied to the claimed limitation of capture a state of the virtual machine, Suzaki discloses a "checkpoint function" that makes it possible to take a snapshot of the state information without stopping the virtual computer. Pet. Reply 14 (citing Ex. 1007, 5).

Patent Owner further argues that Suzaki does not disclose capturing "the state of [a] virtual machine." PO Resp. 46. In particular, Patent Owner contends that the state must correspond to a particular "point in time in the executing of the

virtual [] machine," such that the virtual machine, including all its processes, can be resumed from a single point in time. *Id*. (citing Ex. 1001, col. 3, ll. 7-17). Patent Owner argues that Suzaki fails to disclose capturing the claimed "at a point in time" because Suzaki discloses recording information about each application individually over a period of time. Patent Owner argues that the disclosure in Suzaki is counter to the purpose of the '086 patent, "which is to backup an entire virtual machine in case of failure." *Id*. at 47-48. Patent Owner fails to establish, however, how claims 1 and 12 require the backup of an "entire virtual machine." In fact, claims 1 and 12 recite capturing the state of a first virtual machine where "the first virtual machine comprises at least one virtual disk storing at least one file used by at least one application executing in the first virtual machine." Claims 1 and 12; *see also* Pet. Reply 14. We are, therefore, not persuaded by Patent Owner's argument that Suzaki fails to disclose capturing "the entire virtual machine."

Second, Patent Owner argues that Suzaki does not disclose capturing state while a virtual machine is executing. PO Resp. 50. As discussed above, we do not interpret claims 1 and 12 to require continued execution during capturing. Thus, we are not persuaded by Patent Owner's argument that Suzaki fails to disclose capturing while the virtual machine is executing.

For the foregoing reasons, we conclude that Petitioner has demonstrated by a preponderance of the evidence that claims 1 and 12 are anticipated by Suzaki.

E. Obviousness of claims 11and 22 over Suzaki and Wang

1. Overview of Wang

Wang is titled "Integrating Checkpointing with Transaction Processing" and discloses a transactional Unix-file manager. Ex. 1010, 304. Wang discloses that its Unix-file manager is enabled to "implement per-application transactional file updates" and provides a "transactional critical-memory manager" for checkpointing memory. Ex. 1010, 304, 306. Wang further discloses that its process of checkpointing involves "recording critical memory and file state at a given point of program execution on stable storage." Ex. 1010, 304.

As part of the transactional file update process, Wang discloses that an "UNDO log" is created. Ex. 1010, 306. Specifically, Wang discloses that "[e]very file update operation is intercepted by libfcp_RM, and an idempotent undo operation is added to the UNDO log." Ex. 1010, 306.

2. Analysis

Petitioner argues that dependent claims 11 and 22 are obvious in view of Suzaki and Wang. Petitioner concedes that Suzaki fails to disclose "creating a new log of uncommitted updates," as required by claims 11 and 22, but relies upon the combination of Wang as teaching or suggesting this claim limitation. Pet. 33-34. More particularly, Petitioner argues that the claims are made obvious by Wang's teaching of the creation of an UNDO log. Pet. 35. Petitioner argues that "[e]ach of the operations in the UNDO log corresponds to uncommitted updates on the disk"; "[t]hus, Wang discloses a checkpointing method that includes 'creating a new log of uncommitted updates' as claimed." Pet. 35. Additionally, Petitioner contends that a person of ordinary skill in the art would have reason to include Wang's checkpointing method into the checkpoint function disclosed in Suzaki "to ensure

consistency and recoverability of data." Pet. 34 (citing Ex. 1010, 304; Shenoy Decl. ¶ 37).

Patent Owner counters that Suzaki and Wang may not be combined properly. In particular, Patent Owner argues that Suzaki's disclosure concerning checkpoints is sufficient to instruct a person of ordinary skill in the art on how to implement Suzaki's checkpoint function. PO Resp. 52-53. Patent Owner, therefore, contends that because the implementation details provided by Suzaki are sufficient, a person of ordinary skill in the art would not seek out any other implementation details such as Wang's checkpointing method. *Id.* at 53.

