**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

_____

**BEFORE THE PATENT TRIAL AND APPEAL BOARD**

_____

NETFLIX, INC,

Petitioner,

v.

AVAGO TECHNOLOGIES INTERNATIONAL SALES PTE. LIMITED,

Patent Owner.

_____

Case No. IPR2020-01582

U.S. Patent No. 8,572,138

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# PETITIONER'S NOTICE OF APPEAL

Office of the General Counsel
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

Petitioner Netflix, Inc., hereby gives notice pursuant to 35 U.S.C. § 142 and 37 C.F.R. § 90.2(a) that it appeals to the United States Court of Appeals for the Federal Circuit from the Patent Trial and Appeal Board's Final Written Decision in IPR2020-01582, entered March 11, 2022 (Paper No. 32), and from all orders, decisions, rulings, and opinions underlying the Final Written Decision. A copy of the Final Written Decision is attached to this Notice.

In accordance with 37 C.F.R. § 90.2(a)(3)(ii), Petitioner states that the anticipated issues on appeal include, but are not limited to, the following:

1. The Board's erroneous claim construction of "a plurality of image instances of a plurality of software application that are executable on the plurality of virtual machines."

2. The Board's erroneous finding that Petitioner has not shown by a preponderance of the evidence that claims 1–5, 9, 10, 17, 19-21, and 26 of U.S. Patent No. 8,572,138 ("the '138 patent") are unpatentable.

3. The Board's erroneous finding that Petitioner has not shown by a preponderance of the evidence that claims 1–5, 9, 19–21, and 26 of the '138 patent

are unpatentable under 35 U.S.C. § 103 as obvious over U.S. Patent No. 7,577,722 ("Khandekar").

4. The Board's erroneous finding that Petitioner has not shown by a preponderance of the evidence that claims 1–5, 9, 19–21, and 26 of the '138 patent are unpatentable under 35 U.S.C. § 103 as obvious over Khandekar in view of U.S. Patent Publication No. 8,209,680 ("Le").

5. The Board's erroneous finding that Petitioner has not shown by a preponderance of the evidence that claims 9 and 10 of the '138 patent are unpatentable under 35 U.S.C. § 103 as obvious over Khandekar in view of Le and U.S. Patent No. 7,962,633 ("Sidebottom").

6. The Board's erroneous finding that Petitioner has not shown by a preponderance of the evidence that claim 17 of the '138 patent is unpatentable under 35 U.S.C. § 103 as obvious over Khandekar in view of Le and U.S. Patent Application Publication No. 2003/0036886A1 ("Stone").

A copy of this Notice of Appeal is being filed with the Patent Trial and Appeal Board. In addition, this Notice of Appeal is being filed, along with the required docketing fees, with the Clerk's Office for the United States Court of Appeals for the Federal Circuit.

Date: May 12, 2022

Respectfully,

*/Harper Batts/*

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Paper 32
Entered: March 11, 2022

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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NETFLIX, INC.,
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AVAGO TECHNOLOGIES INTERNATIONAL SALES PTE. LIMITED,
Patent Owner.

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IPR2020-01582
Patent 8,572,138 B2

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Before KRISTEN L. DROESCH, KERRY BEGLEY, and NATHAN A. ENGELS, *Administrative Patent Judges*.

DROESCH, *Administrative Patent Judge*.

# JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
*35 U.S.C. § 318(a)*

# I. INTRODUCTION

We have authority to hear this *inter partes* review under 35 U.S.C. § 6, and this Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, we determine that Petitioner fails to establish by a preponderance of the evidence that claims 1–5, 9, 10, 17, 19–21, and 26 ("challenged claims") of U.S. Patent No. 8,572,138 B2 (Ex. 1001, "'138 Patent") are unpatentable.

## *A. Procedural History*

Netflix, Inc., ("Petitioner") filed a Petition requesting an *inter partes* review of the challenged claims of the '138 Patent. Paper 2 ("Pet"). Avago Technologies International Sales Pte. Limited ("Patent Owner") filed a Preliminary Response. Paper 7. Pursuant to 35 U.S.C. § 314, we instituted trial on March 15, 2021. Paper 9 ("Dec.").

After institution of trial, Patent Owner filed a Response (Paper 13, "PO Resp."), to which Petitioner filed a Reply (Paper 17, "Pet. Reply"), to which Patent Owner filed a Sur-reply (Paper 24, "PO Sur-reply").

Petitioner relies on a Declaration of Prashant Shenoy, Ph.D., (Ex. 1003) to support its Petition. Patent Owner relies on a Declaration of David Rosenblum, Ph.D., (Ex. 2001) to support its Patent Owner Response. Petitioner relies on a second Declaration of Prashant Shenoy, Ph.D., (Ex. 1029) to support its Reply.

Dr. Shenoy and Dr. Rosenblum were cross-examined during trial, and transcripts of Dr. Shenoy's depositions (Exs. 2002, 2007) and Dr. Rosenblum's deposition (Ex. 1024) are included in the record.

Oral argument was held on January 5, 2022. A transcript of the oral argument is included in the record. Paper 31 ("Tr.").

*B. Related Matters*

The parties indicate the '138 Patent is the subject of litigation in *Broadcom Corp. v. Netflix, Inc.*, Case No. 3:20-cv-04677-JD (N.D. Cal.) ("related district court proceeding"), which was filed as *Broadcom Corp. v. Netflix, Inc.*, Case No. 8:20-cv-00529-JVS-ADS (C.D. Cal.) and later transferred to the U.S. District Court for the Northern District of California. *See* Pet. 88; Paper 6, 1.

In addition, claims 11, 12, 14, 22, and 24 of the '138 Patent are the subject of a pending *inter partes* review in IPR2021-00542, based on a petition filed by Petitioner. *See* IPR2021-00542, Paper 11 at 2 (PTAB Sept. 7, 2021).

*C. The '138 Patent (Ex. 1001)*

The '138 Patent relates to automated allocation and management of computing functions and resources within a distributed computing system. *See* Ex. 1001, 1:11–12, 1:37–42.

Figure 1 of the '138 Patent is reproduced below.