We are not persuaded by Patent Owner's argument as the relevant inquiry is not the sufficiency of the Suzaki disclosure, but whether there is a sufficiently "articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). Petitioner asserts that one of ordinary skill would combine the references because both describe checkpointing and are concerned with "consistency and recoverability of data." Pet. Reply 15. In particular, Petitioner asserts that incorporating Wang's checkpoints for Suzaki's checkpoints is nothing more than a "simple substitution of one known element for another" with predictable results because each reference describes checkpointing a running application. *Id.* (citing *KSR*, 550 U.S at 417).

Patent Owner argues that Petitioner's proposed combination would be improper because Suzaki is an operating system based checkpointing method and Wang is an application based checkpointing method. PO Resp. 55-56. Patent Owner, however, fails to identify sufficiently why Wang's application based checkpointing method would not work when applied to Suzaki's checkpointing

method. *See id*. Patent Owner also argues that the combination fails to teach material elements of claims 11 and 22 because Wang teaches a log of committed updates and the claims require a "log of uncommitted updates." PO Resp. 57-58. Patent Owner fails, however, to identify why the modification of the log of committed updates in Wang for a log of uncommitted updates along with Suzaki's checkpointing method would not have been a simple substitution of a known element for another known element.

We are, again, not persuaded by Patent Owner's arguments. For the foregoing reasons, we conclude that Petitioner has demonstrated by a preponderance of the evidence that claims 11 and 22 are unpatentable as obvious over Suzaki and Wang.

F. Motion to Amend

Because we determine that all of the challenged claims are unpatentable, we turn to Patent Owner's contingent request to enter proposed amended claims. Patent Owner proposes claims 31–34 as substitutes for claims 1, 11, 12, and 22, respectively. Mot. to Amend 1–5. As the moving party, Patent Owner bears the burden of establishing that it is entitled to the relief requested in its Motion to Amend. 37 C.F.R. § 42.20(c).

1. Proposed Substitute Claim 31

Patent Owner's proposed substitute claim 31 seeks to amend the preamble of claim 1 as follows:

> A computer readable medium storing a plurality of instructions comprising instructions <u>for a backup program</u> which, when executed<u>, interfaces with a separately executing virtual machine kernel to</u>:

Mot. to Amend, 1. Petitioner argues that substitute claim 31 fails to narrow the scope of original claim 1 because Patent Owner did not identify how this modification to the preamble acts as a limitation on the claims. Opp. 5 (citing *Catalina Mktg. Int'l, Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002). In *Catalina Mktg. Int'l, Inc.*, the Federal Circuit provided that "[i]n general, a preamble limits the invention if it recites essential structure or steps, or if it is 'necessary to give life, meaning, and vitality' to the claim." 289 F.3d at 808 (citation omitted). Petitioner argues that the amendments do not give life, meaning, or vitality to the claim because there are no limitations in the body of claim 31 that rely upon or find antecedents in the amended language in the preamble. Opp. 5. We agree. The terms "backup program" and "separately executing virtual machine kernel" are not referred to in the body of substitute claim 31 and, therefore, the amendments to original claim 1 do not respond to a ground of unpatentability involved in the trial and do not narrow the scope of claim 1. *See Idle Free Sys., Inc. v. Bergstrom, Inc.*, Case IPR2012-00027, Paper 26, 5 (PTAB June 11, 2013) ("A proper substitute claim under 37 C.F.R. § 42.121(a)(i) must only narrow the scope of the challenged claim it replaces."). Additionally, these claims fail to Accordingly, Patent Owner's motion to amend claim 1 with substitute claim 31 is denied.

2. Proposed Substitute Claim 32

Patent Owner's substitute claim 32 adds the following limitations to claim 11:

> The computer readable medium as recited in claim 1 wherein (i) comprises creating a new log of uncommitted updates for each virtual disk in the first virtual machine and creating a memory COW area to capture writes to a memory of the first virtual machine, and wherein the instructions,

> when executed, write updates subsequent to (i) to each virtual disk in the first virtual machine to the new log and write updates subsequent to (i) to the memory of the first virtual machine to the memory COW area during execution of the first virtual machine, such that the first virtual machine can continue executing during (i) and (ii).

Mot. to Amend 2-3. We agree with Patent Owner that substitute claim 32 adds limitations and does not broaden the scope of original claim 11; thus, substitute claim 32 complies with 35 U.S.C. § 316(d)(3). Additionally, Patent Owner argues that the amendments are supported in the original disclosure of the '086 patent (Ex. 2018), primarily by the discussion of Figure 6 in the original disclosure. Mot. to Amend, 4-5 (citing Ex. 2018, 19-20, 23-24). We conclude that the proposed amendments in substitute claim 32 have written description support in the original disclosure of the '086 patent.

With respect to the patentability of claim 32, Patent Owner argues that substitute claim 32 requires "creating a memory COW area to capture writes to a memory of the first virtual machine," and writing subsequent "updates" to each virtual disk to the "new log" and "memory COW area during execution of the first virtual machine." Mot. to Amend, 8 (quoting claim 32). Patent Owner further argues that this is accomplished with the use of COW techniques that allow the virtual machine to continue executing, while also maintaining the state of the virtual machine at a point in time. *Id*. at 14. Patent Owner states that unlike substitute claim 32, Lim does not disclose creating new COW memory area for the purpose of accepting updates during continued execution of the virtual machine. *Id*. at 9. Furthermore, Patent Owner argues the "use of separate 'memory COW' or COW files (i.e. 'new log') to maintain accessibility of an entire virtual machine

including memory and virtual disks during state capture were not known." *Id*. at 14.

In opposing Patent Owner's Motion to Amend, Petitioner argues that substitute claim 32 is unpatentable over Lim in view of Li.[2] Specifically, Petitioner argues that although Lim does not disclose explicitly that the virtual machine can continue to execute during the capturing step, as required by claim 32, Lim can be combined with Li, which teaches executing during portions of the capturing step. Opp. 11 (citing Ex. 1029, 874-75). Specifically, Petitioner cites to Li's disclosure of a copy-on-write (COW) checkpointing algorithm, which Petitioner argues creates address space in main memory to hold updates while the capturing process continues. *Id*. (citing Ex. 1029, 875). Li discloses that, after creating new address space, the copy-on-write (COW) checkpointing algorithm "unfreezes the processors and starts a separate copier thread that copies pages to the new address space." Ex. 1029, 875 (emphasis omitted). Petitioner further argues, as supported by testimony from Dr. Shenoy, that a person or ordinary skill in the art would have combined Lim and Li because they both describe checkpointing processes and a person or ordinary skill in the art would recognize the benefit of minimizing the interruption of a virtual machine during capturing in Lim with the copy-on-write (COW) checkpointing algorithm taught in Li. Opp. 12 (citing Ex. 1031 ¶ 27). Thus, despite Patent Owner's arguments to the contrary, it appears that "use of separate 'memory COW' or COW files (i.e. 'new log') to maintain accessibility" (Mot. to Amend 14) was known in the prior art, and, in

[2] "Low-Latency Concurrent Checkpointing for Parallel Programs" by Li, IEEE TRANSACTIONS ON PARALLEL AND DISTRIBUTED SYSTEMS, Vol. 5, No. 8, Aug. 1994 (Ex. 1029).

fact, Li teaches this very technique in its copy-on-write (COW) checkpointing algorithm. *See* Ex. 1029, 874-875.

Patent Owner attempts to overcome the challenge based on the combination of Lim and Li by arguing that Li still suffers from the defect of Lim, as it interrupts the virtual machine during capturing. Reply Mot. to Amend, 4; *see also* Tr. at 103, ll. 10-11 ("So Li, while its goal is to minimize that interruption, that disruption, that suspension, it doesn't get rid of it completely"). Petitioner's expert, Dr. Shenoy, counters that it is impossible to capture state without suspending the virtual machine, "at least momentarily." Ex. 1031, ¶ 114. Patent Owner responds to this allegation by arguing, based on the testimony of its expert Dr. Green, that claim 32 permits some level of interruption of the virtual machine, so long as it allows the "virtual machine to continue normal execution." Reply Mot. to Amend at 4 (citing Ex. 2028 ¶¶ 28-32). Therefore, Patent Owner concedes that substitute claim 32 encompasses some level of interruption, but that the interruption is minimal. *Id*. Similarly, Patent Owner concedes that the goal of Li's checkpointing method is to "minimize [the] interruption." Accordingly, we are not persuaded by Patent Owner's argument and determine that Lim in view of Li renders obvious the limitation of "first virtual machine can continue executing during (i) and (ii)" recited in substitute claim 32.