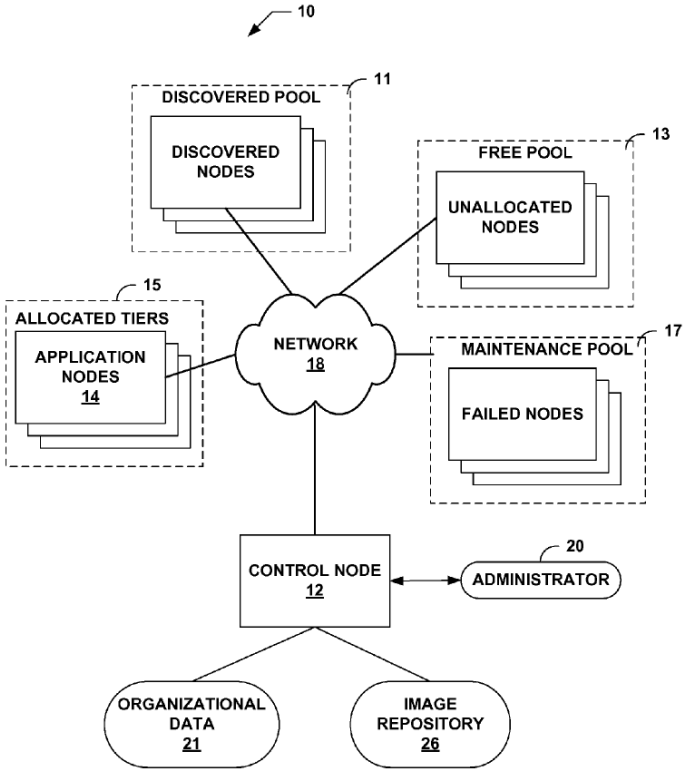


Figure 1 depicts distributed computing system 10 constructed from a collection of computing nodes. *See* Ex. 1001, 2:40–41, 3:54–56. Distributed computing system 10 includes physical computing devices or nodes operating in cooperation with each other to provide distributed processing, at least one control node 12, and network 18 that permits internode communications. *See id.* at 3:56–58, 3:62–66, 4:60–5:4. Control node 12 maintains organizational data 21, stores software image instances in image repository 26, and interacts with system administrator 20 (a user). *See id.* at 5:23–25, 6:4–6, 13:27–32, Fig. 2. Control node 12 provides system support functions for distributed computing system 10, including managing the roles of each computing node and the execution of software applications. *See id.* at 4:46–51, 5:12–13, 5:40–42.

The computing nodes are logically grouped within discovered pool 11, free pool 13, allocated tiers 15, and maintenance pool 17. *See* Ex. 1001, 3:59–62. Discovered pool 11 includes a set of computer nodes discovered by control node 12. *See id.* at 4:6–8. Free pool 13 is a set of unallocated nodes that are available for use. *See id.* at 4:26–27. Allocated tiers 15 include one or more tiers of application nodes 14 that currently provide a computing environment for execution of software applications. *See id.* at 4:35–37. Maintenance pool 17 includes a set of computing nodes that could not be inventoried or have been taken out of service. *See id.* at 4:43–45.

Figure 24 of the '138 Patent is reproduced below.

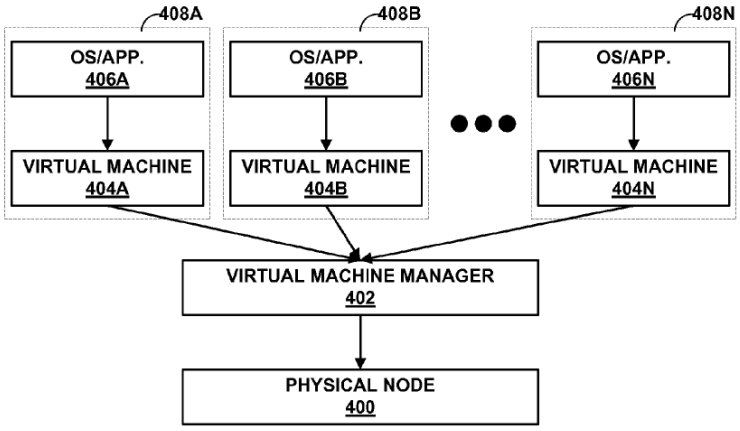


Figure 24 depicts a block diagram of a physical node to which a virtual machine manager and one or more virtual machines are deployed. *See* Ex. 1001, 3:28–30, 32:54–55. Physical node 400 may be any node within distributed computing system 10, for example, any one of application nodes 14. *See id.* at 32:56–58. Virtual machine manager 402 executes on physical node 400 and hosts virtual machines 404A through 404N. *See id.* at 32:59–60, 32:65–67. Virtual machines 404 provide environments on which guest operating systems execute as though they were operating

directly on a physical computing platform. *See id.* at 33:2–6. Multiple operating systems and software applications 406A through 406N may execute on virtual machines 404A through 404N, respectively, and virtual machines 404 may execute on a single physical node or multiple physical nodes. *See id.* at 33:6–11. Virtual machine manager 402 utilizes operating system data and application data for execution of each virtual machine 404. *See id.* at 33:25–27. Operating system data, application data, and instance-specific configuration data for the underlying virtual machines 404 are stored as respective virtual disk image files 408. *See id.* at 33:27–30. Virtual machine disk image file 408A provides a bootable software image for operating system/application information 406A that is capable of being executed on virtual machine 404A. *See id.* at 33:35–39.

Figure 27A of the '138 Patent is reproduced below.

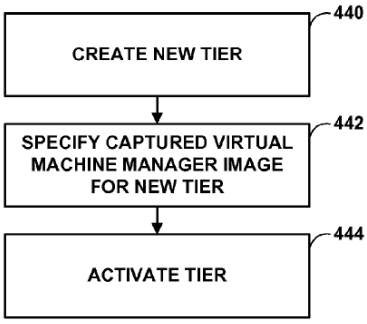


Figure 27A depicts a flow chart illustrating a procedure for autonomic deployment of a virtual machine manager to a node within the distributed computing system. *See* Ex. 1001, 3:38–40, 35:25–27. An administrator will create a new tier in step 440. *See id.* at 35:27–28. The administrator then specifies one or more captured virtual machine manager image instances for assignment to the slots of the new tier in step 442. *See id.* at 35:27–28. After the physical nodes boot with the virtual machine manager image instance, each of the nodes creates a set of virtual machines as specified by

the image instances. *See id.* at 35:33–36. Control node 12 may then discover each of these virtual machines and place them in free pool 13 as if they were independent nodes. *See id.* at 35:36–38.

Figure 27B of the '138 Patent is reproduced below.

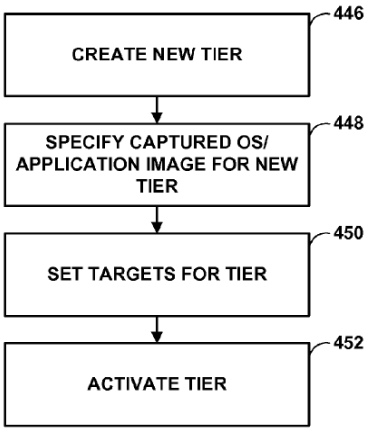


Figure 27B depicts a flow chart illustrating a procedure for deploying an operating system and application image to a node that is executing a virtual machine manager within the distributed computing system. *See* Ex. 1001, 3:41–44, 35:48–51. An administrator instructs the control node to create a new tier or select an existing tier in step 446. *See id.* at 35:51–53. The administrator then specifies a captured operating system and application image for the tier in step 448. *See id.* at 35:54–55. The administrator also sets target values for the image instances to be deployed to the slots of the new tier in step 450. *See id.* at 35:55–58. The administrator then activates the tier in step 452. *See id.* at 35:58. Next, based on the current state and goals of distributed computing system 10, control node 12 automatically selects a virtual machine from free pool 13, associates the virtual machine with a slot in the tier, identifies the virtual disk image file (i.e., image instance) associated with the particular slot, copies the virtual disk image file to the local hard disk of the physical node on which the virtual node resides,

and boots the virtual machine from the virtual disk image file. *See id.* at 35:59–67.

### *D. Illustrative Claim*

Claims 1, 19, and 26 are independent, claims 2–5, 9, 10, and 17 depend from claim 1, and claims 20 and 21 depend from claim 19. Claim 1 is illustrative and reproduced below:

> 1. A distributed computing system comprising:
> a software image repository comprising non-transitory, computer-readable media operable to store: (i) a plurality of image instances of a virtual machine manager that is executable on a plurality of application nodes, wherein when executed on the applications nodes, the image instances of the virtual machine manager provide a plurality of virtual machines, each of the plurality of virtual machine operable to provide an environment that emulates a computer platform, and (ii) a plurality of image instances of a plurality of software applications that are executable on the plurality of virtual machines; and
> a control node that comprises an automation infrastructure to provide autonomic deployment of the plurality of image instances of the virtual machine manager on the application nodes by causing the plurality of image instances of the virtual machine manager to be copied from the software image repository to the application nodes and to provide autonomic deployment of the plurality of image instances of the software applications on the virtual machines by causing the plurality of image instances of the software applications to be copied from the software image repository to the application nodes.

*E. Asserted Challenges to Patentability and Asserted Prior Art*

Petitioner asserts that claims 1–5, 9, 10, 17, 19–21, and 26 would have been unpatentable on the following grounds:

| Claim(s) Challenged | 35 U.S.C. § | Reference(s) |
|---|---|---|
| 1–5, 9, 19–21, 26 | 103[1] | Khandekar[2], |
| 1–5, 9, 19–21, 26 | 103 | Khandekar, Le[3] |
| 9, 10 | 103 | Khandekar, Le, Sidebottom[4] |
| 17 | 103 | Khandekar, Le, Stone[5] |

## II. ANALYSIS

### *A. Claim Construction*

In an *inter partes* review proceeding, the Board applies the same claim construction standard as that applied by federal courts in a civil action under 35 U.S.C. § 282(b), which is generally referred to as the *Phillips* standard. *See Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc); 37 C.F.R. § 42.100(b). Under the *Phillips* standard, "words of a claim 'are generally given their ordinary and customary meaning.'" *Phillips*, 415 F.3d at 1312 (quoting *Vitrionics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (1996)).

[1] The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011), amended 35 U.S.C. § 103 effective March 16, 2013. Because the '138 Patent has an effective filing date prior to the effective date of the applicable AIA amendment, we refer to the pre-AIA version of § 103.
[2] Ex. 1004, US 7,577,722 B1, issued Aug. 18, 2009 ("Khandekar").
[3] Ex. 1005, US 8,209,680 B1, issued June 26, 2012 ("Le").
[4] Ex. 1006, US 7,962,633 B1, issued June 14, 2011 ("Sidebottom").
[5] Ex. 1007, US 2003/0036886 A1, published Feb. 20, 2003 ("Stone").

*Three-Step Deployment Process*

Patent Owner asserts that each of the challenged claims requires an ordered three-step deployment process (or claim elements that perform the ordered three-step deployment process) described in the '138 Patent Specification. *See* PO Resp. 8–42. Petitioner disagrees with Patent Owner's assertions. *See* Pet. Reply 5–17.

As demonstrated in the analysis below in Section II.D., we need not decide whether the challenged claims require an ordered three-step deployment process, as asserted by Patent Owner.

*"a plurality of image instances of a plurality of software application that are executable on the plurality of virtual machines"*

Petitioner asserts that a person of ordinary skill in the art would have understood the phrase "a plurality of image instances of a plurality of software applications that are executable on the plurality of virtual machines," as recited in independent claims 1, 19, and 26, to be "satisfied by, but not limited to, a plurality of virtual disk image files." Pet. 13. Petitioner points out that claim 2, dependent from claim 1, specifies that "the image instances of the plurality of software applications comprise virtual disk image files." *Id.* (quoting Ex. 1001, 36:50–53). According to Petitioner, "a teaching sufficient to satisfy claim 2 must also be sufficient to satisfy claim 1." *Id.* (citing Ex. 1003 ¶ 38).

Patent Owner contends that although claim 2 makes clear that "'virtual disk image files' can be a type of 'image instances of the plurality of software applications,'" the language of claim 1, as well as claims 19 and 26, requires more. PO Resp. 43; *accord* Tr. 52:12–53:1. Noting the claim language shown here in italics—"a plurality of image instances of a plurality

of software applications *that are executable on the plurality of virtual machines*"—Patent Owner argues that Petitioner's position disregards the italicized language by effectively substituting "virtual disk image files" for the entire claim phrase. PO Resp. 43; *accord* Tr. 52:12–53:10. Highlighting the difference, Patent Owner argues that, unlike the italicized language in claim 1, claim 2 does not address how or where the virtual disk image files are deployed. PO Resp. 43–44 (citing Ex. 2001 ¶ 105). Further, according to Patent Owner, the italicized language reflects part of a three-step deployment process of the claimed invention. *Id*. at 44; *see id*. at 22–33 (discussing claim language and Specification support for the purported three-step deployment process). Ultimately, Patent Owner contends that the Board should "apply the plain and ordinary meaning" of the full claim phrase. *Id.* at 45.