For the foregoing reasons, Patent Owner's motion to amend claim 11 with substitute claim 32 is denied.

3. Proposed Substitute Claim 33

Patent Owner's substitute claim 33 adds the following limitations to claim 12:

> (ii) copy at least a portion of the state to a destination separate from a storage device to which the first virtual machine is suspendable, wherein suspending the first virtual machine is performed responsive to a suspend command, wherein the first virtual machine can continue executing during (i) and (ii);
>
> (iii) determine whether additional virtual machines that have not been backed up are present on the first computer system; and
>
> (iv) repeat (i) and (ii) for said additional virtual machines.

Mot. to Amend 3. We agree with Patent Owner that substitute claim 33 adds limitations and does not broaden the scope of original claim 12; thus, substitute claim 33 complies with 35 U.S.C. § 316(d)(3). Additionally, Patent Owner argues that the amendments are supported in the original disclosure of the '086 patent (Ex. 2018). Mot. to Amend, 5-6 (citing Ex. 2018, 12 ("If additional virtual machines remain to be backed-up (decision block 60), the backup program 42 selects the next virtual machine (block 62) and repeats blocks 50-60 for that virtual machine.")). We conclude that the proposed amendments in substitute claim 33 have written description support in the original disclosure of the '086 patent.

With respect to the patentability of claim 33, Patent Owner argues, similar to its arguments for claim 32, that substitute claim 33 requires is not obvious in view of the prior art because the virtual machine can continue executing during the capture step (i) and the copy step (ii). Mot. to Amend, 10. Petitioner counters, however, that this claim is obvious over Lim in view of Li in the same way as the similar limitation in substitute claim 32 is obvious. Opp. 13. For the reasons discussed above for substitute claim 32, we agree that this limitation is obvious based on Lim in view of Li.

Unlike substitute claim 32, substitute claim 33 provides limitations regarding determining whether additional virtual machines have been backed up

and repeating the copying and capturing step for such additional virtual machines. Patent Owner argues that the prior art does not disclose these limitations. Mot. to Amend 12, 14-15. Petitioner counters that it was well known to a person of ordinary skill in the art at the time of the '086 patent application for virtual machine monitors to execute multiple virtual machines, and that each of these virtual machines would have needed to be checkpointed by the methods disclosed in Lim and Li. Opp. 13-14. Specifically, Lim discloses virtual machine monitor 250 to monitor the virtual machines 200 to 200n. Ex. 1004, col. 15, ll. 26-31. Dr. Shenoy states that it would have been obvious to a person of ordinary skill in the art to checkpoint the multiple virtual machines, 200 to 200n, as disclosed in Lim. Ex. 1031 ¶23. We agree and are, thus, not persuaded by Patent Owner's argument that backing up multiple virtual machines was not known in the prior art.

For the foregoing reasons, Patent Owner's motion to amend claim 12 with substitute claim 33 is denied.

4. Proposed Substitute Claim 34

Patent Owner's substitute claim 34 adds the following limitations to claim 22:

> The apparatus as recited in claim ~~12~~33 wherein (i) comprises creating a new log of uncommitted updates for each virtual disk in the first virtual machine and creating a memory COW area to capture writes to a memory of the first virtual machine, and wherein, subsequent to (i), the first computer system is configured to write updates to each virtual disk in the first virtual machine to the new log and write updates to the memory of the first virtual machine to the memory COW area during execution of the first virtual machine ~~such that the first virtual machine can continue executing during (ii)~~.

Mot. to Amend 3-4. Patent Owner argues although certain language was struck from substitute claim 34, this language was added to substitute claim 33; thus, Patent Owner argues that the amendments in substitute claim 34 do not broaden the scope of original claim 22.

Petitioner disagrees and argues generally that the amendment to substitute claim 34 removes a limitation that is not added to substitute claim 33. Opp. 6. More particularly, Petitioner argues that when the language "*such that* the first virtual machine can continue executing (ii)" is removed, substitute claim 34 only requires "creating a memory COW area . . . during *execution* of the first virtual machine," but does not require that the creation of the COW area is what permits such execution to occur. *Id.* at 6. "A proper substitute claim under 37 C.F.R. §42.121(a)(i) must only narrow the scope of the challenged claim it replaces." *Idle Free*, Paper 26, 5 (PTAB June 11, 2013). We determine that Patent Owner's proposed amendments in substitute claim 34 improperly broaden the scope of original claim 22 by removing limitations from the claim that are not equally added to the proposed substitute independent claim. Therefore, Patent Owner's motion to amend claim 22 with substitute claim 34 is denied.