In its Reply, Petitioner asserts that "[i]t is the claim language . . . that omits P[atent Owner's three-step deployment] process by requiring that image instances need only be 'executable'—not actually executed." Pet. Reply 17. In turn, Patent Owner asserts that Petitioner's Reply again disregards the claim language "that are executable on the plurality of virtual machines" entirely. *See* PO Sur-reply 17.

This claim phrase was not expressly construed in the Institution Decision. *See* Dec. 9. We agree with Patent Owner that Petitioner's proposed interpretation, namely, that the claim phrase is satisfied by "a plurality of virtual disk image files," reads "that are executable on the plurality of virtual machines" out of the claim language. *See* Pet. 13; PO Resp. 43–44. Dependent claim 2, on which Petitioner's argument relies, makes clear that "virtual disk image files" can be "image instances of the

plurality of software applications"—but claim 2 does not refer to the additional language "that are executable on the plurality of virtual machines" recited in claim 1 as well as claims 19 and 26. Ex. 1001, 36:35–37, 36:50–52, 38:9–11, 39:4–6. Accordingly, we do not adopt Petitioner's proposed interpretation of the claim phrase.

As in the Institution Decision, we need not expressly construe "a plurality of image instances of a plurality of software applications that are executable on the plurality of virtual machines," but we note that "[a] claim construction that gives meaning to all the terms of the claim is preferred over one that does not do so." *Merck & Co., Inc., v. Teva Pharms. USA, Inc.*, 395 F.3d 1364, 1372 (Fed. Cir. 2005); *see also Bicon, Inc. v. Straumann Co.*, 441 F.3d 945, 950 (Fed. Cir. 2006) ("[C]laims are interpreted with an eye toward giving effect to all terms in the claim."). In this Decision, the words of the entire claim phrase, including "that are executable on the plurality of virtual machines," are given their ordinary and customary meaning.

*"Image Instance"*

The parties do not request a construction of any other claim term. *See* Pet. 13; PO Resp. 8–42; Pet. Reply 5–17; PO Sur-Reply 5–17. Nonetheless, we note that both parties apply the construction of "image instance" to which they agreed in the related district court proceeding—specifically, "a snapshot, or copy, of installed and configured software." Ex. 2003 (Joint Claim Construction and Prehearing Statement in the related district court proceeding), 1–2 (identifying this construction of "image instance" as a stipulated claim construction); PO Resp. 52–53 (citing Ex. 2001 ¶ 134; Ex. 2003, 2) (arguing that Petitioner "admits" to this construction and applying it to dispute Petitioner's unpatentability showing); Pet. Reply 29–

30 (citations omitted) (characterizing this as "the agreed-upon construction of image instances" and applying it within the unpatentability analysis). Because there is no dispute about the proper construction of "image instance" on the record before us, we need not construe this claim term. *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) ("The Board is required to construe 'only those terms . . . that are *in controversy*, and only to the extent necessary to resolve the controversy.'" (emphasis added) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

*B. Principles of Law*

A claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) if in evidence, so-called secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).[6]

"In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016). Although the burden of production may shift, the burden of

[6] The parties do not present evidence of secondary considerations.

persuasion on the issue of patentability remains with the petitioner always and never shifts to the patent owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). To prevail, the petitioner must support its challenge by a preponderance of the evidence. 35 U.S.C. § 316(e).

*C. Level of Ordinary Skill in the Art*

Petitioner asserts that a person of ordinary skill in the art of the '138 Patent would have had either (a) "a bachelor's degree in electrical engineering, computer science, or a similar field with at least two years of experience in distributed computing systems;" or (b) "a master's degree in electrical engineering, computer science, or a similar field with a specialization in distributed computing systems." Pet. 12 (citing Ex. 1003 ¶¶ 33–34). Petitioner further contends that "[a] person with less formal education but more relevant practical experience may also meet" the standard of a person of ordinary skill in the art. *Id.* Petitioner also asserts that a person of ordinary skill in the art

> in 2006 with the above level of skill would have had the knowledge and skills necessary to:
> - Create a distributed computing system with a network of computing devices/servers;
> - Use virtualized computing systems, including the use of commercially available software from VMware such as ESX and GSX software;
> - Create images of physical and virtual machines, including images that include [virtual machine monitors (VMMs)[7]], operating systems, and applications;

[7] The parties use the acronym VMM to refer to the virtual machine monitors disclosed in Khandekar and Le, consistent with the respective use of VMM

- Use rules engines and other knowledge-based systems to automatically deploy images to the nodes of a distributed computing system;
- Implement multi-tier applications and web services on distributed computer systems; and
- Implement systems to monitor the status and state of distributed computer systems.

Pet. 12–13 (citing Ex. 1003 ¶ 35); *see* Ex. 1003 ¶ 12.

Patent Owner contends that of a person of ordinary skill in the art "at the time of the invention of the '138 Patent would have had a bachelor's degree in Electrical Engineering, Computer Science, or a similar discipline, with one to two years of experience in this or a related field." PO Resp. 10 (citing Ex. 2001 ¶ 24). Patent Owner notes the similarities of Petitioner's description of a person of ordinary skill in the art, and asserts that "[a]ny differences in the parties' view of a [person of ordinary skill in the art] are not material to the arguments herein." *See id.* (citing Ex. 2001 ¶ 25).

We determine that a person of ordinary skill in the art would have had a bachelor's degree in electrical engineering, computer science, or a similar field with two years of experience in distributed computing systems, or a master's degree in electrical engineering, computer science, or a similar field with a specialization in distributed computing systems. Our adopted level of ordinary skill is consistent with the level of skill advocated by the parties

in Khandekar and Le. *See, e.g.*, Pet. 6; Ex. 1003 ¶ 12; PO Resp. 48–49, 51, 57–64; Ex. 1004, 4:67–5:1; Ex. 1005, 12:38. Patent Owner also uses the acronym VMM to refer to the claimed virtual machine manager. *See, e.g.*, PO Resp. 34. To avoid confusion, throughout the Decision, we use VMM to refer only to a virtual machine monitor and use the full term for the claimed virtual machine manager.

and the level of skill reflected by the '138 Patent Specification and the asserted prior art.

### *D. Challenges to Patentability*

#### *1. Challenge to Claims 1–5, 9, 19–21, and 26 over Khandekar*

##### *a. Overview of Khandekar (Ex. 1004)*

Khandekar is directed to the application of virtual machine (VM) technology, including creating, configuring, and deploying computer systems with user-specified features. *See* Ex. 1004, 1:7–10, 4:30–35. "The main idea of the invention is that a user who wants access to a computer with specific configuration characteristics interacts with [a] provisioning server . . . and, by means of [a] user console[,] . . . selects components of the computer that he wants to have." *Id.* at 9:65–10:3.