G. Motion to Exclude

Patent Owner filed a Motion to Exclude (Paper 39, "Mot. to Exclude") on March 31, 2014. The Motion to Exclude seeks to exclude certain portions of Petitioner's Petition (Paper 2), Petitioner's Reply to Patent Owner's Response (Paper 33), and the corresponding declarations of Dr. Shenoy in support of these papers (Exs. 1002 and 1030). Mot. to Exclude 1. A motion to exclude must state why the evidence is inadmissible (e.g., based on relevance or hearsay), identify the

corresponding objection in the record, and explain the objection. *See* 37 C.F.R. § 42.64(c); Office Patent Trial Practice Guide, 77 Fed. Reg. at 48,767.

First, Patent Owner argues that Petitioner and its expert, Dr. Shenoy, rely upon hypotheticals concerning how the software products discussed in the cited prior art may have worked and, thus, are outside the scope of subject matter disclosed in the prior art. Mot. to Exclude 1-3. For example, Patent Owner notes that Dr. Shenoy states that the redo log disclosed in the VMware ESX reference can be copied while the virtual machine is executing, but Patent Owner argues that Dr. Shenoy fails to provide any support in the VMware ESX reference for this conclusion. *Id*. at 4. Second, Patent Owner argues that Petitioner's Reply to Patent Owner's Response and the corresponding declaration of Dr. Shenoy mischaracterize the testimony of Patent Owner's expert, Dr. Green. *Id*. at 7. For example, Patent Owner argues that the Petitioner states that "Patent Owner's expert acknowledges that replicating is a *type* of backup," but Dr. Green's actual testimony was that "[r]eplication is a *part* of backup." *Id*. (emphasis added).

It is within our discretion to determine the appropriate weight to be accorded to evidence based on such factors as whether the expert testimony discloses the underlying facts or data on which the opinion is based. *See* 37 C.F.R. § 42.65 ("Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight."). Additionally, we have the discretion to assign appropriate weight to any mischaracterizations by one expert of another expert's testimony. *Rohm and Haas Co. v. Brotech Corp.*, 127 F.3d 1089, 1092 (Fed. Cir. 1997) ("Nothing in the rules or in our jurisprudence requires the fact finder to credit the unsupported assertions of an expert witness."). For the foregoing reasons, we deny Patent Owner's motion to exclude certain portions of

Petitioner's Petition (Paper 2), Petitioner's Reply to Patent Owner's Response (Paper 33), and the corresponding declarations of Dr. Shenoy in support of these papers (Exs. 1002 and 1030).

III. CONCLUSION

We conclude that Petitioner has demonstrated by a preponderance of the evidence that (1) claims 1, 11, 12 and 22 are anticipated by Lim, (2) claims 1, 11, 12, and 22 are anticipated by VMware ESX, (3) claims 1, 11, 12, and 22 are anticipated by VMware GSG, (4) claims 1 and 12 are anticipated by Suzaki, and (5) claims 11 and 22 would have been obvious over Suzaki and Wang.

Patent Owner's motion to amend original claims 1, 11, 12, and 22 with proposed substitute claims 31-34 is denied. Patent Owner's motion to exclude is denied.

This is a final written decision of the Board under 35 U.S.C. § 318(a). Parties to the proceeding seeking judicial review of this decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

IV. ORDER

Accordingly, it is hereby:

ORDERED that claims 1, 11, 12, and 22 of U.S. Patent No. 7,093,086 B1 are unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Amend is *denied*; and

FURTHER ORDERED that Patent Owner's Motion to Exclude is *denied*.

For PETITIONER:

Lori A. Gordon
Michael Q. Lee
Byron L. Pickard
STERNE, KESSLER, GOLDSTEIN
& FOX PLLC
lgordon-PTAB@skgf.com
mlee-PTAB@skgf.com
bpickard-ptab@skgf.com

For PATENT OWNER:

Joseph J. Richetti
Lawrence G. Kurland
BRYAN CAVE LLP
joe.richetti@bryancave.com
lgkurland@bryancave.com