Figure 2 of Khandekar is reproduced below.

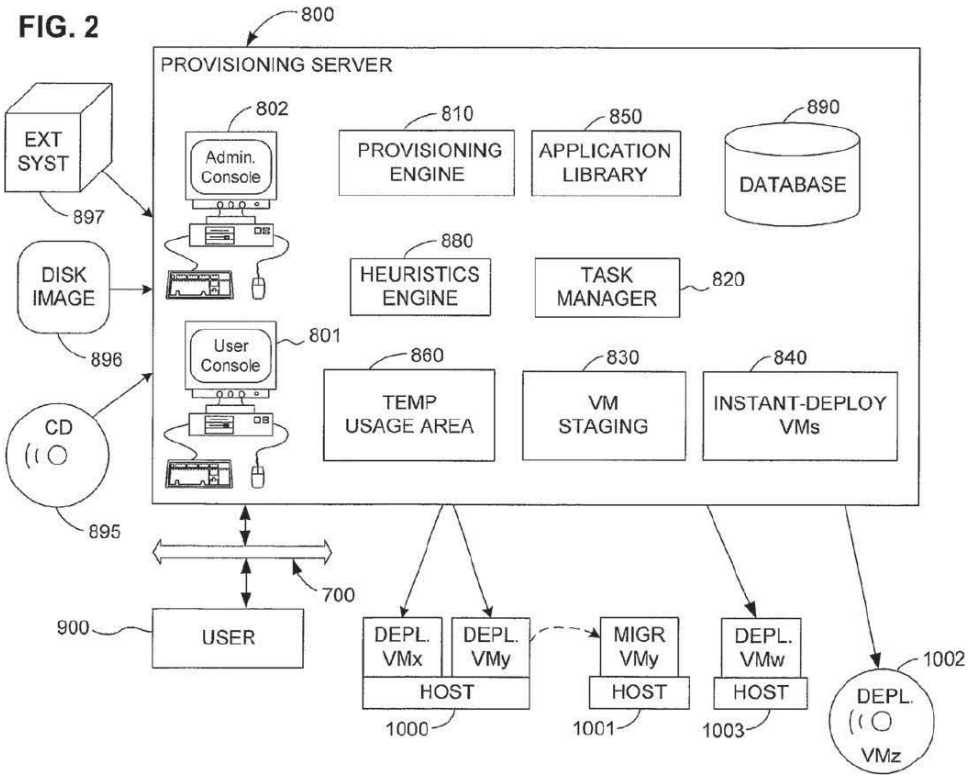

Figure 2 illustrates the main components of VM provisioning. *See* Ex. 1004, 4:17–18, 9:10–12. Provisioning server 800 includes system hardware, system software, and devices as needed. *See id.* at 9:26–32. User console 801 allows end users to interact with provisioning server 800 via network 700 to specify input parameters. *See id.* at 9:46–49, 9:53–56, 13:65–15:39. Administration console 802 allows an administrator to interact with provisioning server 800 to monitor the operations state of the various computers and maintain database 890. *See id.* at 9:59–64, 18:1–55. Heuristics engine 880 takes user input and applies heuristics/rules to select the most appropriate VM from staged VM staging library 830. *See id.* at 10:27–29, 15:40–17:29, Fig. 3. At least one host computer 1000, 1001 is made available to provisioning server 800, and heuristics engine 880 selects which host 1000, 1001 is most appropriate to provision and on which to deploy a VM. *See id.* at 10:29–33. Heuristics engine 880 selects the applications from library 850 to install in the newly created VM. *See id.* at 10:33–35, 18:56–19:18, Fig. 5.

Library 840 stores instant deployment VMs kept in a suspended state until deployed, which allows a user to select a fully configured VM according to an instant-deployment embodiment. *See* Ex. 1004, 11:20–24, 17:30–67, Fig. 4. After the user selects a fully configured VM, provisioning server 800 selects an appropriate host 1000, 1001 on which to provision the VM, copies necessary data to that host, and resumes execution of the VM on the host. *See id.* at 11:24–27.

Khandekar discloses that some interface is usually required between a VM and the underlying host platform, particularly between the VM and the

host operating system, and this interface is referred to as the virtual machine monitor (VMM). *See* Ex. 1004, 6:63–7:6.

> In the preferred embodiment of the invention, a VMM is already pre-installed on each host 1000, 1001 so as to ensure compatibility and proper configuration. . . . It would also be possible, however, for a corresponding VMM to be included along with each staged VM, as long as the characteristics of the host on which the VM is to be installed are known. An advantage of pre-installing a VMM, without a VM, on a plurality of hosts, such as hosts 1000, 1001, 1003, is that it will then be possible to deploy a given VM on any arbitrary one (or more) of these hosts.

Ex. 1004, 13:19–35.

*b. Analysis*

*1. Claims 1–5 and 9*

The limitation of independent claim 1 that recites "a plurality of image instances of a plurality of software applications that are executable on the plurality of virtual machines" is dispositive to our analysis of Petitioner's challenge to claim 1 and claims 2–5 and 9, which depend from claim 1, as obvious over Khandekar. Below, we summarize Petitioner's arguments regarding the preamble and preceding limitations of claim 1 for context and then provide our analysis of the dispositive limitation.

*(a) Claim 1: A distributed computing system comprising:*

Petitioner contends that Khandekar teaches "[a] distributed computing system," as recited in claim 1, based on Khandekar's disclosure of a network of cooperating VMs deployed on respective physical host platforms. *See* Pet. 21–22 (reproducing Ex. 1004, Fig. 2; quoting Ex. 1004, 5:9–11, 12:40–44; citing Ex. 1004, code (57), 4:30–35, 4:58–5:8, 5:11–13, 12:44–50, 23:26–51, 23:54–24:7, Fig. 7; Ex. 1003 ¶¶ 66–69).

*(b) Claim 1: a software image repository comprising non-transitory, computer readable media operable to store: (i) a plurality of image instances of a virtual machine manager that is executable on a plurality of application nodes*

Petitioner asserts that Khandekar teaches the distributed computing system comprises "a software image repository comprising non-transitory computer readable media operable to store . . . a plurality of image instances," as recited in claim 1, based on Khandekar's disclosure of a provisioning server that includes various libraries for storing software images. *See* Pet. 22–23 (reproducing Ex. 1004, Fig. 2; quoting Ex. 1004, 4:36–38, 11:37; citing Ex. 1004, 4:38–41, 11:36–49, 23:28–51, 23:54–24:7; Ex. 1003 ¶¶ 74–77). Petitioner asserts that Khandekar discloses the provisioning server includes several libraries/repositories for software images, and that the provisioning server acts as a central repository with images of virtual machines and applications. *See id.* at 23 (citing Ex. 1004, 11:21–25, 11:50–58, 16:43–63, 18:1–42, 18:56–19:2; Ex. 1003 ¶ 76). According to Petitioner, "Khandekar teaches using standard computer components, which obviously would have included hard disks." *Id.* at 24 (citing Ex. 1004, 9:26–32; Ex. 1003 ¶ 77).

Petitioner further asserts that Khandekar teaches a "virtual machine manager that is executable on a plurality of application nodes" based on Khandekar's disclosure that a VMM is installed on each of a plurality of hardware hosts. *See* Pet. 26–27 (quoting Ex. 1004, 4:66–5:2, 7:7–9; citing Ex. 1004, 5:2–8, 7:10–27, 13:17–35; Ex. 1003 ¶¶ 81–94). Petitioner contends that Khandekar teaches the provisioning server stores a plurality of image instances of VMs and that when the provisioning server provides a VM to a host, it may also include a VMM together with the VM. *See id.*

at 27 (quoting Ex. 1004, 8:41–44, 13:17–28; citing Ex. 1004, 8:36–41, 13:28–35; Ex. 1003 ¶ 82; Pet. 41–47). Petitioner asserts that a person of ordinary skill would have found it obvious to store VMM images in a single repository in the provisioning server because Khandekar teaches storing VMs there, and a corresponding VMM is included and installed together for each VM. *See id.* at 23 (citing, e.g., Ex. 1004, 8:36–44, 13:17–35; Ex. 1003 ¶ 75).

Petitioner asserts that it would have been obvious to one of ordinary skill in the art to modify Khandekar's teachings to include storing a plurality of VMM images, in addition to storing the VM images, in the provisioning server in order to deploy the VMMs and VMs together. *See* Pet. 23, 26–29; *KSR*, 550 U.S. at 418. According to Petitioner, "[s]ince VM images are stored in the provisioning server, a [person of ordinary skill in the art] would have found it obvious to likewise store a plurality of VMM images in the provisioning server so they may be deployed together to hosts, as taught by Khandekar." Pet. 27 (citing Ex. 1004, 8:36–44, 13:17–35); *see id.* at 23 (citing Ex. 1004, 8:36–44, 13:17–35; Ex. 1003 ¶ 75; Pet. 26–32), 28–29 (citing Ex. 1004, 4:36–41, 11:21–25, 16:43–63, 8:36–44, 13:17–35; Ex. 1003 ¶¶ 48, 84). Petitioner further contends that "[d]oing so would have allowed the hosts to be remotely initialized with VMM software and configured to support virtual machines, facilitating Khandekar's goals of automated, flexible deployment of VMs to hosts." *Id.* at 27–28 (citing Ex. 1004, 4:30–35; Ex. 1003 ¶ 83). Petitioner asserts that this modification would also remove the need to manually install VMMs on hosts, which is advantageous for a large number of hosts. *See id.* at 28 (citing Ex. 1004, 4:30–35; Ex. 1003 ¶ 83).

*(c) Claim 1: wherein when executed on the applications nodes, the image instances of the virtual machine manager provide a plurality of virtual machines, each of the plurality of virtual machine operable to provide an environment that emulates a computer platform, and*

Petitioner asserts that Khandekar teaches "when executed on the applications nodes, the image instances of the virtual machine manager provide a plurality of virtual machines, each of the plurality of virtual machine operable to provide an environment that emulates a computer platform," as recited in claim 1, based on Khandekar's disclosure in Figure 1 of VMMs that are executed on a host computer and provide a plurality of VMs. *See* Pet. 37–38 (reproducing Ex. 1004, Fig. 1; quoting Ex. 1004, 5:51–58; citing Ex. 1004, 7:7–27, 13:17–35; Ex. 1003 ¶¶ 112–116). Petitioner further contends that Khandekar teaches each of the VMs is operable to provide an environment that emulates a computer platform. *See id.* at 39–40 (quoting Ex. 1004, 6:23–43, 7:45–47; citing Ex. 1004, 6:44–61, 7:39–44; Ex. 1003 ¶ 115).

*(d) Claim 1: (ii) a plurality of image instances of a plurality of software applications that are executable on the plurality of virtual machines; and*

Petitioner asserts that Khandekar teaches the software image repository is operable to store "a plurality of image instances of a plurality of software applications that are executable on the plurality of virtual machines," as recited in claim 1, based on Khandekar's teachings of three choices for storing and deploying image instances: pre-built, custom-built, and instantly deployable VMs. *See* Pet. 41–42 (quoting Ex. 1004, 9:10–25; citing Ex. 1004, 10:15–26, 14:4–8, 18:56–19:2; Ex. 1003 ¶¶ 122–139; Pet. 13–16, 55–60). According to Petitioner, "[e]ach teaching independently

renders [this] limitation . . . obvious by teaching a plurality of virtual disk image files." *Id.* at 42.

Petitioner further contends that for pre-built and instantly deployable VMs, Khandekar teaches that each virtual disk image file includes an operating system and application data, and for custom-built VMs, the virtual disk image file only includes the operating system. *See* Pet. 42 (citing Ex. 1003 ¶ 123), 43 (quoting Ex. 1004, 15:43–45; citing Ex. 1004, 5:25–36, 8:50–55, 10:15–26, 14:19–25, 15:40–16:12, 18:16–23, Fig. 3; Ex. 1003 ¶¶ 126, 129), 44 (citing Ex. 1004, 15:41–46), 46–47 (citing Ex. 1004, 16:43–63; Ex 1003 ¶ 134). Petitioner asserts that Khandekar teaches its provisioning server includes a plurality of images of pre-built VMs, custom-built VMs, and instantly deployable VMs that are stored in a library or repository of the provisioning server. *See id.* at 42 (quoting Ex. 1004, 10:29, 18:16–23; citing Ex. 1004, 10:27–29, 16:43–63, 22:17–22, 23:54–24:27, Figs. 2–3; Ex. 1003 ¶ 126), 43 (citing Ex. 1004, 15:29–40, 16:43–52; Ex. 1003 ¶ 128), 44 (citing Ex. 1004, 16:43–17:13). Finally, Petitioner contends that Khandekar teaches the aforementioned limitation of claim 1 because "each pre-built, custom-built, and instantly deployable VM includes a virtual disk image file with an OS [(operating system)] and applications that are executable on the virtual machines." *Id.* at 47 (citing Ex. 1004, 6:43–56; Ex. 1003 ¶ 137).

Patent Owner contends that Petitioner relies on the VMs disclosed in Khandekar to satisfy both the recited "image instances of the plurality of software applications" and "the virtual machine." *See* PO Resp. 60 (citing Pet. 41–47). Patent Owner asserts that "none of Khandekar's disclosures related to pre-built, custom-built, and instantly deployable VMs satisfy [the]

requirement for a 'plurality of image instances of a plurality of software application that are executable on the plurality of virtual machines.'" *Id.* at 53 (emphasis omitted).

Petitioner responds that for software application images, Petitioner relies on Khandekar's images of pre-built, custom-built, and instantly deployable VMs, and for virtual machines, Petitioner relies on VMs provided by VMMs, including from VMware software. *See* Pet. Reply 28 (citing Pet. 37–47; Ex. 1004, Fig. 1). Petitioner contends that Khandekar teaches using VMM software to run VMs. *See id.* at 28–29 (reproducing Ex. 1004, Fig. 1; citing Pet. 37–47; Ex. 1029 ¶¶ 4–5). According to Petitioner, "Khandekar's three types of VM images satisfy the agreed-upon construction of image instances: 'a snapshot, or copy, of installed and configured software.'" *Id.* at 29 (citing Pet. 43–47; Ex. 1003 ¶¶ 123, 126–136); *see also id.* at 29–30 (citations omitted) (arguing that images of pre-built, custom-built, and instantly deployable VMs satisfy this construction of image instances).

Patent Owner replies that it never disputed that Khandekar teaches software application images. *See* PO Sur-reply 25 (citing Pet. Reply 28). Rather, Patent Owner "strenuously disputes that either Khandekar and/or Le disclose 'a plurality of image instances of a plurality of software applications that are *executable on* the plurality of virtual machines' as required by the Challenged Claims." *Id.* (citing Ex. 1001, 36:30–32, 38:9–11, 39:4–6) (emphasis added).

We agree with Patent Owner's arguments. Petitioner does not present evidence sufficient to demonstrate that virtual disk image files for Khandekar's pre-built, custom-built, and instantly deployable VMs are

"executable on the plurality of virtual machines" (i.e., capable of execution on the plurality of virtual machines). At best, Petitioner cites Khandekar's teachings that it is the operating system and applications of Khandekar's virtual disk image files—not the virtual disk image files themselves—that are executable on the virtual machines. *See* Pet. 47 (citing Ex. 1004, 6:42–56 (disclosing applications installed and loaded for running on the VM); Ex. 1003 ¶ 137. But this is inconsistent with Petitioner's position that it is Khandekar's virtual disk image files themselves that teach "a plurality of image instances of a plurality of software applications." *See* Pet. 41–42.

In an alternative position, Petitioner asserts that "[t]o the extent P[atent Owner] contends the software applications are somehow distinct from the virtual disk image file, Khandekar teaches custom-built VMs where application images (installation files) are stored in an application library and copied to hosts." Pet. 42 (citing Ex. 1003 ¶ 124). More specifically, Petitioner contends the custom-built VMs include VM disk files that are stored in the provisioning server and copied to hosts. *See id.* at 44 (citing Ex. 1004, 16:43–17:13). Petitioner asserts that for custom-built VMs, the virtual disk image only includes the operating system. *See id.* (citing Ex. 1004, 15:41–46). Petitioner asserts that "[a]pplication images (application installation files) are stored in the provisioning server's application library and copied to hosts." *Id.* at 44–45 (quoting Ex. 1004, 20:18–20, 20:26–28; citing Ex. 1004, 4:42–51, 19:20–20:30, 21:25–64, 23:28–51; Ex. 1003 ¶ 132). Petitioner asserts that "Khandekar teaches images of software applications stored in an applications library . . . that are executable on VMs." *Id.* at 45 (reproducing Ex. 1004, Fig. 5; quoting

Ex. 1004, 18:56–61, 11:50–53; citing Ex. 1004, 10:27–42, 11:53–58, 12:13–23, 18:56–9:2; Ex. 1003 ¶ 131).

In response, Patent Owner contends that Khandekar teaches that custom-built VMs will be stored with just their operating systems installed, and further teaches "the use of an 'executable installation file,' *i.e.*, the file used to install an application for the first time." PO Resp. 52–53 (citing Ex. 1004, 15:45–46, 18:61–19:2). According to Patent Owner, "[t]his installation file . . . is not equivalent to the 'image instances of software applications' required by the '138 Patent." *Id.* at 53 (citing Ex. 2001 ¶ 137). Patent Owner contends that Petitioner "admits that an 'image instance' as used in the '138 Patent refers to 'a snapshot, or copy, of installed and configured software.'" *Id.* (emphasis omitted) (quoting Ex. 2003, 2); *accord* Pet. Reply 29. Patent Owner asserts that Khandekar's executable installation file is completely different from an image instance, and a person of ordinary skill in the art would not recognize them to be equivalent. *See* PO Resp. 53 (citing Ex. 2001 ¶ 137).

Petitioner's Reply does not address Patent Owner's contentions disputing whether Khandekar's application installation files for custom-built VMs teach or suggest "image instances of a plurality of software applications." *See* Pet. Reply 28–30.

We agree with Patent Owner's arguments that Khandekar's disclosure of application installation files does not teach or suggest "a plurality of image instances of a plurality of software applications," in accordance with Petitioner's construction of "image instance." *See* PO Resp. 52–53; Pet. Reply 29 ("Khandekar's three types of VM images satisfy the agreed-upon construction of image instances: 'a snapshot, or copy, of installed and

configured software.'"). We agree with and credit Dr. Rosenblum's persuasive testimony distinguishing Khandekar's "executable installation file" from the recited "image instances of software applications." *See* Ex. 2001 ¶ 137. Accordingly, Petitioner does not present sufficient argument or evidence to demonstrate that Khandekar's application installation files teach or suggest "a plurality of image instances of a plurality of software applications," in accordance with Petitioner's construction of an "image instance" as "a snapshot, or copy, of installed and configured software."

For the foregoing reasons, Petitioner does not present evidence sufficient to demonstrate that Khandekar teaches, suggests, or renders obvious "a plurality of image instances of a plurality of software applications that are executable on the plurality of virtual machines."

*(e) Summary*

After having analyzed the entirety of the record and assigning appropriate weight to the cited supporting evidence, we determine that Petitioner has not established by a preponderance of the evidence that claim 1 and claims 2–5 and 9, dependent therefrom, are unpatentable under 35 U.S.C. § 103 as obvious over Khandekar.

*2. Claims 19–21 and 26*

Independent claims 19 and 26 have similar limitations as those recited in claim 1, in the forms of a method (claim 19) and a non-transitory, computer-readable medium (claim 26). *Compare* Ex. 1001, 38:1–21 (claim 19), *and id.* at 38:61–39:15 (claim 26), *with id.* at 36:26–49 (claim 1).

Identical to claim 1, claims 19 and 26 each recite "a plurality of image instances of a plurality of software applications that are executable on the plurality of virtual machines." *Id.* at 38:9–11, 39:4–6.

Petitioner asserts that Khandekar teaches, suggests, or renders obvious the limitations of claim 19, relying primarily on its arguments addressing claim 1. *See* Pet. 66–70 (citations omitted). Petitioner also contends that Khandekar teaches, suggests, or renders obvious the limitations of claim 26, relying primarily on its arguments addressing claim 19. *See* Pet. 71–74 (citations omitted).

For the same reasons as those explained above addressing claim 1, Petitioner does not present evidence sufficient to demonstrate that Khandekar teaches, suggests, or renders obvious "a plurality of image instances of a plurality of software applications that are executable on the plurality of virtual machines," as recited in claims 19 and 26.

After having analyzed the entirety of the record and assigning appropriate weight to the cited supporting evidence, we determine that Petitioner has not established by a preponderance of the evidence that independent claims 19 and 26 and claims 20 and 21, dependent from claim 19, are unpatentable under 35 U.S.C. § 103 as obvious over Khandekar.

*2. Challenge to Claims 1–5, 9, 19–21, and 26 over Khandekar and Le*

For its challenge based on Khandekar and Le, Petitioner does not rely on the teachings of Le to address the limitation "a plurality of image instances of a plurality of software applications that are executable on the plurality of virtual machines," recited in each of independent claims 1, 19, and 26. *See* Pet. 41–47, 68, 73.

For the same reasons as those explained above addressing the challenge to patentability on the basis of Khandekar alone, discussed above in Section II.D.1., Petitioner does not present evidence sufficient to demonstrate that the combination of Khandekar and Le teaches, suggests, or renders obvious "a plurality of image instances of a plurality of software applications that are executable on the plurality of virtual machines," as recited in claims 1, 19, and 26.

After having analyzed the entirety of the record and assigning appropriate weight to the cited supporting evidence, we determine that Petitioner has not established by a preponderance of the evidence that claims 1–5, 9, 19–21, and 26 are unpatentable under 35 U.S.C. § 103 as obvious over Khandekar and Le.

*3. Challenge to Claims 9 and 10 over Khandekar, Le, and Sidebottom*

In its challenge based on Khandekar, Le, and Sidebottom, Petitioner relies on the teachings of Sidebottom to address the limitations of claims 9 and 10, which depend from independent claim 1, and does not rely on Sidebottom's teachings to address "a plurality of image instances of a plurality of software applications that are executable on the plurality of virtual machines," recited in independent claim 1. *See* Pet. 74–79.

For the same reasons as those explained above addressing the challenges to patentability on the basis of Khandekar alone, and on the basis of the combination of Khandekar and Le, discussed above in Sections II.D.1. and II.D.2., Petitioner does not present evidence sufficient to demonstrate that the combination of Khandekar, Le, and Sidebottom teaches, suggests, or renders obvious "a plurality of image instances of a plurality of software

applications that are executable on the plurality of virtual machines," as recited in claim 1.

After having analyzed the entirety of the record and assigning appropriate weight to the cited supporting evidence, we determine that Petitioner has not established by a preponderance of the evidence that claims 9 and 10 are unpatentable under 35 U.S.C. § 103 as obvious over Khandekar, Le, and Sidebottom.

*4. Challenge to Claim 17 over Khandekar, Le, and Stone*

For its challenge based on Khandekar, Le, and Stone, Petitioner relies on the teachings of Stone to address the limitations of claim 17, which depends from claim 1, and does not rely on Stone's teachings to address "a plurality of image instances of a plurality of software applications that are executable on the plurality of virtual machines," recited in independent claim 1. *See* Pet. 80–87.

For the same reasons as those explained above addressing the challenges to patentability on the basis of Khandekar alone, and on the basis of the combination of Khandekar and Le, discussed above in Sections II.D.1. and II.D.2., Petitioner does not present evidence sufficient to demonstrate that the combination of Khandekar, Le, and Stone teaches, suggests, or renders obvious "a plurality of image instances of a plurality of software applications that are executable on the plurality of virtual machines," as recited in claim 1.

After having analyzed the entirety of the record and assigning appropriate weight to the cited supporting evidence, we determine that Petitioner has not established by a preponderance of the evidence that

claim 17 is unpatentable under 35 U.S.C. § 103 as obvious over Khandekar, Le, and Stone.

## III. CONCLUSION

For the reasons explained above, we conclude as follows:

| Claim(s) | 35 U.S.C. § | Reference(s)/Basis | Claim(s) Shown Unpatentable | Claim(s) Not Shown Unpatentable |
|---|---|---|---|---|
| 1–5, 9, 19–21, 26 | 103 | Khandekar | | 1–5, 9, 19–21, 26 |
| 1–5, 9, 19–21, 26 | 103 | Khandekar, Le | | 1–5, 9, 19–21, 26 |
| 9, 10 | 103 | Khandekar, Le, Sidebottom | | 9, 10 |
| 17 | 103 | Khandekar, Le, Stone | | 17 |
| **Overall Outcome** | | | | 1–5, 9, 10, 17, 19–21 |

## IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has not shown by a preponderance of the evidence that claims 1–5, 9, 10, 17, 19–21, and 26 of the '138 Patent are unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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## CERTIFICATE OF SERVICE

The undersigned hereby certifies that on May 12, 2022, a complete copy of the Petitioner's Notice of Appeal was filed by U.S. Priority Mail Express with the Office of the General Counsel, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. The Notice of Appeal is also being filed with the Patent Trial and Appeal Board through the PTAB E2E system. Finally, this Notice of Appeal is being filed, along with the required docketing fees, with the Clerk's Office for the United States Court of Appeals for the Federal Circuit.

A copy of this Notice of Appeal is being served via email to all parties to this proceeding at the addresses indicated:

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